

**TAXONOMIC MONOGRAPH OF THE  
GENUS PITYOPHTHORUS EICHHOFF IN  
NORTH AND CENTRAL AMERICA  
(COLEOPTERA: SCOLYTIDAE)**

**DONALD E. BRIGHT**

MEMOIRS OF  
THE ENTOMOLOGICAL SOCIETY OF CANADA — No. 118

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**Abstract**

A revision of the species in the genus *Pityophthorus* Eichhoff in North and Central America is presented. The limits of *Pityophthorus* are expanded to include the species previously placed in *Gnatholeptus* Blackman. This unit is maintained as a subgenus. One additional subgenus is described, *Hypopityophthorus*, for *P. debilis* Wood and *P. inops* Wood. The genus contains 220 species in North and Central America. The principal subgenus *Pityophthorus* is divided into 47 species groups. New species are: *micans* (Mexico), *sapineus* (Mexico), *miniatus* (Honduras, Guatemala, and Mexico), *pubifrons* (Mexico), and *acceptus* (British Columbia, Wyoming). New synonymy is proposed as follows: *P. deletus* LeConte (= *P. dolus* Wood); *P. exquisitus* (Blackman) n. comb. (= *P. inceptis* Wood); *P. intextus* (= *P. ornatus* Blackman and *P. limatus* Wood); *P. balsameus* Blackman (= *P. angustus* Blackman) and *P. indigens* Wood (= *P. irritans* Schedl). Five species are given new status as subspecies: *P. tuberculatus* Eichhoff as a subsp. of *P. pulchellus* Eichhoff; *P. subopacus* Blackman as a subsp. of *P. segnis* Blackman; *P. bellus* Blackman as a subsp. of *P. confusus* Blandford; *P. agnatus* Blackman as a subsp. of *P. confertus* Swaine, and *P. aurulentus* Bright as a subsp. of *P. murrayanae* Blackman.

The monograph includes an historical review, a discussion of diagnostic characters, and a discussion of the general biology of species in the genus. Keys to subgenera, species groups, and species are provided. Each species is described and many are illustrated, and all known bionomic and distributional data are included. Distribution records of many species are mapped.

This paper presents a taxonomic treatment of the species of *Pityophthorus* Eichhoff occurring in North and Central America. Two hundred and twenty species are treated, several of which are divided into subspecies. Only five new species are described in the present paper; however, during the course of this study, over 85 species have been described by Bright (1976b, 1977, 1978) and Wood (1971-1977c). In addition, numerous cases of synonymy were documented by the same authors.

*Pityophthorus* contains more than 350 species distributed throughout the world approximately as follows: North and Central America, 220; South America and the West Indies, 55; Africa and Madagascar, 40; Palearctic Region, 27; Japan, 1; and the Philippines, 1; none occurs in the Australian Region. Some of the South American and African species currently in *Pityophthorus* may eventually have to be removed from the genus when the generic concepts are better understood and likewise some species will be transferred into the genus from related genera such as *Araptus* Eichhoff. Among the North and Central American species, 78 are known only from Central America and/or southern Mexico, 39 are known from northern Mexico only, 20 are recorded only from the southwestern United States (and usually northern Mexico), 50 occur in western North America, 14 in eastern North America, and 14 in large areas throughout North America. Only five species are known only from Canada but it is expected that most of these will eventually be found in adjacent parts of the United States. The distribution of each species is outlined in the systematics section.

The North American fauna has been reviewed three times. LeConte, in LeConte and Horn (1876), was the first to attempt a classification, followed by Swaine (1918) and Blackman (1928). Blackman's 1928 work was the standard reference for the genus for the next 50 years. As new species were discovered and new synonyms recognized, his work became obsolete. The determination of species, which was always difficult,

became nearly impossible except for those treated in recent regional works, such as Dodge (1938), Beal and Massey (1945), Wood (1971a), and Bright and Stark (1973).

The present contribution includes all available information on the taxonomy, the geographic distribution, and the biology of the adults. The larvae have not been described except for the brief comparative statements by Thomas (1957) and the descriptions of the larvae of six palearctic species by Lekander (1968). No attempt has been made to include the taxonomy of larval stages in this work.

#### HISTORICAL REVIEW

The following outline reviews only those contributions which have added to the knowledge of *Pityophthorus*, particularly in North America. Papers containing only descriptions of new species are omitted.

Eichhoff (1864) described the genus and included in it two species (*lichtensteini* Ratzeburg and *micrographus* Linnaeus) and a doubtful third (*exsculptus* Ratzeburg). Additional species were placed in the genus by Eichhoff (1872a, b, 1878, 1881).

LeConte, in LeConte and Horn (1876), treated the genus and presented keys to the 18 species then recognized. This early concept of *Pityophthorus* embraced what is now known to be five related genera plus *Pityophthorus*. It is evident that LeConte recognized the differences shown by the species he included in *Pityophthorus* because he divided the genus into three sections: Section A contained the species now in *Gnathotrichus* Eichhoff, Section B included the species now in *Pseudopityophthorus* Swaine, and Section C which contained the species now in *Pityophthorus* as well as a species now in *Pityoborus* Blackman and two species now in *Pityogenes* Bedel.

In 1883 LeConte, in LeConte and Horn (1883), slightly refined his concept of the genus by formally removing those species which belonged in *Gnathotrichus*.

From that time on, very little was done in North America except for the describing of a few new species until 1909 when Swaine wrote his "Catalogue of the Described Species of Scolytidae of America . . .". Swaine included 27 species in the genus but, once again, representatives of several genera were included in this early concept.

In 1910, the Coleopterorum Catalogus was published. *Pityophthorus* then contained 64 species, worldwide.

In 1914, Hopkins designated *Bostrichus lichtensteini* Ratzeburg as the type-species.

Blatchley and Leng (1916) provided a key for the eastern species of *Pityophthorus*. They followed closely the arrangement given by LeConte, in LeConte and Horn (1876), and modified by LeConte in 1883, in LeConte and Horn (1883). They indicated that the entire arrangement of the genus was provisional and would be superseded by Department of Agriculture publications later (Hopkin's?) which did not appear.

In 1918, Swaine published his "Canadian Bark Beetles" in which 26 species were treated. Swaine's concept of *Pityophthorus* was essentially that used preceeding the present study. The species which previous authors had included in the genus but which were not congeneric with the type-species had been removed and placed in their proper genera. Every species (except one) that Swaine included in *Pityophthorus* is still in the genus, either as valid species or as synonyms. The one exception was taken out by Blackman (1928) to form a new genus, *Myeloborus*, which was placed back in *Pityophthorus* during the present study (Bright 1977).

In 1922, Blackman provided descriptions, biological information, and a key to 11 species from Mississippi.

The major contribution to the study of the genus was published in 1928 by M.W. Blackman, who, working at the New York State College of Forestry, had at

his disposal thousands of specimens of *Pityophthorus* that had accumulated in the United States National Museum due to the collecting by field workers conducting forest insect investigations. Nearly three-quarters of the specimens of this genus collected in the western part of the continent were of undescribed species. Blackman divided the genus into seven groups and described two additional genera to accommodate new species which he discovered. Seventy-one species were described as new and 35 previously described species were recognized, for a total of 106 species recognized in North America. Blackman's system has remained in use until the present study. As new species were discovered during the last 15 years, it was found that Blackman's groups would no longer hold, and a new system had to be developed.

After Blackman's revision, various regional studies were completed. These studies essentially followed Blackman's arrangement and, other than proposing new species or new synonyms, did not materially change the system as proposed by Blackman.

In 1938, Schedl attempted to improve the classification of the group of genera in the Pityophthorinae. He briefly discussed the importance of various morphological features, such as the antenna, tibia, and pronotal sculpture. He presented a key to the genera as he recognized them, including four new ones.

In Europe, various regional works have been published that contain discussions of *Pityophthorus* species, but no recent comprehensive review of the genus was available until Pfeffer published his study in 1976. Pfeffer recognized 23 species with three species each containing two subspecies. He discussed the biology, ecology, host relationships, distribution, morphology, and taxonomy of species in the genus. Pfeffer's work serves as an excellent foundation for further work on the Palearctic members of *Pityophthorus*.

The African species were treated by Schedl (1962). He gives taxonomic and biological information on the 22 species known to him, but no key or descriptions. Schedl (1977a) treated nine species from Madagascar, but again no key or descriptions are given.

The species occurring in Mexico, Central America, and South America have never been revised or treated in any way except for new species descriptions and the very brief key given for the known Central American species by Blandford (1904).

## BIOLOGY

Individuals of the species in this genus occur either under the bark or in the pith of recently dead or dying small twigs, branches or boles of coniferous and deciduous trees and in the stems of woody shrubs and vines. The economic damage is generally nil, but some species have been implicated in causing the death of small trees in plantations (especially Christmas trees), several species have been thought to transmit some tree diseases, some species (e.g. *boycei*) are suspected to predispose trees to *Dendroctonus* attacks. As forestry practices change and environments are altered, species of *Pityophthorus* may become serious problems. Members of the genus may also be considered beneficial in that they hasten the decay and eventual breakdown of their host plant by their boring activities.

Coniferous trees in the family Pinaceae serve as hosts for a majority of the species. However, a significant fauna occurs in woody shrubs, vines, non-coniferous trees and herbaceous vegetation. Of the 220 species treated herein, 141 occur in various species of conifers, and of that figure, 101 occur only in *Pinus* spp., eight are found only in *Abies* spp., four only in *Picea* spp., two only in *Pseudotsuga* spp., one is found only in *Larix* sp., and 24 occur in various combinations of the four above genera. No species occur in the coniferous families Taxodiaceae, Cupressaceae, or the Taxaceae.

Of the remaining 79 species, 26 occur in deciduous trees, 31 occur in vines or shrubs, and the host is unrecorded or unknown for 22 species.

Detailed information on the bionomics of most species of *Pityophthorus* is lacking. Amman *et al.* (1974) gave some details on the biology of *confertus*, Hedlin and Ruth (1970) report some data on *orarius*, Blackman (1928) discussed the biology of *ramiperda* (as *fivazi*), and *pulicarius* has been studied by a number of authors. The information contained in the above papers and in other miscellaneous papers is summarized in the discussions of the individual species.

The species in this genus are chiefly polygamous. Monogamy has not yet been detected for any New World species but may exist in those species that are mainly pith borers. It is suspected that *opaculus* and *puberulus* may be monogamous. Monogamy has been documented for the Palearctic species *henscheli* Seitner, *traegardhi* Spessivtseff, *carniolicus* Wichmann, and *morosovi* Spessivtseff (Pfeffer 1976).

Two major types of gallery patterns are observable in the North American phloeophagous species. The most common type is a star-shaped configuration on the cambial region of the host. In this case, the male attacks first and forms a large irregular chamber in the cambium under the entrance hole in the bark. From three to five females (sometimes more) join the male and after mating, construct individual galleries radiating from the central chamber. These galleries are generally kept free of frass. Eggs are laid along the gallery walls in small, specially prepared niches, and the larvae feed away from the galleries in the cambium region. The second major type of gallery is the pitch galleries. Species constructing this type of gallery are generally found in very small twigs. In this case, the male, followed by the female, bores directly into the pith. The female continues mining in the pith, laying eggs along the gallery wall. The larvae feed in the pith and may eventually mine out the entire twig, leaving only a thin covering of bark. Occasionally, species forming star-shaped galleries may bore into the pith and continue mining there to escape excessive heat or dryness. Several variations of the two main types described above have been noted and there is also considerable individual variation between individuals of any one species.

The gallery patterns of the Central American vine-inhabiting species have not been reported.

The number of eggs laid by individual females varies considerably. Hedlin and Ruth (1970) reported that females of *orarius* deposit only one or two eggs in a small chamber at the base of a lateral twig and Amman *et al.* (1974) reported that females of *confertus* lay an average of about 15 eggs per gallery.

Larvae feed either in the cambial region or in the pith, depending on the species involved. Head capsule measurements indicate that the larvae pass through either two (Amman *et al.* 1974) or three (Hedlin and Ruth 1970) instars.

Pupation occurs in enlarged cells at the end of the larval mines or in the pith.

The number of generations per year is not recorded for any phloeophagous species, but presumably is one or fewer per year in the northern latitudes or higher elevations and several per year in the more southern regions or lower elevations.

Large populations of *Pityophthorus* individuals can develop under optimum conditions and these can have a profound effect on other organisms occupying the same host. In a study of the mortality factors of the fir engraver beetle, *Scolytus ventralis* LeConte, a primary enemy of firs in western North America, Stark and Borden (1965) reported that *Pityophthorus pseudotsugae* was a major mortality factor. No brood of *S. ventralis* was found in a section of the bole from 6 to 9 ft above the ground although parental galleries were present and 1277 egg niches were counted. Over 300 adult galleries of *pseudotsugae* occurred in that area and in a 1-ft section of the bole, over 500 *Pityophthorus* adults were found in 110 galleries.

The utilization of pheromones in the secondary attraction process has not been clearly demonstrated for any species of *Pityophthorus* but undoubtedly occurs. Vité (1965) has shown that attacking male *confertus* and *annectens* boring in their respective hosts in field olfactometers, attracted large numbers of beetles of the same species from natural populations. A distinct daily response rhythm was detected. Whether this secondary attraction was in response to natural attractants produced by the host in response to the boring activities of the beetles or to insect-produced attractants is not clear. Chararas (1966) reported tests that indicate that males of *pityographus* (Ratzeburg) (a European species) can attract females. The nature of the attraction was not reported.

#### DIAGNOSTIC CHARACTERS

The various morphological characters used in this study should be familiar to workers in the Coleoptera. However, to ensure that the correct interpretations are applied, a brief discussion of the most commonly used terms is appropriate.

**Frons.** As used in the work, this term denotes the area of the head between the eyes and extending from the epistoma to or above the upper level of the eyes. It is not delimited by sutures as in other insects. This region is one of the most important regions for taxonomic discrimination on the entire body. The characters displayed on the frons are useful for sex, group, and specific determinations.

The frons varies in several distinct directions. On the females, it may be concave, flattened or convex, glabrous or pubescent in all degrees, with or without a carina or any combination of the above. On the males, the frons may be transversely impressed, or convex or deeply to shallowly concave and may bear either a longitudinal or a transverse carina or both. The pubescence is usually much less evident. Several unique departures from the general conditions described above can be noted in several species.

**Antennae.** Several diagnostic characters of primary importance are present on the antennal club. The scape and funicle of the antennae are very similar in all species. The antennal club is circular to oval with two distinct, visible sutures (Figs. 8, 9) (two exceptions). These sutures may be straight to strongly arcuate. The lateral and mesal ends of the sutures on most species are distinctly sclerotized but this condition varies and the sclerotization may be absent in those species in the *Ramiperda* group or the sclerotization may be strongly evident as in many species in several groups. The sclerotization is usually visible only when the antenna is cleared and mounted on a microscope slide.

The relative widths of the first and second segments of the club are an important group character. The first segment is distinctly narrower than the second and the club is widest through the third segment (Fig. 8) in the *Nitidus* group, *Ramiperda* group, *Diglyphus* group, the *Crassus* group in part, and in several others. In a majority of species, the first and second segments are equal in width with the club being widest through these two segments or through the second segment (Fig. 9).

**Pronotum.** The pronotum shows a number of notable characteristics useful for group, and occasionally for specific, distinction.

A major character used to divide the genus is the placement of the asperities on the anterior slope of the pronotum. These may either be randomly placed, with no indication of any order (Figs. 4-7) or they may be arranged in three or four concentric rows (Figs. 1-2). A majority of the species from the United States and Canada from coniferous hosts have randomly placed asperities. The condition of asperities arranged in concentric rows is characteristic of many species in non-coniferous hosts in the tropics. However, some species from coniferous hosts (*barberi*, *jeffreyi*, *arcanus*, etc.) may have the asperities arranged in concentric rows. The distinction between these two conditions is not always clear. In some species, both conditions can be detected on specimens from the same host, locality, date, etc. In these cases, numerous individuals must be examined to determine what the more prevalent condition appears to be. When this distinction seems particularly troublesome, I have placed the species or groups in the key following both characters.

The summit of the pronotum is usually at least slightly elevated. However, in the *Pulicarius* group and in several tropical groups the pronotum is evenly arched from the anterior to posterior margin.

The area behind the summit is smooth and variously punctured. The space between the punctures may be smooth and shining with minute points and/or lines or dull and microreticulate. In a few species the lateral margins of the punctures are slightly elevated, giving a subgranulate appearance to this part of the pronotum.

The lateral margins usually bear a fine raised line on the posterior half and are rounded anteriorly. The only exceptions are those species in the *Annectans* group where mesad of the lateral line there is a prominent groove.

**Elytra.** The elytra provide several important diagnostic characters. The elytral striae may be punctured in regular rows or the entire elytral surface may be randomly punctured. In some groups, each striaal puncture bears a very short seta while punctures in the elytral interstriae bear a distinctly longer seta. Strial setae are absent in some groups. Thus the striae can usually be detected even when the entire elytral surface appears randomly punctured. The elytral interstriae are flat to weakly convex and all may have a median row of punctures, or only the first, third, fifth, seventh, and ninth may bear punctures or the interstriae may be impunctate. The interstriaal punctures may usually be detected by the presence of a relatively long seta arising from each puncture. The surface of the interstriae is smooth and may bear minute points or lines or may be minutely reticulate. The elytral disc denotes the dorsal surface of the elytra extending from the basal margin to the beginning of the declivity and laterally between the fifth interstriae.

**Declivity.** Although the declivity is simply the posterior sloped portion of the elytra, it is treated in this discussion and in the key and descriptions as if it were a separate body region. It and the frons are the most important areas for taxonomic discrimination almost universally in the Scolytidae. In *Pityophthorus* the declivity varies from evenly convex with the striae and interstriae essentially as on the disc, to deeply sulcate or bisulcate with the first and third interstriae elevated and granulate. Between these extremes, numerous variations occur. In addition, several species show extreme departures from the general structure described above. The remarkable declivity of *cristatus* (Fig. 68) is acutely elevated on a nearly complete circle and the declivity of the male *cariniceps* (Figs. 133, 134) bears a blunt, mesal directed protuberance on each elytron. Several other distinctive deviations could be included here but these are all well shown in the illustrations.

The elytral apex may be evenly rounded (Figs. 1-5) or drawn out into an acuminate point (Figs. 6-7). This is an important distinction that serves to divide the genus into major divisions. This characteristic also varies from weakly to strongly acuminate and the former condition may be difficult to differentiate from evenly rounded. Numerous individuals must be examined to determine the trend of the condition. As before, particularly troublesome species are placed in the key under both characteristics.

**Abdomen.** The abdominal sterna generally lack distinguishing characteristics. The apical abdominal terga are useful for sex determination and often are the only means of determining the sex of an individual. Seven visible terga are developed in the female and eight in the male. The first six are more or less membranous and flexible in both sexes. The seventh and eighth terga in the male and the eighth in the female are heavily chitinized and bear numerous setae and punctures.

**Legs.** The legs are very similar in all species. The tibia bears a number of socketed teeth on the outer apical margin, the terminal mucro is not socketed. These teeth vary between individuals of the same species and are therefore not used in this study.

**Male genitalia.** The male genitalia of a number of related and unrelated species were examined to determine if characters were present that could serve to distinguish species. The differences that were found were extremely minute and would be most difficult if not impossible to use. Therefore, characters on the male genitalia are not used in this study.

#### SEXUAL DIMORPHISM

Sexual dimorphism is so pronounced and prevalent in this genus that it is often impossible to identify species unless individuals of both sexes are available. A further

complication is that often several species may be collected from the same host plant and associating males and females of the same species becomes exceedingly difficult.

In very general terms, the frons of the female is usually pubescent while that of the male only bears a few short, scattered setae. The declivity of the male is usually more strongly impressed and the granules (if present) on the first and third interstriae are larger. In those cases where sexual dimorphism is less pronounced, the male frons is usually more strongly convex, or more strongly impressed above the epistoma, or bears stronger punctures. There are, however, a number of species that the only way to determine the sex is by examining the terminal abdominal terga.

#### METHODS

The present study is based on an examination of over 27,000 specimens. Most of these are in the United States Museum of Natural History, in the Canadian National Collection of Insects, and in the personal collections of S.L. Wood and myself. A large majority of the species known from the United States and Canada, and to a lesser extent Mexico, have been personally collected. In fact, more than half of the specimens examined have been collected in the last 15 years by myself or by S.L. Wood. Personal collecting has been conducted in all regions of Canada (except the Yukon-Alaska area), in all regions of the United States (except the extreme southeast region), and in the Mexican states of Chiapas, Durango, Mexico, Nuevo León, and Oaxaca. A special effort has been made to collect in areas not previously sampled, such as the high isolated mountain peaks in the western United States and Mexico and in the areas of endemic coniferous host plants such as *Pinus balfouriana* and *P. aristata* in California, *P. strobus* var. *chiapensis* in Chiapas, *P. culminicola* in Nuevo León, *Abies fraseri* in North Carolina and Tennessee, and in other endemic potential hosts.

The SEM photographs were made with a A.M.R. 1000 scanning electron microscope at an accelerating voltage of 20 kv. All specimens to be photographed were gold-coated.

The distribution and other records listed for each species are taken from personally examined specimens. Records given in the literature are added in a subsequent paragraph. Specimens mentioned under Type Material are omitted under Specimens Examined but the localities are included on the distribution maps. The distribution maps include localities of specimens personally examined and also those from literature records if the records can be judged to be correct.

The names of the host trees listed under Hosts follows the usage of Little (1953) except varietal names are not generally used. The names of the hosts listed under Specimens Examined quotes the label associated with the specimen. The two entries may differ because of the changing of names over time. The host information must be used with caution since the competence of the collector to properly identify the host tree must be considered. The names of other non-tree hosts follows accepted botanical usage as best as could be determined.

The types of all species described by Eichhoff, Blandford, LeConte, Hopkins, Blackman, and myself have been examined. Types of all of Schedl's species except *sparsepilosus* and *acuminatus* were also examined. Specimens compared with the types of these latter species were examined. Types of all species described by Wood and validated prior to December 1979 were examined.

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Various institutions and individuals have allowed me to examine specimens in their care or have sent specimens for my use. These are listed below; the abbreviations are used in the text when referring to specimens examined.

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#### CHECKLIST OF SPECIES IN *PITYOPHTHORUS*

- |                                           |                                   |
|-------------------------------------------|-----------------------------------|
| <i>Pityophthorus</i> Eichhoff             | 11. <i>elegans</i> Schedl         |
| <i>Trigonogenius</i> Hagedorn             | 12. <i>coronarius</i> Blackman    |
| <i>Hagedornus</i> Lucas                   | 13. <i>concinus</i> Wood          |
| <i>Myeloborus</i> Blackman                | 14. <i>arcanus</i> Bright         |
| <i>Pityophthoroides</i> Blackman          | 15. <i>vesculus</i> Wood          |
| <i>Cladoborus</i> Sawamoto                | 16. <i>virilis</i> Blackman       |
| <i>Ctenyophthorus</i> Schedl              | <i>fortis</i> Blackman            |
| Subgenus <i>Hypopityophthorus</i> Bright, | 17. <i>scriptor</i> Blackman      |
| new subgenus                              | 18. <i>hermosus</i> Wood          |
| 1. <i>debilis</i> Wood                    | 19. <i>dimidiatus</i> Blackman    |
| 2. <i>inops</i> Wood                      | 20. <i>minutalis</i> Wood         |
| Subgenus <i>Gnatholeptus</i> Blackman     | 21. <i>torridus</i> Wood          |
| <i>Gnathoporus</i> Schedl                 | 22. <i>nugalis</i> Wood           |
| <i>Gnathophthorus</i> Wood                | 23. <i>atomus</i> Wood            |
| 3. <i>subcribatus</i> Schedl              | 24. <i>attenuatus</i> Blackman    |
| <i>zeteki</i> Blackman                    | <i>pusillus</i> Wood              |
| 4. <i>sparsepilosus</i> (Schedl)          | 25. <i>sobrinus</i> Wood          |
| 5. <i>acuminatus</i> (Schedl)             | Costatus group                    |
| 6. <i>panamensis</i> (Blackman)           | 26. <i>costatus</i> Wood          |
| <i>epistomalis</i> Schedl                 | Amoenus group                     |
| 7. <i>shannoni</i> Blackman               | 27. <i>amoenus</i> Blandford      |
| <i>mandibularis</i> Blackman              | Assitus group                     |
| <i>gentilis</i> Schedl                    | 28. <i>speciosus</i> Wood         |
| 8. <i>semiermis</i> Nunberg               | 29. <i>assitus</i> Wood           |
| Subgenus <i>Pityophthorus</i> Eichhoff    | Obtusipennis group                |
| Scriptor group                            | 30. <i>germanus</i> Bright        |
| 9. <i>mexicanus</i> Blackman              | 31. <i>obtusipennis</i> Blandford |
| 10. <i>hylocuroides</i> Wood              | 32. <i>euterpes</i> Bright        |
|                                           | 33. <i>occulus</i> Bright         |

## Lautus group

- 34. *nemoralis* Wood
- 35. *concentralis* Eichhoff  
*lateralis* Swaine
- 36. *sambuci* Blackman
- 37. *lautus* Eichhoff  
*rhois* Swaine  
*swainei* Blackman  
*natalis* Blackman  
*acerni* Blackman  
*hamamelidis* Blackman
- 38. *molestus* Wood
- 39. *borrichiae* Wood
- 40. *morosus* Wood
- 41. *paulus* Wood
- 42. *liquidambaris* Blackman
- 43. *crinalis* Blackman
- 44. *perexiguus* Wood
- 45. *corruptus* Wood

## Barberi group

- 46. *barberi* Blackman
- 47. *jeffreyi* Blackman

## Juglandis group

- 48. *costatulus* Wood
- 49. *costabilis* Wood
- 50. *tenax* Wood
- 51. *galeritus* Wood
- 52. *burserae* Wood
- 53. *strictus* Wood
- 54. *diligens* Wood
- 55. *nanus* Wood
- 56. *indigenus* Wood
- 57. *franseriae* Wood
- 58. *pudicus* Blackman
- 59. *juglandis* Blackman
- 60. *detentus* Wood

## Pulicarius group

- 61. *pulicarius* (Zimmermann)  
*cubensis* Schedl
- 62. *schwertfegeri* (Schedl)  
*islasi* Wood  
*islasi* Schedl
- 63. *aztecus* Bright
- 64. *dispar* Bright

## Alni group

- 65. *melanurus* Wood
- 66. *alni* Blackman
- 67. *alnicolens* Wood
- 68. *mendosus* Wood
- 69. *timidulus* Wood
- 70. *degener* Wood
- 71. *amiculus* Wood
- 72. *dissolutus* Wood
- 73. *explicitus* Wood

## Guatemalensis group

- 74. *nebulosus* Wood
- 75. *lenis* Wood
- 76. *exquisitus* (Blackman)  
*inceptis* Wood
- 77. *laetus* Wood
- 78. *parilis* Wood
- 79. *scitulus* Wood
- 80. *conspectus* Wood
- 81. *medialis* Wood
- 82. *guatemalensis* Blandford  
*quercinus* Wood

## Deletus group

- 83. *woodi* Bright
- 84. *deletus* Blackman  
*inquietus* Blackman  
*monophyllae* Blackman  
*socius* Blackman  
*dolus* Wood  
*piceus* Bright  
*praealtus* Bright  
*brucki* Bright

## Cristatus group

- 85. *cristatus* Wood

## Diglyphus group

- 86. *glabratulus* (Schedl)
- 87. *ineditus* Bright
- 88. *vespertinus* Bright
- 89. *leiophyllae* Blackman  
*auctor* Blackman
- 90. *diglyphus* Blandford

## Thomasi group

- 91. *thomasi* Bright

## Modicus group

- 92. *modicus* Blackman  
*navus* Blackman

## Elatinus group

- 93. *elatinus* Wood
- 94. *speculum* Bright

## Nitidus group

- 95. *scalptus* Bright
- 96. *indigus* Wood  
*indigenus* Wood  
*irritans* Schedl
- 97. *nitidus* Swaine  
*borealis* Swaine  
*anceps* Blackman  
*varians* Schedl  
*aquilonius* Bright
- 98. *alpinensis* G. Hopping
- 99. *toralis* Wood  
*confusus* Bright  
*collinus* Bright
- 100. *leechi* Wood
- 101. *scalptor* Blackman

- Litos group  
102. *litos* Bright
- Carmeli group  
103. *carmeli* Blackman  
*torreyanae* Swaine
- Aciculatus group  
104. *aciculatus* Bright
- Solus group  
105. *solus* Blackman  
*cribratus* Blackman
- Recens group  
106. *recens* Bright
- Punctifrons group  
107. *punctifrons* Bright
- Furnissi group  
108. *furnissi* Bright  
109. *brevicomatus* Bright
- Montivagus group  
110. *montivagus* Bright
- Intextus group  
111. *intextus* Swaine  
*shepardi* Blackman  
*tonus* Blackman  
*ornatus* Blackman  
*kenti* Blackman  
*limatus* Wood  
112. *cascoensis* Blackman  
*pilifer* Schedl
- Nitidulus group  
113a. *pulchellus pulchellus* Eichhoff  
*hirticeps* LeConte  
*pusio* LeConte  
113b. *pulchellus tuberculatus* Eichhoff  
*rugicollis* Swaine  
*australis* Blackman  
114. *immanis* Blackman  
115. *infulatus* Blackman  
*mollis* Blackman  
*hubbardi* Blackman  
116. *pseudotsugae* Swaine  
*thatcheri* Bright  
117. *malleatus* Bright  
118. *abiegnus* Wood  
119. *sulcatus* Bright  
120. *nitidulus* (Mannerheim)  
*aratulus* LeConte  
*puncticollis* LeConte  
121. *occidentalis* Blackman  
122. *cortezi* Bright  
123. *viminalis* Bright
- Cariniceps group  
124. *cariniceps* LeConte  
*canadensis* Swaine  
*cognatus* Blackman
125. *biovalis* Blackman  
126a. *carinatus carinatus* Bright  
126b. *carinatus monticolae* Bright  
127. *hesperius* Bright  
128. *balsameus* Blackman  
*patchi* Blackman  
*angustus* Blackman  
129. *briscoei* Blackman  
*mundus* Blackman  
130. *concavus* Blackman  
131. *cavatus* Bright
- Nigricans group  
132. *micans* new species  
133. *nigricans* Blandford  
*chiapensis* Bright  
134. *lepidus* Bright
- Nocturnus group  
135. *nocturnus* Schedl  
*hidalgoensis* Blackman  
136. *sapineus* new species
- Segnis group  
137. *pubifrons* new species  
138. *elimatus* Bright  
139. *minus* Bright  
140. *impexus* Bright  
141a. *segnis segnis* Blackman  
141b. *segnis subopacus* Blackman
- Ramiperda group  
142. *deleoni* (Blackman)  
143. *separatus* Bright  
144. *amplus* Blackman  
145. *boycei* Swaine  
*catulus* Blackman  
*iniquus* Blackman  
*siouxensis* Bright  
146. *ramiperda* Swaine  
*fivazi* Swaine  
147. *trepidus* Bright  
148. *keeni* (Blackman)  
149. *pinguis* (Blackman)
- Opaculus group  
150. *fuscus* Blackman  
*smithi* Schedl  
151. *aplanatus* Schedl  
152. *festus* Wood  
153. *culminicolae* Bright  
154. *pellius* Schedl  
155. *opaculus* LeConte  
*abietis* Blackman  
*albertensis* Blackman  
*exiguus* Blackman  
*pygmaeus* Schedl
- Dentifrons group  
156. *setosus* Blackman  
157. *rudis* Blackman

158. *aquilus* Blackman  
*caelator* Blackman  
*aristatae* Bright
159. *dentifrons* Blackman
160. *carinulatus* Swaine  
*opimus* Blackman
161. *tumidus* Blackman
162. *absonus* Blackman  
*demissus* Blackman  
*inyoensis* Bright
163. *abstrusus* Bright
- Venustus group
164. *venustus* Blackman  
*artifex* Blackman
165. *mormon* Bright
- Laticeps group
166. *laticeps* Bright
- Blandus group
167. *apachae* Bright
168. *arceuthobii* Wood
169. *blackmani* Bright
170. *blandulus* Schedl
171. *blandus* Blackman  
*singularis* Bright
172. *brevis* Blackman
173. *californicus* Bright  
*deleoni* Bright
174. *ciliatus* Blackman
175. *clivus* Bright
176. *declivisetosus* Bright
177. *durus* Blackman
178. *electus* Blackman
179. *orarius* Bright
180. *scabridus* Schedl
181. *sierraensis* Bright
- Puberulus group
182. *lecontei* Bright
183. *digestus* (LeConte)  
*idoneus* Blackman  
*hopkinsi* Blackman  
*ponderosae* Blackman
184. *puberulus* (LeConte)  
*infans* Eichhoff
- Confinis group
185. *confinis* LeConte
- Crassus group
186. *montezumae* Bright
187. *schwarzi* Blackman
188. *crassus* Blackman
- Comosus group
189. *comosus* Blackman  
*foratus* Wood
- Chaleoensis group
190. *chaleoensis* Hopkins  
*herrerai* Hopkins
191. *miniatus* new species
192. *ingens* Blackman
- Consimilis group
193. *perotei* Blackman
194. *discretus* Wood
195. *consimilis* LeConte  
*granulatus* Swaine  
*nudus* Swaine
196. *intentus* Bright
- Pullus group
197. *pullus* (Zimmermann)  
*cribripennis* Eichhoff  
*bisulcatus* Eichhoff
198. *grandis* Blackman
- Confusus group
- 199a. *confusus confusus* Blandford
- 199b. *confusus bellus* Blackman
200. *annectans* LeConte  
*citus* Blackman
- Confertus group
201. *megas* Bright
202. *zonalis* Bright
203. *spadix* Blackman
204. *rubidus* Wood
205. *subsimilis* Schedl
206. *subimpressus* Bright
207. *cacuminatus* Blandford
208. *serratus* Swaine
- 209a. *confertus confertus* Swaine  
*burkei* Blackman
- 209b. *confertus agnatus* Blackman  
*comptus* Blackman
- 210a. *murrayanae murrayanae*  
Blackman  
*elongatus* Swaine  
*culteri* Swaine  
*gracilis* Swaine  
*exilis* Swaine  
*tenuis* Swaine  
*depygis* Blackman  
*watsoni* Schedl
- 210b. *murrayanae aurulentus* Bright
211. *acceptus* new species
212. *anthracinus* Bright
213. *mesembria* Bright
214. *bassetti* Blackman
215. *acutus* Blackman
216. *delicatus* Wood
217. *cuspidatus* Blackman
218. *clarus* Blackman
219. *solers* Blackman
220. *solatus* Wood
- Incertae sedis
- novellus* Blackman  
*timidus* Blandford  
*cincinnatus* Blandford

Genus **PITYOPHTHORUS** Eichhoff

*Pityophthorus* Eichhoff, 1864, p. 39; Hagedorn, 1910, p. 69 (additional references, 1864-1909); Hopkins, 1914, p. 127; Blatchley and Leng, 1916, p. 627; Swaine, 1918, p. 94; Leng, 1920, p. 341; Blackman, 1922a, p. 100; Blackman, 1928, p. 5; Dodge, 1938, p. 42; Schedl, 1938, p. 157; Chamberlin, 1939, p. 353; Beal & Massey, 1945, p. 125; Craighead, 1950, p. 331; Chamberlin, 1958, p. 147; Wood, 1961, p. 48; Arnett, 1962, p. 1040, 1045; Wood, 1971a, p. 435; Baker, 1972, p. 254; Bright & Stark, 1973, p. 103; Wood, 1975, p. 391; Furniss & Carolin, 1977, p. 401; Wood, 1977a, p. 207.

*Trigonogenius* Hagedorn, 1912, p. 354; Schedl, 1952, p. 347.

*Hagedornus* Lucas, 1920, p. 683; Schedl, 1952, p. 347.

*Myeloborus* Blackman, 1928, p. 16; Chamberlin, 1939, p. 338; Craighead, 1950, p. 331; Chamberlin, 1958, p. 143; Wood, 1961, p. 47; Arnett, 1962, p. 1040, 1045; Wood, 1971a, p. 424; Bright, 1977, p. 511; Furniss & Carolin, 1977, p. 398.

*Pityophthoroides* Blackman, 1942, p. 199; Wood, 1977a, p. 207.

*Cladoborus* Sawamoto, 1942, p. 165; Schedl, 1959, p. 42 (= *Myeloborus*); Bright, 1977, p. 511.

*Ctenyophthorus* Schedl, 1956, p. 26; Bright, 1977, p. 511.

Subgenus *Gnatholeptus* Blackman, **new status**.

*Gnathophorus* Schedl, 1935, p. 342 (preoccupied); Wood, 1975, p. 391.

*Gnatholeptus* Blackman, 1943, p. 34.

*Gnathophthorus* Wood, 1962, p. 76 (replacement name for *Gnathophorus*); Wood, 1975, p. 391.

Subgenus *Hypopityophthorus*, **new subgenus**.

Type-species: For *Pityophthorus*, *Bostrichus lichtensteini* Ratzeburg, 1837 (subsequent designation by Hopkins, 1914); for *Trigonogenius*, *T. fallax* Hagedorn, 1912 (by monotypy); for *Hagedornus*, *T. fallax* Hagedorn, 1912 (by monotypy); for *Myeloborus*, *Pityophthorus ramiperda* Swaine, 1917 (by original designation); for *Pityophthoroides*, *P. pudens* Blackman, 1942 (by original designation); for *Cladoborus*, *C. arakii* Sawamoto, 1942 (by original designation); and for *Ctenyophthorus*, *C. glabratulus* Schedl, 1956 (by monotypy).

For type-species of the subgenera see the respective subgenus.

**DESCRIPTION.** Body cylindrical, 1.0-4.5 mm in length; color dark brown to reddish brown, lighter when teneral. Frons convex, concave or variously impressed; variously modified by longitudinal and/or transverse carinae or setae or modifications absent. Eyes elongate, emarginate at antennal insertion. Antennae geniculate; scape club-shaped, bearing several plumose setae; funicle 5-segmented (rarely 3-segmented in one species), pedicle large, bulbous, remaining segments much smaller, increasing in width toward club; club flattened, broadly oval to circular, usually 4-segmented except unsegmented in *Hypopityophthorus*, sutures 1 and 2 distinct, transverse to arcuate, chitinized at lateral margins, suture 3 indicated only by an arcuate row of setae. Pronotum slightly longer than wide; sides arcuate to nearly straight and parallel, constricted just before anterior margin; anterior margin broadly to narrowly and evenly rounded, bearing two or more erect serrations except serrations absent in *Costatus* group; anterior slope with numerous asperities, these either scattered or arranged in two or more concentric rows; dorsal surface evenly convex or with an elevated summit at middle; posterior area smooth or reticulate and usually bearing distinct punctures; basal and posterior half of lateral margins bearing a fine raised line (lateral margins grooved in *Confusus* group). Scutellum visible. Elytra longer than wide; basal margins smooth, rounded; sides parallel or subparallel on anterior three-quarters; apex rounded or acuminate; first stria distinctly impressed, remainder not impressed; striae and interstriae variously punctured. Declivity very variable, usually evenly convex or bisulcate with interstriae 1 and 3 variously elevated and granulate (several exceptions). Metepisternum largely concealed by elytra, visible only in front. Tibia triangular, bearing one to four socketed teeth on sinistral margin and two or three socketed teeth on apex, terminal

muco not socketed. Ventral sternites simple, unmodified. Eight terga in male, seven in female, first six membranous, terminal 1 (♀) or 2 (♂) terga heavily chitinized and bearing numerous setae.

**DISCUSSION.** The concept of *Pityophthorus* used in this study departs somewhat from that traditionally used by all authors since Blackman. The limits of the genus have been broadened to include *Gnatholeptus* which is now treated as a subgenus. In addition, one new subgenus is described to include several aberrant species of *Pityophthorus*. These are discussed below.

*Gnatholeptus* was described by Blackman (1943) for several species with large eyes and coarse facets and with remarkably developed mandibles on the females (Fig. 10). Males were unknown at the time of the generic description. When eventually discovered, the males were found to be typical *Pityophthorus* with larger than usual eyes. As more specimens became available, it was realized that the important characteristic for this set of species is the large eyes with coarse facets (evidently correlated with a nocturnal habit), not the large mandibles which are found in the females of only some species. I have, therefore, reduced *Gnatholeptus* to a subgenus of *Pityophthorus*.

Wood (1978a) reorganized the subfamilies and tribes of Scolytidae. In his analysis, *Pityophthorus* and related genera are in the tribe Corthylini, subtribe Pityophthorina. The subtribal category may not be maintained since Wood (pers. comm.) stated that he has found intergradation in the biological characters that are used to categorize the subtribes, i.e. Pityophthorina are true bark beetles (phloeophagus and spermophagus), Corthylini are ambrosia beetles (xylomycetophagus). Among the genera in the Pityophthorina, *Pityophthorus* is most closely related to *Araptus* Eichhoff.

The two genera may be difficult to distinguish, especially the neotropical species. Species of *Araptus* may be distinguished by the more elongate antennal club which bears strongly arcuate sutures with only suture I septate and by the lack of a pronotal summit.

#### KEY TO SUBGENERA OF *Pityophthorus*

1. Antennal club unsegmented or sutures, if visible, extremely obscure, with setae at margins . . . . . *Hypopityophthorus* new subgenus (p. 14)
- Antennal club clearly segmented, sutures distinct, sclerotized at lateral margins and marked by setae along entire width . . . . . 2
2. Eyes very large, about 2.5 times wider than length of antennal scape, scape not reaching or barely reaching posterior margin of eye; facets of eye very large, coarse, only slightly smaller or equal in size to antennal pedicel; mandibles of female frequently very slender, long and curved, meeting on distal fourth or less (Fig. 10) . . . . . subg. *Gnatholeptus* Blackman (p. 16)
- Eyes not greatly enlarged, only about 1.5 times wider than length of antennal scape, scape extending to or beyond posterior margin of eye; facets of eye minute, 3-5 times smaller than antennal pedicel; mandibles stout in both sexes, meeting on entire distal surface . . . . . subg. *Pityophthorus* Eichhoff (p. 22)

#### Subgenus **HYPOPITYOPHTHORUS** new subgenus

Type-species: *Pityophthorus inops* Wood, 1976, present designation.

Members of this subgenus are characterized by the complete lack of sutures on the antennal club, or if sutures are visible, they are extremely obscure. In other characteristics, they fit within the character states of *Pityophthorus*.

Two species are known.

KEY TO SPECIES IN THE SUBGENUS *Hypopityophthorus*

1. Posterior surface of pronotum smooth and shining between punctures; elytral disc with impressed points obscure; frons coarsely punctured, in male without reticulation below upper level of eyes; body length 1.2-1.4 mm . . . . . 1. *debilis* Wood (p. 15)
- Posterior surface of pronotum reticulate between punctures; elytral disc with distinct, clearly impressed points; frons finely punctured, in male reticulate to upper level of eyes; body smaller, 1.1-1.2 mm . . . . . 2. *inops* Wood (p. 15)

1. *Pityophthorus* (*H.*) *debilis* Wood

*Pityophthorus debilis* Wood, 1976, p. 354.

Length 1.2-1.4 mm, about 2.7 times longer than wide.

**Female.** Frons slightly flattened from epistoma to above upper level of eyes; surface shining, usually concealed by dense, long yellowish setae which arise on upper margin above upper eye level and extend beyond epistomal margin. Antennal club oval, about 1.2 times longer than wide; sutures completely absent (sometimes faint lines may be seen). Pronotum about 1.1 times longer than wide, widest at about middle; sides very weakly arcuate to subparallel on posterior half; asperities on anterior slope arranged into 3 or 4 even concentric rows (1 or 2 short rows may be clustered around summit); summit distinctly elevated; posterior area of disc distinctly punctured, the punctures large and deeply impressed; surface between punctures generally smooth and shining but may be obscurely reticulate in some specimens. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures fine, shallowly impressed; discal interstriae about as wide as striae, surface smooth, with fine, impressed points and lines. Declivity broadly convex; interstriae 1 weakly elevated, bearing a few obscure granules; interstriae 2 as wide as discal width, very weakly impressed, flat; interstriae 3 not elevated, bearing a median row of very fine granules; all interstriae except 2 bearing a median row of erect, narrowly spatulate setae; punctures in striae 1 and 2 distinct.

**Male.** Frons more strongly convex, with a weak, transverse impression above epistoma; surface densely punctured, the punctures coarse, surface between punctures smooth below upper level of eyes. Otherwise resembles female.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the data: San Ignacio, S.J., Costa Rica, 4700 ft., VII-5-1963, S.L.W./Mauria glauca/HOLOTYPE *Pityophthorus debilis* S.L. Wood, 1976. The allotype and 38 paratypes bear the same data except some paratypes bear the host label "Unknown broken branch".

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

**HOSTS.** Probably woody shrubs, known only from *Rhus* sp. and *Mauria glauca*.

**DISTRIBUTION.** Southern Mexico to Costa Rica, but probably occurs throughout Central America. Specimens (112) examined from:

## MEXICO

**Chiapas:** 9 mi SE of Teopisca, 14.V.69, *Rhus* sp., D.E. Bright (CNC) 57; 25 mi SE of Teopisca, 18.V.69, *Rhus* sp., D.E. Bright (CNC) 15.

**COSTA RICA:** See type material.

**REMARKS.** Adults of this species are very similar to those of *inops* but may be distinguished by the characters given in the key and the description.

2. *Pityophthorus* (*H.*) *inops* Wood

*Pityophthorus inops* Wood, 1976, p. 353.

Length 1.1-1.2 mm, about 2.7 times longer than wide.

**Female.** Frons as in *debilis* except surface reticulate and bearing short, abundant setae on a median area above epistomal margin. Antennae as in *debilis*. Pronotum as in *debilis* except surface between punctures on posterior portion of disc reticulate. Elytra and declivity as in

*debilis* except discal strial punctures smaller, declivital interstriae 2 more weakly impressed and only interstriae 1, 3, 5, 7, 9 with a median row of erect, spatulate setae.

**Male.** Similar to male *debilis* except surface of frons reticulate from epistoma to upper level of eyes.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Rincon de Osa, Punt., Costa Rica, 100 ft., VII-II-1966, S.L.W./tree limb/HOLOTYPE Pityophthorus inops S.L. Wood, 1976. The allotype and 5 paratypes bear the same data.

All type material is in the SLWC.

**HOST.** Unknown.

**DISTRIBUTION.** Known only from the type locality in Costa Rica.

**REMARKS.** See the key and descriptions for characteristics that distinguish adults of this species from the closely related *debilis*.

#### Subgenus **GNATHOLEPTUS** Blackman new status

Type-species: *Gnatholeptus mandibularis* Blackman, 1942, by original designation; for *Gnathophorus*, *G. sparsepilosus* Schedl, 1935, by monotypy.

Members of this subgenus are characterized by the extremely large eyes with large, coarse facets and by the peculiar modification of the mandibles in the females of some species (Fig. 10). The large eyes are evidently an adaption correlated with a nocturnal habit; the function of the unusual mandibles is not known. Nothing is known of the host plants or habitat of any species in this subgenus.

Six species are known from southern Mexico and Central America, but undoubtedly more remain to be discovered.

#### KEY TO SPECIES IN THE SUBGENUS *Gnatholeptus*

1. Asperities on anterior slope of pronotum scattered . . . . . 2
- Asperities on anterior slope of pronotum arranged in concentric rows (scattered in male *shannoni*) . . . . . 4
2. All declivital interstriae with a row of erect setae, 1 and 3 also bearing moderate-sized granules; elytral apex strongly acuminate; surface of posterior portion of pronotal disc subrugulose, dull, with obscure, shallow punctures; Costa Rica, Panama . . . . . 3. *subcribatus* Schedl (p. 17)
- Declivital interstriae 2 devoid of setae or granules; elytral apex rounded to subacuminate; surface of posterior portion of pronotal disc smooth, reticulate, or shagreened . . . . . 3
3. Elytral apex rounded; surface of posterior portion of pronotal disc shagreened, dull, with fine impressed points; female frons densely pubescent; Costa Rica . . . . . 4. *sparsepilosus* (Schedl) (p. 18)
- Elytral apex subacuminate; surface of posterior portion of pronotal disc dull, densely reticulate, with obscure, shallow punctures; female frons sparsely pubescent; southern Mexico . . . . . 5. *acuminatus* (Schedl) (p. 18)
4. Declivital interstriae 3 without granules; epistomal margin extended in median sixth to form a projection visible between bases of mandibles; mandibles of females long and slender, middle third bearing a tuft of fine, stiff setae; Panama . . . . . 6. *panamensis* (Blackman) (p. 19)
- Declivital interstriae 3 bearing fine to moderately coarse granules; epistomal margin rounded, not extended in median area; mandibles of female shorter, stouter, not bearing a tuft of setae on dorsal surface . . . . . 5
5. Declivital interstriae 3 bearing two moderate-sized, acute granules, a third smaller granule may be present near apex; all declivital interstriae except 2 bearing a median row of 6-10 close, erect setae; Panama . . . . . 7. *shannoni* Blackman (p. 20)



- Declivital interstriae 3 bearing several, very small, rounded granules; declivital interstriae 1, 3, 5, 7 bearing 2-4 widely separated setae; Costa Rica ..... 8. *semiermis* Nunberg (p. 21)

### 3. *Pityophthorus* (*G.*) *subcribatus* Schedl

*Pityophthorus subcribatus* Schedl, 1937, p. 168.

*Gnatholeptus subcribatus* (sic): Bright, 1977, p. 513.

*Pityophthorus zeteki* Blackman, 1942, p. 226; Bright, 1977, p. 513 (= *subcribatus*).

Length 1.8 mm, 2.9 times longer than wide.

**Female.** Frons weakly convex; surface dull, finely, densely, minutely punctured, with a fringe of long, dense setae placed on a large semicircular area extending to slightly above upper eye level and laterally from eye to eye, median area less densely pubescent. Antennal club oval, 1.2 times longer than wide, widest through segments 2 and 3; sutures 1 and 2 straight, transverse; segments 1 and 2 together occupy slightly more than half of total club length. Pronotum about 1.1 times longer than wide, sides subparallel; asperities on anterior slope small, very numerous, scattered in no apparent order; summit not elevated; posterior portion of disc subrugulose, dull, with obscure, shallow, large and small punctures intermixed; median line not evident. Elytra about 2.0 times longer than wide; apex strongly acuminate; discal striae punctured in regular rows, punctures large, shallowly impressed; discal interstriae about as wide as striae, moderately shining with fine, scattered points, devoid of vestiture. Declivity convex, steep; interstriae 1 moderately elevated, bearing a median row of erect, flattened setae and several moderate-sized granules; interstriae 2 as in 1 except granule not obvious; interstriae 3 as in 1, granules appear very slightly larger; remaining interstriae also bearing a row of erect, flattened setae and small granules; striae 1 and 2 slightly impressed, punctures distinct.

**Male.** Frons convex, transversely impressed above epistoma; surface moderately punctured with short, fine setae. Pronotum and elytra as in female. Declivity more roughly sculptured, interstriae 1 and 3 with coarser granules and setae.

**TYPE MATERIAL.** *P. subcribatus*. The holotype (♀) is in the KESC and bears the data: Costa-Rica, Hamburg farm, Reventazon, Ebene Limon, 25-VIII. 1925, F. Nevermann coll./HOLOTYPE *Pityophthorus subcribatus* K.E. Schedl.

*P. zeteki*. The holotype (♀) in the USNM is labeled: Rio Trinidad, Pan., 9. VI. 12/A. Busck coll./Type No. 56014 U.S.N.M./*Pityophthorus zeteki* Blkm. The allotype and two paratypes bear the same data except for the date. One paratype is labeled: Alhajvblo, Pan; 5, IV, II/A. Busck coll.

Holotypes of both names have been examined.

**HOST.** Unknown. All specimens evidently collected at light.

**DISTRIBUTION.** Known only from Panama and Costa Rica but probably occurs more widely in Central America. Specimens (7) examined from:

#### COSTA RICA

**Guanacaste:** 10 mi NW of Liberia, 25.VII.1965, Black light, Paul J. Spangler (USNM) 1.

**PANAMA:** See type material.

**REMARKS.** Adults of this species are easily distinguished by the strongly acuminate elytral apex, by the even row of setae in each declivital interstriae, by the subrugulose pronotal disc and by the brush of long setae on the female frons. The specimens I have examined do not have strongly extended mandibles which is the most obvious generic character of *Gnatholeptus* according to Blackman (1942). However, the mandibles are slender and meet only on a small distal portion of the inner margin and the eyes are large with coarse facets; all of which clearly indicate that this species is properly placed in this subgenus.

4. *Pityophthorus* (*G.*) *sparsepilosus* (Schedl)

*Gnathophorus sparsepilosus* Schedl, 1935, p. 343.

*Gnathophthorus sparsepilosus*: Wood, 1962, p. 76.

*Pityophthorus sparsepilosus*: Wood, 1975, p. 391.

Length 1.5-1.7 mm, about 3.0-3.1 times longer than wide.

**Female.** Frons planoconcave between the eyes, with a semioval brush of densely placed setae, setae on periphery long and incurved, those in central portion shorter, erect. Antennal club about as long as wide; sutures 1 and 2 transverse; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum 1.2-1.3 times longer than wide; sides weakly arcuate; asperities on anterior slope scattered in no apparent order; summit not elevated or only very weakly so, transverse impression not evident; posterior area of disc bearing rather large, shallow punctures; surface between punctures shagreened, dull, with fine, impressed points. Elytra about 2.1 times longer than wide; apex rounded; discal striae punctured in regular rows, punctures larger than those on posterior area of pronotum, close and deeply impressed; discal interstriae impunctate, shagreened. Declivity convex; interstriae 1 broad, weakly but distinctly elevated, with a median row of sparse, very fine setae, granules absent; interstriae 2 as wide as discal width, very weakly impressed, devoid of setae or granules; interstriae 3 not elevated, bearing a median row of fine setae, devoid of granules; punctures in stria 2 visible, smaller and more shallowly impressed than those on disc.

**Male.** Frons convex, weakly flattened above epistoma, surface closely punctured, with fine, inconspicuous setae. Pronotum essentially as in female except punctures on posterior area are larger, closer, and deeper. Elytra essentially as in female. Declivity steep, moderately sulcate; interstriae 1 wide, bearing 2-4 widely separated, acute granules on upper half; interstriae 2 moderately impressed, as wide as on disc; interstriae 3 weakly elevated, as high as 1, bearing about 4, widely separated, rounded granules.

**TYPE MATERIAL.** The types of this species are in the KESC and have not been examined. The description above was prepared from two specimens compared with the type by S.L. Wood. The type data, given by Schedl (1935), are: Costa Rica, Hamburg-farm, Ebene Limon, Reventazon, F. Nevermann coll.

**HOSTS.** Unknown.

**DISTRIBUTION.** Known only from Costa Rica but undoubtedly occurs elsewhere in Central America. Specimens (2) examined from:

## COSTA RICA

**Cartago:** Peralta, 10.III.64, unknown limb, S.L. Wood (SLWC) 2.

**REMARKS.** In addition to the characters given in the key, adults of this species are easily distinguished by the lack of granules on declivital interstriae 1 and 3 on the female and by the presence of two to four large, acute tubercles on those interstriae on the male.

The presence of the very large eyes was such a unique character to Schedl that he proposed a new genus, *Gnathophorus*, for this species. *Gnathophorus* was previously used by Kirby for a cerambycid and Wood (1962) proposed *Gnathophthorus* as a replacement. Wood (1975) placed *Gnathophthorus* in synonymy under *Pityophthorus*. This species is placed in the subgenus *Gnatholeptus* because of the character of the eye. Since specimens are unavailable for re-examination, it is realized that this placement may need to be altered in the future.

5. *Pityophthorus* (*G.*) *acuminatus* (Schedl), **new comb.**

*Neopityophthorus acuminatus* Schedl, 1940, p. 346.

Length 1.3-1.5 mm, 2.7-2.8 times longer than wide.

**Female.** Frons convex, very weakly, narrowly flattened just above epistoma; a weakly elevated, obscure, longitudinal carina extends from epistoma to upper level of eyes; surface

obscurely punctured, punctures shallow, surface between punctures reticulate and dull; vestiture sparse. Antennal club oval, about 1.2 times longer than wide; sutures obscure, straight, or very weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide; sides evenly arcuate; asperities on anterior slope small, obscure but distinct, scattered in no apparent order; summit low; posterior portion of disc dull, densely reticulate, with very obscure, shallow punctures; median line not evident, sculptured as above. Elytra about 1.7 times longer than wide; apex subacuminate; discal striae punctured in regular rows, punctures of moderate size and shallow; discal interstriae about 2.0 times wider than striae, smooth and shining, with scattered minute points on surface. Declivity convex, steep; interstriae 1 weakly elevated, bearing a median row of very fine granules and a row of conspicuous, moderately long setae; interstriae 2 narrow, not impressed, devoid of granules and setae; interspace 3 as high as 1, bearing a similar row of fine granules and setae; interstriae 3 as high as 1, bearing a similar row of fine granules and moderately long setae; remaining interstriae all bearing a median row of setae, the setae on all interstriae about equal in length; punctures in striae 1 and 2 obscure but visible.

**Male.** Almost identical with female, distinguishable only by the slightly stronger sculpturing on the frons and declivity, and by the abdominal segmentation.

**TYPE MATERIAL.** No original type material has been seen. The species was described from at least two specimens, one bearing the data: Tuxtepec, Oaxaca, 13.11.32, M.F. 2246; and the other labeled: Finca La Florida, Chiapas, V '31, lampara trampa. The syntypes are in the KESC. The diagnosis of this species was made from two specimens compared with the syntypes by S.L. Wood.

**HOST.** Unknown.

**DISTRIBUTION.** Known from southern Mexico, but undoubtedly occurs in Central America also. Specimens (3) examined from:

**MEXICO**

**Campeche:** (Francisco) Escarcega, IX.1961, Light trap (CNC) 1. **Tabasco:** 14 mi W of Cardenas, 26.VI.1967, unknown log, S.L. Wood (SLWC) 2.

**REMARKS.** Adults of *acuminatus* are easily distinguished by the subacuminate elytral apex, by the densely reticulate pronotal disc, by the sparsely pubescent female frons, and by the presence of a row of fine granules on declivital interstriae 1 and 3 of both sexes.

6. *Pityophthorus (G.) panamensis* (Blackman), **new comb.**

*Gnatholeptus panamensis* Blackman, 1943, p. 35.

*Pityophthorus epistomalis* Schedl, 1961, p. 224.

Length 1.3-1.5 mm long, about 2.7-2.8 times longer than wide.

**Female.** Frons broadly convex; surface shining, minutely punctured, devoid of pubescence; epistomal margin extended in median area into a long, cylindrical prolongation nearly 3 times longer than its basal width. Mandibles very long and slender, bearing a tuft of fine, stiff setae on middle third of dorsal surface, biting surface confined to distal sixth. Antennal club oval, about 1.5 times longer than wide, widest through segment 3; first two sutures arcuate; first two segments together occupy about half of total club length. Pronotum about 1.2 times longer than wide; sides feebly arcuate; asperities on anterior slope low, broad, fused to form nearly regular concentric rows; posterior area of disc with fine, shallow punctures; surface between punctures weakly shining, faintly reticulate. Elytra about 1.6 times longer than wide; apex narrowly rounded; discal striae punctured in regular rows, punctures deeply impressed and moderate in size; discal interstriae narrow, surface finely rugulose, nearly impunctate except at base and near declivity. Declivity sloping, weakly bisulcate; interstriae 1 moderately elevated, with a median row of erect, short, fine setae; interstriae 2 weakly and narrowly impressed, equal to discal width, without granules or setae; interstriae 3 moderately elevated, equal in height to 1 and bearing a median row of setae, granules absent; punctures in striae 1 and 2 obsolete, in 1 strongly impressed.

**Male.** Not observed in material at hand.

**TYPE MATERIAL.** *G. panamensis*. The holotype (♀) is in the USNM and bears the data: Barro Colo. Isl., CZ, VI-20-14, Z-4816/collected at light/Type No. 56419 U.S.N.M./*Gnatholeptus panamensis* Blackman.

*P. epistomalis*. The holotype (♀) is in the CUIC and is labeled: Barro Colorado Id., Gatun Lake, C.Z., Pan., 26-28 Mar. 1924/*Pityophthorus epistomalis* n. sp. type, Det. K.E. Schedl/HOLOTYPE Cornell U. No. 3875. One paratype is in the KESC.

The holotypes of both names have been examined and compared with one another. Both represent the same species.

**HOST.** Unknown.

**DISTRIBUTION.** Known only from Barro Colorado Island in the Panama Canal Zone.

**REMARKS.** Adults of this species are easily recognized by the peculiar modification of the epistoma which is completely unlike any other species in the genus (see key and description). In addition, the very long, slender mandibles and the lack of granules on the declivital interstriae will aid in recognizing the species.

### 7. *Pityophthorus (G.) shannoni* Blackman

Fig. 10

*Pityophthorus shannoni* Blackman, 1942, p. 224.

*Gnatholeptus shannoni*: Bright, 1977, p. 513.

*Gnatholeptus mandibularis* Blackman, 1943, p. 34; Wood, 1979, p. 134 (= *shannoni*).

*Pityophthorus gentilis* Schedl, 1961, p. 225; Bright, 1977, p. 513 (= *shannoni*).

Length 1.5-1.7 mm, about 3.0 times longer than wide.

**Female.** Frons flattened on a rather small semicircular area extending from epistoma to about halfway to upper eye level, convex above; surface of flattened area densely, minutely punctured and bearing a dense brush of fine, equal length setae, surface above brightly shining, smooth, very sparsely punctured; epistomal margin rounded. Mandibles shorter than in *panamensis*, stouter and devoid of special pubescence. Antennal club about 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.2-1.3 times longer than wide; sides straight and subparallel; asperities on anterior slope very low, broad, arranged in nearly regular concentric rows; posterior area of disc finely, shallowly punctured, punctures very small, widely separated; surface between punctures dull, distinctly reticulate. Elytra 1.8 times longer than wide; apex narrowly rounded; discal striae punctured in nearly regular rows, punctures deeply impressed, moderately coarse; discal interstriae about 1.5-2.0 times wider than striae, surface shining, impunctate except near declivity. Declivity steeply sloping, moderately sulcate; interstriae 1 moderately elevated, with a median row of short, erect setae; interstriae 2 moderately impressed, equal to discal width, devoid of setae or granules; interstriae 3 higher than 1, with 3 large, acute granules and a row of long setae, these longer than those in 1; punctures in striae 1 and 2 obsolete.

**Male.** Frons flattened as in female but punctures larger and deeper, vestiture inconspicuous. Pronotum and elytra as in female. Declivity with sulcus wider and slightly deeper, interstriae 3 slightly higher and granules larger.

**TYPE MATERIAL.** *P. shannoni*. The holotype (♀) is in the USNM and bears the data: Cano Saddle, Gatun L., Pan., R.C. Shannon, May 3-23/Type No. 56015 U.S.N.M./*Pityophthorus shannoni* Blkm. The allotype and 1 paratype bear the same data (USNM).

*G. mandibularis*. The holotype (♀) is in the USNM and bears the data: Barro Colo. Isl., CZ., VI-20-41, Z-4816/collected at light/Type No. 56418 U.S.N.M./*Gnatholeptus mandibularis* Blackman. Thirteen paratypes, all females, bear the same data (USNM).

*P. gentilis*. The holotype (♀) of this species is in the CUIC and is labeled: Barro Colorado Id., Gatun Lake, C.Z., Pan., Apr. 1924/Apr. 1924, J.C. Bradley, col./Pityophthorus gentilis m. ♀ type, Det. K.E. Schedl/HOLOTYPE Cornell U. No. 3876. The allotype, also in the CUIC, bears the labels: Tres Rios Plantatica/Gatun Lake, Panama, 1931/Tozschokke, collector/Pityophthorus gentilis n. sp. ♂ type, Det. K.E. Schedl/Allotype Cornell U. No. 3876. One paratype in the CUIC bears similar labels.

Holotypes of all three names have been examined and found to represent the same species.

HOST. Unknown.

DISTRIBUTION. Known only from Barro Colorado Island, Panama, but undoubtedly occurs in a much more extensive area. Specimens (23) examined from:

PANAMA

**Canal Zone:** Barro Colorado Island, 24.VII.1963, D.Q. Cavagnaro and M.E. Irwin (DEBC) 2; Barro Colorado Island, 26.VI.1962, H. Ruckes (DEBC) 1.

REMARKS. The mandibles of this species are not strongly extended but the adults have the large eyes, which indicates that the species belongs in the present subgenus. In addition, adults may be distinguished by the dense brush of equal length setae on the female frons, by the three large, acute granules in each third declivital interstriae and by the presence of a median row of setae in each declivital interstriae except 2.

8. *Pityophthorus (G.) semiermis* Nunberg

*Pityophthorus semiermis* Nunberg, 1963, p. 98.

*Gnatholeptus semiermis*: Bright, 1977, p. 513.

Length 1.8 mm, 2.9 times longer than wide.

**Holotype** (♂). Frons flattened on a semicircular area extending from epistoma to about half the distance to the upper margin of eyes; surface subopaque, punctures shallow, vague, of moderate size; epistoma rounded. Mandibles slender, moderately extended, meeting on distal half of inner margin. Antennae missing. Pronotum 1.2 times longer than wide, widest on basal half; sides on basal half subparallel; asperities on anterior slope low, broad, basally contiguous, arranged in concentric rows; asperities in the median portion of each row slightly irregularly placed; posterior portion of disc moderately shining, punctures shallow, of moderate size; surface between punctures smooth with scattered, minute points. Elytra 1.7 times longer than wide; apex narrowly rounded; discal striae punctured in nearly regular rows, punctures weakly impressed, vague, rather small; discal interstriae about 2.0 times wider than striae, surface smooth, first, third and fifth with 1 or 2 erect setae on posterior half near declivity. Declivity sloping; interstriae 1 moderately elevated, bearing a few, narrow, flattened setae, granules absent; interstriae 2 moderately impressed, sloping downward toward the distinctly impressed striae 1, surface unmodified except a few, very small setae are scattered at apex; interstriae 3 slightly higher than 1, bearing a row of 2-4 erect, narrow setae and 2 very small, rounded granules; interstriae 5 and 7 also bearing several erect, narrow setae; punctures in striae 1 and 2 obsolete, striae 1 distinctly impressed.

**Female.** Unknown.

TYPE MATERIAL. The holotype (♂) is deposited in the University of Wisconsin collection and is labeled: HOLOTYPUS (red-bordered label)/Costa-Rica, Lalola, 20-VII-61, Light trap/Pityophthorus semiermis sp. nov. Det. M. Nunberg, Data 17-XII-1962. Only the holotype is known.

HOST. Unknown.

DISTRIBUTION. Known only from the type locality in Costa Rica.

REMARKS. Only the male holotype of this species is known. It appears to represent a distinct species characterized most easily by the sparse, erect setae on the first, third, fifth, and seventh discal and declivital interstriae.

#### Subgenus **PITYOPHTHORUS** s. str.

Type-species: *Bostrichus lichtensteini* Ratzeburg, 1837 (subsequent designation by Hopkins, 1914).

This subgenus is characterized by the characters given in the key. Included in this subgenus are all the North American species previously placed in *Myeloborus*, *Pityophthoroides*, *Ctenyophthorus*, and *Pityophthorus*. In this monograph, the subgenus is broken into 47 species groups. Two hundred and eleven species are included.

#### KEY TO SPECIES GROUPS OF SUBGENUS *Pityophthorus*

1. Asperities on anterior slope of pronotum arranged into two or more definite concentric rows, or at least an indication of concentric rows is evident, that is, asperities on lateral portion of pronotum basally contiguous and arranged in a row (Fig. 1); male frons either without a definite carina or with a transverse carina; rarely on coniferous hosts . . . . . 2
- Asperities on anterior slope of pronotum randomly placed, showing no indication of concentric rows (Figs. 4-7); male frons usually with a definite longitudinal or transverse carina, or both, or transversely impressed; on coniferous and broadleaf hosts . . . . . 10
2. Elytral apex broadly to narrowly rounded, may appear subacuminate (Figs. 1-5). . . . . 3
- Elytral apex definitely acuminate (Figs. 6, 7) . . . . . Scriptor group (in part) (p. 28)
3. Asperities on pronotum broad, costiform, each one extending up to one-fourth or more of the pronotal width; antennal funicle variable, with 3-5 segments; anterior margin of pronotum with an elevated, acute ridge, this ridge not serrate . . . . . Costatus group (p. 47)
- Asperities on pronotum not costiform, each one extending much less than one-quarter of pronotal width; antennal funicle always 5-segmented; anterior margin of pronotum serrate . . . . . 4
4. Anterior margin of pronotum bearing 2 or 4 serrations, pronotal summit may be distinct, but not especially high, asperities generally distributed . . . . . 5
- Anterior margin of pronotum bearing 2 or 4 serrations, if four then median pair larger (Fig. 63); pronotal summit high, asperities clustered around summit . . . . . Deletus group (in part) (p. 109)
5. Antennal club with 1 sclerotized, transverse suture; Mexico . . . . . Amoenus group (p. 48)
- Antennal club with 2 sclerotized, transverse sutures . . . . . 6
6. Segment 1 of antennal club distinctly narrower than the others, club widest through segment 3 . . . . . Assitus group (p. 49)
- Segment 1 of antennal club nearly equal in width to others, club widest through segment 2 . . . . . 7
7. Elytral declivity deeply impressed, interstriae 3 strongly elevated, much higher than 1, inner slope precipitous, summit strongly granulate (Figs. 24, 26) . . . . . Obtusipennis group (p. 50)
- Elytral declivity not deeply impressed, interstriae 3 equal in height or only slightly higher than 1, the inner slope sloping, the summit weakly granulate to devoid of granules . . . . . 8
8. Punctures in striae 1 and 2 (especially 2) distinct on declivity, usually equal in size to those on disc; interstriae 2 on declivity as wide as on disc or nearly so, distinctly impressed and flat (Figs. 30, 32, 34, 36, 38). . . . . Lautus group (p. 54)
- Punctures in striae 1 and 2 indistinct, obsolete on declivity, if visible then smaller than those on disc, or if appearing distinct then interstriae 2 not impressed; interstriae 2 on declivity usually wider than discal width, usually not impressed . . . . . 9
9. Occurs in *Pinus* spp. in southwestern United States and northern Mexico; male frons deeply, transversely impressed, with a distinct transverse carina at upper level of eyes (Fig. 40); female frons similar but less deeply impressed (Fig. 39) . . . . Barberi group (p. 69)

- Occurs in non-coniferous plants from southwestern United States to Panama; male frons variable but usually not deeply, transversely impressed; female frons usually flattened and densely pubescent . . . . . Juglandis group (p. 72)
- 10. Elytral apex narrowly to broadly rounded at suture (Figs. 1-5); male frons either without a carina, with a longitudinal carina, or with a poorly developed transverse carina or with both a longitudinal and a transverse carina . . . . . 11
  - Elytral apex moderately to strongly acuminate (Figs. 6, 7); male frons with a transverse carina on upper margin of transverse impression . . . . . 56
- 11. Pronotum evenly arched from base to anterior margin without an elevated summit (in some tropical species a very slight elevation may be evident) (Fig. 2); species in non-coniferous hosts except *Pulicarius* group . . . . . 12
  - Pronotum with a definite elevated summit, surface transversely impressed behind summit, impression may be very weak (Figs. 3-7); species in coniferous hosts . . . . . 14
- 12. Temperate and tropical species in non-coniferous hosts . . . . . 13
  - Temperate species in *Pinus* species . . . . . *Pulicarius* group (p. 83)
- 13. Male and female frons similar, male never with a carina of any kind, female with inconspicuous setae; in vines, shrubs or broadleaf trees, not *Quercus* . . . . .
  - . . . . . *Alni* group (p. 92)
  - Male and female frons distinctly different, male glabrous or sparsely pubescent (Figs. 58, 61), female with long, conspicuous setae (Figs. 57, 60); usually found in *Quercus* species (several exceptions) . . . . . *Guatemalensis* group (p. 99)
- 14. Anterior margin of pronotum with 2 or 4 serrations, if four then median pair much larger than others (Fig. 63); pronotal summit high; asperities clustered near summit . . . . .
  - . . . . . *Deletus* group (in part) (p. 109)
  - Anterior margin of pronotum with more than 4 serrations, median pair usually not distinctly larger than others; pronotal summit prominent or not; asperities more generally scattered . . . . . 15
- 15. Declivity oblique, lateral margins acutely, very strongly elevated from top of interstria 2, around the elytral apex to the opposite interstria 2 (Figs. 3, 68); frons of both sexes very similar, male sometimes with a faint, longitudinal carina . . . . . *Cristatus* group (p. 114)
  - Declivity convex, lateral margins may or may not be evident but never as above; frons usually sexually dimorphic . . . . . 16
- 16. Segment 1 of antennal club much narrower than 2 and 3, club usually widest through segment 3 (Fig. 8) . . . . . 17
  - Segment 1 of antennal club not noticeably narrower than 2 and 3, club widest through segment 2 or 3, if segment 1 appears narrower than others, then club widest through segment 2 (Fig. 9) . . . . . 26
- 17. Elytral interstriae 3 and 9 weakly to distinctly elevated and usually joined near apex or, at least, interstriae 3 and 9 are elevated and joined at apex . . . . . 18
  - Elytral interstriae 3 and 9 not obviously joined at apex, interstriae 9 frequently elevated on lateral portions of elytra . . . . . 20
- 18. Sutures of antennal club not sclerotized at lateral margins; antennal club distinctly sexually dimorphic, large and broad in female, narrowly oval and small in male; frons of both sexes convex, glabrous and bearing a fine longitudinal carina (Figs. 152, 153); posterior portion of pronotum granulate . . . . . *Ramiperda* group (in part) (p. 201)
  - Sutures of antennal club sclerotized at lateral margin; antennal club similar in both sexes; frons variable but not as above; posterior portion of pronotum not granulate . . . . 19
- 19. Interstriae 2 on declivity as wide as on disc (Fig. 71); interstriae 3 straight on declivity (Fig. 71); strial punctures on declivity equal in size to those on disc (Fig. 71); surface of posterior portion of pronotum reticulate between punctures; Mexico and Central America . . . . . *Diglyphus* group (p. 116)
  - Interstriae 2 at least slightly wider on declivity than on disc (Figs. 83, 86); interstriae 3 diverging from suture on declivity (Figs. 83, 86); strial punctures on declivity much smaller than those on disc or completely obsolete; surface of posterior portion of pronotum smooth or minutely reticulate between punctures; United States and Canada . . . . . *Nitidus* group (in part) (p. 126)
- 20. Suture 1 on antennal club strongly arcuate . . . . . 21
  - Suture 1 on antennal club straight to weakly arcuate . . . . . 23

21. Only elytral interstriae 1, 3, 5, 7 punctured and setose, sometimes only sparsely so . . . . . 22  
 - All elytral interstriae punctured and setose (Fig. 213) . . . . . Crassus group (in part) (p. 271)
22. Body less than 1.5 mm in length; frons of female concave, with a dense brush of setae arising on the vertex and extending almost to epistoma; male frons usually with a slightly elevated longitudinal carina; declivital interstriae 1 and 3 devoid of granules; northern Mexico . . . . . Thomasi group (p. 121)  
 - Body more than 1.8 mm in length; frons of female flattened, glabrous except for a dense fringe of long setae on periphery and a longitudinal extension extending from upper level of periphery toward center (Fig. 72); male frons weakly transversely impressed above epistoma with a weak transverse carina above impression (Fig. 73); declivital interstriae 1 and 3 bearing fine granules (Fig. 74); southwestern United States and northern Mexico . . . . . Modicus group (p. 122)
23. Antennal club elongate-oval, 1.3-1.4 times longer than wide; elytral pubescence essentially confined to apical half or less, consisting of long, fine setae placed in a row in each interstriae except 2; pubescence on female frons very long, setae arising on vertex extending beyond epistoma (Figs. 75, 78); Mexico in *Abies religiosa* or *Pseudotsuga menziesii* . . . . . Elatinus group (p. 124)  
 - Antennal club broadly oval, usually less than 1.2 times longer than wide; elytral pubescence more generally distributed, consisting of very short, fine, interstitial setae; pubescence on female frons shorter, setae arising on vertex not extending beyond epistoma; generally distributed in North America in *Pinus*, *Picea*, *Larix*, etc. . . . . 24
24. Surface between punctures on posterior half of pronotum brightly shining, smooth, may be minutely punctured; elytral striae usually punctured in regular rows . . . . . 25  
 - Surface between punctures on posterior half of pronotum dull, minutely reticulate; striae usually punctured in somewhat irregular rows . . . . . Litos group (p. 136)
25. Carina on male frons very weakly elevated to completely absent (Figs. 82, 85); setae on female frons short to long, all of about equal length (Figs. 81, 84) . . . . . Nitidus group (in part) (p. 126)  
 - Carina on male frons sharply elevated, toothlike (Figs. 170, 173); setae on female frons longer and incurved on periphery (Figs. 169, 172) . . . . . Dentifrons group (in part) (p. 221)
26. Male frons weakly to strongly transversely impressed, upper margin of impression bearing a median, elevated, more or less circular callus, sometimes impression is divided by a very fine longitudinal carina which extends from epistoma to the callus (Fig. 88); female frons deeply, broadly concave from epistoma to well above eyes, pubescence long and abundant (Fig. 87); endemic to coastal regions of central and southern California . . . . . Carmeli group (p. 137)  
 - Male frons never as above; female frons variable, but never deeply, broadly concave; generally distributed but not as above . . . . . 27
27. Surface of frons of both sexes convergently aciculate (Figs. 90,91); pronotal and elytral punctures strongly impressed; declivital interstriae 3 not granulate, moderately elevated (Fig. 92) . . . . . Aciculatus group (p. 139)  
 - Surface of frons of both sexes not convergently aciculate; pronotal and elytral punctures variable in depth; declivital interstriae 2 variable . . . . . 28
28. Declivital interstriae 2 randomly, distinctly punctured (Fig. 95) . . . . . Solus group (p. 139)  
 - Declivital interstriae 2 usually not punctured, if punctured, then punctures in an even single row . . . . . 29
29. Male and female frons strongly convex, glabrous; central portion of female frons from epistoma to upper level of eyes very densely, finely granulate-punctate, with a very small callus or longitudinal elevation on epistoma; male frons densely, finely punctured . . . . . Recens group (p. 142)  
 - Male and female frons flattened, impressed, carinate, pubescent, or otherwise modified, not as above . . . . . 30
30. Elytral declivity evenly convex, not impressed or sulcate; striae punctures on declivity obsolete or absent; declivital interstriae 3 bearing about 4 widely separated, minute



- granules; only segment 1 of antennal club sclerotized . . . . . Punctifrons group (p. 143)
- Elytral declivity variable; segments 1 and 2 of antennal club sclerotized, at least at lateral margins . . . . . 31
  - 31. Male frons with both a longitudinal and transverse carina (as in Fig. 118) *or only* with transverse carina, if both present, then transverse carina usually more prominent and may be straight or arcuate . . . . . 32
    - Male frons without carina *or* with only a longitudinal carina, this varying from strongly elevated and toothlike to barely evident, if absent then frons usually transversely impressed (as in Fig. 103) . . . . . 38  - 32. Male and female frons very similar, except that transverse carina on female frons less strongly elevated, and pubescence below carina longer and more conspicuous (Figs. 39, 40); interstriae 2 broadly, shallowly sulcate (Fig. 41) . . . . . Barberi group (in part) (p. 69)
    - Male and female frons distinctly sexually dimorphic; declivital interstriae 2 variable . . . 33  - 33. Elytral apex of female very narrowly rounded, almost subacuminate, that of male broadly rounded; declivital interstriae 2 as wide as on disc; female frons broadly, weakly flattened, median area frequently elevated and usually more densely pubescent, setae short . . . . . Furnissi group (p. 144)
    - Elytral apex usually more broadly rounded in both sexes (except some spp. in *Nitidulus* group); declivital interstriae 2 variable but usually wider on declivity than on disc; male declivity bisulcate, not as above; female frons broadly flattened to concave, median are not elevated or especially pubescent . . . . . 34  - 34. Elytral interstriae largely impunctate and glabrous on disc . . . . . 35
    - Elytral interstriae at least sparsely punctured and setose on disc . . . . . 36  - 35. Female frons sparsely pubescent over entire surface, setae longer and incurved on periphery (Fig. 111); transverse and longitudinal carina on male frons only faintly indicated (Fig. 112); Arizona . . . . . *Nitidulus* group (in part) (p. 151)
    - Female frons glabrous except for a very small fringe of very short, closely placed setae on lateral areas near eyes (Fig. 96); transverse and longitudinal carina on male frons prominent (Fig. 97); southern Mexico . . . . . Montivagus group (p. 145)  - 36. Transverse carina on male frons absent to weakly elevated (Fig. 100); setae on female frons usually of equal or nearly equal length (Fig. 99); small species, 2.1 mm in length or less . . . . . Intextus group (p. 146)
    - Transverse carina on male frons sharply elevated; setae on female frons usually slightly to distinctly longer and incurved on periphery; larger species, usually 2.0 mm or larger . . . . . 37  - 37. Body elongate, slender, about 2.7-2.8 times longer than wide; elytral interstriae sparsely punctured on disc . . . . . *Nitidulus* group (in part) (p. 151)
    - Body stout, about 2.5 times longer than wide; elytral interstriae densely punctured on disc . . . . . Confinis group (in part) (p. 267)  - 38. Male declivity with interstriae 3 rather prominently elevated in median area, or on upper half to almost spinelike and weakly to strongly extended or displaced mesally toward suture, protuberances may almost meet over suture (Figs. 133-136); female frons variously, concavely impressed or ornamented with spongy areas, carinae, or patches of setae (Figs. 123-132); usually slender species, about 3.0 times longer than wide; pronotum distinctly longer than wide . . . . . Cariniceps group (p. 173)
    - Male declivity normally bisulcate or convex, lateral summits not as above; female frons not as above; stouter species, usually less than 3.0 times longer than wide; pronotum only slightly longer than wide . . . . . 39  - 39. Declivital interstriae 3 of male strongly to moderately elevated above 1 and distinctly granulate, may be more strongly elevated on upper half, declivital interstriae 1 devoid of granules or granules, if present, much smaller than those on 1 (Fig. 139); declivity of female more shallowly sulcate, interstriae 3 moderately higher than 1, interstriae 1 with a few minute granules; longitudinal carina on male frons weakly developed (Fig. 138); Mexico and Central America . . . . . Nigricans group (p. 188)
    - Elytral declivity of both sexes variable but not as above; longitudinal carina on male frons variable . . . . . 40

40. Elytral interstriae impunctate and not setiferous on disc, or at least not punctured on anterior half of disc; (1 or 2 punctures may be present on interstriae 3 and 5); longitudinal carina on male frons weakly to moderately elevated . . . . . 41
- At least some elytral interstriae punctate and setiferous on disc (more than 1 or 2 punctures present) or elytral punctures randomly placed; longitudinal carina on male frons weakly to very strongly elevated, if absent then frons transversely impressed . . . . . 43
41. Punctures in striae 1 and 2 obsolete on declivity, not readily visible; in interstriae 3 obvious, more so in male . . . . . Nitidulus group (in part) (p. 151)
- Punctures in striae 1 and 2 distinct on declivity, readily visible; granules in interstriae 3 small or absent . . . . . 42
42. Male frons shining, smooth, punctured, transversely impressed and bearing a very weak longitudinal carina or carina absent, then epistoma bearing a rounded, prominent, median granule (Figs. 144, 147); female frons weakly to moderately concave, densely pubescent (Figs. 143, 146) . . . . . Nocturnus group (p. 192)
- Male frons dull, opaque, minutely reticulate, convex to flattened, usually with a distinct longitudinal carina (Fig. 150); female frons convex to flattened, usually sparsely pubescent (Fig. 149) . . . . . Segnis group (p. 195)
43. Antennal club without chitinized sutures or sutures very weakly chitinized at lateral margins; male and female frons similar, at least weakly convex to weakly concave, rather coarsely punctured, with or without a weak, median, longitudinal carina on lower half; female frons sparsely pubescent (Fig. 152) . . . . . Ramiperda group (p. 201)
- Antennal club with distinctly chitinized sutures; male frons usually convex, often with a conspicuous longitudinal carina; female frons either densely pubescent, or when setae absent, much more densely, finely punctured than in male and never with a longitudinal carina . . . . . 44
44. Discal interstriae 4 not punctured or setiferous, often only interstriae 1, 3, 5, 7, and 9 punctured and setiferous but sometimes 2 is also punctured and setiferous . . . . . 45
- Discal interstriae 4 punctured and setiferous, in this case all discal interstriae are punctured and setiferous . . . . . 51
45. Elytral declivity evenly convex, interstriae 2 not or only very weakly impressed below elytral surface, interstriae 3 not elevated, may or may not bear granules (as in Fig. 155); frons of both sexes may be carinate with carina stronger in male or female carina may be absent, if so, then frons convex to weakly flattened with sparse, short, usually equal length setae (Fig. 154, 156, 158); usually smaller species . . . . . Opatulus group (p. 211)
- Elytral declivity at least weakly bisulcate, interstriae 2 distinctly impressed below elytral surface, interstriae 3 elevated, usually distinctly granulate; frons of female flattened to concave, sparsely to densely clothed with setae, those setae on periphery frequently longer and incurved; usually larger species . . . . . 46
46. Male carina on frons distinct, more strongly elevated on lower half, resembling a laterally flattened tooth (Figs. 170, 173); female frons usually sparsely setiferous, center glabrous or very sparsely setose (Figs. 169, 172) . . . . . Dentifrons group (in part) (p. 221)
- Male carina on frons weakly to strongly elevated, but not toothlike, if strongly elevated, then evenly arched from epistomal margin to near upper level of eyes; female frons usually densely pubescent over entire surface . . . . . 47
47. Carina on male frons laterally flattened, sharply elevated, its crest evenly arched from epistoma to near upper level of eyes (Fig. 176); female frons flattened to concave in center, pubescence usually more abundant, longer and incurved on upper margin of concavity (Fig. 175); elytral declivity convex to impressed, interstriae 2 not widened, interspaces 1 and 3 sparsely granulate to not granulate (Fig. 177) . . . . . Venustus group (p. 233)
- Carina on male frons not laterally flattened and sharply elevated and/or its crest not evenly arched from epistoma to near upper level of eyes, carina moderately to weakly elevated if at all; female frons flattened, pubescence evenly distributed, sparse in central area and longer on periphery; elytral declivity variable, interstriae 2 equal in width to discal width or wider than discal width, interstriae 1 and 3 usually distinctly granulate . . . . . 48

48. Setae on periphery of female frons very long, those arising on upper level extending to epistoma (Fig. 75); carina on male frons broadly convex, distinct (Fig. 76); antennal club elongate oval, 1.3-1.4 times longer than wide; *Abies* or *Pseudotsuga*; Mexico . . . . .  
 . . . . . Elatinus group (in part) (p. 124)  
 - Male and female frons not as above; antennal club less than 1.2 times longer than wide . . . . . 49
49. Elytral declivity of male generally flattened between the fourth interstriae, the suture deeply impressed on upper half of declivity; striae punctures on elytral disc large, deep . . . . .  
 . . . . . Laticeps group (p. 237)  
 - Elytral declivity convex, interstriae 3 on each elytron forming lateral margin, suture not distinctly impressed to deeply impressed, striae punctures on disc not especially large and deep . . . . . 50
50. Summit of declivital interstriae 3 much higher than 1 (Figs. 139, 142); declivital interstriae 1 and 3 distinctly granulate, granules rather large (Figs. 139, 142) . . . . .  
 . . . . . Nigricans group (in part) (p. 188)  
 - Summit of declivital interstriae 3 equal in height or only very slightly higher than 1; granules on declivital interstriae 1 and 3 small (as in Fig. 192) . . . . .  
 . . . . . Blandus group (p. 238)
51. Male and female frons both bearing a longitudinal carina (as in Fig. 198) . . . . .  
 . . . . . Puberulus group (p. 260)  
 - Male and female frons sexually dimorphic, male with a longitudinal carina and sparsely pubescent, female devoid of carina and usually densely pubescent . . . . . 52
52. Pronotum evenly arched, summit not elevated or, at most, very weakly so . . . . .  
 . . . . . Pulicarius group (in part) (p. 83)  
 - Pronotum with a definitely elevated summit . . . . . 53
53. Male carina strongly elevated, usually toothlike (as in Fig. 212) . . . . . 54  
 - Male carina not strongly elevated, not toothlike (as in Fig. 218) . . . . . 55
54. Elytral declivity not sexually dimorphic, interstriae 3 of both sexes evenly convex, weakly elevated with small granules; sutures on antennal club nearly straight or weakly arcuate; carina on male frons more strongly elevated at midpoint, just below upper level of eyes (Fig. 203) . . . . .  
 . . . . . Confinis group (p. 267)  
 - Elytral declivity sexually dimorphic, interstriae 3 of male distinctly elevated only on upper half, that of female evenly convex to apex, distinctly granulate in both sexes; sutures on antennal club distinctly arcuate; carina on male frons strongly compressed laterally, strongly elevated on epistomal region (Fig. 212) . . . . .  
 . . . . . Crassus group (p. 271)
55. Pronotal summit located behind the middle of the pronotum, only weakly elevated; declivital interstriae 2 of female much wider than its discal width, flat; body chunky, 2.5 times longer than wide; declivital interstriae 1 and 3 weakly to not granulate . . . . .  
 . . . . . Comosus group (p. 277)  
 - Pronotal summit located at or near middle, distinctly elevated; declivital interstriae 2 weakly or not widened in both sexes, sulcate; body elongate, about 2.8 times longer than wide; declivital interstriae 1 and 3 strongly to weakly granulate . . . . .  
 . . . . . Blandus group (in part) (p. 238)
56. Temperate and tropical species occurring in broadleaf trees, shrubs, vines, etc. . . . .  
 . . . . . Scriptor group (in part) (p. 28)  
 - Temperate species occurring in coniferous trees . . . . . 57
57. Male and female frons similar . . . . . 58  
 - Male and female frons distinctly sexually dimorphic . . . . . 60
58. Male and female frons broadly, circularly flattened to well above upper eye level and weakly concave in center, evenly punctured, moderately pubescent; pronotum without a distinct summit or summit weakly elevated . . . . .  
 . . . . . Chaleoensis group (p. 279)  
 - Male and female frons distinctly, transversely impressed to weakly convex on area below upper level of eye; pronotum with a distinct summit . . . . . 59
59. Elytral interstriae impunctate and glabrous on disc (Figs. 216, 219); interstriae 1, 3, 5, 7 each bearing a row of hairlike setae on posterior half of elytra (Figs. 226, 219); frons flattened to weakly convex; small species, 1.5-2.0 mm in length . . . . .  
 . . . . . Consimilis group (p. 282)

- At least some elytral interstriae bearing long setae on posterior third of elytra (Fig. 222); frons transversely impressed to weakly concave (Figs. 220, 221); larger species, over 2.0 mm in length . . . . . Pullus group (p. 287)
- 60. Pronotum with a distinct groove on posterior-lateral margin . . . . . Confusus group (p. 290)
- Pronotum not bearing a groove on posterior-lateral margin . . . . . 61
- 61. Female frons longitudinally elevated in midline, setae very short, of equal length, seemingly more abundant along elevation; elytral apex subacuminate in female, broadly rounded in male . . . . . Furnissi group (in part) (p. 144)
- Female frons flattened to weakly concave, setae usually longer and incurved on periphery (as in Fig. 232) but may be short and of equal length; elytral apex acuminate in both sexes . . . . . Confertus group (p. 295)

#### SCRIPTOR GROUP

The species placed in this group are distinguished by the concentric rows of pronotal asperities (Fig. 1) (sometimes irregular in several species) and by the acuminate (narrowly rounded in two species) elytral apex (as in Figs. 12, 14). There are 16 species included in this group. Two additional species, *subsimilis* and *subimpressus*, are included in the key below since some specimens may have concentric rows of pronotal asperities; however, they are more closely related to those in the *Confertus* group and are discussed there. All species, except the two mentioned above, occur in non-coniferous hosts.

#### KEY TO SPECIES IN THE Scriptor group

1. Interstriae 1 moderately to strongly impressed below level of interstriae 3 on upper portions of declivity (especially in males); granules on declivital interstriae 3 usually large and prominent (Fig. 12) . . . . . 2
  - Interstriae 1 not impressed on declivity, equal in height to interstriae 3, or at most very slightly lower; granules on interstriae 3 usually very small (Fig. 22) . . . . . 11
2. Median line on posterior portion of pronotum sharply, narrowly elevated; punctures on posterior portion of pronotum large, deep, almost touching; discal interstriae 1, 3, 5, 7 usually with a median row of sparse setae extending nearly to base; Mexico . . . . . 9. *mexicanus* Blackman (p. 30)
  - Median line on pronotum not elevated; punctures on posterior portion of pronotum finer, shallower, and more widely separated; discal interstriae usually impunctate . . . . . 3
3. Declivity of male very steep, flattened, with an acute, tuberculate margin extending from top of interstriae 3 around apex of opposite interstriae 3, granules on interstriae 1 and 3 large, acute; declivity of female convex, less deeply sulcate, with prominent granules on interstriae 1 and 3; Mexico . . . . . 10. *hylocuroides* Wood (p. 31)
  - Declivity convex and bisulcate in both sexes, with small to prominent rounded granules on interstriae 1 and 3 . . . . . 4
4. Declivital sulcus very wide, flattened to fifth interstriae, interstriae 1 only slightly lower than 3 on upper half; male frons strongly transversely impressed from epistoma to upper level of eyes; posterior portion of pronotum obscurely punctured, reticulate; body slender, about 3.1 times longer than wide; Guatemala . . . . . 11. *elegans* Schedl (p. 32)
  - Declivital sulcus more convex, more narrowly bisulcate, interstriae 3 forming lateral margins; male frons variable; posterior portion of pronotum distinctly punctured . . . . . 5
5. Posterior portion of pronotum bearing rounded, elevated granules on lateral or posterior edges of punctures; surface between punctures on posterior portion of pronotum strongly and densely reticulate; female frons densely pubescent, with longer, downward pointing setae on upper and lateral margin (Fig. 13) . . . . . 6
  - Posterior portion of pronotum not bearing rounded, elevated granules on edges of punctures; surface between punctures on posterior portion of pronotum not strongly reticulate; female frons variable . . . . . 7

6. Body slender, about 2.9-3.0 times longer than wide; female frons broadly flattened, densely pubescent with long setae on upper and lateral margins (Fig. 13); male frons flattened; interstriae 1 on declivity with small granules along entire length, granules on interstriae 3 slightly larger (Fig. 14); Mexico . . . . . 12. *coronarius* Blackman (p. 33)
- Body stouter, 2.7-2.8 times longer than wide; female frons broadly concave, with long setae on complete periphery; male frons moderately, transversely impressed; interstriae 1 on declivity devoid of granules except at base and at apex, granules on interstriae 3 acute, prominent; Mexico . . . . . 13. *concinus* Wood (p. 34)
7. Occurs in conifers in southwestern United States; declivital interstriae 2 very broad, moderately sulcate (Fig. 17); pronotal asperities arranged in even or irregular rows; female frons pubescent over entire surface, setae on periphery longer and incurved (Fig. 15) . . . . . 14. *arcanus* Bright (p. 35)
- Occurs in shrubs in southeastern and western United States or in deciduous trees or shrubs in Central America; declivital interstriae 2 not broadly sulcate; pronotal asperities scattered or in even concentric rows; female frons variable but not as above . . . . . 8
8. Pronotal asperities numerous and scattered in no apparent order; declivital striae 1 and 2 with distinct punctures, these almost equal in size to those on disc; declivital setae of male narrowly spatulate; Panama . . . . . 15. *vesculus* Wood (p. 35)
- Pronotal asperities arranged in even concentric rows; punctures in declivital striae obscure; declivital setae hairlike in males . . . . . 9
9. Declivity deeply bisulcate in male, interstriae 3 much higher than 1, with large, coarse granules (Fig. 20); female declivity more shallowly bisulcate; Idaho to northern Mexico . . . . . 16. *virilis* Blackman (p. 36)
- Declivity moderately to shallowly bisulcate in both sexes, interstriae 3 only slightly higher than 1 with moderately large to small granules . . . . . 10
10. Granules on declivital interstriae 1 and 3 small; female frons evenly pubescent on a large semicircular area, setae slightly longer on periphery; male frons moderately deeply, transversely impressed; southeastern U.S.A. . . . . 17. *scriptor* Blackman (p. 39)
- Granules on declivital interstriae 1 and 3 moderately large; female frons densely pubescent, the setae on the periphery very closely placed and very long, extending downward almost to epistoma and masking surface of frons; male frons shallowly, transversely impressed; Honduras . . . . . 18. *hermosus* Wood (p. 40)
11. Basal half of pronotum dull, densely, minutely reticulate, punctures barely visible if at all . . . . . 19. *dimidiatus* Blackman (p. 41)
- Basal half of pronotum dull to shining, punctures always distinctly visible . . . . . 12
12. Punctures in declivital striae 2 obscure, very difficult to see . . . . . 13
- Punctures in declivital striae 2 usually distinct, obvious . . . . . 17
13. Declivital interstriae 1 and 3 devoid of granules or granules extremely minute; female frons flattened, pubescence long on periphery, somewhat sparser in a median, longitudinal space; male frons impressed; Guatemala . . . . . 20. *minutalis* Wood (p. 42)
- Declivital interstriae 1 and 3 with generally distinct granules; male and female frons variable, not as above . . . . . 14
14. Male frons convex, with a weak longitudinal carina; female frons concave, uniformly covered with dense pubescence, the setae on periphery longer and incurved; southwestern U.S.A. . . . . 21. *torridus* Wood (p. 43)
- Male frons very weakly, transversely impressed, with an extremely fine, longitudinal carina or a narrow, longitudinal, smooth space; female frons flattened, with either 3 tufts of extremely long, fine setae extending downward to apex of mandibles or flattened area uniformly pubescent . . . . . 15
15. Female frons with three tufts of extremely long, downward pointing setae which extend almost to tips of mandibles; male frons generally convex, narrowly transversely impressed above epistoma, with a weak longitudinal carina; Guatemala . . . . . 22. *nugalis* Wood (p. 43)
- Female frons uniformly pubescent on a subcircular area occupying 70-75% of distance between eyes, setae short, usually all of equal length (Fig. 21); male frons weakly transversely impressed from epistoma to upper level of eye, usually with a longitudinal smooth space; Mexico . . . . . 16

16. Size smaller, 0.8-1.2 mm; declivital interstriae 2 very weakly impressed, interstriae 3 weakly elevated, granules on 1 and 3 minute, obscure . . . . . 23. *atomus* Wood (p. 44)
- Size larger, 1.2-1.5 mm; declivital interstriae 2 more deeply impressed, 3 distinctly elevated, granules on 1 and 3 distinct . . . . . 24. *atenuatus* Blackman (p. 45)
17. Occurs in *Pinus* spp.; surface between punctures on posterior portion of pronotum smooth, with only a few minute points and/or lines . . . . . 18
- Occurs in vines; surface between punctures on posterior portion of pronotum densely micropunctate; Costa Rica . . . . . 25. *sobrinus* Wood (p. 46)
18. Elytral apex distinctly, strongly acuminate, the apices projecting downward on female; southern Mexico and Guatemala (see *Confertus* group) . . . . . 205. *subs similis* Schedl (p. 301)
- Elytral apex moderately acuminate, the apices not projecting downward on female; southern Mexico (see *Confertus* group) . . . . . 206. *subimpressus* Bright (p. 303)

### 9. *Pityophthorus* (*P.*) *mexicanus* Blackman

Figs. 11, 12

*Pityophthorus mexicanus* Blackman, 1928, p. 121; Schedl, 1939, p. 348; Schedl, 1963, p. 158.

Length 2.2-2.9 mm, about 2.9 times longer than wide.

**Female.** Frons flattened on a broad semicircular area extending from epistoma to above upper level of eyes and laterally occupying about 90% of distance between eyes; surface of flattened area very densely, deeply, and finely punctured except for a rather broad, median space just above epistomal margin; surface above and lateral to flattened area smooth, with large, deep, scattered punctures; vestiture consisting of abundant, rather long, uniformly placed, yellowish setae scattered over flattened, semicircular area, setae on periphery of flattened area somewhat longer, setae absent on impunctate, smooth space above epistomal margin. Antennal club elongate-oval, 1.2-1.3 times longer than wide, all segments about equal in width; sutures 1 and 2 transverse; segments 1 and 2 together occupy slightly more than half of total club length. Pronotum 1.0-1.1 times longer than wide, widest at about middle; asperities on anterior slope arranged into 3 or 4 concentric rows, these sometimes irregular with 1 or 2 individual asperities off-set or placed between rows, several additional irregular rows may be evident around summit; summit distinctly elevated; posterior area of disc strongly punctured, punctures large, deep, almost touching; surface between punctures shining, with minute lines and points; median line narrowly, strongly elevated from summit to about half the distance to posterior margin, more strongly elevated just behind summit, area on each side of median line behind summit distinctly but weakly impressed or flattened. Elytra 1.7-1.8 times longer than wide; apex strongly acuminate; discal striae punctured in regular rows, punctures equal in size to those on posterior portion of pronotum, deeply impressed, almost touching; discal interstriae generally narrower than striae, surface shining with numerous fine lines and points; interstriae 1, 3, 5, 7, and sometimes 2, each with a median row of large, scattered punctures, these extending nearly to base, each puncture bearing an erect seta. Declivity steep, deeply impressed; interstriae 1 rather strongly elevated to apex, impressed below level of 3 and bearing from 6 to 8 rather large, rounded granules; interstriae 2 narrowed at beginning of declivity, then broadly widened in central portion, flattened to weakly sulcate, surface as on disc; interstriae 3 strongly elevated on upper half, higher than 1, bearing about 4-6 (sometimes more) large, rounded granules, these pointing inwards toward suture, several additional granules may be on unelevated lower portion; punctures in striae 1 and 2 distinct, visible.

**Male.** Frons flattened from just above upper level of eyes to epistomal margin, with a low, broad, weakly elevated epistomal process; surface rather strongly and densely punctured; vestiture inconspicuous. Pronotum, elytra, and declivity as in female except punctures, asperities, and granules stronger and usually more numerous.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Hopk. U.S. 6094 A.D. Hopkins, Apr. 12 '07, Bred/Rubber plant/TYPE *Pityophthorus*

mexicanus Blackman/Type No. 41313 U.S.N.M. The allotype and 19 paratypes bear the same Hopkins number but the locality, Coahuila, Mexico or Coeren, Coahuila, Mexico has been added. One paratype with this same number has been seen with a host label "Ficus", and 3 have the host label "Parthenium argentium". One paratype is labeled: Hopk. U.S. 8949/N.O. Catilla, collector/Rubber tree/Chapala, Jal., Mex.

The holotype, allotype, and most of the paratypes are in the USNM. One paratype is in the DFEC and several are in the CNC.

HOST. *Parthenium argentium* (Guayule or Rubber plant).

DISTRIBUTION. Northern and Central Mexico. Specimens (32) examined from:

MEXICO

**Coahuila:** Torreón, 16.VI.45, Guayule wood, V.E. Rumney (USNM) 8; (SLWC) 2.

**Jalisco:** See type material.

Additional localities in literature:

**Hidalgo:** Rcho. San Leronimo, 29.I.61, *Pinus* sp., F. Islas (Schedl 1963). **Mexico:** Desierto de le Leones, 1961, *Abies* (?), F. Islas (Schedl 1963).

BIOLOGY. Lloyd (1911), under the name *nigricans*, discusses briefly some aspects of the biology of this species. Adults were found boring in guayule that had been stacked awaiting treatment for the extraction of the rubber. A considerable amount of material was destroyed, i.e. up to 40% of the volume of the bark. Since the bark contains practically all of the rubber, loss may be great enough to warrant serious consideration.

Galleries are the typical radiate type. From four to six female galleries extend from the enlarged nuptial chamber. Parent and larval mines both engrave the surface of the wood.

Recently, guayule has been under consideration as a potentially important source of natural rubber. If this plant becomes intensively cultivated in the future, then the activities of this insect may become a serious factor in its growth and/or storage.

REMARKS. Adults of this species are easily distinguished by the deeply impressed elytral declivity on which interstriae 3 is rather strongly elevated on the upper half and bears six or more rounded granules, by the distinctly granulate declivital interstriae 1, by the sharply elevated median line on the posterior half of the pronotum, by the presence of an epistomal process on the male frons, and by the large size.

#### 10. *Pityophthorus (P.) hylouroides* Wood

*Pityophthorus hylouroides* Wood, 1964, p. 69.

Length 1.1-1.5 mm, 2.7 times longer than wide.

**Female.** Frons flattened on a large semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface finely, closely punctured and bearing abundant, uniformly distributed, long setae of equal length. Antennal club nearly circular, about 1.1 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest at middle; asperities on anterior slope arranged into three somewhat irregular, concentric rows, with one or two more indefinite rows around summit; summit elevated, distinct; posterior portion of disc moderately punctured, punctures fine and deep, surface between punctures moderately shining, with numerous fine points; median line narrow, not elevated, impunctate. Elytra 1.7-1.8 times longer than wide; apex moderately acuminate; discal striae punctured in regular rows, punctures

slightly larger than those on posterior portion of pronotum, deeply impressed; discal interstriae about as wide as striae, surface moderately shining, marked by numerous fine lines and points, impunctate and glabrous. Declivity steep, convex, bisulcate; interstriae 1 distinctly elevated, bearing a median row of 4-6 distinct, acute granules; interstriae 2 rather deeply sulcate, wider than discal width, surface as on disc; interstriae 3 rather strongly elevated on upper half, higher than interstriae 1, bearing about 4 acute granules; lateral margin of declivity extending laterally to interstriae 4; punctures of striae 1 and 2 moderately distinct, especially in 2.

**Male.** Frons transversely impressed from epistoma to just above upper level of eyes, upper margin of impression abruptly elevated; surface shining, with shallow, fine punctures; vestiture inconspicuous. Pronotum and elytra essentially as in female. Declivity very steep, abrupt; interstriae 1 moderately, uniformly elevated to apex, deeply impressed on upper half, bearing about 6-8 small, acute granules; interstriae 2 deeply sulcate, wider than on disc, elevated laterally; interstriae 3 distinctly, moderately elevated from upper margin to middle of declivity, distinctly higher than 1, bearing 4-6 large, acute tubercles; apical and lateral margins acute, tuberculate, extending from interstriae 3 around apex to opposite interstriae 3; punctures of striae 1 and 2 evident only on upper portions.

TYPE MATERIAL. The holotype (♂) in the SLWC bears the data: 11 mi. N.E. Jacala, Hidalgo, Mex., VI-22-53, 5100 ft./Taken on Rhus/HOLOTYPE *Pityophthorus hylocuroides* SLWood 1964. The allotype and 12 paratypes bear the same data.

All the type material is in the SLWC.

HOST. *Rhus* sp.

DISTRIBUTION. Known only from the type locality.

REMARKS. This species is fairly closely related to *virilis*. Adults of *hylocuroides* may be distinguished by the very steep, flat elytral declivity with acute lateral margins of the male, by the presence of small, acute granules on interstriae 1 (granules largely absent in *virilis*, except near apex), by the more widely separated punctures on the posterior portion of the pronotum and by the distribution.

#### 11. *Pityophthorus (P.) elegans* Schedl

*Pityophthorus elegans* Schedl, 1938, p. 184.

Length 1.35 mm about 3.1 times longer than wide.

**Holotype** (♂). Frons broadly, strongly, transversely impressed from epistoma to upper level of eyes, upper margin of impression abrupt, weakly elevated; surface shining, sparsely, finely punctured, with sparse, inconspicuous setae. Features of antennal club not visible. Pronotum 1.3 times longer than wide, widest at middle; sides very weakly arcuate; anterior margin broadly rounded, with a row of weak serrations, these basally contiguous; asperities on anterior slope small, weakly elevated, scattered in no apparent order except those in first row placed in an irregular concentric row; summit low but distinct; posterior surface of disc vaguely punctured, punctures fine, moderately large, shallowly impressed; surface between punctures moderately shining, reticulate with minute points and lines. Elytra 1.3 times longer than wide; apex very narrowly rounded, subacuminate; discal striae punctured in regular rows, punctures very large except those in first striae shallow; discal interstriae as wide as or slightly narrower than striae, surface shining, subrugulose, no interstitial setae evident. Declivity very wide, broadly flattened, moderately bisulcate; interstriae 1 weakly elevated, with a median row of minute, setiferous granules; interstriae 2 moderately impressed on upper half, about as wide as on disc, surface as on disc; interstriae 3 weakly elevated on upper half, slightly higher than 1 on upper half, distinctly lower than 1 on lower half, bearing a median row of fine, setiferous granules; interstriae 4 visible on declivital face; punctures in striae 1 and 2 distinct, those in 2 equal in size to those on disc.

**Female.** Unknown.



**TYPE MATERIAL.** The holotype ( $\delta$ ) is in the USNM and bears the data: TYPE *Pityophthorus elegans* Schedl (red label)/*Pityophthorus elegans* n.sp., Eggers det. 1926 (label upside down)/*Pityophthorus tumidus* Blandf., Determ. Strohmeier (label upside down)/Guatemala, Conrad/type (handwritten)/Eggers collection 1948/Type No. 60251 U.S.N.M./*Pityophthorus elegans* Schedl.

**HOST.** Unknown.

**DISTRIBUTION.** Known only from Guatemala.

**REMARKS.** Since this species is known only from the male holotype, it is not possible to comment on its relationships. The species is placed in the Scriptor group to facilitate identification.

Adults can be most easily distinguished by the broadly flattened, moderately sulcate elytral declivity. The fourth declivital interstriae is visible on the declivital face in only a few species of *Pityophthorus*. It and the third are visible in *elegans* and both bear a median row of fine, short setae. The male frons is rather strongly impressed to the upper level of the eyes. Additional characters given in the key should enable one to distinguish this species.

## 12. *Pityophthorus (P.) coronarius* Blackman

Figs. 13, 14

*Pityophthorus coronarius* Blackman, 1942, p. 220.

Length 1.5-1.9 mm, about 3.0 times longer than wide.

**Female.** Frons flattened on a large, oval area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface shining, finely and densely punctured, with densely placed, long, fine setae covering all of the surface, setae on upper and lateral margins much longer and coarser. Antennal club nearly circular, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum 1.1-1.2 times longer than wide, widest near base; asperities on anterior slope arranged into three or four irregular concentric rows, rows somewhat broken and several vague, indistinct rows can sometimes be detected at summit; summit not distinctly elevated; posterior portion of disc moderately punctured, punctures of moderate size and depth, lateral or posterior edges of each puncture elevated into a shining, minute elevation; surface between punctures dull, densely, minutely reticulate; median line narrow, indefinite, not elevated and often narrowly impressed. Elytra 1.7-1.8 times longer than wide; apex distinctly acuminate; discal striae punctured in regular rows, punctures larger and deeper than those on posterior portion of pronotum; discal interstriae as wide as or narrower than striae, surface shining, minutely reticulate-rugulose, impunctate and glabrous. Declivity moderately deeply bisulcate; interstriae 1 distinctly elevated, moderately impressed below level of 3 with a median row of 5 or 6 distinct but small, rounded granules; interstriae 2 moderately deeply sulcate, not widened or only slightly so, surface densely and minutely reticulate, feebly shining; interstriae 3 distinctly elevated, distinctly but slightly higher than 1, bearing a median row of about 6 distinct, small granules, these more closely placed on upper half of interstriae and slightly larger than those on 1; interstriae 5 and 7 each with a few granules; punctures in striae 1 and 2 usually distinct, shallower, and finer than those on disc.

**Male.** Frons weakly flattened to weakly convex, with a very fine, faint, longitudinal carina extending from epistoma to near upper level of eyes, surface more strongly punctured; vestiture inconspicuous. Pronotum, elytra, and declivity essentially as in female except striae punctures slightly larger, interstriae 1 more deeply impressed on declivity and granules on interstriae 1 and 3 larger.

**TYPE MATERIAL.** The holotype ( $\text{♀}$ ) in the USNM bears the labels: Mexico, XI-4-38/Lot No. 38-16754/Type No. 55994 U.S.N.M. The allotype and 65 paratypes bear the same data.

Most of the type material is in the USNM; some paratypes are in the SLWC and the CNC.

HOSTS. *Sambucus* sp. and probably other shrubs.

DISTRIBUTION. Mexico. Specimens (96) examined from:

#### MEXICO

**Jalisco:** 14 mi NW of Guadalajara, 19.VII.53, S.L. Wood (SLWC) 12; Jalisco, 17.IX.41, *Sambucus* (SLWC, USNM) 13; Volcan Colima, 23.VI.65, unknown shrub, S.L. Wood (SLWC) 4.

REMARKS. Adults of this species are readily recognized by the subgranulate appearance of the posterior half of the pronotum, by the densely pubescent female frons, and by the moderately deeply sulcate elytral declivity on which interstriae 1 is moderately impressed below the level of interstriae 3.

### 13. *Pityophthorus* (*P.*) *concinnus* Wood

*Pityophthorus concinnus* Wood, 1977a, p. 214.

Length 2.1-2.5 mm, about 2.7-2.8 times longer than wide.

**Female.** Frons deeply concave on a large circular area extending from epistoma to above upper level of eyes, densely pubescent over entire surface, central setae erect and of moderate length, those on periphery much longer and densely placed. Antennal club circular; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum as long as wide; asperities on anterior slope arranged into three or four irregular concentric rows, with several additional irregular rows at summit; punctures on posterior portion of disc moderately large, somewhat shallow, widely separated, each puncture with posterior or lateral margin slightly elevated and smooth, resulting in a subasperate appearance, surface between punctures densely, minutely reticulate. Elytra 1.5-1.6 times longer than wide; apex moderately acuminate; discal striae punctures large, deep and close, placed in regular rows (striae 1 and 2 somewhat irregular); discal interstriae narrower than striae, surface densely reticulate. Declivity steep; interstriae 1 moderately elevated, impressed below level of 3, devoid of granules except at apex; interstriae 2 weakly impressed, not widened; interstriae 3 weakly elevated, bearing 2 large granules and 2 or 3 smaller ones; interstriae 5 and 7 with 1 or 2 prominent granules lateral to midpoint of declivity; punctures in striae 1 and 2 distinct.

**Male.** Frons deeply, transversely impressed from epistoma to slightly above upper level of eyes. Pronotum and elytra essentially as in female. Declivital granules and setae larger and stouter.

TYPE MATERIAL. The holotype (♀) is in the USNM and bears the data: Unidentified wood, Plaquepaque (sic), Mex., X.2.41/Nogales No. 49236/Lot No. 41-18984/HOLOTYPIC *Pityophthorus concinnus* S.L. Wood. The allotype and 14 paratypes bear the same data. Four additional paratypes are labeled: Mexico, III-22-1962, Crump coll., unidentified wood/Boston No. 27132/Lot No. 62-11725.

The holotype, allotype, and 11 paratypes are in the USNM, additional paratypes are in the CNC and the SLWC.

HOST. Unknown.

DISTRIBUTION. Mexico. Known only from type locality.

REMARKS. This species is similar to *coronarius*. Adults of *concinnus* are most easily distinguished by their larger size, by the larger granules on declivital interstriae 1 and 3, and by the totally different frons of both sexes as described in the respective descriptions.

14. *Pityophthorus (P.) arcanus* Bright

Figs. 15, 16

*Pityophthorus arcanus* Bright, 1976b, p. 429.

Length 1.8-2.4 mm, 2.7-2.9 times longer than wide.

**Female.** Frons flattened on a broad semicircular area; surface of flattened area densely pubescent, setae on periphery longer and incurved. Antennal club 1.6-1.7 times longer than wide, all three visible segments equal in width; sutures 1 and 2 transverse, heavily chitinized at lateral margins. Pronotum 1.1-1.2 times longer than wide; asperities on anterior slope arranged into three regular or irregular concentric rows, with several additional vague rows at summit; punctures on posterior portion of disc large, deep, and close; surface between punctures densely marked with fine points. Elytra 1.7-1.8 times longer than wide; apex weakly acuminate; discal strial punctures large, deep and close, placed in regular rows; discal interstriae narrower than striae, 2-4 impunctate, 1, 5, 7, 9 sparsely punctured. Declivity sloping; interstriae 1 and 3 distinctly elevated, 3 very slightly higher than 1, both with about 6 moderately large granules; interstriae 2 very broad, moderately sulcate, surface opaque, densely, minutely reticulate.

**Male.** Frons moderately deeply, transversely impressed, upper margin of impression strongly subtriangularly elevated, a weakly elevated, longitudinal, median carina extends across impression. Otherwise resembles female.

**TYPE MATERIAL.** The holotype (♀) in the CNC bears the data: Bear Canyon, Santa Catalina Mtns., Ariz., VII-15-1968, D.E. Bright/*Pinus cembroides*/HOLOTYPE *Pityophthorus arcanus* D.E. Bright, CNC No. 15081. The allotype and 15 paratypes bear the same data. Additional paratypes labeled as follows: 7, same as holotype except host is *Pinus ponderosa*; 26, 12 mi. N. Sedona, Coconino Co., Ariz., VII-13-68, D.E. Bright/*Pinus ponderosa* and 7, Walker, Ariz., Yavapai Co., VIII-23-68, D.E. Bright/*Pseudotsuga menziesii*.

The holotype, allotype, and most of the paratypes are in the CNC; additional paratypes are in the KESC and the SLWC.

**HOSTS.** *Pinus cembroides*, *monophylla*, *ponderosa*; *Pseudotsuga menziesii*.

**DISTRIBUTION.** Southwestern United States. Specimens (101) examined from:

## UNITED STATES

**Arizona:** Bear Canyon, Santa Catalina Mountains, 1.VIII.74, *Pinus ponderosa*, D.E. Bright (CNC) 2. **Nevada:** 25 mi NW of Las Vegas, 10.VI.69, *Pinus monophylla*, W. Harwood (SLWC) 2. **Texas:** Madera Canyon, 23 mi N of Fort Davis, 19.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 3; McKittrick Canyon, Guadalupe Mountains National Park, 16.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 37.

**REMARKS.** Superficially, the adults of this species resemble those in the *Confertus* group but because of the concentric rows of pronotal asperities, *arcanus* is placed in the *Scriptor* group.

Adults may be distinguished from those of the other species in the group by the characters given in the key and in addition by the large, deep strial punctures, by the narrow, impunctate discal interstriae, and by the dense reticulation on the second declivital interstriae.

15. *Pityophthorus (P.) vesculus* Wood*Pityophthorus vesculus* Wood, 1978b (1979), p. 401.

Length 1.3-1.4 mm, about 3.0 times longer than wide.

**Female.** Frons flattened from epistoma to well above eyes; surface finely, densely punctured, densely clothed with abundant, fine, moderately long setae, those on periphery

only slightly longer if at all. Antennal club oval, about 1.2 times longer than wide; sutures 1 and 2 weakly indicated, transverse; segments 1 and 2 together occupy slightly more than half of club length. Pronotum about 1.2 times longer than wide, widest on posterior half; asperities on anterior slope numerous, scattered in no apparent order; posterior portion of disc shining, punctures moderately large, weakly impressed; surface between punctures densely micropunctate. Elytra about 1.8 times longer than wide; apex strongly acuminate; discal striae punctured in regular rows, punctures large, deeply impressed; discal interstriae about as wide as striae, surface smooth, shining, with scattered impressed points, impunctate except near declivity. Declivity steep, shallowly bisulcate; interstriae 1 slightly impressed below 3 on upper portion, higher than 3 below, granules minute; interstriae 2 weakly impressed, shining; interstriae 3 slightly higher than 1 above, with a median row of very fine granules; punctures of striae 1 and 2 distinct, about as large as those on disc; vestiture hairlike, absent on interstriae 2.

**Male.** Frons convex, slightly transversely impressed on lower third, surface coarsely, densely punctured, vestiture inconspicuous. Pronotum and elytra as in female. Declivity as in female except interstriae 2 more deeply impressed, 1 and 3 with larger granules; vestiture narrowly spatulate.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the data: Ft. Clayton, C.Z., 100 ft., Panama, XII-22-1963, SLW/Unknown log/HOLOTYPE *Pityophthorus vesculus* S.L. Wood 1978. The allotype and 3 paratypes bear the same data.

All of the type material is in the SLWC.

**HOST.** Unknown log. Wood (1978*b*) states that the type series was collected from the bark of a bole 25 cm in diameter with large, simple leaves 25 cm long.

**DISTRIBUTION.** Known only from the type locality in Panama.

**REMARKS.** The above description was taken from a topotypic male and female.

Wood (1978*b*) compares this species with *acuminatus*; however, *acuminatus* has the large eyes which is characteristic of species in the subgenus *Gnatholeptus*. I place *vesculus* in the Scriptor group where it is easily recognized by the randomly placed asperities on the pronotum, by the distinctive vestiture on the male declivity, and by the distinct striae punctures on the declivity. The eyes of *vesculus* are small, similar to those of the other species in the nominate subgenus.

## 16. *Pityophthorus (P.) virilis* Blackman

Figs. 1, 18-20; Map 1

*Pityophthorus virilis* Blackman, 1928, p. 143; Chamberlin, 1939, p. 402; Chamberlin, 1958, p. 160; Wood, 1971*a*, p. 427; Bright, 1977, p. 518.

*Pityophthorus fortis* Blackman, 1928, p. 142; Chamberlin, 1939, p. 402; Bright, 1977, p. 518 (= *virilis*).

Length 1.3-1.6 mm, 2.7-2.8 times longer than wide.

**Female.** Frons flattened to weakly concave from epistoma to well above eyes and nearly from eye to eye, flattened area occupying about 94% of distance between eyes; surface finely, densely punctured except on a median area just above epistoma, this area sometimes obscured; vestiture moderately long, consisting of numerous, hairlike setae, those on periphery longer and often incurved. Antennal club about 1.3 times longer than wide, widest through segment 2 or 3, sutures 1 and 2 straight, chitinized on lateral one-third, segment 3 arcuate, indicated only by setae and punctures. Pronotum about 1.2 times longer than wide, widest at about midpoint; asperities on anterior slope arranged into three or sometimes four concentric rows, these rows occasionally broken, especially in median area;

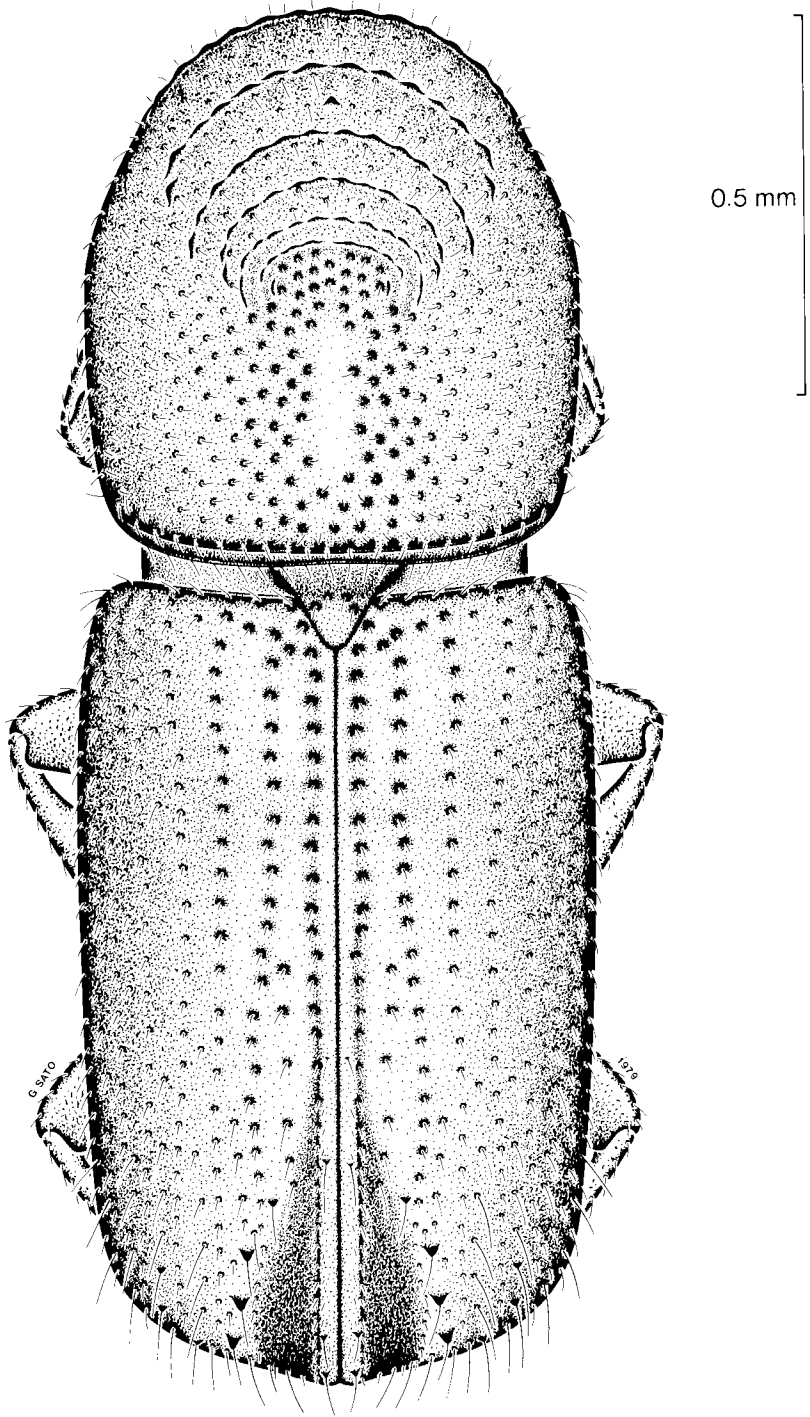


FIG. 1. *Pityophthorus virilis* Blackman.

posterior portion of disc smooth, shining, punctures rather large, deeply impressed and close; surface between punctures smooth, shining, micropunctate. Elytra about 1.6 times longer than wide; apex when viewed from above broadly rounded to subacuminate; discal strial punctures in regular rows, punctures large, close and rather deep; discal interstriae about as wide as striae, surface minutely reticulate, impunctate, and glabrous except near declivity. Declivity convex; interstriae 2 slightly wider than on disc, deeply impressed; interstriae 1 and 3 elevated, 3 slightly higher than 1, only slightly elevated above 2, granules rather large and prominent on 3, largely absent on 1, except at apex; punctures of striae 1 and 2 distinct, at least as large as those on disc.

**Male.** Frons broadly, transversely impressed, the median carina on upper margin transverse, short and distinctly elevated; surface more strongly punctured than in female, glabrous or very sparsely pubescent. Pronotum as in female except asperities slightly larger. Elytra as in female except declivital interstriae 1 and 3 more strongly elevated and slightly more granulate.

**TYPE MATERIAL.** *P. virilis*. The holotype (♀) in the USNM bears the data: Hopk. U.S. 2305/Hopkins, collr., Vermego, N.M./TYPE *Pityophthorus virilis* Blackman/Type No. 41327 U.S.N.M. The allotype and 14 paratypes bear the same data. Additional paratypes are labeled: 2, Hopk. U.S. 6111, Glen Eyrie, Colo./*Rhus copallina*/A.D. Hopkins, Bred Apr. 3, '06; 3, Hopk. U.S. 9477c; 2, Canon City, Colo., 14-2-98/Soltay; 8, Hopk. U.S. 9903-r/G. Hofer, colr./El Paso., Colo./Shrub.

Most of the type material is in the USNM; additional paratypes are in the DFEC and the CNC.

*P. fortis*. The holotype (♀) in the USNM is labeled: Hopk. U.S. 3867/W.F. Fisk Coll./Montell, Tex./*Rhus*/TYPE *Pityophthorus fortis* Blackman/Type 41326 U.S.N.M. The allotype and 15 paratypes bear identical data. Eighteen additional paratypes bear the same data except Hopk. U.S. 3874; 1 paratype is labeled: Hopk. U.S. 5994-a/A.B. Champlain, colr./El Paso Co., Colo./May 12-15/*Rhus trilobata*.

Most of the type material is in the USNM. Additional paratypes are in the DFEC and the CNC.

**HOSTS.** *Rhus* spp.

**DISTRIBUTION.** Southern Idaho and Wyoming to northern Mexico and western Texas (Map 1). Specimens (243) examined from:

#### UNITED STATES

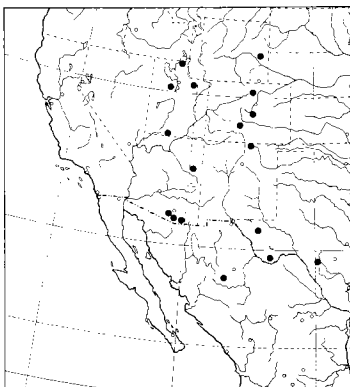
**Arizona:** Arivaca Road, 23.VII.58, *Rhus*, S.L. Wood (SLWC) 13; Cave Creek Canyon, Chiricahua Mtns., 27.VII.74, *Rhus* sp., D.E. Bright (CNC) 44; Lakeside, 11.VIII.62, Black light, S.L. Wood & J.B. Karren (SLWC) 1; Pena Blanca, 22.VI.48, *Rhus* sp. (USNM) 2. **Colorado:** North Poudre Canyon, Larimer Co., 12.VI.68, *Rhus trilobata*, S.L. Wood (SLWC) 4. **New Mexico:** See type material. **Texas:** Big Bend National Park, 3.VII.74, *Rhus* sp., D.E. Bright (CNC) 40; Davis Mountains, 14.IV.35, J.N. Knull (SLWC, USNM) 9; Uvalde, 23.V.35, J.N. Knull (USNM) 1. **Utah:** Kanab, 14.VII.48, *Rhus trilobata*, S.L. Wood (SLWC) 5; Logan Canyon, various dates 1945-48, *Rhus trilobata*, S.L. Wood (SLWC) 40; River Heights, 6.VI.35, *Rhus trilobata*, T.O. Thatcher (USNM) 4; Tabiona, 16.VI.60, *Rhus trilobata*, D.E. Bright & S.L. Wood (DEBC) 4; W of Utah Lake, 17.IV.65, S.L. Wood (SLWC) 3. **Wyoming:** Lusk, 15.VI.68, S.L. Wood (SLWC) 1.

#### MEXICO

**Chihuahua:** 16 mi NE of San Juanito, 19.VII.60, *Rhus trilobata*, S.L. Wood (SLWC) 5.

Additional locality in literature:

**Idaho:** Cache Valley (Wood 1971a).



MAP 1. Collection localities for *P. (Pityophthorus) virilis*.

REMARKS. The holotypes of *fortis* and *virilis* were compared with each other and with specimens from various parts of the western United States. The differences noted by Blackman (1928) are obvious when comparing individual specimens with the holotypes but when series are examined the differences are not so evident. Specimens from Arizona closely resemble specimens identified as *virilis* from New Mexico while a series from northern Utah is more like specimens identified as *fortis* from Texas. Specimens from Colorado are intermediate. In the absence of any consistent morphological or host differences only one species can be recognized.

The adults of *virilis* closely resemble those of *scriptor*. For notes on differences see Remarks under *scriptor*.

#### 17. *Pityophthorus (P.) scriptor* Blackman

Map 2

*Pityophthorus scriptor* Blackman, 1921, p. 7; Blackman, 1922a, p. 106; Blackman, 1928, p. 142; Beal & Massey, 1945, p. 127; Chamberlin, 1939, p. 401; Craighead, 1950, p. 331; Baker, 1972, p. 255; Bright, 1976c, p. 184 (lectotype desig.).

Length 1.4-1.5 mm, 2.8-2.9 times longer than wide.

**Female.** Frons and antennae essentially as in *virilis*. Pronotum slightly longer than wide, otherwise essentially as *virilis*. Elytra 1.7-1.8 times longer than wide, essentially as in *virilis*. Declivity convex; interstriae 2 rather weakly impressed; interstriae 1 and 3 weakly elevated, equal in height, granules very small; punctures of striae 1 and 2 distinct.

**Male.** Frons essentially as in *virilis* except concavity slightly shallower and median carina at upper level of eyes slightly shorter. Pronotum and elytra essentially as in *virilis*. Declivity shallower; interstriae 3 less strongly elevated; granules prominent, almost toothlike.

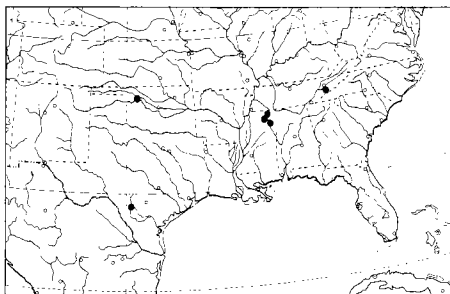
**TYPE MATERIAL.** The lectotype (♀) in the USNM bears the labels: Mississippi A&M, 2-14-1920/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. Mi. 132/TYPE *Pityophthorus scriptor* Blackman/TYPE No. 41763 U.S.N.M./LECTOTYPE *Pityophthorus scriptor* Blackman, D.E. Bright, 1976. Numerous other specimens from the type series (paralectotypes) were also examined.

**HOSTS.** *Rhus* spp.

DISTRIBUTION. Southeastern United States, west to Texas and Oklahoma (Map 2). Specimens (33) examined from:

#### UNITED STATES

**Mississippi:** Corinth, 11.IV.20, M.W. Blackman (CNC, USNM) 10; New Albany, M.W. Blackman (USNM) 1. **Oklahoma:** Orion, Major Co., 22.II.77, *Rhus* sp., D.C. Arnold (CNC) 4. **Tennessee:** Gatlinburg, 20.VII.51, *Rhus*, S.L. Wood (SLWC) 17. **Texas:** Montell, 28.V.37, *Rhus hirta*, W.F. Fiske (USNM) 3; state record only, C.V. Riley (USNM) 7.



MAP 2. Collection localities for *P. (Pityophthorus) scriptor*.

BIONOMICS. Blackman (1922a) states that this species is frequently found in the same shrubs as *lautus* but the galleries of *scriptor* are longer, slightly coarser, and less symmetrical. The beetles are of little or no economic importance since they attack and complete the destruction of sumac that has been injured by some other cause.

REMARKS. Adults of this species most closely resemble those of *virilis* but they may be distinguished by the finer, smaller granules on declivital interstriae 1 and 3, by the weakly elevated declivital interstriae 3, and by the distribution.

#### 18. *Pityophthorus (P.) hermosus* Wood

*Pityophthorus hermosus* Wood, 1976, p. 356.

Length 1.0-1.4 mm, about 2.7 times longer than wide.

**Female.** Frons flattened on a large semicircular area extending laterally from eye to eye and from epistoma to vertex; surface completely concealed by a very dense brush of long, yellowish pubescence, setae from vertex, and from lateral areas extending downward or inward to just above epistomal margin. Antennal club broadly oval, 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate to transverse; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum 1.1 times longer than wide, widest near posterior angles; asperities on anterior slope arranged into three or four definite concentric rows with one or two small supplementary rows sometimes evident around summit; summit weakly elevated; posterior area of disc weakly punctured, punctures fine and shallow, edges of punctures frequently elevated into microgranules; surface between punctures dull, minutely reticulate; median line narrow, impunctate. Elytra 1.7 times longer than wide; apex distinctly, strongly acuminate; discal striae punctured in regular rows, punctures much larger than those on posterior portion of pronotum and deeply impressed; discal interstriae narrower than striae, surface shining, minutely rugulose or with numerous fine lines and points, impunctate and glabrous. Declivity steep, bisulcate; interstriae 1 rather strongly elevated, impressed below level of 3, with a median row of fine, moderately large, acute granules; interstriae 2 sulcate, distinctly but not deeply impressed; interstriae 3 elevated above level of 1, bearing about 3 moderately large, acute granules on



upper two-thirds; punctures in striae 1 and 2 generally obsolete and not visible, but may be weakly visible in 2.

**Male.** Frons transversely impressed on an area extending from epistoma to upper level of eyes, surface of impressed area very finely, densely punctured, surface of area on vertex more strongly, deeply punctured; vestiture short, semirecumbent, more densely placed in impressed area. Pronotum and elytra as in female. Declivity more deeply sulcate; interspace 1 more deeply impressed, granules on interstriae 1 and 3 larger, more prominent. setae on interstriae scalelike.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: Yuscaran, Paraiso, Honduras, 2400 ft., IV-23-1964, S.L.W./Perymanium grande/HOLOTYPE Pityophthorus hermosus S.L. Wood 1976. The allotype and 29 paratypes bear the same data. Eight paratypes are labeled: Zamorano, Moraz., Honduras, 2200 ft., IV-18-64, S.L.W./Eupatorium dalioides.

Most of the type material is in the SLWC. Two paratypes are in the CNC (No. 15468).

**HOSTS.** *Perymanium grande* and *Eupatorium dalioides* (small shrubs or trees in the Asteraceae).

**DISTRIBUTION.** Known only from the type-series localities in Honduras but should be expected throughout southern Mexico to Costa Rica.

**REMARKS.** This species is related to *virilis* and *scriptor*. Adults can be most easily distinguished by the moderately large, acute granules on declivital interstriae 1 and 3, by the shallowly bisulcate elytral declivity, and by the distribution.

#### 19. *Pityophthorus (P.) dimidiatus* Blackman

*Pityophthorus dimidiatus* Blackman, 1942, p. 221.

Length 1.2-1.3 mm, about 2.9 times longer than wide.

**Female.** Frons broadly flattened on semicircular area extending from epistomal margin to well above eyes and laterally occupying about 70% of distance between eyes; surface densely, finely punctured with a short, weakly elevated, longitudinal tubercle just above epistomal margin; vestiture short, moderately abundant, all setae of equal or nearly equal length. Antennal club oval, about 1.2 times longer than wide, widest through segment 2; first two sutures straight, 3 arcuate; first two segments occupy about half of club length. Pronotum about 1.1 times longer than wide, widest on posterior half; asperities on anterior slope low, basally contiguous, arranged into three very regular, concentric rows, a vague fourth row may be detected at summit; posterior area of disc dull, opaque, entire surface densely microreticulate, punctures very shallow, vague, hardly visible; median line not obvious. Elytra 1.7-1.9 times longer than wide; apex distinctly acuminate; discal striae punctured in fairly regular rows, punctures shallow, vague; discal interstriae slightly narrower than striae, densely rugulose, impunctate, and glabrous. Declivity convex, sloping; interstriae 1 moderately elevated, with a median row of fine, distinct granules; interstriae 2 moderately sulcate, opaque, rugulose; interstriae 3 weakly elevated, about as high as 1, with a median row of fine granules; punctures in striae 1 and 2 obsolete, not visible.

**Male.** Frons transversely impressed on a broad semicircular area about the same size as on female; surface finely punctured, with a very weak median callus or tubercle just above epistomal margin; vestiture very sparse. Pronotum essentially as in female. Elytra as in female except striae punctures slightly larger and interstitial setae on declivity slightly stouter, flattened and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) in the USNM is labeled: Mexico, XI-17-38/Lot No. 38-17192/Type No. 55995 U.S.N.M. The allotype and 1 paratype bear the same data.

**HOST.** Unknown.

**DISTRIBUTION.** The species is known only from Mexico.

**REMARKS.** This species is known only from three specimens taken at quarantine in 1938. No locality (other than Mexico) or host is given.

Adults may be recognized by the nearly impunctate, densely reticulate, opaque posterior portion of the pronotum, by the vague strial punctures, by the distinctly acuminate elytral apex, by the short, flattened setae on the declivital interstriae of the male, and by the characters of the female frons as given in the key and description.

20. *Pityophthorus (P.) minutalis* Wood

*Pityophthorus minutalis* Wood, 1976, p. 357.

Length 1.0-1.2 mm, 3.2 times longer than wide.

**Female.** Frons weakly convex to weakly flattened on a semicircular area extending from epistoma to just above upper level of eyes and nearly from eye to eye; surface of flattened area finely, very densely micropunctate, clothed with moderately long, yellowish setae, these more densely placed and longer at lateral area near eye or around entire periphery, setae in central area shorter, sparser, and more recumbent. Antennal club nearly circular, about 1.1 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, 1 distinctly chitinized, 2 very weakly chitinized, chitin visible only at extreme lateral edges; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum 1.2-1.3 times longer than wide, widest at about middle; asperities on anterior slope arranged into three definite concentric rows, with one or two additional, weak rows around summit; summit distinctly elevated; posterior area of disc finely punctured, punctures shallow, ill-defined; surface between punctures dull, densely scored with very fine lines and points to minutely reticulate; median line indistinct, impunctate. Elytra 2.1 times longer than wide; apex distinctly acuminate; discal striae punctured in regular rows, punctures very slightly larger than those on posterior portion of pronotum, shallowly impressed and indefinite; discal interstriae moderately shining, as wide as striae, surface microrugose to rather strongly marked by impressed fine lines and points. Declivity convex, weakly bisulcate; interstriae 1 weakly elevated, bearing a median row of very fine, minute granules or granules absent; interstriae 2 weakly sulcate, not widened, surface shining, smooth; interstriae 3 weakly elevated, equal in height to 1, bearing a median row of extremely fine granules or granules absent; punctures in striae 1 and 2 obscure, those in 2 slightly more obvious.

**Male.** Frons weakly transversely impressed from epistoma to upper level of eye, surface shining, finely punctured; vestiture sparse. Pronotum similar to female except serrations on anterior margin slightly larger, and punctures on posterior portion slightly larger. Declivity as in female except slightly steeper, more shallowly sulcate and interstriae bearing flattened, scalelike setae.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Palin, Esquintla, Guatemala, 1000 ft., V-19-1964, S.W. Wood/Unknown shrub/**HOLOTYPE** *Pityophthorus minutalis* S.L. Wood, 1976. The allotype and 10 paratypes bear the same data.

Most of the type material is in the SLWC. Two paratypes are in the CNC.

**HOST.** Unknown shrub.

**DISTRIBUTION.** Known only from type locality in Guatemala.

**REMARKS.** Adults of this species are recognized by their small size, by the extremely fine granules on the declivital interstriae, and by the characteristics of the female frons as described in the diagnosis.

21. *Pityophthorus* (*P.*) *torridus* Wood

*Pityophthorus torridus* Wood, 1971c, p. 76.

Length 1.8-2.0 mm, 2.9 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistomal margin to well above eyes (about half of flattened area is above upper level of eyes) and nearly from eye to eye, very weakly broadly, concave in central area; surface shining, finely and very densely punctured; vestiture consisting of a dense brush of fine, long, erect setae over entire flattened area, those setae on periphery only slightly longer than those in central portion. Antennal club oval, 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 subtransverse to weakly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest at about middle; asperities on anterior slope arranged into three concentric rows, rows slightly irregular, several smaller, lower rows may be developed just around summit; summit elevated, distinct; posterior area of disc finely punctured, punctures moderately large and moderately deep; surface between punctures smooth, moderately shining, with numerous very fine points and minute lines; median line broad, narrowly, weakly elevated. Elytra 1.9 times longer than wide; apex acuminate; discal striae punctured in regular rows, punctures equal in size to those on posterior portion of pronotum, moderately deep; discal interstriae at least slightly wider than striae, surface smooth, moderately shining, very finely reticulate, impunctate except on posterior third and occasionally interstriae 2 and 4 may bear 1 or 2 setiferous punctures on disc. Declivity sloping, moderately bisulcate; interstriae 1 distinctly, moderately elevated, bearing a median row of 8-10 moderate-sized granules; interstriae 2 moderately impressed, only slightly wider than discal width, bearing a few small, setiferous granules at and above base, surface as on disc; interstriae 3 weakly elevated, equal in height or very slightly lower than 1, bearing a similar median row of rounded, setiferous granules; punctures of striae 1 and 2 much smaller and shallower than those on disc.

**Male.** Similar to female except frons weakly convex to flattened with a weakly elevated, longitudinal carina extending from epistomal margin to or slightly above upper margin of eyes, surface on each side of carina sparsely punctured and with sparse setae. Pronotal punctures larger. Elytra and declivity as on female.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: New Mexico, High Rolls, 6 mi. W., elev 6000 ft., VI-2-1969, SLW/Franseria/**HOLOTYPE** *Pityophthorus torridus* S.L.W. 1971. The allotype and 2 paratypes bear the same data.

All type material is in the SLWC.

**HOST.** *Franseria* sp. prob. *deltoidea*.

**DISTRIBUTION.** Known only from the type locality in New Mexico.

**REMARKS.** Adults of this species can be distinguished from those of other species in the Scriptor group by their large size, by the presence of a weakly elevated, longitudinal carina on the male frons, by the nearly obsolete strial punctures on the declivity, and by the peculiar host.

22. *Pityophthorus* (*P.*) *nugalis* Wood

*Pityophthorus nugalis* Wood, 1976, p. 356.

Length 1.4 mm, 3.2 times longer than wide.

**Female.** Frons weakly convex; surface shining and weakly, finely punctate-granulate; vestiture consisting of very long, fine, downward-curved, yellowish setae placed in three distinct tufts, one on the longitudinal midline and one each on lateral areas next to eyes, setae in these tufts very closely placed and those in midline extending almost to tips of mandibles, those in lateral tufts extending beyond mandibles, surface between tufts with a few scattered setae. Antennal club slightly elongate-oval, about 1.2 times longer than wide, widest through segment 2; suture 1 transverse, obvious because of distinct chitinization at

lateral margins, 2 obsolete, not easily visible, chitinization confined to extremely small area on margin or may be absent; segments 1 and 2 together occupy more than two-thirds of total club length. Pronotum 1.2-1.3 times longer than wide, widest at about middle; asperities on anterior slope arranged into three distinct, concentric rows, with one or two additional, indistinct rows around summit; summit distinctly elevated; posterior area of disc finely punctured, punctures shallow, small, somewhat indistinct; surface between punctures moderately dull, densely micropunctate to minutely reticulate; median line broad, impunctate. Elytra 2.1 times longer than wide; apex weakly acuminate; discal striae punctured in regular rows, punctures slightly larger and slightly more deeply impressed than those on posterior portion of pronotum but still somewhat obscure; discal interstriae about as wide as striae, surface moderately dull, marked by numerous fine points and lines to minutely reticulate, glabrous. Declivity convex, weakly bisulcate; interstriae 1 distinctly elevated, with a median row of 3 or 4 minute, setiferous granules; interstriae 2 very weakly sulcate, not widened, surface as on disc; interstriae 3 weakly elevated, as high as or slightly lower than 1, with a median row of minute, setiferous granules; punctures in striae 1 and 2 obscure, difficult to see.

**Male.** Frons generally convex, very weakly flattened in median area, narrowly transversely impressed just above epistoma, with a faint, weakly elevated, longitudinal carina extending a short distance above transverse impression; surface finely punctured-granulate, setae short, scattered. Pronotum and elytra as in female. Declivity as in female except granules on interstriae 1 and 3 slightly larger and interstitial setae slightly longer.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: Volcán Pacaya, Guatemala, 4000 ft., VI-1-1964, S.L.W./Unknown vine/HOLOTYPIC Pityophthorus nugalis Wood, 1976. The allotype and 4 paratypes bear the same data.

All type material is in the SLWC.

**HOST.** Unknown vine.

**DISTRIBUTION.** Known only from the type locality in Guatemala.

**REMARKS.** The peculiar configuration of the pubescence on the female frons will easily distinguish this species from others in the group. Adults may be also distinguished by the weakly flattened male frons which bears a very weakly elevated, longitudinal carina, by the weakly granulate declivital interstriae 1 and 3, and by the obscure punctures on the posterior portion of the pronotum and in the elytral striae.

### 23. *Pityophthorus atomus* Wood

*Pityophthorus atomus* Wood, 1964, p. 61.

Length 0.8-1.2 mm, 2.9 times longer than wide.

**Female.** Frons essentially as in *attenuatus*, described below, except setae slightly longer. Antennal club as in *attenuatus*. Pronotum and elytra as in *attenuatus*. Declivity steep, very weakly bisulcate; interstriae 1 narrowly distinctly elevated, with a median row of very fine, obscure, setiferous granules; interstriae 2 very weakly sulcate, slightly widened, surface as on disc; interstriae 3 very weakly elevated, about as high as 1, with a median row of very fine, obscure, setiferous granules; punctures in striae 1 as described for *attenuatus*.

**Male.** As described for *attenuatus*.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and is labeled: Vera Cruz, V.C., Mexico, VI-30-53, 50 ft./ HOLOTYPIC *Pityophthorus atomus* S.L. Wood, 1964. The allotype and 11 paratypes bear the same data.

Most of the type material is in the SLWC, 1 paratype (No. 12582) is in the CNC and 1 is in the SEMC.

**HOST.** Unidentified shrub.

**DISTRIBUTION.** Known definitely only from the type locality in Veracruz.

**REMARKS.** In the original draft of this manuscript, I placed *atomus* in synonymy under *attenuatus*. Wood, in his review of the manuscript, commented that *atomus* was a valid species and should be retained. After re-examining specimens in the CNC, I have decided to follow Wood's suggestion and retain *atomus* as a valid species. However, I still have doubts about the integrity of the species.

Adults of *atomus* and *attenuatus* are very similar and distinction is extremely difficult. Those of *atomus* are generally smaller (see key) but some specimens of *attenuatus* as small as those of *atomus* can be found. The elytral declivity of *atomus* is very shallowly bisulcate, is more deeply sloping and the granules on the first and third interstriae are minute. Until more specimens from different localities become available, it probably is best to recognize two species.

#### 24. *Pityophthorus (P.) attenuatus* Blackman

Figs. 21, 22

*Pityophthorus attenuatus* Blackman, 1942, p. 222; Schedl, 1977b, p. 42.

*Pityophthorus pusillus* Wood, 1964, p. 62; Wood, 1978b, p. 397 (= *attenuatus*).

Length 1.0-1.6 mm, 3.2 times longer than wide.

**Female.** Frons flattened on a semicircular area extending from epistomal margin to just above upper level of eyes and laterally occupying 70-75% of distance between eyes, feebly concave at center; surface of flattened area smooth with scattered, impressed punctures; vestiture consisting of abundant, fine setae, nearly uniform in length, scattered over surface of flattened area. Antennal club elongate-oval, 1.4-1.5 times longer than wide, widest through segment 2; suture 1 transverse, distinctly chitinized at lateral margins, 2 obscure usually not visible, either very lightly chitinized at lateral margin or chitinization not evident at all; segment 1 occupies about one-quarter of total club length. Pronotum 1.1-1.2 times longer than wide, widest near base; asperities on anterior slope arranged into three distinct concentric rows, with one or two additional vague rows at summit, weakly elevated; posterior area of disc vaguely punctured, punctures shallow and close; surface between punctures shining, with numerous fine lines and points; median line moderately narrow, impunctate. Elytra 2.1 times longer than wide; apex narrowly rounded to subacuminate; discal striae punctured in regular rows, punctures distinct, slightly larger and deeper than those on posterior portion of pronotum; discal interstriae about as wide as striae or narrower, surface shining with numerous fine lines and points, impunctate and glabrous. Declivity convex, weakly bisulcate; interstriae 1 narrowly, rather strongly elevated, bearing a median row of fine, setiferous granules; interstriae 2 moderately sulcate, slightly widened, surface as on disc; interstriae 3 weakly elevated, about as high as 1 or sometimes very slightly higher, bearing a row of fine, setiferous granules; punctures in striae 1 and 2 entirely obsolete or occasionally very weakly evident, if so, then much smaller than those on disc.

**Male.** Slightly stouter than female. Frons weakly, broadly, transversely impressed from epistoma to upper level of eyes, usually with a median, very narrow, smooth space ending at a very small tubercle on epistoma; surface finely punctured, punctures larger and slightly deeper than on female. Pronotum, elytra, and declivity essentially as in female except declivital sulcus slightly deeper, granules slightly larger and setae stouter.

**TYPE MATERIAL.** *P. attenuatus*. The holotype (♀) in the USNM bears the data: Crate-Wood from Mexico, X-29-40/Lot No. 40-22720/ ♀ / Type No. 55996 U.S.N.M. The allotype and 48 paratypes bear the same data.

Most of the type material is in the USNM, 2 paratypes are in the CNC.

*P. pusillus*. The holotype (♀) is in the SLWC and bears the data: 9 mi. S. Zimapán, Hdgo., Mexico, VI-23-53, 6100 ft./HOLOTYPE *Pityophthorus pusillus* S.L. Wood 1964. The allotype and 18 paratypes bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC, 1 is in the SEMC, and 1 is supposed to be in the USNM.

HOSTS. Unidentified shrubs. There is one record from *Quercus* and *Alnus* and an unverified record from *Pinus ochoterenai*.

DISTRIBUTION. Southern Mexico to El Salvador, probably occurs throughout Central America. Specimens (95) examined from:

MEXICO

**Hidalgo:** See type material. **Jalisco:** Volcan Colima, 23.VI.65, unknown shrub, S.L. Wood (SLWC) 6. **Michoacán:** 4 mi W of Quiroga, 17.VI.65, unknown shrub, S.L. Wood (SLWC) 16. **Oaxaca:** Highway 131, 115 mi S of Oaxaca, 27-30. V. 71, *Alnus* sp. and *Quercus* sp., D.E. Bright (CNC) 4.

Additional record from literature:

EL SALVADOR: Metapán, 17.I.75, *Pinus ochoterenai* (Schedl 1977b).

REMARKS. Adults of *attenuatus* may be distinguished from those of other species in the group by the uniformly pubescent female frons and by the more distinctly, broadly impressed male frons which frequently bears a very fine tubercle on the midpoint of the epistoma. Adults of *attenuatus* are very similar to those of *subimpressus* but may be most easily distinguished by the obscure stria punctures on the declivity of *attenuatus*.

The elytral apex varies from rather distinctly subacuminate to narrowly rounded. Those specimens with the latter condition may key out to the *Lautus* group.

The type material of both species was examined and compared. All were found to agree in the essential features but demonstrated variation in size. The type series of *pusillus* ranges in size from 0.8 to 1.2 mm, while the type series of *attenuatus* ranges from about 1.4 to 1.6 mm. Recently collected series ranged in size up to 1.4 mm and fill in the apparent gap. In the absence of any distinguishing characters, I agree with Wood (1968b) that *pusillus* is a synonym of *attenuatus*.

25. *Pityophthorus (P.) sobrinus* Wood

*Pityophthorus sobrinus* Wood, 1976, p. 357.

Length 1.7-1.8 mm, 3.1-3.2 times longer than wide.

**Female.** Frons broadly flattened to weakly concave on a large oval area extending from epistoma to well above upper level of eyes and laterally from eye to eye; surface brightly shining, very finely punctured except on a smooth, oval spot about the size of antennal club just above epistomal margin, punctures very shallow and close; vestiture abundant, consisting of long setae arising from entire flattened surface, except on glabrous median spot above epistoma, setae on periphery longer and incurved. Antennal club oval, 1.2-1.3 times longer than wide, widest through segment 2; suture 1 transverse, distinctly chitinized, 2 not evident except at extreme lateral margin; segments 1 and 2 together occupy more than two-thirds of total club length. Pronotum 1.3 times longer than wide, widest at about middle; asperities on anterior slope arranged into two to four irregular, concentric rows, with one to three additional irregular rows around summit; summit moderately elevated; posterior area of disc densely punctured, punctures deeply impressed, of moderate size and close; surface between punctures moderately shining, densely micropunctate; median line narrow, not elevated. Elytra 1.9 times longer than wide; apex weakly acuminate; discal striae punctured in very regular rows, punctures distinctly larger than those on posterior portion of pronotum, deeply impressed, and close; discal interspaces narrower than striae, impunctate, glabrous, with surface shining and marked by numerous minute points and lines. Declivity convex, bisulcate; interstriae 1 rather strongly, broadly elevated, equal in height to 3, bearing a median row of 4-6 fine, setiferous granules; interstriae 2 distinctly, rather deeply impressed, not widened or only very slightly so, flat, surface more densely micropunctate, somewhat opaque; interstriae 3 moderately elevated, as high as 1, with a median row of fine, setiferous

granules; punctures in striae 2 distinct, obvious, less distinct in 1; remaining alternate interstriae bearing a median row of fine setae.

**Male.** Frons weakly, transversely impressed from just above epistoma to upper level of eye, with a weak, short, transverse, median elevation at upper level; surface finely punctured except just above midpoint of epistoma; vestiture short, sparse. Pronotum and elytra essentially as in female. Declivity as in female except granules on interstriae 1 and 3 larger and interstriae 2 slightly more deeply impressed.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: S.E. of Cartago, Costa Rica, 5600 ft., VII-2-1963, S.L.W./ Unknown vine/HOLOTYPE *Pityophthorus sobrinus* Wood, 1976. The allotype and 30 paratypes bear the same data.

Most of the type material is in the SLWC. Two paratypes are in the CNC (No. 15462).

**HOST.** Unknown vine.

**DISTRIBUTION.** Known only from the type locality in Costa Rica.

**REMARKS.** Adults of *sobrinus* are most easily distinguished by the features of the elytral declivity (see diagnosis), by the very even, deeply punctured elytral striae, by the broadly flattened, densely pubescent female frons, and by the large, deep punctures on the posterior portion of the pronotum.

#### COSTATUS GROUP

Adults of this group are characterized by the 3- to 5-segmented antennal funicle, by the long, low, costiform asperities on the anterior portion of the pronotum, by the smooth, elevated rugae on the reticulate posterior portion of the pronotum, and by the strongly convex dorsal surface of the pronotum.

Only one species is known.

#### 26. *Pityophthorus (P.) costatus* Wood

*Pityophthorus costatus* Wood, 1975, p. 395.

Length 1.1-1.3 mm, 2.3 times longer than wide.

**Female.** Frons evenly convex, with a narrow, transversely oval, shallow to deep impression just above the epistomal margin; epistoma distinctly elevated; surface moderately shining, rather densely reticulate, punctures very sparse and shallow; vestiture inconspicuous. Antennal club oval, about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; first two segments together occupy about half of total club length; funicle with 3-5 segments. Pronotum about 1.1 times longer than wide, widest near posterior angles; sides weakly arcuate, strongly converging; anterior margin narrowly rounded, bearing a distinctly elevated, entire ridge, serrations absent; asperities on anterior slope very low, broad, sometimes several are connected, forming an arcuate row, these rows occasionally extending more than one-fourth of pronotal width, surface between rows opaque and reticulate; summit not evident; posterior area opaque, densely reticulate, rows of asperities extending onto posterior portion as smooth, weakly elevated, transverse elevations, punctures at most only very vaguely indicated, very shallow and sparse. Elytra about 1.5 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep; discal interstriae about as wide as striae, surface densely marked by fine lines and points, distinct interstitial punctures absent except on apical half. Declivity convex; interstriae 1 very weakly elevated, narrow, bearing a median row of 9 or 10 distinct, stout bristles, these slightly longer than interstitial width, and extending onto posterior portion of disc; interstriae 2 not widened, not impressed, essentially as on disc; interstriae 3 as in 1 except bristles generally slightly less numerous; interstriae 4, 5, 7 also bearing a few, stout bristles; punctures of striae 1 and 2 slightly reduced in size but still visible.

**Male.** Similar to female except impression above epistoma more strongly impressed and divided by a weak, longitudinal elevation.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: Tapanti, Cart., Costa Rica, 4000 ft., VII-2-1963, S.L. Wood/unknown vine/HOLOTYPE *Pityophthorus costatus* S.L. Wood, 1975. The allotype and 12 paratypes bear the same data. Two additional paratypes are labeled: 13 mi. S.E. Cartago, Costa Rica, 5600 ft., VII-3-1963, S.L.W./unknown vine.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

**HOST.** Unknown vines.

**DISTRIBUTION.** Known only from the type-series localities in Costa Rica.

**REMARKS.** This is an aberrant species that I have placed in a group of its own. Adults are readily recognized by the characters given in the key and description.

#### AMOENUS GROUP

Adults of this group are unique in having only one chitinized suture in the antennal club, in having somewhat broken concentric rows of asperities on the pronotum and in having a subacuminate or narrowly rounded elytral apex. The group contains only one species.

#### 27. *Pityophthorus (P.) amoenus* Blandford

*Pityophthorus amoenus* Blandford, 1904, p. 237; Hagedorn, 1910, p. 70.

Length 2.2 mm, 3.0 times longer than wide.

**Female.** Frons flattened in central area from epistoma to well above upper eye level, laterally occupying about 73% of distance between eyes; surface weakly, transversely impressed at midlevel, densely, roughly punctured except on a smooth, median area just above epistomal margin, densely pubescent over punctured area, setae moderately long and erect, and appearing to all be of equal or nearly equal length. Antennal club oval, about 1.3 times longer than wide; only one transverse suture obvious and chitinized. Pronotum about 1.1 times longer than wide, widest at level between summit and base; asperities on anterior slope arranged into three obscure, but irregular, concentric rows, concentric feature best developed on lateral areas, several additional and more irregular rows may be clustered around summit; summit distinct but weakly elevated; posterior area of disc deeply punctured, punctures moderately large, deep and widely separated; surface between punctures dull, densely, and minutely reticulate. Elytra 1.8 times longer than wide; apex subacuminate (posterior half of right elytron broken off); discal striae punctured in regular rows, punctures deeply impressed, close (almost touching) and large (larger than those on posterior portion of pronotum); discal interstriae (except 2) about as wide as striae, appearing weakly convex, surface moderately dull, finely reticulate, impunctate. Declivity steep, moderately deeply bisulcate; interstriae 1 narrow, bearing a median row of about 6 small, acute granules; interstriae 1 distinctly wider than discal width, sulcate; interstriae 3 about equal in height to 1, weakly arcuate, bearing a median row of about 4 distinct granules, these larger than those on 1; punctures in striae 1 and 2 visible, shallower than those on disc.

**Male.** Unknown

**TYPE MATERIAL.** This species was described from one specimen that is now in the BMNH. The holotype was examined and bears the labels: TYPE (an orange-bordered circle)/Duenas, Guatemala, G.C. Champion/B.C.A. Col. IV. 6, *Pityophthorus amoenus* Blandford/*Pityophthorus amoenus* Bld (handwritten label, placed upside down on pin).

**HOST.** Unknown.

**DISTRIBUTION.** Known only from type locality in Guatemala.



REMARKS. Only the holotype of this species is known. Careful comparisons of the type of this species with representatives of all other possible named species indicate that *amoenus* is apparently distinct. It evidently has not been collected again despite the rather concentrated collecting efforts in southern Mexico and Central America.

#### ASSITUS GROUP

This group is characterized by the very small first antennal segment, by the concentric rows of asperities on the pronotum, by the distinct punctures in striae 1 and 2 on the declivity, by the narrow second declivital interstriae, and by the similar frons of both sexes.

Two species, both from southern Mexico, are included in the group.

#### KEY TO SPECIES IN THE Assitus group

1. Surface between punctures on posterior portion of pronotum shining, densely micropunctate; size smaller, 1.6-2.1 mm . . . . . 28. *speciosus* Wood (p. 49)
- Surface between punctures on posterior portion of pronotum dull to shining, densely minutely reticulate; size larger, 2.0-2.4 mm . . . . . 29. *assitus* Wood (p. 50)

#### 28. *Pityophthorus* (*P.*) *speciosus* Wood

*Pityophthorus speciosus* Wood, 1977a, p. 215.

Length 1.6-2.1 mm, about 2.7 times longer than wide.

**Female.** Frons weakly flattened on area between eyes; surface shining, closely, densely punctured, punctures deep and close; vestiture inconspicuous. Antennal club oval, about 1.5 times longer than wide; segment 1 much smaller than segments 2 or 3; suture 1 transverse in central portion, arcuate laterally, 2 and 3 strongly arcuate. Pronotum 1.1 times longer than wide; asperities on anterior slope arranged into four definite, concentric rows, with one or two vague rows around summit; summit not distinctly elevated; posterior area of disc densely punctured, punctures of moderate size; surface between punctures moderately shining, with numerous, distinct, minute points. Elytra 1.7-1.8 times longer than wide; apex truncate; discal striae punctured in regular rows, punctures of moderate size, deep and close; discal interstriae densely, randomly, micropunctate but points not as dense as on posterior portion of pronotum. Declivity steep, bisulcate; interstriae 1 moderately elevated, bearing a median row of fine granules; interstriae 2 not widened, about as wide as discal width, moderately impressed; interstriae 3 slightly higher than 1, bearing a median row of about 5 large granules, these larger than those on interstriae 1; punctures in striae 1 and 2 distinct.

**Male.** Virtually identical with female except asperities on anterior slope much larger and declivital granules larger.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the labels: MEX., Oax., 15 miles S. Valle Nacional, 4000', V.20.71, Bright/HOLOTYPE *Pityophthorus speciosus* S.L.Wood 1977/HOLOTYPE CNC No. 15792. The allotype and 11 paratypes bear the same data.

All the type material is in the CNC except some paratypes are in the SLWC.

**HOST.** Unknown.

**DISTRIBUTION.** Known only from the type locality in Mexico.

**REMARKS.** This species is closely related to *assitus* but adults of *speciosus* are most easily distinguished by the densely punctate microsculpturing of the posterior pronotal surface and by their slightly smaller size. Other minor differences in the shape of the declivity were noted but they are very subtle and are difficult to express in words.

29. *Pityophthorus (P.) assitus* Wood

*Pityophthorus assitus* Wood, 1977a, p. 214.

Length 2.0-2.4 mm, about 2.7-2.8 times longer than wide.

**Female.** Frons evenly convex with a weakly elevated, smooth, longitudinal, median callus above upper level of eyes, also sometimes very weakly transversely impressed below eye level; surface moderately dull to shining, punctures rather large and deep; surface between punctures microreticulate; vestiture inconspicuous. Antennal club broadly oval 1.3-1.4 times longer than wide, widest through segment 3, segment 1 much smaller than segments 2 or 3; sutures 1 and 2 strongly arcuate. Pronotum 1.1 times longer than wide; asperities on anterior slope arranged into three prominent, concentric rows with two additional, somewhat broken rows around summit; summit not strongly elevated; posterior area of disc distinctly punctured, punctures deep and rather large; surface between punctures moderately dull, densely minutely reticulate. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures equal in size and depth to those on posterior portion of pronotum; discal interstriae microreticulate and micropunctate, sometimes with a few larger punctures. Declivity convex; interstriae 1 moderately elevated, slightly lower than 3, bearing a median row of fine granules; interstriae 2 about as wide as on disc, moderately impressed; interstriae 3 elevated slightly higher than 1, bearing a median row of moderate sized granules, these larger than those on interstriae 1; punctures in striae 1 and 2 distinct.

**Male.** Almost indistinguishable from female except antennal club slightly narrower, over 1.4 times longer than wide, and interstriae 2 slightly less impressed on declivity.

**TYPE MATERIAL.** The holotype (♀) in the CNC bears the data: Mex., Lagos de Colores, Chis., V-17-1969, D.E. Bright/HOLOTYPE *Pityophthorus assitus* S.L. Wood/HOLOTYPE CNC No. 15791. The allotype and 59 paratypes bear the same data.

**HOST.** Unknown.

**DISTRIBUTION.** Known only from Oaxaca and Chiapas, Mexico. Specimens (69) examined from:

**MEXICO**

**Chiapas:** See type material. **Oaxaca:** 15 mi S of Valle Nacional, 4000 ft, 20.V.71, D.E. Bright (CNC) 8.

**REMARKS.** This species is very similar to the previous species, but the adults of *assitus* are most easily distinguished by the dense, minute reticulation on the posterior surface of the pronotum and on the elytral interstriae and by the larger body size.

**OBTUSIPENNIS GROUP**

The species included here are all characterized by the concentric rows of asperities on the pronotum, by the strongly elevated and strongly granulate third declivital interstriae (Figs. 24, 26), by the distinct punctures in striae 1 and 2 on the declivity (Figs. 24, 26), and by the similar frons of both sexes.

Four species are included in the group.

**KEY TO SPECIES IN THE Obtusipennis group**

- 1. Body length 2.8 mm; antennal sutures 1 and 2 weakly arcuate; anterior margin of pronotum narrowly rounded; declivital interstriae 2 bearing several setiferous granules at apex; Mexico . . . . . 30. *germanus* Bright (p. 51)
- Body length 1.4-2.2 mm; antennal sutures 1 and 2 transverse; anterior margin of pronotum broadly rounded; declivital interstriae 2 smooth to apex, not bearing granules at apex . . . . . 2

2. Body larger, 1.9-2.2 mm, about 2.6-2.8 times longer than wide; frons of both sexes flattened or weakly impressed; Mexico, Guatemala . . . . . 31. *obtusipennis* Blandford (p. 51)  
 - Body smaller and more slender, 1.4-1.8 mm long and 3.0 or more times longer than wide; frons of both sexes convex . . . . . 3  
 3. Elytral declivity deeply impressed; frons shining, evenly punctured on lower half; Chiapas . . . . . 32. *euterpes* Bright (p. 52)  
 - Elytral declivity more shallowly impressed (Fig. 26); frons dull, densely reticulate or reticulate-granulate on lower half (Fig. 25); Nayarit to Honduras . . . . . 33. *occlusus* Bright (p. 53)

### 30. *Pityophthorus* (*P.*) *germanus* Bright

*Pityophthorus germanus* Bright, 1976b, p. 434.

Length 2.8 mm, 2.8 times longer than wide.

**Male.** Frons concealed in unique specimen available. Antennal club 1.7 times longer than wide, widest through segments 2 and 3; sutures weakly arcuate. Pronotum 1.1 times longer than wide, widest behind summit; anterior margin rather narrowly rounded; asperities on anterior slope arranged into three definite, nearly even, concentric rows with two more broken, indefinite rows around summit; posterior area of disc bearing large, deep punctures; surface between punctures smooth, shining, densely micropunctate. Elytra 1.5 times longer than wide; apex truncate, bisinuate; discal striae punctured in regular rows, punctures large, deep and close; discal interstriae weakly convex, surface brightly shining, smooth, with a few punctures in each, these equal in size and depth to those in striae. Declivity deeply sulcate; interstriae 1 weakly elevated above 2, with a median row of prominent, setiferous granules; interstriae 2 deeply impressed, slightly widened, smooth except for several setiferous granules at apex; interstriae 3 much higher than interstriae 1, with abundant, prominent granules along summit and on inner slope; punctures of striae 1 and 2 prominent, about equal in size and depth to those in discal striae.

**Female.** Unknown.

**TYPE MATERIAL.** The holotype ( $\delta$ ) is in the CNC and bears the labels: MEX., Oax., 92 mi. N. Oaxaca, 3000', V.18.71, Bright/at black light/HOLOTYPE *Pityophthorus germanus* D.E. Bright, 1976, CNC No. 15083.

**HOST.** Unknown, but probably *Pinus*.

**DISTRIBUTION.** Known only from the type locality in Oaxaca, Mexico.

**REMARKS.** This species is closely related to *obtusipennis* but the adults of *germanus* can be distinguished by the larger size, by the more strongly elevated third declivital interstriae, by the weakly granulate apex of the second declivital interstriae, and by the other characters mentioned in the key.

The host of this species is unknown but based on the relationship to other species it is suspected to be *Pinus* spp.

### 31. *Pityophthorus* (*P.*) *obtusipennis* Blandford

Figs. 23,24

*Pityophthorus obtusipennis* Blandford, 1904, p. 240; Hagedorn, 1910, p. 73; Schedl, 1956, p. 18; Bright, 1976c, p. 184 (lectotype desig.).

Length 1.9-2.2 mm, 2.7-2.8 times longer than wide.

**Female.** Frons weakly, transversely impressed above epistoma to near upper level of eyes, with a faint, longitudinal carina extending from weakly elevated epistoma to above upper level of eyes, this carina sometimes shorter; surface shining, very closely, densely punctate, punctures deeply impressed. Antennal club 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest between base and summit; anterior margin broadly rounded; asperities on anterior slope arranged into three concentric rows, one or two additional indistinct rows at summit; summit weakly elevated;

posterior area of disc densely punctured, punctures of moderate size, rather deeply impressed; surface between punctures shining, with numerous fine points and lines. Elytra 1.4-1.6 times longer than wide; apex broadly rounded, almost truncate; discal striae punctured in regular rows, punctures rather large, deeply impressed; discal interstriae convex, about as wide as striae or slightly narrower, shining, bearing sparse, fine points and lines; interstriae 1, 3, 5, 7 each bearing a median row of large punctures, each of these punctures bearing a long, fine seta. Declivity steep; interstriae 1 weakly elevated above 2, bearing a median row of fine, setiferous granules; interstriae 2 deeply impressed, smooth to apex, not wider than discal width; interstriae 3 strongly, abruptly elevated on upper portion, bearing on elevated portion a median row of 6-8 moderately large, rounded granules; punctures of striae 1 and 2 distinct, impressed, slightly smaller than those on disc; striae 3 indistinctly visible, passing to the outside of the elevated interstriae 3, punctures obscure but usually visible.

**Male.** Very similar in size and morphological characters to female except declivital interstriae 3 more strongly, abruptly elevated and toothed and punctures of striae 1 and 2 larger and more deeply impressed.

**TYPE MATERIAL.** This species was described from two specimens. The lectotype ( $\sigma$ ) in the BMNH is labeled: Type (orange bordered circle)/Balheu, Vera Paz, Champion/B.C.A. Col. IV-6, *Pityophthorus obtusipennis* Blandf./LECTOTYPE *Pityophthorus obtusipennis* Blandford, D.E. Bright, 1976. The second specimen (BMNH) has not been seen.

**HOSTS.** Known definitely from *Pinus lawsoni*, *leiophylla*, and *strobis* var. *chiapensis* but probably occurs in most species of pines in its range.

**DISTRIBUTION.** Central Mexico to Guatemala and probably extends to southern limit of pines in Honduras. Specimens (26) examined from:

#### MEXICO

**Chiapas:** 5 mi SW of El Bosque, 3.VII-69, *Pinus strobis* var. *chiapensis*, D.E. Bright (CNC) 6. **Hidalgo:** Jacala, 18.I.36, *Pinus lawsoni*, D. Deleon (USNM) 2. **Mexico:** Nepantla, 9.V.71, *Pinus leiophylla*, D.E. Bright (CNC) 5. **Michoacán:** 18 mi W of Quiroga, 17.VI.65, *Pinus* sp., S.L. Wood (SLWC) 1; 21 mi W of Morelia, 17.VI.65, *Pinus* sp., S.L. Wood (SLWC) 10.

**GUATEMALA:** See type material.

**REMARKS.** This species displays sexual dimorphism mainly in the structure of the declivity. In the male, the lateral margins (interstriae 3) are abruptly, strongly elevated while in the female interstriae 3 is only weakly elevated and the entire declivity is flatter and broader. In the males the elevated interstriae 3 forms the lateral margin of the declivity and interstriae 4 is not part of the declivity; in the female, interstriae 4 can be seen on the declivital face, passing lateral to interstriae 3.

### 32. *Pityophthorus* (*P.*) *euterpes* Bright

*Pityophthorus euterpes* Bright, 1978, p. 75.

Length 1.5-1.8 mm, 3.0-3.1 times longer than wide.

**Male.** Frons convex, with a faint, longitudinal carina extending from weakly elevated epistoma to upper level of the eyes; surface shining, closely, deeply punctured; vestiture inconspicuous. Antennal club 1.5 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum 1.2 times longer than wide, widest at middle; anterior margin broadly rounded; asperities on anterior slope arranged into three distinct, concentric rows, two other indistinct, concentric rows are at summit, some of those in first and second rows slightly offset; summit distinctly but weakly elevated; posterior area of disc strongly punctured, punctures deep, and moderately large; surface between punctures brightly shining, smooth, with scattered

fine points; median line broad, scarcely elevated. Elytra 1.7 times longer than wide; apex broadly rounded, weakly produced at suture; discal striae punctured in regular rows, punctures rather large, deeply impressed; discal interstriae weakly convex, about 1.5 times wider than striae, surface shining, impunctate, very finely sculptured with fine lines and points. Declivity deeply sulcate; interstriae 1 weakly elevated above 2, bearing a median row of fine, setiferous granules; interstriae 2 not wider than discal width, smooth to apex; interstriae 3 abruptly elevated, much higher than 1, bearing about 6 prominent, acute granules along summit; punctures of striae 1 and 2 distinct, impressed, somewhat smaller than those on disc.

**Female.** The form suspected to be the female is nearly identical with the male except declivital interstriae 3 is much less strongly elevated with much finer granules.

**TYPE MATERIAL.** The holotype ( $\delta$ ) in the CNC bears the data: Mex., 21 mi. W. Lazaro Cardenas, Chis., VI-26-1969, D.E. Bright/ *Pinus oocarpa*/ HOLOTYPE *Pityophthorus euterpes* D.E. Bright, 1977, CNC No. 15167. Five paratypes bear the same data. Three additional paratypes are labeled: MEX., Lagos des Colores, Chis., VI-14-1969, D.E. Bright and 1 paratype is labeled: Ocosingo Valley, Chiapas, Mexico, VII-7-1960, Stannard.

The holotype and most of the paratypes are in the CNC, additional paratypes are in the SLWC and the KESC.

**HOST.** *Pinus oocarpa* and probably other species of *Pinus*.

**DISTRIBUTION.** Known only from the type-series localities in Chiapas, Mexico.

**REMARKS.** This species is closely related to *obtusipennis* but the adults of *euterpes* may be distinguished by their smaller, more slender body and by the finer granules on the first and third declivital interstriae.

### 33. *Pityophthorus (P.) oclusus* Bright

Figs. 25, 26

*Pityophthorus oclusus* Bright, 1976b, p. 437.

Length 1.4-1.7 mm, about 3.0 times longer than wide.

**Female.** Frons convex, weakly flattened on area below upper level of eyes, with a weakly elevated, median callus frequently evident at upper level of eyes and a very weak, longitudinal elevation sometimes evident extending from epistomal margin to callus, if present, this elevation frequently interrupted in middle by a very weak, transverse impression; surface rugose, rather strongly punctured; vestiture inconspicuous. Antennal club oval, 1.4-1.5 times longer than wide, widest through segment 3; sutures 1 and 2 weakly arcuate, usually not distinctly visible; segment 1 narrower than 2; segments 1 and 2 together occupy about one-third of total club length. Pronotum 1.2 times longer than wide, widest at middle; anterior margin broadly rounded; asperities on anterior slope generally isolated but may be basally contiguous especially on lateral areas, arranged into four concentric rows with one or two additional indistinct concentric rows at summit; summit weakly elevated, transverse impression behind summit weak; posterior area of disc moderately punctured, punctures rather small, moderately impressed; surface between punctures brightly shining, rather densely micropunctate. Elytra 1.7 times longer than wide; apex almost truncate; discal striae punctured in regular rows, punctures very large, much larger than those on posterior portion of pronotum; discal interstriae narrower to slightly wider than striae, brightly shining, with numerous very fine lines and points. Declivity weakly bisulcate; interstriae 1 rather strongly elevated, impressed slightly below level of interstriae 3, bearing a median row of 5 or 6 moderately large, acute granules; interstriae 2 flat, about as wide as discal width, slightly impressed below 1 and 3; interstriae 3 moderately elevated, bearing a median row of 6-8 moderately large, acute granules, these larger than those on interstriae 1; punctures in striae 1 and 2 distinct, equal in size or only very slightly smaller than those on disc.

**Male.** Virtually indistinguishable from female except by abdominal segmentation.

TYPE MATERIAL. The holotype (♀) in the SLWC is labeled: Yuscaran, Paraiso, Honduras, 2400 ft., IV-23-1964, S.L.W./*Pinus caribaea*/HOLOTYPE *Pityophthorus occlusus* D.E. Bright, 1977. The allotype and 19 paratypes bear the same data. Additional paratypes are labeled: 10, San Lucas, Paraiso, Honduras, IV-22-1964, 2400 ft., S.L. Wood/*Pinus oocarpa*; 2, 26 miles southeast Nochixtlan, Oaxaca, Mexico, VI-17-1967, SLW/*Pinus* and 3, Laguna Sta. Maria. N., Mexico, VII-6-1965, 3000 ft., S.L. Wood/*Pinus*.

Most of the type material is in the SLWC, additional paratypes are in the CNC and the KESC.

HOSTS. *Pinus caribaea* and *oocarpa* but probably occurs in other species of *Pinus*.

DISTRIBUTION. Known only from the type-series localities in Mexico and Honduras.

REMARKS. The large, distinct granules on declivital interstriae 1 and 3, the large strial punctures and the rugose frons of both sexes should distinguish the adults of this species from related species in this group.

#### LAUTUS GROUP

Species belonging to this group may be recognized by the distinct punctures in striae 1 and 2 on the declivity (as in Fig. 36), by the usually distinctly impressed, flat, not widened declivital interstriae 2, and by the regular concentric rows of asperities on the pronotum. The group contains 13 species, all of which occur in the southeastern United States, Mexico, or Central America.

#### KEY TO SPECIES IN THE Lautus group

1. Male and female frons similar, pubescence sparse . . . . . 2
- Male and female frons sexually dimorphic, female frons distinctly pubescent, male frons only sparsely pubescent . . . . . 9
2. Declivital interstriae 2 bearing a median row of fine setiferous granules or only fine setae (Fig. 28); antennal club narrowly oval, about 1.5 times longer than wide . . . . . 3
- Declivital interstriae 2 never bearing granules or setae; antennal club broadly oval, less than 1.5 times longer than wide . . . . . 4
3. Declivital interstriae 2 bearing a row of fine granules and setae, setae as long as those on interstriae 1 and 3; surface between punctures on pronotum strongly reticulate; Honduras to Costa Rica . . . . . 34. *nemoralis* Wood (p. 55)
- Declivital interstriae 2 bearing fine punctures and setae, setae much shorter than those on interstriae 1 and 3 (Fig. 28); surface between punctures on pronotum smooth, brightly shining; Florida and Cuba . . . . . 35. *concentralis* Eichhoff (p. 56)
4. Frons bearing a weak but distinct, longitudinal carina or elevation; punctures on posterior portion of pronotum numerous, small and shallow (except *borrichiae*) . . . . . 5
- Frons bearing a very small tooth on epistomal margin, no other carina or elevation evident (Fig. 29); punctures on posterior portion of pronotum large, deep, and widely spaced; Mexico . . . . . 36. *sambuci* Blackman (p. 58)
5. Frons flattened or transversely concave to upper level of eyes, divided by a weak, longitudinal, narrow elevation (Fig. 31); declivity sloping (Fig. 32); asperities on anterior pronotal slope arranged into broken concentric rows . . . . . 6
- Frons convex, usually with a distinct, narrow elevation extending from epistoma to vertex, elevation interrupted in center by a weak, transverse impression, if elevation absent, then frons rugose, elevation frequently indicated by a small, elongate callus at upper level of eyes; declivity steep; asperities on anterior pronotal slope arranged in even, concentric rows . . . . . 7

6. Occurs in eastern United States; setae on declivital interstriae about 1.5 times longer than interstitial width (Fig. 32); median elevation on frons only weakly indicated . . . . . 37. *lautus* Eichhoff (p. 58)
- Occurs in eastern Mexico; setae on declivital interstriae longer, more than 2.0 times longer than interstitial width; median elevation on frons sharply elevated . . . . . 38. *molestus* Wood (p. 61)
7. Body length 1.0-1.3 mm; declivital setae stout, about equal in length to interstitial width; Florida . . . . . 39. *borrichiae* Wood (p. 61)
- Body length 1.4-1.7 mm; declivital setae fine, hairlike, nearly 2.0 times longer than interstitial width; Mexico and Central America . . . . . 8
8. Frons shining, deeply punctured, frontal elevation not evident but frequently indicated by elongate callus at upper level of eyes (Fig. 33); discal interstriae smooth, with sparse, minute points; Chiapas to Honduras . . . . . 40. *morosus* Wood (p. 62)
- Frons dull, reticulate, sparsely punctured, elevation usually distinct but frequently interrupted in middle by a weak, transverse, densely punctured impression; discal interstriae with numerous fine lines, surface irregular; Mexico . . . . . 41. *paulus* Wood (p. 63)
9. Occurs in eastern North America; female frons densely pubescent only on upper margin above upper level of eyes, shining and glabrous below (Figs. 35, 37); male frons flattened, densely punctured . . . . . 10
- Occurs in Mexico and Central America; female frons pubescent over entire area between eyes, setae may be longer and more abundant on periphery of flattened area; male frons weakly transversely impressed . . . . . 11
10. First two segments of antennal club occupy more than half of total club length, club 1.4 times or less longer than wide; lower half of female frons weakly but distinctly punctured, the punctures rather large (Fig. 35); southeastern U.S.A. . . . . 42. *liquidambaris* Blackman (p. 64)
- First two segments of antennal club occupy about one-third of total club length, club 1.5 times longer than wide; lower half of female frons smooth, brightly shining, sometimes punctures visible but then the punctures are minute (Fig. 36); eastern U.S.A. . . . . 43. *crinalis* Blackman (p. 66)
11. Occurs in Central America; setae on declivital interstriae scalelike in male, hairlike in female; pubescence on female frons abundant on periphery, sparse in central area . . . . . 44. *perexiguus* Wood (p. 67)
- Occurs in Mexico; setae on declivital interstriae as above or hairlike in both sexes; pubescence on female frons variable . . . . . 12
12. Body size 0.8-1.6 mm; female frons pubescent on a narrowly oval, median area, all setae of equal length (Fig. 21); granules on declivital interstriae 3 large; setae on declivity scalelike in male, hairlike in female (Fig. 22); Mexico . . . . . 24. *attenuatus* Blackman (p. 45, Scriptor group)
- Body size 1.5-1.8 mm; female frons pubescent on a broad area extending from eye to eye and to above upper eye level; central portion of female frons less densely pubescent, setae on periphery longer; granules on declivital interstriae 3 small; setae on declivity hairlike in both sexes . . . . . 45. *corrutus* Wood (p. 68)

### 34. *Pityophthorus (P.) nemoralis* Wood

*Pityophthorus nemoralis* Wood, 1976, p. 351.

Length 1.4-1.9 mm, about 2.6-2.8 times longer than wide.

**Female.** Frons convex, very weakly, transversely impressed below upper level of eyes, with a weak, longitudinal elevation extending from epistoma to above upper level of eyes, this elevation frequently interrupted where it crosses the transverse impression, elevation more sharply elevated on epistoma below the transverse impression; surface densely punctured, punctures deep, of moderate size and close; punctures absent on longitudinal elevation. Antennal club narrowly oval, 1.5 times longer than wide, widest at middle; first two sutures transverse to weakly arcuate; first two segments together occupy less than half of total club length. Pronotum 1.1 times longer than wide, widest at a point midway between summit and base; asperities on anterior slope arranged into three, fairly regular, concentric

rows, second and third rows sometimes slightly irregular and broken, one or two irregular, small rows may be seen around summit; posterior area of disc finely punctured, punctures moderate to large and deeply impressed; surface between punctures dull, densely micro-reticulate, with a few, scattered, fine points intermixed; median line broad, impunctate, and sculptured as above. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deeply impressed and almost touching, making the striae themselves appear impressed; discal interstriae appearing almost convex, about as wide as striae, brightly shining with numerous fine lines and points. Declivity convex, steep; interstriae 1 moderately elevated, bearing a distinct, median row of numerous, fine, setiferous granules; interstriae 2 weakly impressed, weakly sulcate, equal in width to discal width, bearing a distinct median row of fine, setiferous granules; interstriae 3 weakly elevated, about equal in height to interstriae 1, bearing a distinct median row of fine, setiferous granules; punctures in striae 1 and 2 distinct, equal in size to those on disc, striae 1 distinctly impressed.

**Male.** Virtually indistinguishable from female.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Zamorano, Moraz., Honduras, 2200 ft., IV-18-1964, S.L. Wood/Aristolochia anguicida/HOLOTYPE *Pityophthorus nemoralis* S.L. Wood 1976. The allotype and 26 paratypes bear the same data. Thirteen paratypes bear the data: S.E. of Cartago, Costa Rica, 5600 ft., VII-29-1963, S.L.W./unknown vine and 3 additional paratypes bear the same data except the date is VII-2-1963.

Most of the type material is in the SLWC, 3 paratypes are in the CNC.

**HOST.** Vines.

**DISTRIBUTION.** Known only from the type-series localities in Honduras and Costa Rica but probably occurs throughout Central America.

**REMARKS.** Adults of this species are easily distinguished by the distinct, median row of setae and granules in the second declivital interstriae.

### 35. *Pityophthorus centralis* Eichhoff

Figs. 27, 28; Map 3

*Pityophthorus centralis* Eichhoff, 1878, p. 188; Hagedorn, 1910, p. 70 (additional references); Blatchley & Leng, 1916, p. 630; Swaine, 1918, p. 104; Blackman, 1928, p. 40; Chamberlin, 1939, p. 361; Bright, 1978, p. 72 (neotype desig.).

*Pityophthorus lateralis* Swaine, 1917, p. 28; Swaine, 1918, p. 104; Blackman, 1922a, p. 103; Blackman, 1928, p. 40; Chamberlin, 1939, p. 361; Wood, 1957, p. 401 (= *centralis*); Bright, 1967, p. 678.

Length 1.2-1.5 mm, 2.7-3.0 times longer than wide.

**Female.** Frons convex, weakly, transversely impressed above epistoma; surface shining, deeply, densely punctured; vestiture inconspicuous. Antennal club elongate oval, 1.4-1.5 times longer than wide, widest through segments 2 and 3; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide, widest at about summit; asperities on anterior slope arranged into three or four even concentric rows, sometimes with one or two additional broken rows at summit; summit distinctly elevated; posterior area of disc densely, deeply punctured, punctures close; surface between punctures shining, generally smooth, with numerous, very fine points. Elytra 1.5-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep and close; discal interstriae shining, narrower than striae, smooth, with very fine points and lines. Declivity convex; interstriae 1 slightly elevated above 2, usually smooth or with a few, very fine granules; interstriae 2 shining, as wide as on disc, with a median row of very fine punctures and very fine setae; interstriae 3 moderately elevated, slightly higher than 1, with several, very fine granules; punctures of striae 1 and 2 not clearly visible, slightly reduced and obscure.



**Male.** Nearly identical with female except frons more strongly transversely impressed, declivital setae stouter and pronotal punctures slightly deeper and slightly larger.

**TYPE MATERIAL.** *P. centralis*. The neotype was designated by Bright (1978) and is in the USNM. It bears the labels: Biscayne, Fla., 29.5/coll. Hubbard and Schwarz/9/nicht Pityophthorus centralis Eichh. (in Eggers handwriting) Eggers 1927/NEOTYPE Pityophthorus centralis Eichh., D.E. Bright 1977.

*P. lateralis*. The lectotype of this species has been designated by Bright (1967) and is in the Cornell University collection. It bears the data: Key West, Fla./Cornell U., Lot 302, sub. 21/type of description/LECTOTYPE Pityophthorus lateralis Swaine, D.E. Bright 1967.

One paralectotype is in the CNC.

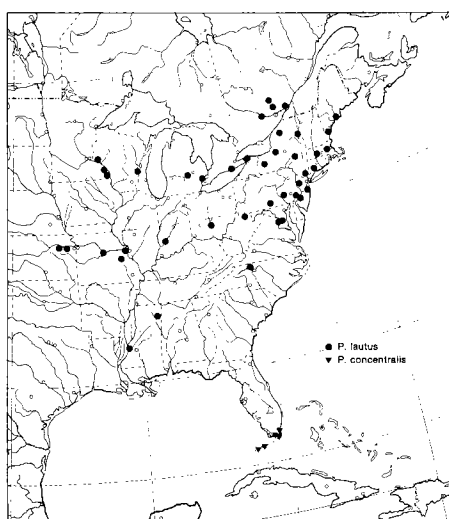
Wood (1957) compared Swaine's types of *lateralis* with numerous specimens of *centralis* and concluded that *lateralis* represented only a minor variation found in almost any long series of the species. Blackman (1928) suggested the same conclusion stating that *lateralis* may represent only a variation of *centralis* as it occurs in the same lot of material along with specimens identified as *centralis* by Eichhoff and Schwarz. I agree with their conclusions.

**HOSTS.** *Metopium toxiferum*. Several series are labeled *Pinus elliotii*.

**DISTRIBUTION.** Known only from Cuba and Florida (Map 3). Specimens (91) examined from:

#### UNITED STATES

**Florida:** Big Pine Key, 9.V.67, *Pinus elliotii*, D.E. Bright (CNC) 7; Everglades National Park, 7.VI.51, at light, S.L. Wood (SLWC) 1; Haw Creek (CNC) 1; Key Largo, 11-17.VI.77, *Metopium toxiferum*, R. Turnbow (CNC) 6; Key Vala, 29.VI.51, *Metopium toxiferum*, S.L. Wood (SLWC) 3; Key West, 1.IV.03, *Rhus metopium*, E.A. Schwarz (DFEC, USNM) 2; Paradise Key, various dates 1914, H.S. Barber (USNM) 6; Plantation Key, 26.VI.51, *Metopium toxiferum*, S.L. Wood (SLWC) 2; Plantation Key, 3.V.67, *Pinus elliotii*, D.E. Bright (CNC) 51; Royal Palm Park, 26.III.24, W.S.B. (CNC) 1; Sugarloaf Key, 3.VII.51, *Metopium toxiferum*, S.L. Wood (SLWC) 5; Sugarloaf Key, 9.V.67, D.E. Bright (CNC) 4.



MAP 3. Collection localities for *P. (Pityophthorus) lautus* and *P. centralis*.

REMARKS. This species is rather closely allied to *lautus* but the adult of *concentralis* may be distinguished by the regular concentric rows of pronotal asperities, by the more obscure strial punctures on the declivity, by the row of minute setae on the second declivital interstriae, and by the host.

36. *Pityophthorus (P.) sambuci* Blackman

Figs. 29, 30

*Pityophthorus sambuci* Blackman, 1942, p. 207.

Length 1.4-1.7 mm, about 2.7-2.8 times longer than wide.

**Female.** Frons very weakly, transversely impressed from epistoma to about upper level of eyes, epistoma very slightly elevated; surface brightly shining, closely punctured, punctures closer and more deeply impressed above impression; vestiture sparse, consisting of fine, yellowish setae of equal length, setae much longer and denser on epistomal margin. Antennal club elongate-oval, 1.5-1.6 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum about 1.1 times longer than wide, widest at about level of summit; asperities on anterior slope arranged into two or three somewhat broken concentric rows with one or two small, irregular rows at summit; posterior area of disc closely, deeply punctured, punctures large, most almost touching but some separated by a distance equal to their own diameter; summit distinct; surface between punctures smooth, shining, minutely punctate-reticulate. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures rather large, deep; discal interstriae moderately shining, about as wide as or slightly wider than the striae, surface minutely reticulate. Declivity steep, flattened; interstriae 1 weakly elevated, smooth; interstriae 2 weakly impressed, flat to weakly sulcate, smooth; interstriae 3 very weakly elevated if at all, uniserrately punctate-setose, devoid of granules; striae 1 and 2 with strong, easily visible punctures.

**Male.** Very similar to female except frons more strongly punctured and more strongly impressed and interstitial setae slightly shorter and stouter on declivity.

TYPE MATERIAL. The holotype ( $\delta$ ) in the USNM bears the data: Mexico: at N.Y., XI-14-40, Sambucus/Lot No. 40-23808/Type No. 55982 USNM, and a large, red square. One hundred and sixty-five paratypes with similar data are in the USNM and several are in the CNC.

HOST. *Sambucus* sp.

DISTRIBUTION. Known only from interceptions of infested crate wood from Jalisco, Mexico. Specimens (176) examined from:

MEXICO

**Jalisco:** Tlaquepaque, 6.X.43, unidentified wood in packing crate, intercepted at Nogales (USNM) 10.

REMARKS. This species clearly belongs in the *Lautus* group but is evidently not closely related to any of the currently included species. Adults may be distinguished by the shallow, nearly flat, elytral declivity which does not bear granules on interstriae 1 or 3, by the large strial punctures on the declivity and by the somewhat irregular concentric rows of pronotal asperities.

37. *Pityophthorus (P.) lautus* Eichhoff

Figs. 31, 32; Map 3

*Pityophthorus lautus* Eichhoff, 1872a, p. 135; Hagedorn, 1910, p. 71 (additional references); Blatchley & Leng, 1916, p. 633; Swaine, 1918, p. 104; Blackman, 1922a, p. 103; Blackman, 1928, p. 37; Chamberlin, 1939, p. 360; Bright, 1976b, p. 427 (neotype designation).

*Pytophthorus rhois* Swaine, 1917, p. 26; Swaine, 1918, p. 99; Blackman, 1922a, p. 103; Blackman, 1928, p. 38; Dodge, 1938, p. 43; Chamberlin, 1939, p. 360; Beal & Massey, 1945, p. 128; Craighead, 1950, p. 331; Baker, 1972, p. 255; Bright, 1976b, p. 427 (= *lautus*).

*Pityophthorus natalis* Blackman, 1921, p. 8; Blackman, 1922a, p. 104; Blackman, 1928, p. 39; Chamberlin, 1939, p. 361; Beal & Massey, 1945, p. 130; Craighead, 1950, p. 331; Baker, 1972, p. 255; Bright, 1976b, p. 427 (= *lautus*); Bright, 1976c, p. 183; Bright, 1977, p. 517 (= *rhois*).

Length 1.3-1.6 mm, 2.5-2.6 times longer than wide.

**Female.** Frons flattened on an area less than a semicircle, highest extension of flattened area about at level of upper margin of eyes; surface brightly shining, evenly punctured, punctures rather deep, and close; vestiture sparse, consisting of short, yellowish setae of nearly equal length. Antennal club about 1.4 times longer than wide, widest through segments 2 and 3; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy about one-half of total club length. Pronotum less than 1.1 times longer than wide, widest at posterior angles; asperities on anterior slope rather small, acute, arranged into three to five broken, concentric rows, with several, additional, smaller rows around summit; summit weakly elevated; posterior area of disc densely, closely punctured, punctures rather large, deeply impressed and close; surface between punctures smooth, shining, with numerous, very fine points; median line narrow, very weakly elevated. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep and close; discal interstriae shining, about as wide or only slightly wider than striae, surface smooth with a few fine lines. Declivity convex; interstriae 1 and 3 weakly elevated, 3 higher than 1, both with median row of extremely fine, setiferous granules; interstriae 2 impressed below level of 1 and 3, equal in width to discal width, flat, shining; striae 1 and 2 impressed or at least punctures obvious and impressed, punctures smaller than on disc but readily visible.

**Male.** Frons more deeply, transversely impressed, punctures coarser. Declivital punctures deeper, coarser. Otherwise closely resembles female.

**TYPE MATERIAL.** *P. lautus*. The neotype, designated by Bright (1978), is in the USNM. It bears the data: Hopk. U.S. 7237E/Morgantown, W. Va./Picea/Pityophthorus piceae Hopk. 5-20-02 (folded)/8/Pityophthorus lautus Eichh. m. type in coll. Eichhoff vergleichen (in Eggers handwriting) Eggers 1927/NEOTYPE Pityophthorus lautus Eichhoff, D.E. Bright, 1977. Three additional specimens from the same locality were evidently also compared with the type but do not bear Eggers label.

*P. rhois*. The holotype in the Cornell University collection is labeled: Ithaca, N.Y./J.M. Swaine, No. 11, Sub. b/Pityophthorus rhois Type No. 1379. Thirty-five paratypes with the same data are in the CNC and the USNM.

*P. natalis*. A lectotype has been designated by Bright (1976b) and is in the USNM. It bears the data: Mississippi A & M, 11-7-1919/ M.W. Blackman, collector/ N.Y.S. Coll. For. Lot No. Mi 22/Type/Type No. 56911 U.S.N.M./LECTOTYPE Pityophthorus natalis Blackman, D.E. Bright, 1976. Eleven paralectotypes are in the USNM, the DFEC, and the CNC.

**HOSTS.** *Acer* spp., *Cercis* sp., *Hamamelis* spp., *Juglans* spp., *Quercus* spp., and *Rhus* spp. The host recorded on the neotype is evidently an error or an accidental occurrence.

**DISTRIBUTION.** Eastern North America, from Quebec and Ontario south to Mississippi and west to Kansas (Map 3). Specimens (289) examined from:

#### CANADA

**Ontario:** Beachburg, 27.XI.69, *Rhus* sp. (CNC) 4; St. Williams, 20.VII.67, *Acer saccharinum* (CNC) 4. **Quebec:** Aylmer, 14.VIII.20, C.B. Huchings (CNC) 3; Ste. Anne's, J.M. Swaine (CNC) 10; Wakefield, 11.V.51, *Rhus typhina*, S.L. Wood (SLWC) 19.

## UNITED STATES

**Connecticut:** New Haven, 18.I.11, *Rhus glabra*, A.B. Champlain (CNC) 1. **District of Columbia:** Washington, Poison Ivy (USNM) 1. **Indiana:** Shoals, 24.VIII.51, Red Bud, S.L. Wood (SLWC) 8. **Kansas:** Lawrence, 5.IX.51, Walnut, S.L. Wood (SLWC) 8; Lawrence, 5.IX.50, Sumac, S.L. Wood (SLWC) 12; Topeka (USNM) 2. **Maine:** Kittery Point, 2.VII.19, M.W. Blackman (UMDE) 2. **Maryland:** Plummer's Island, 8.I.08, Walnut, A.D. Hopkins (USNM) 2. **Massachusetts:** Farmington, IV.08, *Rhus* and oak twigs, C.A. Frost (CNC) 1; Springfield, 8.VII.01, *Rhus* (USNM) 2. **Michigan:** Ag. College, 12.III.17, Pettit (MSUC) 3; Ag. College, 23.I.09 (MSUC) 9; Detroit (CNC) 1. **Minnesota:** Houston Co., SE tip, 23.V.36, H.R. Dodge (SLWC) 2; Winona Co., 30.VIII.36, *Rhus typhina*, H.R. Dodge (SLWC) 8. **Mississippi:** Waltersville, 23.IV.20, M.W. Blackman (DFEC) 7. **Missouri:** Jefferson City, H. Soltan (USNM) 1; St. Louis (USNM) 3; Union, 26.VII.51, *Rhus*, S.L. Wood (SLWC) 2. **New Jersey:** Chesters, Sumach (CNC) 2; Five Mile Beach, IV.22, H.A. Kaeber (USNM) 10; Orange Mtns. (CNC) 1; Red Bank, H.A. Kaeber (USNM) 2; Sewell (CNC) 2. **New York:** Cranberry Lake, 6.VIII.21, Blackman and Fiviz (DFEC) 1; Green Lakes State Park, 14.X.70, *Rhus typhina* R.C. Miller (DFEC) 30; Huyac Reserve, near Rensselaerville, 29.VIII.67, *Rhus typhina*, R.J. Matthews (CNC) 3; Warrensburg, 7.V.30, *Rhus typhina*, C.R. Bruck (OSUC) 4; West Point, 6.V.09, W. Robinson (USNM) 1. **North Carolina:** Durham, 10-17.VII.41, *Rhus glabra*, C.L. Massey (RMSC) 2; Durham, 1941, *Cercis canadensis* (RMSC) 3. **Ohio:** Pickaway Co., *Acer* sp., D.J. & J.N. Knull (OSUC) 6. **Pennsylvania:** Essington, VI.27, H.A. Kaeber (USNM) 15; Hummelstown, 19.III, J.N. Knull (DFEC) 5; Philadelphia, 19.IV.14, *Rhus*, G.M. Greene, (USNM) 9. **Virginia:** Rosslyn, Chittenden (USNM) 7; Vienna, 20.III.37, *Acer saccharum*, J.C. Bridwell (USNM) 14. **West Virginia:** Monongalia Co., Hopkins (USNM) 3. **Wisconsin:** Beaver Dam, 2.IV.10, Sumac (CNC) 1; Buffalo Co., 30.VIII.36, H.R. Dodge (SLWC) 1.

**BIONOMICS.** Blackman (1922a) states that the galleries of this species are constructed in the inner bark and outer sapwood in injured or dying host material. The parent galleries are of the radiate type consisting of from two to five egg galleries extending from a central nuptial chamber. The egg galleries are relatively short, seldom being more than 4.0 cm in length. They engrave the surface rather deeply. The egg niches are arranged rather evenly on each side of the egg galleries. Larval mines are wandering and are for the most part in the inner bark, grooving the surface of the wood only lightly.

**REMARKS.** The types and numerous specimens of *natalis* and *rhois* were compared with each other and with the neotype of *lautus*. No significant morphological differences could be detected. Since the biology and distribution of the three "species" is also very similar, only one widespread variable species can be recognized.

Three varieties of *rhois* have been described: *swaini* Blackman, from *Rhus* in the South; *hamamelidus* Blackman, from *Hamamelis* in West Virginia, and *acerni* Blackman, from *Acer* in West Virginia. When large numbers of specimens from many different parts of the range are compared, the range of variation is seen to be considerable. The same structural differences which Blackman used to distinguish the three varieties above can also be seen in specimens from different hosts and localities. No clearcut distinction or break can be seen which would enable one to designate varieties or races, and no geographical breaks are present on which subspecies could be based. Varietal terms are therefore not used in this revision.

There is, however, a gradual increase in size from south to north with a corresponding change in other structural characters such as the sculpturing of the

pronotum and elytra, the body length/width ratio and the declivital characters.

*Pityophthorus lautus* is closely related to *atomus* Wood and *concentralis* Eichhoff. The adults of *lautus* may be distinguished from other members of the group by the large, deep punctures in the first two striae on the declivity, by the very fine granules on declivital interstriae 1 and 3, and by the hosts and distribution.

### 38. *Pityophthorus (P.) molestus* Wood

*Pityophthorus molestus* Wood, 1976, p. 362.

Length 1.3-1.7 mm, about 2.8 times longer than wide.

**Female.** Frons flattened on a broad semicircular area extending to above upper level of the eyes, divided by a sharp, weakly elevated, longitudinal carina, this carina extending from epistomal margin to above eyes, more strongly elevated on lower portion; surface moderately shining, obscurely punctured, densely microreticulate, vestiture inconspicuous. Antennal club oval, about 1.3 times longer than wide, widest about middle; first two sutures transverse; first two segments together occupy slightly more than half of total club length. Pronotum 1.1 times longer than wide, widest at about middle; asperities on anterior slope arranged into four concentric rows, these rows somewhat irregular or broken, with a few asperities offset from the row, one or two very fine concentric rows may be present around summit; posterior area densely punctured, punctures large and deep; surface between punctures shining, densely micropunctate; median line broad, densely micropunctate, not elevated. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures fairly large and deeply impressed; discal interstriae narrower than striae, shining, with numerous fine points and lines. Declivity convex, steep; interstriae 1 weakly elevated, bearing a median row of about 5 or 6 very fine granules; interstriae 2 weakly impressed, weakly sulcate, equal in width to discal width, glabrous, surface as on disc; interstriae 3 very weakly elevated, equal in height to interstriae 1, bearing a median row of very fine granules; punctures in striae 1 and 2 large, distinct, more especially so in striae 2, those in striae 2 equal in size to those on disc.

**Male.** Almost identical with female, distinguishable with certainty only by abdominal segmentation.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: Los Abritos, S.L.P., Mexico, June 18, 1953/Sweet Gum/HOLOTYPE *Pityophthorus molestus* S.L. Wood, 1976. The allotype and 12 paratypes bear the same data. Most of the type material is in the SLWC; 1 paratype is in the CNC.

**HOST.** *Liquidambar styraciflua*.

**DISTRIBUTION.** Known only from the type locality in San Luis Potosi but will probably be found throughout the Mexican distribution of Sweet Gum.

**REMARKS.** Adults of this species resemble those of *lautus* but may be distinguished by the presence of a sharply elevated, median carina on the frons, by the more shallowly impressed elytral declivity, and by the longer setae on the interstriae on the declivity.

### 39. *Pityophthorus (P.) borrichiae* Wood

*Pityophthorus borrichiae* Wood, 1964, p. 60.

Length 1.0-1.3 mm, 2.8 times longer than wide.

**Female.** Frons convex, very weakly, transversely impressed above epistoma, with a weak, longitudinal carina sometimes evident extending from epistomal margin to upper level of eyes; surface shining, deeply, densely punctured from upper level of eyes to epistoma, minutely strigose above; vestiture sparse, inconspicuous, consisting of short, yellowish setae. Antennal club 1.1 times longer than wide, widest through segments 2 and 3; sutures 1 and 2 transverse. Pronotum 1.2 times longer than wide, widest at a point behind summit; asperities on anterior slope arranged into two or three regular, even, concentric rows with one or two

additional broken rows clustered around summit; posterior area of disc moderately shining, punctures deep and large; surface between punctures densely, finely minutely reticulate over entire surface. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctures rather small, fine, shallow; discal interstriae shining, equal to or slightly wider than striae, surface marked by minute points and lines. Declivity convex; interstriae 1 and 3 rather strongly elevated, 3 slightly higher than 1, both with a median row of rather large, rounded granules; interstriae 2 distinctly impressed below level of 1 and 3, about equal to discal width, flat, moderately shining; punctures of striae 1 and 2 weakly impressed, distinct but not readily visible.

**Male.** Identical with female except declivital granules very slightly larger and declivital setae slightly shorter and slightly stouter.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Key Largo, Fla., 6-25-51, Price, Beemers-Wood/*Borrichia arborescens*/ Holotype *Pityophthorus borrichiae* S.L. Wood, 1964. The allotype and 28 paratypes were taken at the same locality on the same date from *B. frutescens*.

The holotype, allotype, and most of the paratypes are in the SLWC. Additional paratypes are in the CNC, the SEMC, and the USNM.

**HOST.** *Borrichia* spp.

**DISTRIBUTION.** Known only from the type locality in Florida.

**REMARKS.** This species is closely related to *attenuatus* and *lautus*. The adults can be recognized by the completely reticulate surface between the punctures on the posterior portion of the pronotum, by the glabrous female frons, and by the host and distribution.

#### 40. *Pityophthorus (P.) morosus* Wood

Figs. 33, 34

*Pityophthorus morosus* Wood, 1976, p. 362.

Length 1.3-1.6 mm, about 2.7 times longer than wide.

**Female.** Frons convex, with a feeble, transverse impression above epistoma, a weak, longitudinal callus on vertex and a weak, tuberclelike, median elevation on epistoma; surface distinctly punctured except on elevations, surface between punctures smooth and shining on lower half, transversely reticulate on vertex; vestiture fine, sparse, inconspicuous. Antennal club oval, 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, straight, chitinized for entire length; segments 1 and 2 together occupy over one-half of total club length. Pronotum about 1.1 times longer than wide, widest at about middle; asperities on anterior slope arranged in three or sometimes four definite concentric rows, with one or two additional, vague rows clustered at summit; posterior area of disc distinctly punctured, punctures rather large, deeply impressed; surface between punctures shining, generally smooth but also bearing a few, minute lines and points. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deeply impressed; discal interstriae about 2.0 times wider than striae, smooth and impunctate. Declivity steep; interstriae 1 and 3 evenly elevated, each bearing a row of distinct, setiferous granules; interstriae 2 moderately impressed, as wide as on disc; punctures in striae 1 and 2 distinct, slightly impressed.

**Male.** Very similar to female in all respects, distinguishable with certainty only by abdominal segmentation.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: Zamorano, Moraz., Honduras, 2200 ft., IV-18-1964, S.L.W./*Eupatorium daleoides*/HOLOTYPE *Pityophthorus morosus* S.L. Wood, 1976. The allotype and 19 paratypes bear the same data. Nine additional paratypes are labeled: Volcan de Agua, Guat., 3000 ft., V-19-1964, S.L.W./Woody vine.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOSTS. Various shrubs, vines, and trees. The recorded hosts are "*Eupatorium daleoides*", "unknown sapling", and "Woody vine".

DISTRIBUTION. Chiapas and Veracruz to Honduras. Specimens (151) examined from:

MEXICO

**Chiapas:** 13 mi N of Ocozocoatula, 2.VII.69, D.E. Bright (CNC) 49; 13 mi N of Tapilula, 10.V. 69, D.E. Bright (CNC) 43; 9 mi SE of Teopisca, 14.V.69, D.E. Bright (CNC) 9. **Veracruz:** 9 mi E of Huatusco, 7.VII.67, unknown sapling S.L. Wood (SLWC) 48.

GUATEMALA: See type material.

HONDURAS: See type material.

REMARKS. Adults of *morosus* are very similar to those of *paulus*. They may most easily be distinguished by the shining, deeply punctured frons and by the smooth elytral interstriae which may bear a few minute points. Otherwise the two species are very similar and distinction may be difficult.

41. *Pityophthorus (P.) paulus* Wood

Map 4

*Pityophthorus paulus* Wood, 1964, p. 63.

Length 1.4-1.7 mm, 2.5 times longer than wide.

**Female.** Frons convex, very weakly impressed on each side of a weak, longitudinal carina; carina faintly elevated from epistoma to vertex, interrupted for a short distance at about level of midpoint of eyes; surface weakly shining, microreticulate, punctures small, weakly impressed. Antennal club 1.5 times longer than wide; sutures 1 and 2 straight, 3 arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum 1.1 times longer than wide, widest between summit and base; asperities on anterior slope usually arranged in three definite, concentric rows, a fourth weakly indicated row is present, those in second row may be slightly irregular; posterior area of disc smooth, rather opaque, punctures larger and more deeply impressed than those on frons; surface between punctures with fine, sinuate lines. Elytra 1.8 times longer than wide, apex broadly rounded; discal striae punctured in regular rows, punctures shallow; discal interstriae about 1.5 times wider than striae, impunctate, rather dull, microsculpture as on pronotum. Declivity steep; interstriae 1 and 3 elevated, 3 slightly higher than 1, both bearing a row of fine but distinct granules; interstriae 2 slightly impressed, flat; striae 1 and 2 distinct, slightly impressed, the first more so, punctures distinct.

**Male.** Very similar to female except frons more strongly punctured and very slightly impressed between epistoma and upper level of eyes, transverse carina interrupted in central portion and more strongly elevated just above epistomal margin and lateral elevations of declivity slightly higher.

TYPE MATERIAL. The holotype (♀) in the SLWC bears the data: 24 miles NE Jacala, Hidalgo, Mex., VI-22-53/HOLOTYPE *Pityophthorus paulus* S.L. Wood, 1964. The allotype and 18 paratypes bear the same data.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

HOST. The host is not recorded for most of the specimens seen. Two series have been seen with *Baccharus* sp. recorded as the host.

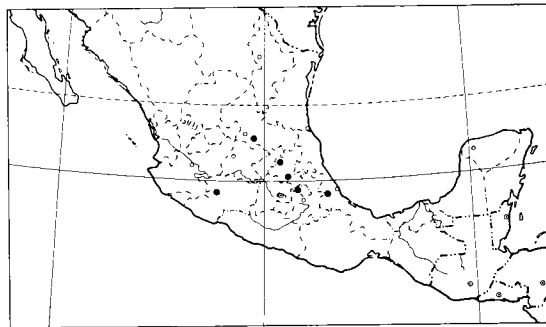
DISTRIBUTION. This species is recorded from central Mexico (Map 4). Specimens (149) examined from:

## MEXICO

**Hidalgo:** 10 mi E of Pachuca, 10.VI.67, *Baccharus*, S.L. Wood (SLWC) 15. **Michoacán:** 6 mi S of Carapán, 18.VI.65, S.L. Wood (SLWC) 19. **San Luis Potosí:** 30 mi E of San Luis Potosí, 12.VI.71, D.E. Bright (CNC) 5. **Tlaxcala:** 11 mi N of Tlaxco, 9.VII.67, *Baccharus* sp., S.L. Wood (SLWC) 14. **Veracruz:** 1 mi N of Cerro Gordo, 6.VII.67, unknown vine, S.L. Wood (SLWC) 28; 9 mi E of Huatusco, 7.VII.67, unknown sapling, S.L. Wood (SLWC) 48.

REMARKS. Occasionally specimens of this species are found in which the pronotal asperities are scattered rather than in concentric rows. These specimens are similar in all other respects to other members of the species.

Adults of this species can be most easily recognized by the similar frons of both sexes, by the concentric rows (usually) of pronotal asperities, and by the moderately deeply sulcate elytral declivity which bears obvious stria punctures and distinct interstitial setae and granules (except on interstriae 2).



MAP 4. Collection localities for *P. (Pityophthorus) paulus*.

#### 42. *Pityophthorus (P.) liquidambaris* Blackman

Figs. 35, 36; Map 5

*Pityophthorus liquidambaris* Blackman, 1921, p. 14; Blackman, 1922a p. 104; Blackman, 1928, p. 40; Chamberlin, 1939, p. 361; Beal & Massey, 1945, p. 131; Craighead, 1950, p. 331; Baker, 1972, p. 255; Bright, 1976c, p. 183.

Length 1.3-1.5 mm, about 2.8 times longer than wide.

**Female.** Frons broadly flattened to weakly concave from eye to eye and from epistoma to well above eyes, sometimes with a weak, longitudinal, median carina; surface shining, weakly but distinctly punctured, punctures moderate in size, shallow; vestiture mostly confined to area above eyes along dorsal periphery of flattened area, and consisting of a rather dense brush of yellowish setae, these setae extend downward about half the distance to epistoma, shorter, finer setae are located in flattened portion and along lateral margins near eye and antennal insertions. Antennal club broadly oval, 1.4 times longer than wide, widest through segment 3, nearly equally divided into three segments, first two sutures transverse, chitinized at lateral margins only, suture 3 strongly arcuate, indicated only by setae; segments 1 and 2 together occupy about half or less of total club length. Pronotum 1.1 times longer than wide, widest behind middle; asperities on anterior slope arranged into three or four distinct and one or two indistinct concentric rows, these rows occasionally broken, especially in median area; summit distinct; posterior area of disc smooth, shining, punctures rather large, deep and close; surface between punctures micropunctate. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, close and rather deep; discal interstriae as wide or wider than striae, surface brightly shining to dull, micropunctate, not pubescent. Declivity convex; interstriae 1 and 3 equal in height, bearing a median row of fine granules; interstriae 2 slightly impressed.



**Male.** Frons flattened to slightly concave on an arcuate area, the upper margin even with upper eye level; surface closely punctured, setose. Pronotum as in female except asperities larger, sharper. Elytra as in female except stria punctures and declivital granules larger.

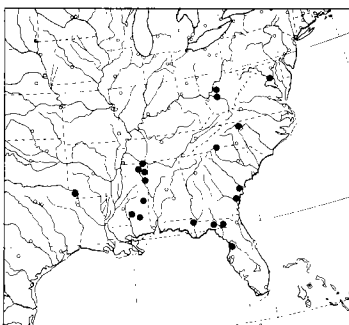
**TYPE MATERIAL.** This species was described from a long series of specimens from Mississippi and Louisiana. A lectotype designated by Bright (1976) bears the labels: Mound, Louisiana, 3-2-20/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. M: 149/Type/Type No. 56913 U.S.N.M./LECTOTYPE *Pityophthorus liquidambaris* Blackman, D.E. Bright, 1976. The USNM holds 31 original specimens and the DFEC holds an additional 46 original specimens. One paralectotype is also in the CNC.

**HOST.** *Liquidambar styraciflua*.

**DISTRIBUTION.** Southeastern United States from the District of Columbia south to Florida, west to Arkansas (Map 5). Specimens (199) examined from:

#### UNITED STATES

**Arkansas:** Texarkana, *Liquidambaris*, A.D. Hopkins (USNM) 2. **District of Columbia:** Washington, Hubbard & Schwarz (USNM) 1. **Florida:** Haw Creek, Hubbard & Schwarz (USNM) 1; Hernando Co., 4.III.30, C.C. Tigner (USNM) 1; Mariana, *Liquidambaris*, W.F. Fiske (USNM) 6; Monticello, 15.VI.51, Sweet gum, S.L. Wood (SLWC) 2; Swanee Springs, 15.VI.61, Sweet gum, S.L. Wood (SLWC) 2. **Georgia:** Riceboro, 12.VII.51, Sweet gum, S.L. Wood (SLWC) 4; Savannah, *Liquidambaris*, W.F. Fiske (USNM) 4. **Louisiana:** See type material. **Mississippi:** Corinth, 25.IV.20, M.W. Blackman (DFEC) 20; Fulton, 4.VII.21, C.J. Drake (CNC) 52; Hattiesburg, 2.XI.19, M.W. Blackman (DFEC) 10; Lucas, 26.IV.20, M.W. Blackman (DFEC) 1; Meridan, 25.IV.20, M.W. Blackman (DFEC) 1; Ripley, 26.IV.20, M.W. Blackman (DFEC) 1. **North Carolina:** Beardman, *Liquidambar styracifera*, A.D. Hopkins (USNM) 3; Tryon, *Liquidambaris*, A.D. Hopkins (USNM) 1. **West Virginia:** Charleston, *Liquidambaris* (USNM) 1; Jackson Co., *Liquidambaris* (USNM) 5; Kanawha Co., *Liquidambaris* (USNM) 1.



MAP 5. Collection localities for *P. (Pityophthorus) liquidambaris*.

**BIONOMICS.** Blackman (1922a) and Beal and Massey (1945) have discussed the biology of this species. The following account is condensed from their writings.

Sweet gum is evidently the only host. Adults of *liquidambaris* breed in the bark of saplings, branches, and twigs down to ¼ in. in diameter. The beetles are polygamous, constructing a typical radiate type of gallery. Two to five females may be associated with one male, each female constructing her own egg gallery. The egg galleries are short, and groove the wood of small limbs rather deeply. Egg niches are closely placed on both sides of the egg gallery. Larval mines wander in no

apparent direction, lightly grooving the wood. There are three generations per year in the southern United States. Beal and Massey (1945) list three species of parasites recorded from *liquidambaris*: *Ecphyus* sp., *Tetrastichus* sp., and *Eurytoma phloeotribi* Ashmead.

REMARKS. This species is very closely allied to *crinalis*. Adults of *liquidambaris* differ from those of *crinalis* by the features of the antennal club and the female frons as mentioned in the key to species.

#### 43. *Pityophthorus crinalis* Blackman

Figs. 37, 38; Map 6

*Pityophthorus crinalis* Blackman, 1928, p. 41; Chamberlin, 1939, p. 362; Beal & Massey, 1945, p. 128; Craighead, 1950, p. 331; Baker, 1972, p. 255.

Length 1.3-1.6 mm, 2.7-2.8 times longer than wide.

**Female.** Frons essentially as in *liquidambaris* except lower half brightly shining, impunctate or with very fine, scattered punctures and setae; upper portion of concavity below fringe of long setae bears a pile of dense, short, branched setae. Antennal club elongate-oval, 1.5 times longer than wide, widest through segment 3; suture 1 weakly arcuate, 2 more strongly so; segments 1 and 2 together occupy one-third of total club length. Pronotum 1.2 times longer than wide, widest just behind middle; sides weakly arcuate, distinctly constructed behind broadly rounded anterior margin; otherwise as in *liquidambaris*. Elytra 1.6-1.7 times longer than wide, otherwise as in *liquidambaris*.

**Male.** As in *liquidambaris*.

TYPE MATERIAL. The holotype (♀) is in the USNM and bears the data: Washington, D.C., 12.6/Coll. Hubbard & Schwartz/ ♀ /Type, *Pityophthorus crinalis* Blackman/Type No. 41270 USNM. Numerous paratypes from Maryland, Florida, Michigan, West Virginia, and North Carolina are also in the USNM and the DFEC.

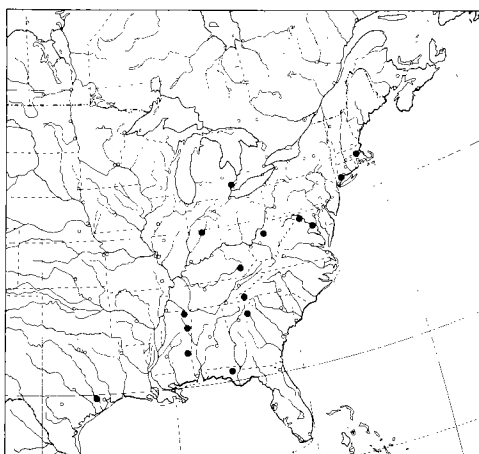
HOSTS. *Rhus* spp. (*Toxicodendron*). *Quercus albus* is also a recorded host.

DISTRIBUTION. Known from Massachusetts and Michigan, south to Florida and eastern Texas (Map 6). Specimens (124) examined from:

#### UNITED STATES

**Connecticut:** Milford, 8.VI.20, M.P. Zappe (CNC) 1. **District of Columbia:** Washington (DFEC) 1. **Florida:** Haw Creek (USNM) 66; Mariana, *Rhus* sp., W.F. Fisk (USNM) 9. **Georgia:** Whitehall Forest, Clark Co., IV-76, R. Turnbow (CNC) 4. **Indiana:** Indianapolis, 30.III.72, poison ivy, J.J. Favinger (USNM) 1. **Kentucky:** Barbourville, 2.V.65, R.E. White (SLWC) 3. **Maryland:** Blacksburg, *Rhus toxic.*, Hubbard & Schwarz (USNM) 2. **Massachusetts:** Framingham, 25.V.08, *Rhus* twigs, C.A. Frost (CNC) 1. **Michigan:** Detroit (USNM) 10. **Mississippi:** A&M, College Station, 5.X.20, M.W. Blackman (USNM) 2; Corinth, 25.X.20, M.W. Blackman (USNM) 2; Meridian, 5.VIII.20, M.W. Blackman (USNM) 1. **North Carolina:** Fletcher, *Rhus metopium*, A.D. Hopkins (USNM) 4. **Texas:** Columbus, Hubbard & Schwarz (USNM) 2. **West Virginia:** Jefferson Co., *Rhus* (USNM) 1; Kanawha Station, *Rhus vernix* A.D. Hopkins (USNM) 11; Kanawha Station, *Quercus alba*, A.D. Hopkins (USNM) 2.

REMARKS. This species is closely related to *liquidambaris* but the adults of *crinalis* can be distinguished by the more slender antennal club in which the two basal segments occupy less than one-half the total club length and by the features of the female frons.



MAP 6. Collection localities for *P. (Pityophthorus) crinalis*.

#### 44. *Pityophthorus (P.) perexiguus* Wood

*Pityophthorus perexiguus* Wood, 1976, p. 355.

Length 1.1-1.2 mm, almost 2.4 times longer than wide.

**Female.** Frons flattened to weakly impressed on a broad semicircular area extending from epistomal margin to above upper level of eyes; surface shining, very obscurely punctured; vestiture consisting of moderately long, moderately abundant, erect to slightly incurved setae placed on periphery of flattened area, central portion generally glabrous but a few shorter, erect setae are sometimes present. Antennal club oval, 1.5 times longer than wide, widest at middle; sutures 1 and 2 transverse; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum about 1.2 times longer than wide, widest on posterior half; asperities on anterior slope arranged into three or four concentric rows, the first row regular and even, remaining rows somewhat broken; posterior area of disc moderately punctured, punctures distinct, moderately deep; surface between punctures moderately shining, densely microreticulate; median line narrow, not elevated. Elytra 1.7-1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures of moderate size and depth; discal interstriae shining, about as wide as striae, surface shining, rather strongly microrugulose and roughened, resulting in an obscuring of striae punctures. Declivity convex, steep; interstriae 1 distinctly elevated, bearing a median row of 4 or 5 small granules; interstriae 2 abruptly, weakly impressed, wider than discal width on right elytron, equal to discal width on left; interstriae 3 weakly elevated, equal in height to 1, rather strongly curved toward apex on right elytron, straighter on left, bearing a median row of 7-10 fine granules; punctures in striae 1 obsolete, in 2 distinct, equal in size to those on disc, the second striae distinctly curved on right elytron, more weakly curved on left.

**Male.** Frons convex, very weakly transversely impressed above summit; surface shining, very finely punctured; vestiture sparse, inconspicuous. Pronotum and elytra as in female except declivital interstriae 2 more strongly impressed and not widened on either elytron, interstitial setae shorter, much broader and scalelike.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the labels: Dominical, Punt., Costa Rica, 10 ft., XII-9-1963, S.L.W./ Attached unbroken branch/HOLOTYPE *Pityophthorus perexiguus* S.L. Wood, 1976. The allotype and 19 paratypes bear the same data. Additional paratypes labeled as follows: 22 Canás, Guanacaste, Costa Rica, VII-13-1966, S.L. Wood/tree branch and 8, Limon Bay, Canal Zone, Panama, XII-30-1963, S.L. Wood/tree limb.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOST. Unknown. Recorded from broken tree limbs and branches.

DISTRIBUTION. Known only from the type-series localities.

REMARKS. This species closely resembles *attenuatus* (see p. 45). The adults of *perexiguus* may be distinguished by their larger size, by the lack of a transverse elevation on the male frons at the upper level of the eyes, and by the different configuration of the pubescent area of the female frons.

#### 45. *Pityophthorus (P.) corruptus* Wood

*Pityophthorus corruptus* Wood, 1976, p. 363.

Length 1.5-1.8 mm, 2.7 times longer than wide.

**Female.** Frons flattened to above upper level of eyes, weakly transversely impressed above epistoma; surface moderately shining, densely punctured, punctures moderately large, close, space between punctures with minute points and lines; vestiture not abundant, consisting of moderately long, sparse, yellowish setae covering surface and longer, more abundant setae on periphery of flattened area, longest setae on vertex reaching less than half the distance to the mandibles. Antennal club oval, 1.3 times longer than wide, widest through segment 3; first two sutures weakly arcuate; first two segments together occupy about half of total club length. Pronotum as long as wide, widest at point between summit and base; asperities on anterior slope arranged into three or four broken, concentric rows, those on lateral portion more evenly concentric; posterior area of disc densely punctured, punctures large, deep, and very close; surface between punctures shining, smooth, with a few fine points; median line narrow, impunctate. Elytra about 1.7-1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deeply impressed and almost touching; discal interstriae equal to or slightly wider than the striae, surface smooth, shining, with very fine lines and points. Declivity sloping; interstriae 1 weakly elevated, bearing a median row of 4-6 fine granules; interstriae 2 slightly impressed, flat, shining, equal in width to discal width, glabrous; interstriae 3 weakly elevated, equal or slightly higher than 1, bearing a median row of 6-8 fine granules; punctures in striae 1 and 2 distinct, equal in size or only slightly smaller than those on disc, slightly less deeply impressed.

**Male.** Frons distinctly but weakly impressed from epistoma to upper level of eyes; surface of impressed area shining, weakly subrugulose and weakly punctured; vestiture sparse, inconspicuous. Pronotum essentially as in female except asperities in more even, concentric rows. Elytra as in female except striae punctures slightly larger and deeper; declivital interstriae 2 slightly deeper and declivital granules slightly larger.

TYPE MATERIAL. The holotype (♀) in the SLWC bears the data: 31 mi. S. Matamoros, Pue., Mex., VI-14-1967, 6000 ft., S.W.L./*Toxicodendron*/HOLOTYPE *Pityophthorus corruptus* Wood 1976. The allotype and 25 paratypes all bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOST. *Rhus* spp. (*Toxicodendron*).

DISTRIBUTION. Known only from the type locality but it undoubtedly occurs over much of central Mexico at least.

REMARKS. Adults of this species closely resemble those of *lautus*. However, the frons of *corruptus* is distinctly sexually dimorphic while that of *lautus* is not. In addition, adults of *corruptus* are slightly larger than those of *lautus*. The host and distributional differences will also aid in distinguishing the species.

## BARBERI GROUP

The species that belong to this group may be recognized by the oval antennal club on which the first two sutures are transverse, by the more or less even to broken concentric rows of asperities on the anterior slope of the pronotum, by the punctured elytral interstriae, and by the weakly sulcate elytral declivity on which interstriae 2 is much wider than on disc (Fig. 41).

Two species are included in this group.

## KEY TO SPECIES IN THE Barberi group

1. Punctures in striae 2 visible on declivity (Fig. 41); interstriae 3 weakly elevated on declivity (Fig. 41); discal interstriae sparsely punctured; male frons strongly impressed above epistoma, transverse carina strongly developed (Fig. 40); setae on female frons short, sparse (Fig. 39); southwestern U.S.A. and northern Mexico . . . . . 46. *barberi* Blackman (p. 69)
- Punctures in striae 2 not readily visible on declivity; interstriae 3 not elevated on declivity; discal interstriae abundantly punctured; male frons weakly impressed over epistoma, transverse carina weakly developed; female frons with a few long setae; California . . . . . 47. *jeffreyi* Blackman (p. 71)

46. *Pityophthorus (P.) barberi* Blackman

Figs. 39-41; Map 7

*Pityophthorus barberi* Blackman, 1928, p. 112; Chamberlin, 1939, p. 389.

Length 1.7-2.2 mm, 2.7-3.0 times longer than wide.

**Female.** Frons weakly to strongly transversely impressed above epistoma, with an arcuate, transverse, weak to strong elevation or carina at upper level of eyes, evenly convex above elevation; surface below carina brightly shining, rather densely, strongly punctate, punctures close, nearly touching; vestiture sparse, consisting of short, yellowish setae of nearly equal length. Antennal club elongate-oval, 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 straight; first two segments together occupy two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest at about middle; asperities on anterior slope rather strongly developed, arranged into three regular to slightly irregular or broken concentric rows, one or two vague rows may be around summit; posterior area bearing rather large, deep and close punctures; surface between punctures smooth, moderately shining. Elytra 1.6-1.8 times longer than wide; apex rather narrowly rounded; discal striae punctured in regular rows, punctures rather large, and deep; discal interstriae shining, from 1.0 to 2.0 times wider than striae, sparsely punctured, the punctures similar in size to those in striae. Declivity rather abrupt, flat; interstriae 1 and 3 weakly elevated, 1 more strongly so, each with a median row of fine granules; interstriae 2 widened, flat, smooth and moderately shining; punctures of striae 1 and 2 reduced in size but still evident.

**Male.** Very similar to female except setae on frons sparser, transverse elevation on frons stronger, and asperities on pronotum stronger.

**TYPE MATERIAL.** The holotype ( $\delta$ ) in the USNM bears the labels: Las Vegas H.S., N.M./Schwarz, Barber, Collector/*Pinus edulis*/TYPE *Pityophthorus barberi* Blackman/Type No. 41310 USNM. Numerous paratypes bear identical data, some with additional data as "*Pinus edulis*" and the date "May 5, 1902". Three paratypes are from Manitou, Colorado, *Pinus edulis*; 3 are from El Paso Co., Colorado, *Pinus edulis*; and 1 is from Panguitch, Utah, *Pinus edulis*.

The type series has been broken up and paratypes are known to be in the DFEC and the CNC besides the USNM.

**HOSTS.** *Pinus cembroides*, *edulis*, *leiophylla*, and *ponderosa*.

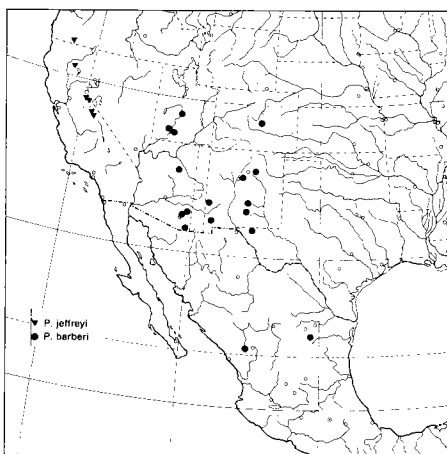
**DISTRIBUTION.** Southwestern United States north to central Colorado and Utah and south into northern Mexico (Map 7). Specimens (100) examined from:

## UNITED STATES

**Arizona:** Bear Canyon, Santa Catalina Mtns., 15.VIII.68, *Pinus cembroides*, D.E. Bright (CNC) 1; Carr Canyon, Cochise Co., 23.VII.8, *Pinus leiophylla*, D.E. Bright (CNC) 5; 10 mi SW of Flagstaff, 14.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 2; Montezuma Pass, Cochise Co., 25.VII.68; *Pinus cembroides*, D.E. Bright (CNC) 1; Pinaleno Mtns., Graham Co., 15.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 11. **Colorado:** See type material. **New Mexico:** 10 mi E of Aragon, 10.VII.68, *Pinus edulis*, D.E. Bright (CNC) 16; Cloudcroft, 12.V.37, *Pinus edulis*, R.L. Furniss (USNM) 2; Dry Camp, Sandia Mtns., 31.V.69, *Pinus edulis*, S.L. Wood (SLWC) 1; 5 mi W of Lake Roberts, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 1; Nogal Lake Forest Camp, 1.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 3. **Texas:** Guadeloupe Mountains National Park, 17.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 4. **Utah:** Beaver, 16.IV.49, *Pinus edulis*, S.L. Wood (SLWC) 1; Gooseberry, Fishlake National Forest, 9.VI.60, *Pinus edulis*, S.L. Wood (SLWC) 1.

## MEXICO

**Durango:** 23 mi W of Durango, 4.VI.65, *Pinus cembroides* S.L. Wood (SLWC) 19; 30 mi W of Durango, 19.VI.71, *Pinus cembroides*, D.E. Bright (CNC) 7; 40 mi W of Durango, 14.VI.71, *Pinus cembroides*, D.E. Bright (CNC) 11. **Nuevo León:** 15 mi E of San Roberto, 5.V.71, *Pinus cembroides*, D.E. Bright (CNC) 5.



MAP 7. Collection localities for *P. (Pityophthorus) jeffreyi* and *P. barberi*.

**BIONOMICS.** Individuals of this species live in the larger branches of its host tree.

**REMARKS.** Adults of this species are relatively easy to distinguish by the broad, flattened elytral declivity. The second declivital interstriae is broadly widened, flat, smooth, and at least feebly shining and interspaces 1 and 3 are weakly but distinctly elevated and granulate. The transversely impressed and transversely carinate frons of both sexes is also an important character for distinguishing this species.

*Pityophthorus barberi* is evidently closely related to *jeffreyi* but may be distinguished by the relatively prominent striae punctures on the declivity, by the characters of the frons described above, and by the host and distribution.

47. *Pityophthorus* (*P.*) *jeffreyi* Blackman

Map 7

*Pityophthorus jeffreyi* Blackman, 1928, p. 113; Chamberlin, 1939, p. 389; Bright & Stark, 1973, p. 114.

Length 1.8-2.1 mm, 2.8 times longer than wide.

**Female.** Frons flattened to very weakly transversely impressed above epistoma with no indication of a transverse carina; surface moderately shining, densely punctured, punctures close, nearly touching; vestiture sparse, consisting of moderately long, yellowish setae of nearly equal length. Antennal club 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 straight; first two segments together occupy two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest slightly ahead of summit; asperities on anterior slope strongly developed, acute, arranged in three, relatively even concentric rows, one or two vague additional rows may be arranged at summit; posterior area of disc bearing rather large, deep and close punctures; surface between punctures smooth, shining, with very fine points and lines. Elytra 1.7-1.8 times longer than wide; apex narrowly rounded; discal striae punctured in regular rows, punctures more obscurely impressed than in *barberi*, rather deep and close; discal interstriae moderately shining, from 1.0 to 2.0 times wider than striae, punctures rather abundant, about equal in size and depth to those in striae. Declivity abrupt, sloping; interstriae 1 elevated above 2, bearing a median row of weak granules; interstriae 2 very weakly impressed, wider than on disc, smooth, flat; interstriae 3 very weakly elevated, bearing a row of fine granules, these larger than those on interstriae 1; punctures of striae 1 and 2 reduced in size, those in 2 obsolete and not visible.

**Male.** Almost identical with female except punctures on frons more distinct and setae sparser. Most easily distinguished by differences in abdominal segmentation.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Hopk. U.S. 8794-i/ Reared July 6,10/TYPE *Pityophthorus jeffreyi* Blackman/ Type No. 41311 USNM. The type locality is Bishop, California. Eighteen paratypes bear the same data, some bear the date "Oct. 4, 1909". Two paratypes bear the labels: Hopk. U.S. 14459H/ Meyers, Cal./ F.B. Herbert, colr./ *Pinus jeffreyi*.

Most of the type material is in the USNM, paratypes are also in the CNC and the DFEC.

**HOSTS.** *Pinus aristata*, *jeffreyi*, and *ponderosa*.

**DISTRIBUTION.** Known only from California and Oregon (Map 7). Specimens (51) examined from:

## UNITED STATES

**California:** Bishop, 4.X.09, *Pinus jeffreyi*, J.D. Coffman (USNM and DFEC) 19; Old Station, 29.X.47, *Pinus jeffreyi*, S.L. Wood (SLWC) 7; 10 mi N of Westgard Pass, 6.IX.68, *Pinus aristata*, D.E. Bright (CNC) 3; **Oregon:** Klamath Falls, 1930, *Pinus ponderosa*, F.P. Keen (USNM) 1.

**REMARKS.** This species appears to be most closely related to *barberi* but the adults of *jeffreyi* may be distinguished by the lack of a transverse carina on the frons and by the very indistinct punctures in striae 2 on the declivity.

The three specimens from *Pinus aristata* differ slightly from typical *jeffreyi*. The discal interstriae are more sparsely punctured (as in *barberi*), the male frons is more deeply impressed and the transverse carina is stronger, but not as strong as in *barberi*. However, the punctures in the second declivital interstriae are obscure, as in typical *jeffreyi*, and other characters lead one to place these specimens in *jeffreyi*. More material is needed from eastern California before their status can be properly established.

## JUGLANDIS GROUP

The species included in this group are distinguished by the concentric rows of pronotal asperities, by the generally convex elytral declivity which is only very slightly impressed if at all, by declivital interstriae 1 and 3 being about equal in height, by the glabrous, discal elytral interstriae, and by the host relationships. At present 13 species are included in the group.

KEY TO SPECIES IN THE *Juglandis* group

1. Anterior slope of pronotum bearing 4 or more concentric, continuous costae, the summit of each costa subserrate, individual asperities not detectable; female frons flattened to weakly concave, pubescence short; male frons convex, distinctly punctured, devoid of carina; posterior portion of pronotum with numerous impressed points on surface between punctures . . . . . 2
- Anterior slope of pronotum with asperities arranged in several concentric rows, each row strongly serrate, divided to or near their bases, individual asperities usually detectable; female and male frons variable but not as above; surface between punctures on posterior portion of pronotum smooth and shining or reticulate . . . . . 3
2. Sutures of antennal club straight to moderately procurved; declivital striae 1 and 2 finely punctured in both sexes, interstriae 2 weakly impressed in female; male frons subglabrous; body length 0.9-1.2 mm; Jalisco to Oaxaca . . . . . 48. *costatulus* Wood (p. 73)
- Sutures of antennal club strongly procurved; declivital striae 1 and 2 rather coarsely punctured in female, interstriae 2 more strongly impressed; male frons pubescent near epistoma; body length 1.6-1.8 mm; Jalisco . . . . . 49. *costabilis* Wood (p. 74)
3. All declivital interstriae (except 2 and rarely 6) with a median row of short setae . . . 4
- Declivital interstriae 1, 3, 5, 7 with a median row of short setae . . . . . 7
4. Pronotum evenly arched from base to anterior margin, pronotal summit not elevated and transverse impression not present; pronotal asperities arranged in up to 8 broken concentric rows; interstriae 1 on declivity impressed below level of interstriae 3; Guatemala . . . . . 50. *tenax* Wood (p. 74)
- Pronotum with a definitely elevated (sometimes weak) pronotal summit and with a transverse impression behind summit; pronotal asperities arranged in 3-5 even, concentric rows; declivity variable . . . . . 5
5. Declivital interstriae 3 with small but distinct granules; declivital setae scalelike in male, hairlike in female; Costa Rica . . . . . 51. *galeritus* Wood (p. 75)
- Declivital interstriae 3 devoid of granules, if present granules extremely minute; declivital setae hairlike in both sexes . . . . . 6
6. Antennal club elongate-oval, more than 1.4 times longer than wide; female frons flattened on a very large semicircular area extending far above upper level of eyes, pubescence dense and long on periphery, sparser in central area, male frons flattened on a smaller area, pubescent but pubescence much less dense than on female; Mexico . . . . . 52. *burserae* Wood (p. 76)
- Antennal club oval, 1.4 times or less longer than wide; female frons convex, pubescence short, male frons weakly transversely impressed, punctured; Costa Rica . . . . . 53. *strictus* Wood (p. 76)
7. Declivital interstriae 3 higher than 1 . . . . . 8
- Declivital interstriae 3 equal in height to 1 or lower . . . . . 9
8. Pronotal asperities arranged into three concentric rows (a vague 4th row is infrequently seen); declivital interstriae 3 devoid of granules in both sexes or granules extremely fine; female frons pubescent over entire surface, setae short, of equal length; declivity steep, interstriae 3 only slightly higher than 1; Mexico . . . . . 54. *diligens* Wood (p. 77)
- Pronotal asperities arranged in four or more definite concentric rows; declivital interstriae 3 of male with distinct granules, female devoid of granules; female frons densely pubescent only on lower portion below upper level of eyes, setae long, dense, extending at least to midpoint of mandibles; declivity sloping, interstriae 3 slightly but definitely higher than 1; Mexico . . . . . 55. *nanus* Wood (p. 78)



9. Antennal club with only one suture sclerotized; declivity evenly convex; male frons strongly convex, surface dull, minutely reticulate, impunctate; Mexico . . . . . 56. *indigenus* Wood (p. 79)
- Antennal club with two sutures sclerotized; declivity evenly convex to weakly impressed; male frons weakly convex, transversely impressed or broadly flattened, surface punctured . . . . . 10
10. Declivital interstriae 2 distinctly impressed, lower than 3; declivital interstriae 1 and 3 with a median row of fine granules; New Mexico . . . . . 57. *franseriae* Wood (p. 80)
- Declivital interstriae 2 not distinctly impressed, equal in height to 3; declivital interstriae 1 and 3 devoid of granules except in male *juglandis* . . . . . 11
11. Elytral declivity strongly, evenly convex, punctures in striae 1 and 2 distinct; serrations on anterior margin of pronotum located in median area only; pronotal asperities in broken concentric rows; female frons flattened to well above eyes, setae on upper margin very long, masking surface; Mexico . . . . . 58. *pubicus* Blackman (p. 80)
- Elytral declivity less strongly convex to flattened, punctures in striae 1 and 2 indistinct to obsolete; serrations on anterior margin of pronotum more generally located, extending to lateral margin; pronotal asperities in even to slightly broken concentric rows; female frons variable but not as above . . . . . 12
12. Body length 1.7-2.0 mm; declivital interstriae 1 and 3 with a row of small granules in male; concentric rows of pronotal asperities usually somewhat irregular; southwestern United States . . . . . 59. *juglandis* Blackman (p. 81)
- Body length 1.5-1.8 mm; declivital interstriae 1 and 3 devoid of granules in both sexes; pronotal asperities arranged in fairly regular concentric rows; Mexico . . . . . 60. *detentus* Wood (p. 82)

48. *Pityophthorus (P.) costatulus* Wood

*Pityophthorus costatulus* Wood, 1976, p. 351.

Length 0.9-1.2 mm, about 2.6 times longer than wide.

**Female.** Frons flattened from epistoma to upper level of eyes, weakly concave in small median area; surface shining, densely, finely punctured; vetiture moderately abundant, consisting of moderately long, equal length setae evenly distributed over surface. Antennal club small, about as long as wide, widest through segment 2; sutures 1 and 2 transverse, straight to moderately procurved; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest on posterior half; anterior margin broadly rounded, bearing an elevated, subserrate costa; anterior slope bearing four or more elevated, concentric, subserrate costae, with one or two additional costae around summit, these costae not divided into individual asperities; summit weakly indicated; posterior portion of disc rather shallowly punctured, punctures large and somewhat indistinct; surface between punctures dull, denselv micropunctate. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures small, shallowly impressed; discal interstriae about 2.0 times wider than striae, surface shining, densely micropunctate. Declivity convex; interstriae 1 narrowly weakly elevated, bearing a median row of 4-6 minute granules and short, fine, erect setae; interstriae 2 at most weakly impressed, surface as on disc; interstriae 3 not elevated, bearing a median row of very fine granules and short, fine setae; punctures in striae 1 and 2 finely punctured, 1 weakly impressed.

**Male.** Similar to female except frons weakly convex, densely, rather strongly punctured, with fine, inconspicuous setae and declivital setae slightly stouter, almost narrowly spatulate.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and is labeled: Niltepec, 18 mi. W., VI-23-1967, Oax., 100 ft., Mex. SLW/Thevetia/HOLOTYPE *Pityophthorus costatulus* S.L. Wood 1976. The allotype and 22 paratypes bear the same data. All the type material is in the SLWC except for 2 paratypes in the CNC.

**HOST.** *Thevetia* twig terminals (a small tree or shrub in the Apocynaceae).

**DISTRIBUTION.** Known only from the type locality in southern Mexico.

REMARKS. Adults of this species and the next are immediately recognized by the elevated, concentric costae on the anterior slope of the pronotum in contrast to the isolated or semi-isolated asperities on other species in the group. *P. costatulus* is distinguished from *costabilis* by the characters given in the key.

49. *Pityophthorus (P.) costabilis* Wood

*Pityophthorus costabilis* Wood, 1976, p. 352.

Length 1.6-1.8 mm, about 2.6 times longer than wide.

**Female.** Frons largely concealed on specimens available, probably similar to *costatulus*. Antennal club about as long as wide, widest through segment 2; sutures 1 and 2 strongly procurved; segments 1 and 2 as in *costatulus*. Pronotum as in *costatulus* except costae more strongly serrate. Elytra as in *costatus* except declivital striae 1 and 2 more strongly punctured, interstriae 1 without granules, 2 more strongly impressed and 3 slightly elevated and without granules.

**Male.** Similar to female and as in male *costatus* except frons more strongly punctured, punctures in declivital striae minute, declivital interstriae 3 with minute granules.

TYPE MATERIAL. The holotype (♀) in the SLWC bears the data: 10 miles W. Tizapán, Jalisco, Mexico, VII-18-1953, S.L.W./Thevetia/HOLOTYPE *Pityophthorus costabilis* S.L. Wood, 1976. The allotype and 6 paratypes bear the same data. All type material is in the SLWC.

HOST. *Thevetia* branches.

DISTRIBUTION. Known only from the type locality in central Mexico.

REMARKS. Adults of *costabilis* are very similar to those of *costatulus* but may be distinguished by the characters noted in the key and description.

50. *Pityophthorus (P.) tenax* Wood

*Pityophthorus tenax* Wood, 1976, p. 354.

Length 1.6-1.8 mm; about 2.8 times longer than wide.

**Female.** Frons convex; surface shining, with coarse, close, deep punctures, interpuncture space smooth on lower half, minutely reticulate above upper eye level; vestiture sparse, inconspicuous. Antennal club elongate-oval, about 1.7 times longer than wide, widest through segments 1 and 2; sutures 1 and 2 straight, 1 more heavily chitinized; segments 1 and 2 together occupy about one-half of total club length. Pronotum about 1.2 times longer than wide, widest at about middle; asperities on anterior slope arranged into up to eight broken, concentric rows, additional indistinct rows may be evident near or at summit; summit not elevated and transverse impression absent; posterior area of disc densely punctured, punctures large and deep (slightly larger than those on *juglandis*); surface between punctures moderately shining, reticulate, or micropunctate; median line broad, impunctate, may be weakly and narrowly elevated at anterior extremity. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures about equal in size and depth to those on posterior area of pronotum; discal interstriae equal in width to striae, surface moderately shining, minutely reticulate or with fine lines and points and impunctate. Declivity convex, sloping; interstriae 1 weakly elevated, impressed below level of 3, usually devoid of granules but bearing a median row of fine setae; interstriae 2 not impressed, equal in width to discal width, glabrous; interstriae 3 not elevated, devoid of granules but bearing a row of fine setae; all remaining interstriae bearing a median row of fine setae; punctures in striae 1 and 2 almost obsolete but faintly visible, striae 1 strongly impressed.

**Male.** Very similar to female except frons slightly more strongly convex.

TYPE MATERIAL. The holotype (♀) is in the SLWC and is labeled: Volcán Pacaya, Esq., Guatemala, VI-1-1974, S.L. Wood/broken branch/HOLOTYPE *Pityophthorus tenax* S.L. Wood, 1976. The male allotype and 1 paratype bear the same data.

All type material is in the SLWC.

**HOST.** Unknown. The type series was collected from a broken branch 2 cm in diameter from a large tree (Wood 1976).

**DISTRIBUTION.** Known only from the type locality.

**REMARKS.** This species is evidently related to *juglandis* and is quite similar in appearance to it. Adults of *tenax* are most easily distinguished by the evenly arched pronotum on which no elevated pronotal summit is evident and by the presence of setae in all declivital interstriae except 2. In addition, the adults differ from those of *juglandis* by the absence of long setae on the female frons, by the longer and more abundant interstitial setae, and by the steeper elytral declivity.

51. *Pityophthorus (P.) galeritus* Wood

*Pityophthorus galeritus* Wood, 1976, p. 355.

Length 1.3-1.4 mm, about 2.8 times longer than wide.

**Female.** Frons flattened on a broad semicircular area extending from epistoma to above upper level of eyes and laterally nearly from eye to eye, the width equal to about 80% of the distance between eyes; surface minutely, densely punctured on flattened portion, relatively impunctate laterally near eyes; vestiture abundant, especially on periphery, consisting of short, erect, yellowish setae, median area just above epistomal margin slightly elevated and glabrous. Antennal club small, about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 subtransverse to weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1-1.2 times longer than wide, widest behind middle; asperities on anterior slope arranged in four or five even, concentric rows, the summit row very small, sometimes inconspicuous; summit not strongly or distinctly elevated; posterior area of disc weakly punctured, punctures rather large, shallow and close; surface between punctures shining, densely, minutely punctured or with fine, impressed lines; median line narrow, very weakly elevated on anterior third. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures larger and deeper than those on posterior portion of pronotum; discal interstriae about as wide or slightly wider than striae, impunctate and glabrous on disc (except 1), surface shining, marked with numerous fine lines and points. Declivity convex, weakly bisulcate, steep; interstriae 1 narrowly elevated above, more broadly elevated toward apex, bearing a few very fine, setiferous granules; interstriae 2 as wide as discal width, weakly impressed below level of interstriae 1 and 3; interstriae 3 very slightly higher than 1, bearing about 5 small, but distinct, setiferous granules; punctures in striae 1 obsolete, not visible, in 2 obscure but usually visible; declivital interstriae (except 2) each with a median row of short, erect, hairlike setae.

**Male.** Frons weakly but distinctly transversely impressed on an area equal to female, punctures fine, dense, except largely absent along epistomal margin. Pronotum essentially as in female except punctures on posterior portion slightly larger and deeper. Elytra as in female except striae punctures larger and deeper, declivity slightly more deeply sulcate and interstitial setae broader, more scalelike.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: Rio Damitas, S.J., Costa Rica, 700 ft., II-18-1964, S.L.W./*Rheedia edulis*/HOLOTYPE *Pityophthorus galeritus* Wood. The male allotype and 3 paratypes bear the same data.

All type material is in the SLWC.

**HOST.** *Rheedia edulis* (a small tree in the Guttiferae).

**DISTRIBUTION.** Known only from the type locality in Costa Rica but the recorded host occurs from Oaxaca to Panama.

**REMARKS.** Adults of this species can be most easily recognized by the concentric rows of pronotal asperities, by the small but distinct granules on declivital interstriae 3,

by the obscurely punctured posterior of the pronotum, and by the presence of hairlike or scalelike setae on the posterior portion of all elytral interstriae (except 2).

52. *Pityophthorus (P.) burserae* Wood

*Pityophthorus burserae* Wood, 1976, p. 362.

Length 1.5-1.7 mm, about 2.6 times longer than wide.

**Female.** Frons broadly flattened from epistoma to well above upper level of eyes and laterally from eye to eye; surface brightly shining, largely impunctate but may have a few impressed points and lines; vestiture long, incurved, abundant on periphery of flattened area, median area bearing only a few, short setae. Antennal club elongate-oval, more than 1.4 times longer than wide, widest through segment 2; suture 1 weakly arcuate, suture 2 more strongly arcuate; segments 1 and 2 together occupy at least one-half of total club length. Pronotum 1.1 times longer than wide, widest at middle; sides parallel on posterior half; asperities on anterior slope arranged in four even, concentric rows, the asperities basally contiguous; summit rather distinctly elevated; posterior area of disc moderately punctured, punctures of moderate size, not especially deep, close; surface between punctures moderately dull, smooth, with fine lines and points; median line rather broad, impunctate, dull, with fine lines and points. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures larger and deeper than those on posterior portion of pronotum; discal interstriae narrower than striae, moderately dull, impunctate and glabrous on disc. Declivity convex; interstriae 1 weakly impressed, broad, bearing a median row of rather stout setae; interstriae 2 about as wide as discal width, moderately dull with fine lines and points, impunctate; interstriae 3 slightly higher than 1, bearing a median row of moderately stout setae; all remaining interstriae also bearing a median row of erect setae; punctures in striae 1 and 2 obscure, difficult if not impossible to see, especially in 2.

**Male.** Frons broadly flattened to broadly transversely impressed, surface shining, densely punctured on lateral portions; vestiture distinct, long, much less abundant than on female. Pronotum as in female except punctures on posterior portion slightly larger. Elytra as in female except striae punctures larger and declivity somewhat broader and more deeply impressed.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the labels: Atenquique, Jal., Mex., VII-2-1965, 3000 ft., S.L.W./Bursera/ HOLOTYPE *Pityophthorus burserae* S.L. Wood, 1976. Two paratypes bear the same data. The allotype and 2 paratypes are labeled: 13 mi. N. Juchitlán, Jal., Mex., VII-2-1965, 3000 ft., S.L.W./Bursera.

All type material is in the SLWC.

**HOST.** *Bursera* sp.

**DISTRIBUTION.** Known only from the type-series localities in central Mexico.

**REMARKS.** Adults of this species may be distinguished by the broadly flattened, shining female frons which bears long, incurved setae on the periphery, by the four even, concentric rows of asperities on the pronotum, by the lack of granules on the first and third declivital interstriae, and by the presence of a median row of setae on the posterior portion of all elytral interstriae.

53. *Pityophthorus (P.) strictus* Wood

*Pityophthorus strictus* Wood, 1976, p. 354.

Length 1.2-1.3 mm, 1.6 times longer than wide.

**Female.** Frons strongly convex on upper area above eye level, flattened below eye level; surface moderately shining, densely, minutely punctate-granulate; vestiture inconspicuous, consisting of scattered, fine, moderately long, yellowish setae. Antennal club oval, 1.3-1.4 times longer than wide, widest through segment 2; suture 1 rather strongly arcuate; suture 2 arcuate but less so than suture 1; first two sutures together occupy half or slightly

more than half of total length of club. Pronotum 1.1 times longer than wide, widest at about middle; sides evenly, weakly arcuate; asperities on anterior slope arranged into four concentric rows, these rows very even but may be interrupted in median portion; summit weakly elevated; posterior area of disc weakly punctured, punctures of moderate size, shallowly impressed; surface between punctures brightly shining, marked by numerous fine lines; median line impunctate, not elevated, wide, surface marked with fine lines. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures about equal in size to those on posterior portion of pronotum and slightly more deeply impressed; discal interstriae slightly wider than striae, impunctate and glabrous on disc, surface moderately shining, marked by numerous fine lines. Declivity convex; interstriae 1 narrowly, weakly elevated bearing a median row of very fine granules and fine setae; interstriae 2 very weakly impressed, equal in width to discal width; interstriae 3 very slightly higher than 1, bearing a median row of very fine granules and fine setae; remaining interstriae each bearing a median row of fine setae; striae 1 narrowly, distinctly impressed, punctures very small, impressed; striae 2 also bearing rather distinct but small, impressed punctures.

**Male.** Frons as in female except lower area more distinctly flattened and surface much less densely pubescent. Otherwise very closely resembles female.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: Santa Ana, S.J., Costa Rica, 4000 ft., VI-30-1963, S.L.W./*Rheedia edulis*/ HOLOTYPE *Pityophthorus strictus* S.L. Wood, 1976. The allotype and 4 paratypes bear the same data.

All type material is in the SLWC.

**HOST.** *Rheedia edulis* (a small tree in the Guttiferae).

**DISTRIBUTION.** Known only from the type locality in Costa Rica but the recorded host occurs from Oaxaca to Panama.

**REMARKS.** The characteristics presented in the key to species should enable one to distinguish adults of this species.

Adults of *strictus* differ from those of *galeritus*, which also occur in *Rheedia edulis* in the same locality, by the extremely minute granules on the third declivital interstriae in contrast to the distinct granules as in *galeritus*, and by the fine declivital setae on both sexes in contrast to the narrowly scalelike setae on the declivity of male *galeritus*.

#### 54. *Pityophthorus (P.) diligens* Wood

*Pityophthorus diligens* Wood, 1976, p. 363.

Length 1.3-1.4 mm, 1.8 times longer than wide.

**Female.** Frons distinctly flattened to weakly transversely impressed from epistoma to upper level of eyes and laterally nearly from eye to eye, flattened area occupying about 72% of the distance between eyes; surface shining, densely, minutely punctate-granulate; vestiture inconspicuous, consisting of short, hairlike setae scattered over surface of flattened area, with widely scattered, shorter setae on vertex and lateral portions. Antennal club small, about 1.4 times longer than wide, widest through segment 2; first two sutures transverse, suture 1 heavily chitinized, suture 2 less so; segments 1 and 2 together occupy definitely more than half of total club length. Pronotum about 1.1 times longer than wide, widest behind middle; sides distinctly but weakly arcuate; asperities on anterior slope arranged into three concentric rows, with a vague fourth row indicated occasionally at summit; summit not strongly or distinctly elevated; posterior area of disc distinctly punctured, punctures rather large and deep; surface between punctures moderately shining, surface densely microreticulate; median line broad, with a very narrow, weakly elevated ridge extending from summit to three-fourths of the distance to the base. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures about equal in size or slightly smaller than those on posterior portion of pronotum; discal interstriae narrower than striae, impunctate and glabrous, surface moderately shining, with numerous fine lines. Declivity steep, convex; interstriae 1 impressed below level of 3, weakly elevated, bearing a median

row of extremely fine, setiferous granules; interstriae 2 about equal in width to discal width, surface smooth, moderately shining; interstriae 3 weakly elevated, higher than 1, bearing a median row of very fine, setiferous granules; interstriae 1, 3, 5, 7 bearing a median row of fine setae; punctures in striae 1 and 2 obscure, usually more readily visible in 1.

**Male.** Frons more deeply transversely impressed, surface shining, finely punctured, vestiture inconspicuous. Pronotum and elytra as in female. Declivity slightly more deeply sulcate, interstriae 1 slightly higher. Otherwise resembles female.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: Pachuca, 10 miles E., Hdg., Mex., VI-1-1967, el. 8000 ft., S.L. Wood/unknown shrub/HOLOTYPE *Pityophthorus diligens* S.L. Wood, 1976. The allotype and 11 paratypes bear the same data with appropriate type labels.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

**HOST.** Desert shrub with bluish leaves (Wood 1976).

**DISTRIBUTION.** Known only from the type locality in Central Mexico.

**REMARKS.** The presence of three definite, concentric rows of asperities on the pronotum, the sparse pubescence on the female frons and the structure of the elytral declivity will distinguish the adults of this species from others of the group.

#### 55. *Pityophthorus (P.) nanus* Wood

*Pityophthorus nanus* Wood, 1964, p. 64.

Length 1.2-1.5 mm, 3.0 times longer than wide.

**Female.** Frons flattened from epistoma to upper level of eyes; surface densely, finely punctured, punctures very small, distinctly impressed; vestiture abundant, confined to lower half of flattened area, consisting of rather long, yellowish setae which curve downward, reaching to a point at least halfway between the base and the apex of the mandibles. Antennal club about as long as wide, widest through segment 2; first two segments together occupy about half of total club length. Pronotum 1.2 times longer than wide, widest at middle; sides weakly arcuate, almost subparallel on basal half; asperities on anterior slope arranged into four even, concentric rows, with one or two much smaller, more irregular rows at summit; posterior area of disc finely punctured, punctures not especially close; surface between punctures shining, with a few, scattered, fine points. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures moderately large, rather deeply impressed; discal interstriae shining, about as wide as striae, surface with numerous fine lines and points. Declivity convex, steep; interstriae 1 rather wide, weakly elevated, with or without a median row of very fine granules; interstriae 2 not impressed or sulcate, equal in height to 3, not widened; interstriae 3 similar to 2 except may or may not bear a median row of fine granules; interstriae 1, 3, 5, 7 with very fine, short, yellowish setae; punctures of striae 1 and 2 reduced but distinctly visible, those in striae 2 larger than those in 1 and striae 2 much reduced but still visible.

**Male.** Frons rather deeply, transversely impressed, impression abrupt at upper level of eyes creating a carinalike elevation, setae sparse, very fine. Pronotum essentially as in female except asperities somewhat larger, especially those on anterior margin. Elytra more coarsely punctured; declivity more deeply impressed, interstriae 3 much higher than 1; declivital interstriae 1 and 3 bearing a median row of fine granules, these larger on 3.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Totalapan (sic), Oax., Mex., 3000 ft., VII-7-1953/K.U. Mex. 1953 Expedition/ 53-88/HOLOTYPE *Pityophthorus nanus* Wood, 1964. The allotype and 7 paratypes bear the same labels.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

**HOST.** The host for the type series is unknown; one series from Oaxaca is labeled *Pinus* and two series are from *Bursera*.

DISTRIBUTION. Southern Mexico. Specimens (48) examined from:

MEXICO

**Chiapas:** Jct. highways 190 and 195, 12.V.69, D.E. Bright (CNC) 15. **Jalisco:** Barra de Navidad, IX.65, N.L.H. Krauss (SLWC) 9; 13 mi N of Juchitlán, 2.VII.65, *Bursera*, S.L. Wood (SLWC) 5. **Oaxaca:** 8 mi SE of Camerón, 21.VI.67, *Pinus*, S.L. Wood (SLWC) 2; 4 mi N of Totolapan, 20.VI.67, *Bursera*, S.L. Wood (SLWC) 4.

REMARKS. The adults of this species are most easily recognized by the long downward pointing setae on the lower half of the female frons, by the rather deeply transversely impressed male frons, by the slightly to moderately impressed declivital interstriae 1, and by the distribution.

56. *Pityophthorus (P.) indigenus* Wood

*Pityophthorus indigenus* Wood, 1976, p. 361.

Length 1.1-1.4 mm, about 2.5 times longer than wide.

**Female.** Frons flattened on a broad, semicircular area extending from epistoma to above upper level of eyes and laterally nearly from eye to eye; surface brightly shining, densely, minutely, punctate-rugose; vestiture moderately abundant, consisting of moderately long, yellowish, incurved setae, the setae arising near the vertex of the flattened area extending downward almost to epistomal margin. Antennal club about 1.2 times longer than wide, widest through segment 2; suture 1 weakly arcuate, sclerotized, 2 more strongly, distinctly arcuate, not evidently sclerotized; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest behind middle; sides moderately arcuate; asperities on anterior slope arranged into three definite concentric rows, with an indistinct fourth row at summit; summit rather prominent; posterior area of disc weakly punctured, punctures poorly defined, shallow; surface between punctures shining, marked with indefinite lines and points or sometimes minutely reticulate in patches or over entire surface; median line not obvious. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures much more distinct and deeper than those on posterior portion of pronotum; discal interstriae narrower than striae, surface weakly shining, weakly, minutely reticulate, impunctate and largely glabrous on disc. Declivity evenly convex, not sulcate or impressed; interstriae 1 narrowly, weakly elevated, bearing a median row of very fine granules and a few narrowly spatulate setae; interstriae 2 not impressed or widened, occasionally bearing two or three narrowly spatulate setae; interstriae 3 not elevated, equal in height to 1 and 2, bearing a median row of narrowly spatulate setae; interstriae 5, 7, 9 bearing 2-4 erect, narrowly spatulate setae in a median row; punctures of striae 1 and 2 much reduced, obscure, indistinct.

**Male.** Frons strongly convex; surface minutely punctate-reticulate, glabrous. Pronotum as in female except punctures on posterior area more distinct and surface between punctures smoother. Elytra and declivity essentially as in female except interstitial setae finer and punctures of declivital striae 1 and 2 finer.

TYPE MATERIAL. The holotype (♀) is in the SLWC and bears the data: 2 mi W. Armeria, Col., Mexico, VI-28-1965, 12 ft., S.L. Wood/*Bursera*/HOLOTYPE *Pityophthorus indigenus* S.L. Wood, 1976. The allotype and 6 paratypes bear the same data plus appropriate type labels. Additional paratypes are labeled: 3, 18 mi W. Níltepec, Oax., Mex., VI-23-1967, 100 ft, SLW/*Bursera* and 1, 13 mi N. Juchitlan, Jal., Mex., VII-2-1965, 3000 ft, S.L. Wood.

All of the type material is in the SLWC.

HOST. *Bursera* sp.

DISTRIBUTION. Known only from the type-series localities in Mexico.

REMARKS. Adults of this species may be distinguished from other members of the group by the characters mentioned in the key. In addition, they may be dis-

tinguished from those of *nanus* by the more feebly sulcate elytral declivity, by the much longer setae on the female frons, and by the shallowly impressed male frons.

#### 57. *Pityophthorus (P.) franseriae* Wood

*Pityophthorus franseriae* Wood, 1971c, p. 75.

Length 1.2-1.3 mm, about 2.7 times longer than wide.

**Female.** Frons flattened on a rather narrow subcircular area extending to just beyond upper margin of eyes; surface moderately shining, closely, finely punctured and minutely reticulate, punctures obscure; vestiture moderately abundant, consisting of short setae of equal length. Antennal club about 1.2-1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; first two segments together occupy two-thirds of total club length. Pronotum less than 1.1 times longer than wide, widest at about middle; sides subparallel on posterior one-half; asperities on anterior slope arranged into three even, concentric rows, with one or two irregular rows at summit; posterior area of disc finely punctured, punctures widely separated; surface between punctures smooth, shining, with sparse, minute points and lines; median line smooth, not obvious. Elytra 1.6 times as long as wide; apex weakly acuminate; discal striae punctured in regular rows, punctures moderately large, impressed; discal interstriae moderately shining, slightly wider than striae, surface minutely punctured. Declivity steep; interstriae 1 weakly elevated to apex, finely granulate-setose; interstriae 2 weakly impressed, moderately shining, with scattered minute points; interstriae 3 weakly elevated, very finely granulate-setose; striae 1 and 2 with punctures entirely obsolete and not visible.

**Male.** Very similar to female except transverse impression deeper, with the upper margin of impression obvious, forming an arcuate, transverse carina above upper margin of eyes; surface of frons slightly impressed, punctures coarser; vestiture sparser, less conspicuous; declivital granules slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the labels: New Mexico, High Rolls, 6 mi. W., el. 6000 ft., VI.2.1969, SLW/HOLOTYPE *Pityophthorus franseriae* S.L.W. 1971. The allotype and 56 paratypes bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

**HOST.** *Franseria* sp. probably *deltoidea*.

**DISTRIBUTION.** Known only from High Rolls, New Mexico, although the host plant occurs throughout the southwestern United States.

**BIONOMICS** Adults of this species were found in the dead and dying stems in living clumps of the host plant.

**REMARKS.** This species is unique among the species of this group in having the striae punctures on the declivity completely lacking. No trace of the striae punctures can be seen on the specimens examined. The peculiar host as well as other characters given in the key will also aid in distinguishing this species.

#### 58. *Pityophthorus (P.) pudicus* Blackman

*Pityophthorus pudicus* Blackman, 1942, p. 208.

Length 1.3-1.5 mm, about 2.6 times longer than wide.

**Female.** Frons flattened on a large, oval area extending from epistomal margin to well above upper level of eyes, area above eyes more than equal to area below and flattened area between eyes equal to 92% of the distance between eyes; surface obscured by a dense brush of long, yellowish, downward pointing setae that extend to upper margin of epistoma, epistoma fringed with a dense row of shorter setae that cover basal half of mandibles. Antennal club broadly oval, about 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 arcuate; segments 1 and 2 together occupy about half of total club length.



Pronotum 1.1 times longer than wide, widest behind middle; sides very weakly arcuate; asperities on anterior slope arranged into three or four broken concentric rows, the rows more evenly concentric on lateral areas, irregular in discal area; summit not distinctly elevated; posterior area of disc moderately shining, deeply punctured, punctures deeply impressed, rather large, and close; surface between punctures minutely reticulate; median line broad, impunctate, very weakly elevated. Elytra 1.6 times longer than wide; apex moderately rounded; discal striae punctured in regular rows, punctures of moderate size, somewhat smaller and more shallowly impressed than those on posterior portion of pronotum; discal interstriae about as wide or slightly wider than striae, impunctate, surface brightly shining and marked with fine lines and points. Declivity evenly convex; interspace 1 very weakly elevated, with a median row of very fine setae; interstriae 2 not impressed, as wide as discal width, unmodified; interstriae 3 equal in height to 2, bearing a median row of fine, erect setae; remaining interstriae also with a median row of fine setae; punctures of striae 1 and 2 moderately distinct, smaller and shallower than those on disc.

**Male.** Frons convex to very weakly flattened, divided by a very fine, longitudinal median carina that is more distinctly elevated and minutely reticulate on upper portions above upper level of eyes; surface punctured, the punctures fine, especially toward epistoma; vestiture inconspicuous except along epistomal margin. Pronotum, elytra, and declivity essentially as in female.

**TYPE MATERIAL.** Described from one specimen. The holotype ( $\delta$ ) in the USNM bears the labels: In Sambucus sp. Wood/Guadalajara, Mexico, VII-6-41/ New York N.Y., No. 90440/Type No. 55983 U.S.N.M./Pityophthorus pudicus n. sp. (penciled handwriting on yellow piece of paper).

**HOSTS.** *Sambucus* sp. and unknown shrubs.

**DISTRIBUTION.** Known only from Jalisco, Mexico. Specimens (20) examined from:

#### MEXICO

**Jalisco:** Guadalajara, 30.VIII.43, in wood of pottery crate, intercepted at Nogales (USNM) 1; Vol. Colima, 23.VI.65, unknown shrub, S.L. Wood (SLWC) 18.

**REMARKS.** Adults of this species may be distinguished by the somewhat uneven concentric rows of pronotal asperities, by the densely pubescent female frons, by the evenly convex elytral declivity, and by the more distinct punctures in striae 1 and 2.

#### 59. *Pityophthorus (P.) juglandis* Blackman

*Pityophthorus juglandis* Blackman, 1928, p. 42; Chamberlin, 1939, p. 362; Bright & Stark, 1973, p. 106; Furniss & Carolin, 1977, p. 402.

Length 1.7-2.0 mm, about 3.0 times longer than wide.

**Female.** Frons broadly flattened to weakly concave from epistoma to well above upper level of eyes; surface moderately shining, densely, finely punctured, punctures quite small and impressed; vestiture abundant, consisting of moderately long, yellowish setae all of equal length or those on periphery only slightly longer and incurved. Antennal club 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse or weakly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum 1.1-1.2 times longer than wide, widest at about middle; sides straight and sub-parallel on posterior half; asperities on anterior slope arranged into four or more broken concentric rows, median portions of these rows usually irregular, individual asperities somewhat scattered, additional indistinct rows may be evident near or at summit; summit distinctly but weakly elevated; posterior area of disc densely punctured, punctures large, deep and close; surface between punctures moderately shining, minutely reticulate or densely micro-punctate; median line broad, impunctate, may be weakly and very narrowly elevated just behind summit. Elytra 1.9 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures about equal in size and depth to those on posterior portion of pronotum; discal interstriae equal to or narrower than striae, surface moderately

shining, usually minutely reticulate or with numerous fine lines and points, impunctate and glabrous. Declivity convex, sloping; interstriae 1 weakly elevated, devoid of granules but with a median row of fine setae; interstriae 2 not impressed, equal in width to discal width, glabrous; interstriae 3 not elevated, convex, bearing a median row of fine setae; remaining interstriae 4, 7, 9 bearing a few setae in a median row; punctures of striae 1 and 2 almost obsolete but faintly and distinctly visible, slightly more visible in striae 1, striae 1 sometimes very narrowly, weakly impressed.

**Male.** Frons weakly transversely impressed or broadly flattened on smaller area than in female; surface closely punctured and sparsely pubescent. Pronotum and elytra as in female except punctures slightly stronger. Declivity essentially as in female except interstriae 1 and 3 each bear a median row of distinct granules and interstitial setae are longer and interstriae 2 may be very weakly impressed.

**TYPE MATERIAL.** The holotype is in the USNM and is labeled: 7136, 15 July 96/Black walnut, Lone Mtn., N. Mex./TYPE *Pityophthorus juglandis* Blackman/Type No. 41271 U.S.N.M. One paratype bears the same data. The allotype and 4 paratypes bear the data: Hopk. U.S. 5581, 9-17-07/J.L. Webb, collector/Paradise, Ariz./Juglans; 1 paratype is labeled: New Mexico, Cockerell, on walnut; and 2 paratypes are without data of any sort except for the paratype labels.

All type material is evidently in the USNM.

**HOST.** *Juglans* spp.

**DISTRIBUTION.** Southern California to New Mexico, south into northern Mexico. Specimens (54) examined from:

#### UNITED STATES

**Arizona:** Chirichua Mts., 19.IX.47, D.J. & J.N. Knull (OSUC) 1; Miller Canyon, 22.VIII.58, Walnut, S.L. Wood (SLWC) 19; Oak Creek Canyon, 23.VII.60, S.L. Wood (SLWC) 1; 5 mi W of Portal, 28.VI.58, W.F. Barr (SLWC) 1. **California:** Tarzana, *Juglans californica* (CASC) 7. **New Mexico:** See type material.

#### MEXICO

**Chihuahua:** 6 mi N of Chihuahua, 21.VII.60, *Juglans* sp., S.L. Wood (SLWC) 15.

Additional localities in literature:

**California:** San Fernando, *Juglans nigra* (Bright & Stark 1973).

**REMARKS.** Adults of *juglandis* are most easily distinguished by the evenly convex elytral declivity on which interstriae 1 and 3 of the male bear distinct granules, by the broadly flattened, densely pubescent female frons, by the irregular rows of asperities on the anterior surface of the pronotum, by the close, deep punctures on the posterior portion of the pronotum, by the generally distinct rows of punctures in declivital striae 1 and 2, and by the host.

#### 60. *Pityophthorus* (*P.*) *detentus* Wood

*Pityophthorus detentus* Wood, 1976, p. 352.

Length 1.5-1.8 mm, 2.9 times longer than wide.

**Female.** Frons broadly flattened on a large semicircular area extending from the epistoma to well above upper level of eyes and occupying about 83% of the distance between eyes; surface shining, minutely punctured and frequently bearing a weakly elevated longitudinal carina which extends from epistomal margin to upper margin of flattened area; vestiture abundant, consisting of conspicuous, long, incurved setae on margin of flattened area and shorter, erect setae scattered over surface. Antennal club elongate-oval, 1.3-1.4 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.1 times longer than wide, widest behind middle; sides weakly arcuate; asperities on anterior slope arranged into three definite concentric rows with several irregular broken rows around summit;

summit distinct, weakly elevated; posterior area of disc distinctly punctured, punctures large, deeply impressed; surface between punctures brightly shining, smooth, sometimes with a few very minute points; median line broad, impunctate, not elevated. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures slightly larger than those on posterior portion of pronotum, deeply impressed; discal interstriae narrower than striae, surface shining, smooth and glabrous, with numerous minute points and lines. Declivity steep, flattened; interstriae 1 weakly elevated, devoid of granules, bearing a median row of erect, stout setae; interstriae 2 flattened, not at all impressed, glabrous; interstriae 3 not elevated, as wide as discal width or sometimes difficult to distinguish, bearing a median row of stout setae; punctures in striae 1 and 2 obsolete to not visible; entire declivital face dull, densely micropunctate or minutely reticulate.

**Male.** Frons rather deeply, broadly, transversely impressed, impression reaching from epistoma to just above upper level of eyes, divided by a prominent, moderately elevated, longitudinal carina; surface somewhat shallowly concave on each side of carina, densely micropunctate to minutely reticulate; vestiture sparse, consisting of a few scattered, erect, short setae. Pronotum and elytra essentially as in female. Declivity as in female except setae slightly longer.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Carapan, Mich., Mexico, VI-18-1965, 7000 ft., S.L. Wood/Unknown vine/HOLOTYPE *Pityophthorus detentus* S.L. Wood, 1976. The allotype and 26 paratypes bear the same data. Three additional paratypes are labeled: 6 mi. E. Vol. Paricutin, Mexico, VI-19-1965, 7500 ft., S.L. Wood/Rhus.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

**HOSTS.** Shrubs (*Rhus*) and vines.

**DISTRIBUTION.** Central Mexico. Specimens (38) examined from:

#### MEXICO

**Michoacán:** See type material. **Querétaro:** 10 mi E Landa de Matamores, 11.VI.1971, *Rhus* sp., D.E. Bright (CNC) 7.

**REMARKS.** Adults of the species resemble somewhat those of *juglandis* but the relationship is not particularly close. The characteristics given in the key will distinguish *detentus* from other species in the group.

#### PULICARIUS GROUP

The adults of species belonging to this group are characterized by the evenly arched dorsal surface of the pronotum with no indication of an elevated summit, by the strongly and distinctly punctured elytral striae and interstriae, by the convex elytral declivity on which the second interstriae is only slightly wider than its discal width, and by the absence of granules on the third declivital interstriae.

All species occur in various species of *Pinus* and occasionally in *Abies* and *Picea*.

#### KEY TO SPECIES IN THE *Pulicarius* group

1. Occurs in eastern North America and in the Caribbean region; epistomal margin transverse (Fig. 43); summit of pronotum located near midpoint of pronotum; length less than 2.0 mm . . . . . 61. *pulicarius* (Zimmermann) (p. 85)
- Occurs from southwestern United States to Honduras; epistomal margin emarginate; pronotal summit located well behind middle of pronotum; length greater than 1.9 mm . . . . . 2
2. Male frons bearing two deeply concave, transversely oval cavities separated by a distinct, usually sharply elevated, longitudinal carina (Fig. 46); female frons weakly, transversely impressed (Fig. 45); elytral punctures large and deep on both sexes; Nevada to Honduras . . . . . 62. *schwerdtfegeri* (Schedl) (p. 88)
- Male and female frons not as above; elytral punctures moderate in size and depth . . . 3

3. Male frons weakly, broadly, transversely impressed, impression divided by a distinct longitudinal carina, this carina more strongly elevated at lower end and projecting over (or overlapping) epistoma (Fig. 49); female frons broadly flattened, bearing a small, weakly elevated, median callus on epistoma (Fig. 48); punctures in declivital striae 1 and 2 deeply impressed and distinct (Fig. 50); Mexico . . . 63. *aztecus* Bright (p. 90)
- Male frons convex to below upper level of eyes, with a strongly protuberant median callus overlapping the narrow, deeply impressed epistoma (Fig. 52); female frons broadly flattened, devoid of elevated callus on epistoma (Fig. 51); punctures in declivital striae 1 and 2 shallowly impressed, indistinct (Fig. 53); Chiapas . . . 64. *dispar* Bright (p. 91)

61. *Pityophthorus (P.) pulicarius* (Zimmermann)

Figs. 2, 42-44; Map 8

*Crypturgus pulicarius* Zimmermann, 1868, p. 144.

*Cryphalus pulicarius*: LeConte, 1868, p. 155.

*Pityophthorus pulicarius*: LeConte & Horn, 1876, p. 353; Hagedorn, 1910, p. 74 (additional references); Blatchley & Leng, 1916, p. 629; Swaine, 1918, p. 99; Blackman, 1922a, p. 102; Blackman 1928, p. 63; Dodge, 1938, p. 44; Beal & Massey, 1945, p. 133; Bright, 1976c, p. 187 (lectotype desig.).

*Pityophthorus cubensis* Schedl 1972, p. 65; Wood, 1977a, p. 210 (= *pulicarius*).

Biology, distribution etc.: Knull, 1932, p. 66, 212; Felt, 1933, pp. 994-995; Craighead, 1950, p. 331; Merkel & Kowal, 1956, p. 7; Smith & Mergen, 1954a, p. 864; Smith & Mergen, 1954b, 2 pp.; Lyons, 1957, p. 163; Neel, 1969, p. 159; Baker, 1972, p. 255; Clark, 1972, p. 151.

Length 1.3-2.0 mm, about 2.6 times longer than wide.

**Female.** Frons weakly, transversely concave on area below upper level of eyes; surface moderately shining, densely punctured, punctures deep, of moderate size, becoming finer on epistoma; vestiture on surface moderately dense, setae on periphery slightly longer and incurved; epistomal margin transverse, straight. Antennal club nearly circular, about as long as wide; first two sutures weakly arcuate to nearly straight; first two segments together occupy slightly more than half of total club length. Pronotum about 1.2 times longer than wide, widest at about middle; asperities on anterior slope low, numerous, scattered in no apparent order, sometimes two or three may be basally contiguous and may form vague, broken concentric rows; summit located at midpoint of disc, usually not elevated but sometimes may be very weakly so; posterior area of disc not impressed behind summit, deeply and densely punctured, punctures large; surface between punctures dull, densely and minutely reticulate; median line narrow, frequently obscured by punctures. Elytra about 1.4 times longer than wide; apex broadly rounded; discal striae and interstriae deeply and densely punctured, punctures all of equal or nearly equal size, resulting in the appearance of a randomly punctured surface, striae sometimes indicated by extremely small, recumbent setae arising from striae punctures, those from interstitial punctures are very slightly longer and semierect. Declivity convex, very steep; interstriae 1 elevated, not widened, bearing a row of very fine granules; interstriae 2 as wide or even slightly narrower than its discal width, impunctate, weakly impressed; interstriae 3 weakly elevated, about as high as 1, distinctly and deeply punctured, sometimes a very few, fine granules may be present; punctures of striae 1 and 2 very deep and distinct.

**Male.** Frons evenly, broadly convex, very slightly flattened to weakly concave on an oval, median area; surface moderately punctured; epistoma narrow, very deeply impressed except for a small, median portion densely fringed with stout, yellowish setae. Pronotum and elytra as in female except sculpture stronger and pronotal and elytral punctures deeper and larger. Declivity as in female except interstriae 2 more deeply impressed.

**TYPE MATERIAL.** The lectotype, designated by Bright (1976c), bears the labels: small green square/Type 1001/C. pulicarius Zimm./ LECTOTYPE *Crypturgus pulicarius* Zimmermann, D.E. Bright 1976. It is in the LeConte collection in the MCZ. Three additional specimens that could have formed part of the type series were also seen but were not so labeled.

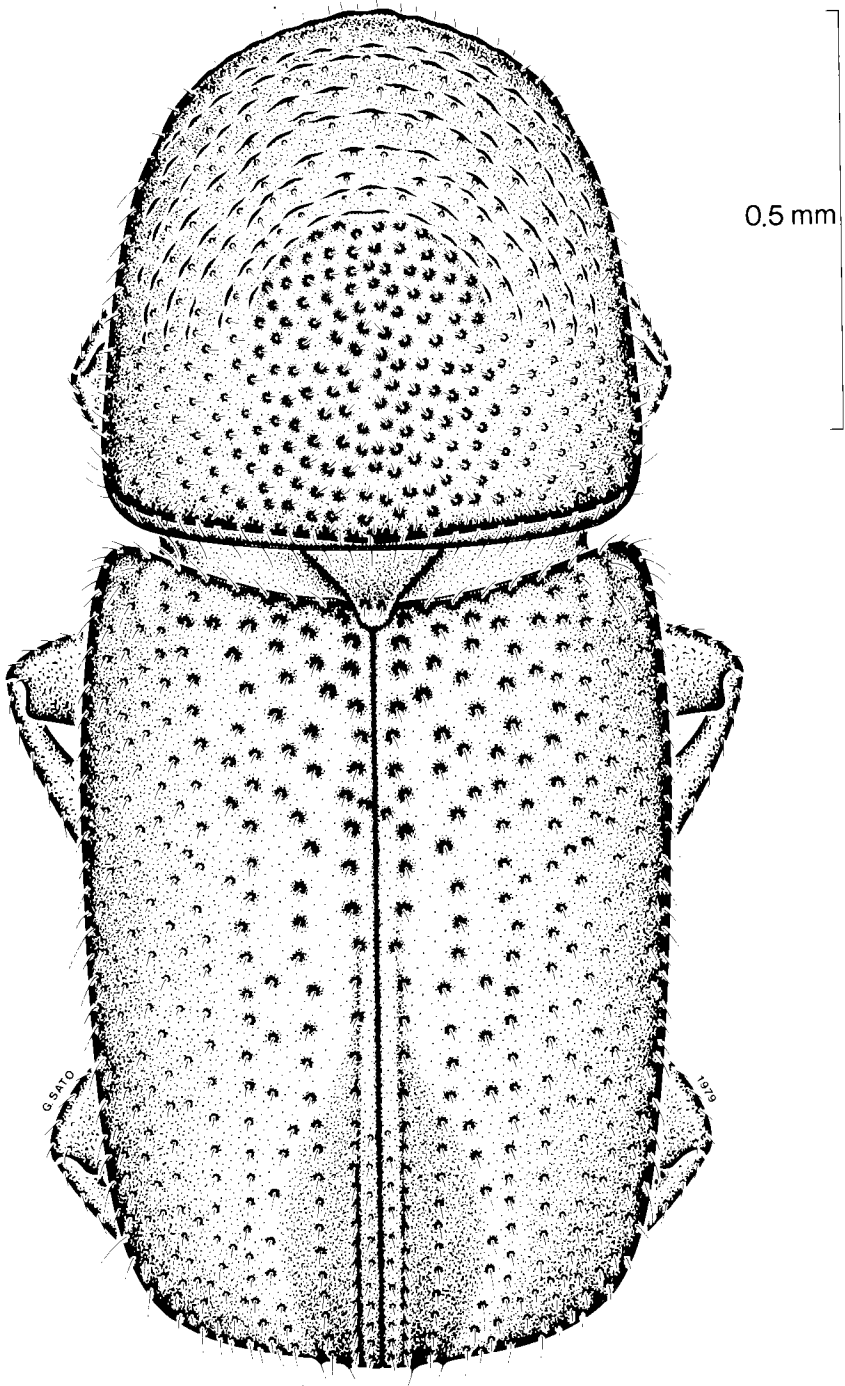


FIG. 2. *Pityophthorus pulicarius* (Zimmermann).

**HOSTS.** All species of *Pinus* in its range; also recorded from *Abies balsamea* and *Picea* spp.

**DISTRIBUTION.** Eastern United States and Canada, also Cuba (Map 8). Specimens (600) examined from:

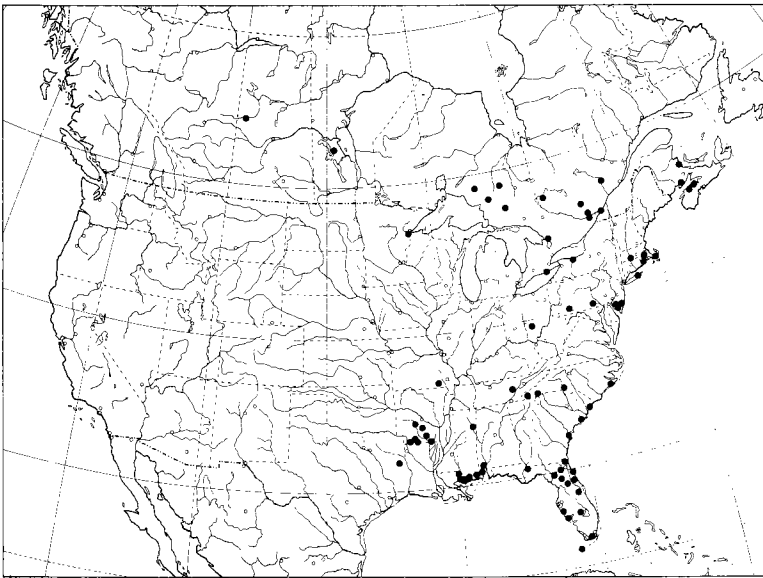
#### CANADA

**Manitoba:** Fairford River, 29.VII.63, *Picea glauca* (NFRCE) 1; Gypsumville, 29.VII.63, *Pinus banksiana* (NFRCE, CNC) 6. **New Brunswick:** Hampton, 6.VIII.69, white elm (CNC) 1; Kouchibouguac National Park, VIII.77, *Pinus banksiana*, D.E. Bright (CNC) 1. **Nova Scotia:** Cannas, 27.VII.61, Balsam fir (CNC) 3; Kentville, 5.VIII.65, Red pine (CNC) 5; 3 mi W of Kingston, 15.VII.70, *Pinus rigida*, D.E. Bright (CNC) 6. **Ontario:** Connaught, 24.VIII.66, *Pinus resinosa* (CNC) 2; Gogama, 8.VIII.63, *Pinus resinosa*, R. Trieselman (CNC) 3; Kapuskasing, 19.VII.63, *Pinus banksiana*, G. Atkinson (CNC) 1; Oba, 28.VIII.42, Jack pine (CNC) 2; Simcoe Co., 10.VI.41, Austrian pine (CNC) 4; Timmins, 17.VI.63, *Pinus banksiana*, H. Foster (CNC) 4; Washago, 30.VIII.63, *Pinus nigra*, A. Aarnden (CNC) 2. **Quebec:** Chelsea, 20.VI.17, J.M. Swaine (CNC) 6; Grand Remous, 17.VIII.78, *Pinus banksiana* (LFRC) 2; Lac Louvicourt, 1.IX.78, *Pinus banksiana* (LFRC) 2; Moffet, 16.VIII.78, *Pinus banksiana* (LFRC) 2; Pointe à David, 2.VI.75, *Pinus banksiana* (LFRC) 1; Riv. aux Rats, 14.VII.78, *Pinus banksiana* (LFRC) 1; Ste. Annes, J.M. Swaine (CNC) 1; Wychwood, 21.VI.17, J.M. Swaine (CNC) 2. **Saskatchewan:** Mustus Lake, 12.VIII.63, *Pinus banksiana* (NFRCE, CNC) 5.

#### UNITED STATES

**Alabama:** Mobile, 13.VI.51, S.L. Wood (UADE) 1; Wagarville, 6.IV.45, Loblolly pine, J.W. Stauffer (USNM) 4. **Arkansas:** Ashley Co., various dates 1966 (UADE) 4; Bradley Co., 7.VI.66 (UADE) 2; Cleveland Co., - 60 (UADE) 3; Columbia Co., various dates 1966 (UADE) 3; Grant Co., 9.IV.67, Pine (UADE) 40; Hot Springs, VI.20, J.N. Knull (USNM) 2; Hot Springs Co., 9.VIII.66 (UADE) 1; Lafayette Co., IV.67, 1. Brown (UADE) 200; Union Co., 13.VI.66 (UADE) 10. **Connecticut:** Saltenstal, 29.VIII.59, White pine cones, W.R. Hensen (USNM) 4. **Delaware:** Wilmington, 27.VIII.56, Red pine, H. Telford (UDCC) 4. **Florida:** Alachua Co., 18.II.56, Slash pine (USNM) 4; Archbold Biological Station, Highlands Co., 23.IV.67, *Pinus elliotti*, D.E. Bright (CNC) 39; Baker Co., various dates 1958-60, *Pinus elliotti* and *P. palustris* (USNM) 3; Big Pine Key, 2.VII.51, *Pinus*, S.L. Wood (SLWC) 2; Big Pine Key, 9.V.67, *Pinus elliotti*, D.E. Bright (CNC) 2; Chattahoochee, 15.V.67, *Pinus elliotti*, D.E. Bright (CNC) 5; Flager Co., 22.III.30, D.B. Webb (USNM) 3; Gainesville, Summer 1957, L.A. Hetrick (DEBC) 5; Hilliard, 28.VII.34, R.H. Beamer (SLWC) 1; Homestead, 26.VII.40, J.C. Bradley (CNC) 5; Olustee, V.41, *Pinus caribaea*, G.H. Hepling (USNM) 4; Oneco, 31.III.55, J.C. Martin (CNC) 3; Paradise Key, 3.III.19, on pine (USNM) 1; Pinellas Co., 19.V.30, B.P. Morra (USNM) 4; Putnam Co., 10.II.30, D.B. Webb (USNM) 8; Royal Palm Park, 22.I.24 (CNC) 1; Saint Augustine, 5.III.40 (CASC) 6; Sanford, II.VII.51, *Pinus*, S.L. Wood (SLWC) 5. **Georgia:** Brunswick, 12.VII.51, *Pinus*, S.L. Wood (SLWC) 1. **Kentucky:** Cumberland State Park, 23.VII.51, *Pinus*, S.L. Wood (SLWC) 1. **Louisiana:** Bogalusa, 7.IV.25, *Pinus palustris*, R. St. George (USNM) 8; Couington, 12.VI.51, S.L. Wood (UADE) 1; West Pearl River at Highway 90, 6.IV.76, A. Smetana (CNC) 1. **Massachusetts:** Farmingham, 8.VI.07, C.A. Frost (CNC) 1; Hyannas Port, 29.VIII.99, *Pinus rigida* (USNM) 1; Springfield, 12.VIII.32 (USNM) 10. **Minnesota:** Cloquet, 8.IX.36, Norway spruce, H.R. Dodge (SLWC) 2. **Mississippi:** Gulfport, (DFEC) 35; Lucedale, 7.VI.32, H. Dietrich (CNC) 1; McNeill, 13.XI.29, Longleaf pine (USNM) 9; Ocean Springs (DFEC) 15; Ramsey Springs, 26.VI.29, Longleaf pine (USNM) 9; State College (DFEC) 15. **Missouri:** VanBuren, 20.V.54, *Pinus* sp.

(OSUC) 1. **New Jersey**: Lakehurst (CNC) 1; Vineland, 1.47, Austrian pine, J.J. Truncer (USNM) 2. **New York**: East Hampton, 1940, *Pinus* (USNM) 10; Rochester, 26.IX.39, *Pinus rigida*, J.R. Hansbrough (SLWC) 11. **North Carolina**: Asheville (DFEC) 1; Charlotte, 18.X.60, *Pinus* (USNM) 1; Cherokee, 19.VII.51, *Pinus*, S.L. Wood (SLWC) 3; Morehead City, 15.VI.42, *Pinus palustris*, J.A. Beal (RMSC) 1. **Ohio**: Hocking Co., VI.37, *Pinus echinata* (USNM) 1. **Pennsylvania**: Camp Hill, 13.X.73, Red pine twigs (USNM) 1; Mt. Alto, 1.II.31, *Pinus rigida* cone, J.N. Knull (USNM) 2; Windber, 1939, Jack pine (USNM) 1. **Rhode Island**: Kingston, 6.VIII.41, Mugho pine (USNM) 7; Newport, 20.VI.12 (USNM) 1. **South Carolina**: Edgefield, 20.III.65, Loblolly pine (USNM) 1; Myrtle Beach, 14.VII.51, *Pinus*, S.L. Wood (SLWC) 1. **Texas**: Bessmay, 2.IV.47, Slash pine (USNM) 4; Rusk, 9.V.38, Loblolly pine, P.A. Young (USNM) 2.



MAP 8. Collection localities for *P. (Pityophthorus) pulicarius*.

**BIONOMICS.** This species usually attacks dead and dying twigs of various species of pine, but at times may attack green twigs and cause extensive dieback of terminal leaders. This damage is especially serious in Christmas tree or nursery plantations. This species has also been found attacking the scions of slash pine grafts. The damage may be extensive and in the past has caused considerable concern (Smith and Mergen 1954a). This species may also play a role in the transmission of diseases of pines. Occasionally this and other species of *Pityophthorus* (probably *puberulus*) breed in red pine cones and shoots that have been killed by *Conophthorus resinosae* (Lyons 1957).

Galleries of this species are constructed in the pith and wood of the twigs. The beetles enter the terminals and small twigs by boring through the bark and sapwood into the pith. The nuptial chamber is constructed in the pith or adjacent to it and the egg galleries extend through the pith. The larvae feed through the pith, sometimes boring through the sapwood and feeding just beneath the bark. Specimens of this species may be found in dead and dying twigs, in the buds, in small cones, in small fire-killed trees and is often very abundant in slash. Attacks are usually on twigs already injured by low temperatures, fire, etc. and are therefore

secondary. Attacks may, however, hasten the death of twigs or may kill twigs that otherwise would survive the initial injury.

REMARKS. Adults of *pulicarius* are easily recognized by the steep elytral declivity, by the deep, distinct punctures in declivital striae 1 and 2, by the narrow declivital interstriae 2, by the peculiar modifications on the male frons (see description and Fig. 43) and by the densely, deeply punctured elytral striae and interstriae.

62. *Pityophthorus* (*P.*) *schwerdtfegeri* (Schedl)

Figs. 45-47; Map 9

*Conophthorus schwerdtfegeri* Schedl, 1956, p. 28; Schwerdtfeger, 1957, p. 506; Bright, 1976c, p. 187 (lectotype desig.).

*Pityophthorus schwerdtfegeri*: Wood, 1966, p. 28.

*Pityophthorus islasi* Wood, 1962, p. 80; Wood, 1966, p. 28 (= *schwerdtfegeri*).

*Conophthocranulus islasi* Schedl, 1963, p. 163; Wood, 1966, p. 28 (= *schwerdtfegeri*).

Length 1.9-3.0 mm, about 2.3 times longer than wide.

**Female.** Frons flattened to weakly convex over a broad area, sometimes with a very faint longitudinal carina extending from epistoma to upper margin of flattened area; surface smooth, brightly shining, with numerous, fine, deep punctures and weakly, transversely impressed between upper margins of eyes; vestiture consisting of fine, hairlike setae scattered over flattened area; epistomal margin deeply emarginate. Antennal club 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; first two segments together occupy about half of total club length. Pronotum 1.1 times longer than wide, widest at base; sides arcuate; asperities on anterior slope rather small, numerous, arranged in no apparent order, summit located on basal third, indefinite, not elevated; posterior area of disc distinctly punctured, punctures large, deep and close; surface between punctures dull, densely microreticulate; median line wide, impunctate. Elytra 1.5 times longer than wide; apex broadly rounded; discal striae and interstriae strongly punctured, punctures large, deep, randomly placed, making discernment of striae and interstriae difficult, the interstriae indicated by rows of very long, hairlike setae arising from interstitial punctures; surface brightly shining, finely reticulate. Declivity convex; interstriae 1 weakly elevated, bearing a median row of fine granules; interstriae 2 not widened, impunctate, very weakly impressed; interstriae 3 very weakly elevated, equal in height to 1, deeply punctured; punctures of striae 1 and 2 deep and distinct.

**Male.** Frons deeply, transversely concave on each side of a sharp longitudinal carina, the carina ending in an acute point just above epistoma; epistoma deeply emarginate, bordered above by an elevated, transverse ridge. Pronotum and elytra essentially as in female except sculpturing stronger.

TYPE MATERIAL. *C. schwerdtfegeri* Schedl. This species was described from two specimens. The lectotype (♂) designated by Bright (1976c), is in the KESC and bears the data: Rancho Alegre, Guatemala, 23-IX-195-, F. Schwerdtfeger/Type *Conophthorus schwerdtfegeri* Schedl/♂/LECTOTYPE *Conophthorus schwerdtfegeri* Schedl, D.E. Bright 1976. One female paralectotype, also in the KESC, bears the same labels.

*P. islasi* Wood. The holotype (♀) in the SLWC bears the labels: Temascaltepec, Mex., 17.VII.60, ♀, *P. oocarpa cogollos*/HOLOTYPE *Pityophthorus islasi* Wood. The allotype and 3 paratypes bear the same data. One paratype is in the USNM, 1 is in the collection of Federico Islas, and the remainder of the type series is in the SLWC. Seven additional specimens bearing identical data but not bearing type labels have also been seen (NFRC).

*C. islasi* Schedl. The holotype (♂) in the KESC bears identical data with the types of *P. islasi* cited above. The holotype has not been examined during this study but Wood (1966) examined the type of all three names and concluded that all represent the same species.



HOSTS. *Pinus engelmannii*, *oocarpa*, *ponderosa*, *pseudostrobus*, and probably other species of pines in its range.

DISTRIBUTION. Southwestern United States north to Nevada, and south to Honduras (Map 9). Specimens (53) examined from:

#### UNITED STATES

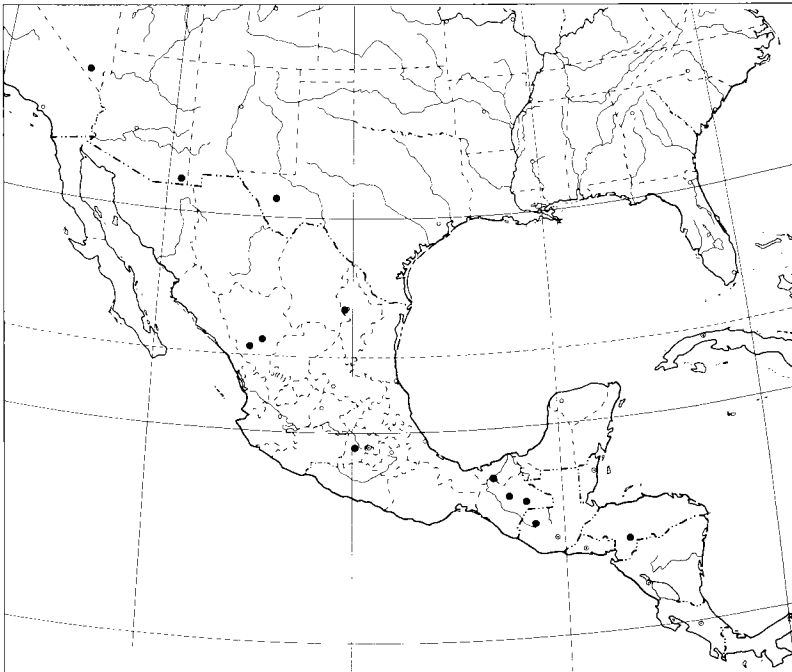
**Arizona:** Chiricahua Mtns., 12.VIII.52, D.J. & J.N. Knull (OSUC) 2; Madera Canyon, 1.VI.78, *Pinus engelmannii*, S.L. Wood (SLWC) 9. **Nevada:** Kyle Canyon, Clark Co., 24.IX.59, *Pinus ponderosa*, D.F. Zoller (SLWC) 4. **Texas:** Jeff Davis Co., 20.VI.52, D.J. & J.N. Knull (OSUC) 1.

#### MEXICO

**Chiapas:** 5 mi SW of El Bosque, 3.VII.69, *Pinus* sp., D.E. Bright (CNC) 5; 21 mi W of Lázaro Cárdenas, 26.VI.69, *Pinus oocarpa*, D.E. Bright (CNC) 1; 8 mi N of Ocosingo, 2.VI.69, *Pinus oocarpa*, D.E. Bright (CNC) 5. **Durango:** El Salto, 25.III.74, *Pinus*, M.M. Furniss (SLWC) 2; 20 mi NE of El Salto, 23.VII.58, *Pinus* sp., S.L. Wood (SLWC) 3. **Nuevo León:** Chipinque Mesa, near Monterrey, 26.IV.69, *Pinus ponderosa*, D.E. Bright (CNC) 4.

GUATEMALA: See type material.

HONDURAS: Finca Sta. Elena, near Tegucigalpa, 22.XI.51, *Pinus oocarpa*, F. Schwerdtfeger (KESC) 1; Tegucigalpa, 18.I.68, *Pinus pseudostrobus*, E. Clark (SLWC) 3.



MAP 9. Collection localities for *P. (Pityophthorus) schwerdtfegeri*.

BIONOMICS. Schwerdtfeger (1957) briefly reports on the galley pattern and biology of this species. The galley system consists of an irregular shaped nuptial chamber, cut into the bark and wood with a diameter of about 3 mm, and several

slightly curved egg galleries. The egg galleries are about 25 mm long but the length varies greatly depending on the condition of the phloem and on the age and condition of the beetle. Egg niches are cut into the walls of the egg galleries and plugged with brownish-white boring dust. The number of eggs laid was not determined. Larval and pupal habits were also not observed.

On Chipinque Mesa, near Monterrey, Nuevo León, Mexico, specimens of this species were found in the very small branch tips on a vigorous green Ponderosa pine. A large percentage of the terminal and lateral branch tips had turned brown for a distance of about 15 cm. Adults of this species were found boring in the pith of these brown twigs. In a few cases, eggs and larvae were also found in the pith area.

REMARKS. This is a very distinctive species, easily recognized by the two, transversely oval cavities on the male frons which are separated by a sharp carina (Fig. 46), by the convex sulcate elytral declivity of both sexes, by the deep, distinct punctures in the first and second declivital striae, and by the roughly triangular-shaped pronotum on which the summit is located on the basal third and is not prominent or elevated.

### 63. *Pityophthorus (P.) aztecus* Bright

Figs. 48-50

*Pityophthorus aztecus* Bright, 1977, p. 520.

Length 2.5-3.7 mm, about 2.2-2.5 times longer than wide.

**Female.** Frons weakly flattened on a semicircular area extending from epistoma to well above upper level of eyes and laterally nearly from eye to eye; surface shining, distinctly, deeply punctured, punctures large, almost touching; a low, distinct, impunctate, toothlike callus is present on midpoint of epistoma; vestiture moderately abundant, consisting of long, yellowish setae, one seta arising from each puncture on the surface, all setae of approximately equal length, those on periphery may be slightly longer and incurved; epistomal margin deeply emarginate. Antennal club elongate-oval, about 1.4-1.5 times longer than wide, widest through segment 2; sutures 1 and 2 weakly but distinctly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum about as long as wide, widest near posterior angles; asperities on anterior slope low, indistinct, scattered in no apparent order; summit located behind middle of disc, very weakly elevated or not elevated; posterior area of disc at most very weakly, transversely impressed behind summit, densely and deeply punctured; surface between punctures dull, densely microreticulate, numerous granules are interspersed between punctures near summit; median line broad, weakly elevated, impunctate. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae and interstriae densely, deeply punctured, interstitial punctures slightly smaller than those in striae, resulting in a confusedly punctate elytral surface, striae not readily discernible. Declivity convex, steep; interstriae 1 narrowly, weakly elevated, with a few weak punctures in a median row; interstriae 2 not widened, very weakly impressed, impunctate; interstriae 3 very weakly elevated if at all, equal in height to 1, with a distinct median row of deep punctures; punctures in striae 1 and 2 deeply impressed and distinct.

**Male.** Frons shallowly impressed to flattened on each side of a distinct, sharp, broad, longitudinal carina, the carina most strongly elevated at lower end and overlapping epistoma; surface deeply, densely punctured; epistoma narrowly impressed above margin, with a fringe of stout setae; epistomal margin deeply emarginate. Pronotum, elytra, and declivity essentially as in female.

TYPE MATERIAL. The holotype (♀) in the USNM bears the data: km 50, Mex. Pueb., pine, Guerera coll. #16, Jan. 23-60, 11564/HOLOTYPE *Pityophthorus aztecus* D.E. Bright. The allotype and 3 paratypes bear the same data plus appropriate type labels. Additional paratypes are labeled: 4, 1 mi. W. Las Vegas, V.C., Mex., VII-5-1967, S.L. Wood/ Pinus; 3, MEX., 20 mi. N. Cuernavaca, Mex., VII-15-1969, D.E. Bright/ Pinus sp. and 1, Rio Frio, Mex., MEX., I.IX.69, L.A. Kelton.

The holotype, allotype, and 2 paratypes are in the USNM, 4 paratypes are in the SLWC, and 5 paratypes are in the CNC.

HOSTS. *Pinus* spp.

DISTRIBUTION. Coahuila to Veracruz, Mexico. Specimens (173) examined from:

#### MEXICO

**Coahuila:** Cañón de Amangos, Arleaga, 4.IX.72, *Pinus* sp., H. Morens N. (CNC) 160. **Mexico:** See type material. **Veracruz:** See type material.

REMARKS. Adults of this species are easily distinguished from those of other species in this group by the very distinctive male frons (Fig. 49), by the small median callus on the female epistoma (Fig. 48), and by the wide second declivital interstriae (Fig. 50).

#### 64. *Pityophthorus (P.) dispar* Bright

Figs. 51-53

*Pityophthorus dispar* Bright, 1976b, p. 431.

Length 2.4-3.1 mm, about 2.4 times longer than wide.

**Female.** Frons flattened to weakly, transversely impressed on a semicircular area from epistoma to upper level of eyes; surface obscurely punctured, punctures small, shallow, usually vaguely defined; a weakly elevated, impunctate callus is present on midpoint of epistoma; vestiture on surface moderately abundant, consisting of long, yellowish setae, one seta arising from each puncture, all setae of nearly equal length except those on periphery may be slightly longer and incurved; epistomal margin emarginate. Antennal club elongate-oval, 1.4 times longer than wide, widest through segment 2, suture 1 weakly arcuate, 2 more strongly so; first two segments together occupy about half of total club length. Pronotum about as long as wide or slightly wider than long, widest at posterior angles; sides weakly arcuate, converging anteriorly; asperities on anterior slope low, broad, very numerous, becoming almost granulate on and near summit, scattered in no apparent order; summit located behind middle of disc, not elevated; posterior area of disc not transversely impressed behind summit and densely, deeply punctured; surface between punctures dull, densely microreticulate; median line broad, impunctate, weakly elevated, frequently with a very weakly impressed, longitudinal median impression. Elytra about 1.5 times longer than wide; apex broadly rounded; discal striae and interstriae densely and deeply punctured, usually in definite, discernible rows, all punctures equal or nearly equal in size and depth, interstitial punctures each bearing a moderately long, hairlike seta, the setae arising from striae punctures very short, about equal in length to diameter of puncture. Declivity convex, steep; interstriae 1 narrowly elevated, with a median row of fine setae as on disc; interstriae 2 flat, not widened, weakly impressed, impunctate; interstriae 3 weakly elevated, about equal in height to 1, with a median row of setiferous punctures as on disc; punctures of striae 1 and 2 vague and indistinct, only moderately to weakly impressed.

**Male.** Frons convex from about midpoint to vertex, with a distinct, strongly elevated, toothlike, median callus located below midpoint and overlapping the narrow, deeply impressed epistoma; epistoma below callus densely fringed with moderately long, yellowish setae and immediately above and around callus is a narrow, arcuate impression; surface above callus densely and deeply punctured, microreticulate between punctures. Pronotum, elytra, and declivity essentially as in female.

TYPE MATERIAL. The holotype (♀) in the CNC bears the data: MEX., 7 mi. E. San Cristobal, Chis., V-13-69, D.E. Bright/*Pinus montezumae*/HOLOTYPE *Pityophthorus dispar* D.E. Bright, CNC No. 13727. The allotype and 8 paratypes bear the same data and 8 additional paratypes bear the same data except the date is V-26-69 and the host is *Pinus* sp.; 1 paratype is labeled 8 mi. east of San Cristobal, Chiapas, Mexico, V-30-69, *Pinus montezumae*; 1 paratype same as above except the date is VI-6-69 and the host is *Pinus ochoterenai* and 1 paratype is from 5 miles east of San Cristobal, Chiapas, Mexico, VII-8-69, *Pinus* sp.

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.

HOSTS. *Pinus montezumae*, *ochoterenai*, and other species of *Pinus*.

DISTRIBUTION. Southern Mexico and probably to the southern extremity of pine growth in Honduras. Known only from the type material from Chiapas.

REMARKS. This species is easily recognized by the peculiar frons of the male (see description and Fig. 52), by the vague punctures on the first and second declivital striae (Fig. 53), by the abundant interstitial setae (Fig. 53), and by the broadly flattened to weakly transversely impressed female frons (Fig. 51).

#### ALNI GROUP

The species placed in this group all occur in the Neotropical Region in various species of deciduous trees, vines, and woody shrubs. They are all characterized by the similar frons of both sexes, by the lack of a pronotal summit, by the scattered asperities on the anterior slope of the pronotum, and by the host and distribution.

Only nine species are included in this group but probably many more species remain to be discovered in the Neotropical Region.

#### KEY TO SPECIES IN THE Alni group

1. Declivity sloping, convex, not bisulcate; declivital interstriae 3 not bearing granules or granules, if visible, are minute . . . . . 2
  - Declivity shallowly to strongly bisulcate; declivital interstriae 3 always armed with granules (these may be very small to absent, if so, note declivital character) . . . . . 4
2. Pronotum strongly rugose and reticulate on posterior portion, not punctured; elytral surface strongly rugose; Chiapas . . . . . 65. *melanurus* Wood (p. 93)
  - Pronotum smoother, with distinct punctures on posterior half, rugae minute or absent; elytral surface smooth . . . . . 3
3. Declivital interstriae 2 bearing a median row of stout setae; elytral striae impressed on disc, interstriae convex; lateral areas of pronotum asperate almost to base; pronotum and elytra shining; Veracruz . . . . . 66. *alni* Blackman (p. 93)
  - Declivital interstriae 2 not bearing a median row of setae; elytral striae not impressed, discal interstriae flat; lateral areas of pronotum punctate to subasperate; pronotum and elytra dull to only moderately shining, reticulate; Oaxaca . . . . . 67. *alnicolens* Wood (p. 94)
4. Male frons deeply, concavely impressed in median area just below upper level of eyes; male bearing a conspicuous tubercle posterior to oral cavity; declivity of both sexes at most only weakly bisulcate; frons, pronotum, and elytra somewhat shagreened, without any indication of reticulation . . . . . 5
  - Frons of male not deeply impressed in median area; male always devoid of tubercle on lateral margin of oral cavity; declivity of both sexes more deeply, broadly impressed; surfaces not shagreened . . . . . 6
5. Body size smaller, 1.4-1.7 mm; declivital setae narrowly spatulate; Costa Rica . . . . . 68. *mendosus* Wood (p. 95)
  - Body size larger, 1.9-2.1 mm; declivital setae hairlike; Panama . . . . . 69. *timidulus* Wood (p. 96)
6. Frons flattened to shallowly transversely impressed in both sexes; declivital interstriae 3 of male abruptly elevated, inner slope nearly vertical; declivity of male deeply sulcate . . . . . 7
  - Frons convex in both sexes; declivital interstriae 3 of male not abruptly elevated, inner slope sloping; declivity of male shallowly bisulcate . . . . . 8
7. Pronotal disc smooth, punctures moderately coarse, their margins not elevated; elytra with only scattered impressed points, striae not discernible; Panama . . . . . 70. *degener* Wood (p. 96)

- Pronotal disc reticulate, the punctures fine, their lateral margins feebly elevated, smooth and shining; elytra with abundant impressed points on disc and declivity; Veracruz to Costa Rica . . . . . 71. *amiculus* Wood (p. 97)
- 8. Punctures on frons fine, barely visible; striae strongly impressed on declivity; surface of declivital sulcus rising to striae 2; Costa Rica . . . . . 72. *dissolutus* Wood (p. 98)
- Punctures on frons coarse, readily visible; striae not strongly impressed on declivity; declivital sulcus broad, surface on lower half not rising from striae 1 to 2; Puebla . . . . . 73. *explicitus* Wood (p. 98)

65. *Pityophthorus (P.) melanurus* Wood

*Pityophthorus melanurus* Wood, 1976, p. 364.

Length 1.7-2.0 mm, about 3.0 times longer than wide.

**Female.** Frons broadly convex, with a slight transverse impression just above epistoma; surface dull, reticulate, punctures fine; vestiture sparse, consisting of short, fine setae scattered over surface. Antennal club about 2.0 times longer than wide, widest through segment 2; sutures 1 and 2 straight, transverse; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.2 times longer than wide, widest near middle; anterior margin broadly rounded, bearing about 16 coarse serrations; asperities on anterior slope small, suberect, scattered in no apparent order; summit not evident; posterior area of disc bearing numerous, coarse, elevated rugae, these extending to base not punctured; surface between rugae densely, strongly reticulate. Elytra about 1.8 times longer than wide; apex narrowly rounded; discal striae not impressed, the punctures moderately to strongly randomly placed; discal interstriae wider than striae, punctures similar to those in striae, randomly placed; surface of interstriae shining, subrugulose. Declivity convex, sloping; interstriae 1, 2, 3 similar, of equal height, sculptured as on disc, each bearing a median row of erect, scalelike setae; punctures in striae 1 and 2 punctured as on disc.

**Male.** Unknown.

**TYPE MATERIAL.** The holotype (♀) is deposited in the CNC and bears the data: 5 miles W. San Cristobal L.C., Chis., Mex., V.3.1969, H. Howden/Beating Oak/HOLOTYPE *Pityophthorus melanurus* S.L. Wood 1976/HOLOTYPE CNC No. 15378. Three paratypes bear the same data except the date.

Paratypes are in the CNC and the SLWC.

**HOST.** *Quercus* sp.

**DISTRIBUTION.** Known only from the type locality in Chiapas.

**REMARKS.** Adults of *melanurus* are very similar to those of *alni* but may be distinguished by the much more coarsely rugose pronotum, by the smaller size, and by the subrugulose surface of the elytra.

*P. melanurus*, *alni*, and *alnicolens* form a compact set of species, characterized by the convex, sloping elytral declivity, by the lack of granules on the third declivital interstriae, and by less obvious characters such as the type of the elytral vestiture. All three are obviously closely related.

66. *Pityophthorus (P.) alni* Blackman

*Pityophthorus alni* Blackman, 1942, p. 209.

Length 1.8-2.5 mm, 2.8-2.9 times longer than wide.

**Female.** Frons weakly convex, usually transversely flattened above epistomal margin; surface dull to moderately shining, finely punctured except on a median space just above epistoma, this space may be weakly elevated and extended into a weakly elevated longitudinal carina; vestiture sparse, consisting of moderately long setae scattered over surface. Antennal club large, 1.1-1.2 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate or almost transverse; segments 1 and 2 together occupy about half of total club length. Pronotum 1.2 times longer than wide, widest on posterior half; anterior margin

somewhat narrowly rounded, bearing only a few very weak serrations, or a weakly elevated, sharp ridge in place of serrations; asperities on anterior slope small, suberect, numerous and scattered in no discernible order, those on lateral areas very low and wide, and extend nearly to base; summit not elevated or only weakly so, transverse impression absent; posterior area of disc deeply punctured, punctures large, close and deeply impressed; surface between punctures dull, densely reticulate-granulate; median line inconspicuous. Elytra about 1.8 times longer than wide; apex narrowly rounded; discal striae weakly but distinctly impressed, punctured in regular rows, punctures very large and deeply impressed; discal interstriae wider than striae, convex, impunctate on basal half, each bearing a median row of erect, fine setae on posterior half; surface of interstriae black, weakly to brightly shining. Declivity convex, sloping; interstriae 1 weakly elevated bearing a median row of fine granules and erect, flattened, scalelike setae; interstriae 2 not impressed, equal to discal width, bearing a median row of narrow, flattened, scalelike setae; interstriae 3 similar to 2 except erect scales slightly longer; remaining interstriae also similar; punctures in striae 1 and 2 much smaller than those on disc and more weakly impressed.

**Male.** Frons less flattened, more strongly transversely impressed above epistomal margin, and median longitudinal carina more evident. Pronotum and elytra essentially as in female.

**TYPE MATERIAL.** The holotype (♀) is in the USNM and is labeled: 686-1/Alnus/Jalapa, V.C., 2-9-36/Rt. antennae and left fore leg on slide/♀/Type No. 55984. The allotype and 6 paratypes bear the same data.

All of the type material is in the USNM.

**HOST.** *Alnus* spp.

**DISTRIBUTION.** Known only from Veracruz, Mexico but certainly occurs elsewhere in southern Mexico. Specimens (13) examined from:

#### MEXICO

**Veracruz:** Las Vigas, 1 mi W, 5.VII.67, *Alnus*, S.L. Wood (SLWC) 5.

**REMARKS.** Adults of this species are easily recognized by the subasperate appearance of the lateral portions of the pronotum, by the distinctly impressed elytral striae which bear large, deep punctures, by the convex, sloping elytral declivity which bears a median row of scalelike setae in each interstriae, and by the host.

*P. alni* seems related to *alnicolens* Wood but is easily distinguished by the features mentioned in the key.

#### 67. *Pityophthorus* (*P.*) *alnicolens* Wood

*Pityophthorus alnicolens* Wood, 1977a, p. 213.

Length 1.8-2.0 mm, about 2.8 times longer than wide.

**Female.** Frons as in *alni* except sculpturing stronger and longitudinal carina weaker. Antennal club oval, 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum essentially as in *alni* except anterior margin definitely serrate and lateral portions punctate to subasperate. Elytra as in *alni* except discal striae not impressed, discal interstriae flat, punctured and setiferous nearly to base. Declivity as in *alni* except steeper, interstriae 2 devoid of setae, and setae on other interstriae finer and longer.

**Male.** Not recognizable in material at hand.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: MEX., Oax., Hwy 131, 115 mi. S. Oaxaca, 6000'; V-27-30-71 / *Alnus* sp./ D.E. Bright collr/HOLOTYPIC *Pityophthorus alnicolens* Wood, 1977/HOLOTYPIC CNC No. 15793. Four paratypes bear the same data plus appropriate type labels.

Most of the type material is in the CNC, paratypes are also in the SLWC.

HOST. *Alnus* sp.

DISTRIBUTION. Known only from the type locality in southern Mexico.

REMARKS. The characters given in the key and the diagnosis should enable one to easily distinguish the adults of *alnicolens* from other species in the group.

68. *Pityophthorus (P.) mendosus* Wood

*Pityophthorus mendosus* Wood, 1975, p. 397.

Length 1.4-1.7 mm, 2.8 times longer than wide.

**Female.** Frons evenly convex to weakly, transversely flattened above epistoma, a very faint longitudinal line can be detected extending from epistoma to well above eyes; surface shining, somewhat shagreened, distinctly punctured, punctures fine, shallow; vestiture inconspicuous. Antennal club oval, 1.1 times longer than wide, widest through segment 3; sutures 1 and 2 moderately arcuate; first two segments together occupy more than half of total club length. Pronotum 1.1-1.2 times longer than wide, widest at about middle; sides moderately arcuate, subparallel on basal half; anterior margin broadly rounded, bearing 8-12 low, broad, contiguous serrations; asperities on anterior slope numerous, low, broad, scattered in no apparent order except near summit where one or two concentric rows are formed; posterior area of disc densely punctured, punctures distinct and deep; surface between punctures moderately shining, shagreened, marked by very fine, moderately abundant points; median line broad, not elevated or otherwise distinct. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctures in regular rows, punctures distinct, deep and close; discal interstriae equal to or slightly wider than striae, impunctate; surface of interstriae moderately shining, shagreened, marked with numerous very fine points and lines. Declivity evenly convex; interstriae 1 broad, slightly elevated, sculptured as on disc; interstriae 2 not wider than discal width, essentially unmodified; interstriae 3 not elevated, about equal in height to 1, bearing a few, very fine setiferous granules and/or punctures; punctures of striae 1 much smaller than those on disc, those in striae 2 about equal in size to those on disc, striae 1 very narrowly impressed.

**Male.** Frons deeply, concavely, transversely impressed from epistoma to near upper level of eyes, lower portion of impression somewhat inflated on each lateral corner just above epistoma; surface rugose-punctate below upper level of impression and smooth, densely reticulate above; lateral margin of ridge surrounding oral cavity bearing a conspicuous, elongate tubercle, this tubercle situated just posterior to mandibles. Pronotum essentially as in female except sides more strongly arcuate, punctures somewhat finer. Elytra as in female except setae on declivity broader, more distinctly spatulate.

TYPE MATERIAL. The holotype (♀) in the SLWC bears the data: San Isidro Gen. S.J., Costa Rica, 3000 ft., XII-5-1963, S.L.W./Phosphoro petioles/HOLOTYPE *Pityophthorus mendosus* S.L. Wood 1975. The allotype and 18 paratypes bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOST. Leaf petioles of *Phosphoro* sp.

DISTRIBUTION. Known only from the type locality in Costa Rica but probably occurs throughout Central America.

REMARKS. The deeply impressed frons of the male, the conspicuous tubercle on the lateral margin of the oral cavity of the male, the smooth, somewhat shagreened surface of the frons, pronotum and elytra of both sexes, and the narrowly spatulate setae on declivital interstriae 1, 3, 5, 7, etc. will distinguish adults of this species from all other species except those of *timidulus*. From this latter species, adults of *mendosus* can be distinguished by their smaller size and by the distribution and hosts. These two species may eventually prove to be the same but for the present I prefer to regard them as distinct. The habitat of each is distinctly different, e.g. *mendosus* in leaf

petioles and *timidulus* in saplings, and the size ranges of the two are distinct. Minor other morphological differences are also evident.

69. *Pityophthorus (P.) timidulus* Wood

*Pityophthorus timidulus* Wood, 1975, p. 396.

Length 1.9-2.1 mm, 2.5 times longer than wide.

**Female.** Frons, antennae, pronotum, and elytra essentially as in *mendosus*. Differs by larger size and more slender setae on declivital interstriae 1, 3, 4, 5, 7, 9.

**Male.** As in *mendosus* except for size and shape of declivital setae.

TYPE MATERIAL. The holotype (♀) in the SLWC is labeled: Volcan Chiriqui, Panama, 5500 ft., I-11-1964, S.L.W./Unknown sapling/HOLOTYPE *Pityophthorus timidulus* S.L. Wood 1975. The allotype and 12 paratypes all bear identical data.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

HOST. Unknown sapling.

DISTRIBUTION. Known only from the type locality in Panama but probably occurs throughout Central America.

REMARKS. See discussion under *P. mendosus*.

70. *Pityophthorus (P.) degener* Wood

*Pityophthorus degener* Wood, 1975, p. 397.

Length 1.9-2.1 mm, 2.5 times longer than wide.

**Female.** Frons broadly, shallowly, transversely impressed from epistoma to slightly above upper level of eyes and laterally nearly from eye to eye, with a faint, longitudinal carina or median line; surface densely, finely punctured, punctures in the flattened area fine and close, punctures above flattened area slightly larger, deeper and more widely separated; vestiture abundant but inconspicuous. Antennal club elongate-oval, 1.3 times longer than wide, widest through segments 2 and 3; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy slightly less than half of total club length. Pronotum 1.1-1.2 times longer than wide, widest just behind middle; sides weakly arcuate, subparallel; anterior margin broadly rounded, bearing about a dozen, low, broad, contiguous serrations; asperities on anterior slope numerous, low, blunt, scattered in no apparent order; posterior area of disc rather densely punctured, punctures of moderate size, deep and close; surface between punctures smooth, moderately shining, with numerous fine points; median line impunctate, broad, not elevated. Elytra 1.6-1.7 times longer than wide; apex rather narrowly rounded; discal striae not discernible, surface with only scattered impressed points; discal interstriae about 2.0 times wider than striae, impunctate; surface of interstriae moderately shining, smooth, with scattered fine lines and points. Declivity moderately bisulcate; interstriae 1 slightly widened, elevated distinctly above 2, surface as on disc but also with a median row of very fine, sparse, setiferous granules or punctures; interstriae 2 moderately sulcate, slightly broader than discal width, surface as on disc; interstriae 3 moderately elevated, very slightly higher than 1, bearing a row of very fine, sparse, setiferous granules; punctures in striae 1 and 2 usually distinct, but may be obsolete in some specimens.

**Male.** Frons distinctly flattened to distinctly transversely, usually arcuately impressed, impression divided by a weak, longitudinal median line or carina; surface deeply punctured on flattened area, except on median area above epistoma, punctures much deeper and larger than those on female. Pronotum as in female except serrations on anterior margin much larger, and asperities on anterior slope larger. Elytra as in female except striae punctures slightly larger. Declivity more deeply bisulcate; interstriae 1 as on female except granules much larger; interstriae 2 much more deeply impressed; interstriae 3 more abruptly elevated, the inner slope almost vertical, granules much larger than those on female.

TYPE MATERIAL. The holotype (♂) in the SLWC is labeled: Volcan Chiriqui, Panama, 5500 ft., I-11-1964, S.L.W./Unknown limb/HOLOTYPE *Pityophthorus*



degener S.L. Wood 1975. The allotype and 7 paratypes bear data identical with that of the holotype.

All of the type material is in the SLWC.

HOST. Unknown limb.

DISTRIBUTION. Known only from the type locality in Panama.

REMARKS. Adults of this species can be recognized by the rather deeply bisulcate elytral declivity of the male, by the distinct granules on declivital interstriae 1 and 3 of the male, by the flattened to shallowly impressed frons of both sexes and by the strongly punctured elytral striae.

Adults of this species resemble those of *mendosus* and *timidulus* but may be distinguished by the less deeply impressed male frons, by the more strongly impressed elytral declivity, by the finer pronotal punctures, and by the absence of a tubercle on the lateral margin of the oral cavity.

#### 71. *Pityophthorus* (*P.*) *amiculus* Wood

*Pityophthorus amicus* Wood, 1975, p. 398.

Length 1.7-2.1 mm, 2.7-2.8 times longer than wide.

**Female.** Frons distinctly flattened to weakly, transversely impressed, the impression sometimes divided by a weakly elevated median carina that extends from near epistomal margin to vertex, this carina sometimes less elevated in central portion of flattened area; surface of flattened area densely punctured except just above epistomal margin, punctures deep, almost touching, punctures above flattened area similar but more widely separated; vestiture relatively abundant but inconspicuous. Antennal club broadly oval, 1.2 times longer than wide, widest through segment 3; sutures 1 and 2 moderately arcuate; segments 1 and 2 together occupying about or slightly more than half of total club length. Pronotum 1.2 times longer than wide, widest toward posterior angles; sides weakly arcuate, subparallel on basal half; anterior margin broadly rounded, bearing about eight very broad, low, contiguous serrations; asperities on anterior slope numerous, low, broad, essentially isolated from each other and scattered in no apparent order; posterior area of disc rather densely punctured, punctures fine, shallow, lateral margins of each puncture very slightly elevated or subasperate and shining; surface between punctures moderately shining, densely reticulate, and with numerous fine points; median line rather narrow, frequently more lightly shining. Elytra 1.5-1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures moderately large and moderately deep; discal interstriae about 2.0 times wider than striae, impunctate; surface of interstriae shining, with numerous fine points and lines. Declivity deeply bisulcate; interstriae 1 not widened, rather strongly elevated and bearing a median row of about 8 small, rounded granules; interstriae 2 deeply impressed, distinctly narrowed at upper level, then widening on declivital face to become slightly wider than discal width; interstriae 3 abruptly, arcuately elevated, distinctly higher than interstriae 1, the inner slope almost vertical, summit bearing about 8 large, rounded granules, these larger than those on interstriae 1; punctures in striae 1 and 2 distinct, slightly smaller than those on disc.

**Male.** Virtually identical with female except serrations on anterior margin of pronotum larger and more erect and the declivital granules may be larger.

TYPE MATERIAL. The holotype ( $\delta$ ) in the SLWC is labeled: Guapiles, Lim, Costa Rica, 300 ft., VII-22-66, SLW/Unknown vine/HOLOTYPE *Pityophthorus amicus* S.L. Wood 1975. The allotype and 12 paratypes bear the same data. Eighteen additional paratypes are labeled: Coatzacoalcos, 18 mi. E., V.C., Mex., VI-26-1967, el. 100 ft., SLW/ unknown vine.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOST. Unknown vine.

DISTRIBUTION. Known only from the type-series localities in Veracruz and Costa Rica but probably occurs throughout Central America and southern Mexico.

REMARKS. Adults of this species are distinguished by the deeply sulcate elytral declivity of both sexes, by the flattened frons of both sexes and by the numerous, impressed points on the elytra and declivity. It appears remotely related to *degener* but differs in the declivital characters, e.g. the declivity of female *degener* is shallowly bisulcate and interstriae 3 is not abruptly elevated as it is in female *amiculus*. The hosts of the two species also differ at least in the limited series that are available.

72. *Pityophthorus (P.) dissolutus* Wood

*Pityophthorus dissolutus* Wood, 1975, p. 398.

Length 1.5-1.7 mm, 2.7 times longer than wide.

**Female.** Frons convex, frequently divided by a very weak, longitudinal carina, this carina more strongly elevated on epistoma and may terminate in a small tuberculate projection, frequently carina may be obsolete and only epistomal tubercle is visible; surface dull, opaque, densely reticulate, with numerous faint punctures; vestiture inconspicuous. Antennal club broadly oval, 1.2 times longer than wide, widest through segment 3; segment 1 small, much narrower than segment 2; suture 1 moderately arcuate, suture 2 more strongly arcuate; first two segments together occupy less than half of total club length. Pronotum 1.1 times longer than wide, widest near posterior angles; sides moderately arcuate, subparallel on basal half; anterior margin rather narrowly rounded, bearing about eight erect, contiguous serrations, the median four to six more erect and larger than others; asperities on anterior slope numerous, low, broad, usually isolated but several may be basally contiguous; posterior area of disc sparsely punctured, punctures fine, shallow, lateral margin of each puncture frequently weakly elevated, smooth and shining; surface between punctures dull, densely reticulate; median line broad, not elevated. Elytra 1.6-1.7 times wider than long; apex broadly rounded; discal striae punctured in regular rows, punctures of moderate size, moderately deep; discal interstriae about 2.0 times as wide as striae, impunctate; surface of interstriae moderately shining, densely marked by fine lines and points. Declivity convex, shallowly bisulcate; interstriae 1 moderately elevated, not wider than discal width, bearing a median row of very fine setiferous granules; interstriae 2 weakly impressed, slightly widened, sides sloping toward the impressed striae 1, surface as on disc; interstriae 3 only weakly elevated, slightly higher than 1, bearing a median row of very fine setiferous granules equal in size to those in interstriae 1; punctures in striae 1 and 2 obsolete, when visible they are much smaller and shallower than those on disc.

**Male.** Virtually identical with female, recognizable with certainty only by the abdominal segmentation.

TYPE MATERIAL. The holotype (♂) is in the SLWC and bears the labels: S.E. of Cartago, Costa Rica, 5600 ft., IX-24-1963, S.L.W./ Unknown vine/HOLOTYPE *Pityophthorus dissolutus* S.L. Wood 1975. The allotype and 27 paratypes bear the same data. Additional paratypes are labeled: 2, Tapanti, Cart., Costa Rica, 4000 ft., IX-24-63, S.L.W./unknown vine and 6, Volcan Chiriqui, Panama, 5500 ft., I-11-1964, S.L.W./unknown sapling.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOSTS. Unknown vines and saplings.

DISTRIBUTION. Known only from Panama and Costa Rica (localities above).

REMARKS. Adults of this species are similar to those of *explicitus* but may be distinguished by the characters presented in the key and in the following diagnosis.

73. *Pityophthorus (P.) explicitus* Wood

*Pityophthorus explicitus* Wood, 1975, p. 399.

Length 1.5-1.8 mm, 2.6-2.7 times longer than wide.

**Female.** Frons as in *dissolutus* except punctures larger, deeper, and more readily visible. Antennal club essentially as in *dissolutus*. Pronotum 1.1 times longer than wide, widest at about middle; sides more strongly arcuate than in *dissolutus*; anterior margin broadly rounded,

bearing six to eight rather low, broad, contiguous serrations, generally smaller than those on *dissolutus*; posterior area of disc more densely punctured than in *dissolutus*, punctures slightly larger, slightly deeper and closer, lateral margins of punctures weakly elevated and shining as in *dissolutus*; otherwise as in *dissolutus*. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; sculpturing as in *dissolutus*. Declivity convex, moderately deeply sulcate, more so than in *dissolutus*; interstriae 1 moderately elevated, bearing a median row of very fine, setiferous granules; interstriae 2 moderately sulcate, slightly wider than discal width, surface as on disc; interstriae 3 weakly elevated, slightly higher than interstriae 1, bearing median row of fine setiferous granules, these about equal in size to those on interstriae 1; punctures of striae 1 and 2 largely obsolete, when faintly visible they are much smaller and shallower than those on disc.

**Male.** Virtually identical with female, distinguishable only by abdominal segmentation.

**TYPE MATERIAL.** The holotype (♂) in the SLWC bears the data: Teziutlan, 6 mi. N.E., Pue., Mex., VII-2-1967, el. 4800 ft., S.L. Wood/Unknown vine/**HOLOTYPE** *Pityophthorus explicitus* S.L. Wood 1975. The allotype and 14 paratypes bear the same data.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

**HOST.** Unknown vine.

**DISTRIBUTION.** Known only from the type locality in Puebla, Mexico but probably occurs throughout southern Mexico and possibly into Central America.

**REMARKS.** This species is closely related to *dissolutus* and they may eventually prove to be one variable species. Adults of *explicitus* can be distinguished by the characters noted in the key and especially by those in the diagnosis.

#### GUATEMALENSIS GROUP

Almost all of the species in this group occur in *Quercus* spp. in the southern temperate and tropical regions. The adults are characterized by the long setae on the female frons and by the convex male frons which is acarinate or the carina, if present, is very faint.

Nine species are currently placed in the group but undoubtedly many more species remain to be discovered.

#### KEY TO SPECIES IN THE Guatemalensis group

1. Declivity convex to shallowly sulcate, granules in declivital interstriae 3 minute to absent (Figs. 56, 59); in hosts other than *Quercus* . . . . . 2
- Declivity slightly to strongly sulcate, granules in declivital interstriae 3 small to rather coarse (Fig. 62); usually in *Quercus* . . . . . 5
2. Setae on declivital interstriae 1 and 3 narrowly spatulate (Fig. 56); male frons distinctly, narrowly impressed above epistoma (Fig. 55); pubescence on female frons rather sparse (Fig. 54); Veracruz . . . . . 74. *nebulosus* Wood (p. 100)
- Setae on declivital interstriae 1 and 3 hairlike; male frons more evenly convex; pubescence on female frons abundant . . . . . 3
3. Declivity convex, granules in declivital interstriae 3 obsolete to absent; lateral portions of pronotum subasperate . . . . . 4
- Declivity rather narrowly, shallowly sulcate, declivital interstriae 3 with small but distinct granules; lateral portions of pronotum smooth, punctured; Costa Rica . . . . . 75. *lenis* Wood (p. 101)
4. Punctures on posterior portion of pronotum very deep, large, and close; striae punctures distinct on disc; interstriae smooth, with scattered fine lines and points; Jalisco and Michoacán . . . . . 76. *exquisitus* (Blackman) (p. 102)
- Punctures on posterior portion of pronotum shallow, obscure, and indistinct; striae punctures on disc shallow, small, indistinct; interstriae densely sculptured with fine, subrugulose elevations; Costa Rica . . . . . 77. *laetus* Wood (p. 103)

5. Strial punctures on elytral declivity rather coarse, only slightly smaller than those on disc; smaller species . . . . . 6
- Strial punctures in striae 1 and 2 of elytral declivity minute, less than one-fourth as large as those on disc; larger species . . . . . 7
6. Declivity convex, interstriae 1 distinctly, weakly elevated, 1 and 3 each with a few fine granules; posterior portion of pronotal disc subreticulate, punctures moderately coarse; female frons with peripheral setae rather long, those in central area uniformly short; Honduras . . . . . 78. *parilis* Wood (p. 103)
- Declivity steep, rather strongly sulcate, interstriae 1 unarmed, interstriae 3 bearing 2 small denticles on upper half; posterior portion of pronotal disc shining, minute and fine punctures intermixed; female frons with central pubescence only slightly shorter than on margins; Panama . . . . . 79. *scitulus* Wood (p. 104)
7. Declivity not impressed, granules on interstriae 1 and 3 very small; male frons flat, shining, more sparsely and more finely punctured; female frons flattened on a small area, vestiture less abundant; Costa Rica . . . . . 80. *conspectus* Wood (p. 105)
- Declivity sulcate, granules on interstriae 1 and 3 larger; male frons strongly convex and granulate-punctate above; female frons flattened on a large area, vestiture rather abundant . . . . . 8
8. Declivity less strongly impressed, granules on interstriae 1 and 3 slightly smaller; elytral disc with moderately abundant transverse lines; strial punctures on disc not always clearly formed; striae 1 impressed only near declivity; Costa Rica . . . . . 81. *medialis* Wood (p. 106)
- Declivity more strongly impressed, granules on interstriae 1 and 3 larger (Fig. 62); elytral disc smooth, with numerous impressed points; strial punctures on disc rather deeply, sharply impressed; striae 1 narrowly impressed to base; Mexico . . . . . 82. *guatemalensis* Blandford (p. 106)

#### 74. *Pityophthorus* (*P.*) *nebulosus* Wood

Figs. 54-56

*Pityophthorus nebulosus* Wood, 1976, p. 363.

Length 1.4-1.7 mm, about 3.0 times longer than wide.

**Female.** Frons flattened from epistoma to slightly above upper level of eyes, upper margin weakly elevated; surface shining, finely, densely punctured except on a small area just above epistomal margin; vestiture moderately abundant, consisting of moderately long setae evenly distributed over flattened area, those setae on periphery slightly longer and incurved. Antennal club circular, about as long as wide, widest through segment 2; sutures 1 and 2 weakly indicated, transverse; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.1 times longer than wide, widest at posterior angles; asperities on anterior slope small, erect, scattered in no apparent order but some may be arranged in vague, broken concentric rows; summit weakly indicated; posterior area of disc finely punctured, punctures shallow, close; surface between punctures dull, minutely reticulate. Elytra 1.8 times longer than wide; apex rounded; discal striae vaguely punctured in regular rows, punctures very shallow; discal interstriae about 1.5 times wider than striae, surface moderately shining, densely minutely reticulate, impunctate. Declivity convex; interstriae 1 weakly elevated, bearing a median row of about 4 or 5 erect, narrowly spatulate setae, granules absent or very small; interstriae 2 weakly impressed, flattened, without setae, surface as on disc; interstriae 3 not elevated, as high as 1, bearing a median row of spatulate setae as in 1, granules absent; setae also present on remaining alternate interstriae; punctures in 1 and 2 distinct, striae 1 narrowly impressed.

**Male.** Similar to female except frons more narrowly and more deeply impressed, vestiture sparse, posterior portion of pronotum more finely punctured, and declivity more widely impressed, shallowly sulcate.

**TYPE MATERIAL.** The holotype (♀) is deposited in the CNC and bears the data: MEX., Lake Catemaco, V.C., V-1-3, 1969, D.E. Bright/Bursera sp./HOLOTYPE *Pityophthorus nebulosus* S.L. Wood 1976/HOLOTYPE 15377 CNC. No. The allotype and 16 paratypes bear the same data.

Ten paratypes are in the CNC, 6 are in the SLWC.

HOST. *Bursera* sp.

DISTRIBUTION. Known only from the type locality in Veracruz.

REMARKS. Wood (1976) compared this species with *nanus* and indeed there is a good deal of similarity. However, I have placed *nebulosus* in a different species group based on the scattered pronotal asperities as opposed to the evenly concentric rows of asperities in *nanus*. The asperities in *nebulosus* do show a very weak indication of forming concentric rows but this is only evident to someone with considerable experience in distinguishing this characteristic.

The adults of *nebulosus* are readily recognized by the scattered pronotal asperities, by the dull appearance of the body surfaces, and by the presence of 4 or 5 erect spatulate setae in declivital interstriae 1, 3, 5, 7, and 9 (Fig. 56).

75. *Pityophthorus* (*P.*) *lenis* Wood

*Pityophthorus lenis* Wood, 1976, p. 358.

Length 1.2-1.5 mm, 2.6 times longer than wide.

**Female.** Frons broadly flattened from eye to eye and from epistomal margin to well above eyes, moderately to weakly concave in median two-thirds; surface shining, minutely reticulate, strongly punctured on margins especially above upper level of eyes; a small tubercle is frequently located on midpoint of epistomal margin; vestiture abundant, consisting of long, incurved setae on margin of flattened area, especially on margin above upper level of eyes, frequently a circular, weakly elevated, glabrous callus at apex of upper margin is evident. Antennal club oval, about 1.4 times longer than wide, widest through segment 3; sutures 1 and 2 arcuate; segment 1 very small, much narrower than 2; segments 1 and 2 together occupy less than half of total club length. Pronotum 1.1 times longer than wide, widest behind middle; asperities on anterior slope low, blunt, scattered in no apparent order; summit not pronounced; posterior area of disc weakly punctured, punctures small and shallow; surface between punctures dull, densely microreticulate. Elytra 1.6 times longer than wide; apex narrowly rounded; discal striae punctured in regular rows, punctures small, very shallow and indistinct; discal interstriae at least 2.0 times wider than striae; surface moderately shining, with numerous, closely placed minute points, lines, and surface irregularities making discernment of striae punctures difficult. Declivity convex, weakly bisulcate; interstriae 1 distinctly and narrowly elevated, surface dull, densely reticulate and bearing 2 or 3 very small granules; interstriae 2 weakly impressed, surface as in 1 but devoid of granules; interstriae 3 weakly elevated, equal in height and sculpture to 1, with a median row of 4 or 5 very small granules; punctures of striae 1 and 2 obsolete, not readily visible.

**Male.** Frons convex, with a fine, longitudinal carina extending from epistoma to above upper level of eyes, surface densely punctured, punctures close and deep; surface between punctures dull, minutely, densely reticulate; vestiture inconspicuous. Pronotum and elytra essentially as in female except asperities on anterior area of pronotum slightly stronger.

TYPE MATERIAL. The holotype (♀) in the SLWC bears the data: Tapanti, Cart., Costa Rica, 4000 ft., X-24-1963 S.L. Wood/Unknown vine/HOLOTYPE *Pityophthorus lenis* S.L. Wood, 1976. The allotype and 11 paratypes bear the same data as the holotype.

Most of the type material is in the SLWC, 1 paratype is in the CNC.

HOST. Unknown woody vine.

DISTRIBUTION. Known only from the type locality in Costa Rica.

REMARKS. Adults of this species are most easily recognized by the dense pubescence on the margin of the female frons, by the very small granules on the first and third declivital interstriae, by the dull, reticulate elytral declivity on which the striae punctures are obsolete and only weakly visible, and by the strongly reticulate pronotal disc.

76. *Pityophthorus (P.) exquisitus* (Blackman), **new comb.**

Figs. 57-59

*Neodryocoetes exquisitus* Blackman, 1942, p. 196.*Pityophthorus inceptis* Wood, 1975, p. 396. **New synonymy.**

Length 1.4-1.7 mm, 2.8 times longer than wide.

**Female.** Frons flattened or weakly concave on a semicircular area occupying about 70% of the distance between eyes and extending from epistomal margin to above upper level of eyes; surface of flattened portion concealed by a dense brush of moderately long, incurved yellowish setae, all of these about equal in length and curving inward toward center of frons, those on upper margin may be slightly longer than the others, reaching nearly to epistomal margin. Antennal club broadly oval, 1.1 times longer than wide, widest through segment 3; sutures 1 and 2 weakly arcuate; segment 1 definitely narrower than 2; segments 1 and 2 together occupy about half of total club length. Pronotum only slightly longer than wide, widest at posterior angle; sides moderately arcuate; asperities on anterior slope small and low, scattered at random over surface but showing a very weak tendency to form groups of three or four arranged in rows; summit not pronounced; posterior area of disc very deeply punctured, punctures large and close; surface between punctures opaque, densely microreticulate. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures smaller than those on posterior portion of pronotum, deeply impressed and close; discal interstriae about as wide as striae, impunctate; surface shining, marked with scattered fine lines and points. Declivity evenly convex; interstriae 1 not definitely widened or elevated, with a median row of short, fine, scattered setae; interstriae 2 not widened, essentially as on disc; interstriae 3 not elevated or modified, essentially as on disc except for a median row of about 6 fine setae; punctures of striae 1 and 2 reduced in size but visible, striae 1 not impressed.

**Male.** Frons convex, bearing a very faint longitudinal carina, this carina more evident above upper margin of eyes; surface shining, finely punctured, punctures small and shallow; vestiture inconspicuous. Pronotum and elytra similar to female except sculpture stronger.

**TYPE MATERIAL.** *N. exquisitus*. The holotype (♀) is in the USNM and bears the labels: In wood stem, Mexico, IV-21-41, N.Y. 89506/Lot No. 41-7315/TYPE No. 55977 U.S.N.M./♀/*Neodryocoetes exquisitus* Blkm. The allotype bears the same data. Forty-three paratypes are in the USNM, all collected on various dates from unidentified bark on wood crates or in wood stems, intercepted at quarantine. Two of these paratypes bear the label "candilla sticks".

*P. inceptis*. The holotype (♀) in the SLWC is labeled: 4 mi. W. Quiroga, Mich., Mexico, VI-7-1965, 6700 ft., S.L. Wood/Unknown shrub/HOLOTYPIC *Pityophthorus inceptis* S.L. Wood 1975. The allotype and 1 paratype bear identical labels. All type material is in the SLWC.

The holotypes and paratypes of both names have been examined and compared with one another and with additional specimens. All represent the same species.

**HOSTS.** *Sambucus* sp. and various other unknown shrubs.

**DISTRIBUTION.** Known only from central Mexico but undoubtedly occurs in a much larger area. Specimens (96) examined from:

**MEXICO**

**Jalisco:** Guadalajara, 30.XII.42, in pottery crate under bark, Nogales (USNM, CNC) 40; Tlaquepaque, 7.XI.41, in *Sambucus* wood canes (USNM) 8. **Michoacán:** See type material.

**REMARKS.** Adults of this species are most readily recognized by the dense brush of yellowish setae on the female frons (Fig. 57); by the large, deep punctures on the posterior portion of the pronotum, and by the evenly convex elytral declivity on which striae 1 is not impressed, interstriae 1 is not armed with granules, interstriae 2 is not widened, interstriae 3 is not elevated and interstriae 1, 3, 4, 5, 7 each bear a median row of a few, hairlike setae (Fig. 59).

77. *Pityophthorus (P.) laetus* Wood

*Pityophthorus laetus* Wood, 1976, p. 358.

Length 1.7-1.9 mm, 2.7 times longer than wide.

**Female.** Frons broadly flattened from eye to eye, bearing moderately long setae scattered over surface except on a glabrous, median, longitudinal space, setae on periphery of flattened area much longer and incurved. Antennal club elongate-oval, about 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate, apparently not chitinized, obsolete; first two segments together occupy more than one-half of total club length. Pronotum 1.1 times longer than wide, widest at posterior angles; sides weakly arcuate; asperities on anterior slope numerous and low, scattered in no apparent order; summit not pronounced; posterior area of disc very dull, densely and minutely reticulate and weakly punctured, punctures shallow, of moderate size and indistinct, lateral margins frequently slightly elevated and shining, giving a weakly subasperate appearance on lateral portions; surface between punctures dull, densely minutely reticulate. Elytra 1.7 times longer than wide; apex rather narrowly rounded; discal striae indistinct, punctured in nearly regular rows, punctures small, shallow and very indistinct; discal interstriae about 2.0 times or less wider than striae; surface shining, rather densely sculptured with subrugose elevations, punctures and lines, making discernment of striae punctures difficult; interstriae 1, 3, 5, 7, etc. each with a few, scattered setae, those on interstriae 1 more numerous. Declivity almost evenly convex; interspace 1 very slightly elevated, subrugose and shining, with a distinct median row of erect setae; interstriae 2 very shallowly impressed, equal in width to discal width, subrugose and shining, devoid of median row of setae except on base and apex; interstriae 3 very weakly elevated, equal in height to 1, subrugose and shining and bearing a row of setae as on 1; punctures in striae 1 and 2 very indistinct but usually visible, weakly impressed.

**Male.** Unknown.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the labels: Volcan Poas, Her., Costa Rica, 7700 ft., XI-19-1963, S.L.W./Unknown broken branch/**HOLOTYPE** *Pityophthorus laetus* S.L. Wood, 1976. Two paratypes bear the same data.

All type material is in the SLWC.

**HOST.** Unknown broken tree branch.

**DISTRIBUTION.** Known only from the type locality in Costa Rica.

**REMARKS.** Only the females of this species are known. The characters which will distinguish the females from others of the group are the broadly flattened frons which bears long setae on the periphery, the obscure pronotal and discal striae punctures, the subrugose elytral interstriae, and the distinct but minute setae on the alternate declivital interstriae.

78. *Pityophthorus (P.) parilis* Wood

*Pityophthorus parilis* Wood, 1976, p. 359.

Length 1.6-1.7 mm, 2.9 times longer than wide.

**Female.** Frons flattened on a broad, suboval area extending from epistomal margin to well above upper level of eyes and laterally occupying about 80% of the distance between eyes; surface shining, moderately punctate-granulate, mostly hidden by pubescence; vestiture abundant, consisting of a fringe of long, downward pointing, yellowish setae on the periphery of flattened area and densely placed setae, all of equal length, in the central area, lower margin of eye also with a few, long setae. Antennal club slightly oval to nearly circular, widest through segment 2; sutures 1 and 2 moderately arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest on posterior half; sides moderately arcuate; asperities on anterior slope numerous, isolated, rather low and blunt, scattered in no apparent order; summit not distinct; posterior area of disc bearing large, deep punctures, these nearly touching; surface between punctures shining, marked with numerous, scattered lines and points, subreticulate. Elytra 1.6-1.7 times longer than wide; apex narrowly

rounded; discal striae punctured in regular rows, punctures rather large, deep, almost touching; discal interstriae slightly wider than striae, smooth, shining and impunctate, with a few, very minute points scattered over surface. Declivity convex; interstriae 1 weakly elevated, bearing a median row of small, rounded granules, each granule bearing a stout, hairlike seta that is longer than interstitial width; interstriae 2 not definitely widened, not impressed, devoid of granules or setae; interstriae 3 not elevated, bearing a median row of rounded, setiferous granules as on 1; remaining interstriae each bearing a median row of 6-8 hairlike setae, the row extending from declivital base to apex; punctures in striae 1 and 2 nearly obsolete, weakly impressed in 2, about equal in size to those on disc.

**Male.** Unknown.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: Buenos Aires, Cor., Honduras, 7000 ft., V-7-1964, S.L. Wood/Quercus/HOLOTYPE *Pityophthorus parilis* S.L. Wood, 1976. Two paratypes bear the same data.

All of the type material is in the SLWC.

**HOST.** *Quercus* spp.

**DISTRIBUTION.** Known only from Honduras.

**REMARKS.** The adults of this species are probably most easily distinguished by the large, suboval area of pubescence on the female frons on which the marginal setae are much longer and downward pointing, by the convex declivity which bears small rounded granules on the first and third interstriae, and by the host and distribution.

#### 79. *Pityophthorus (P.) scitulus* Wood

*Pityophthorus scitulus* Wood, 1976, p. 359.

Length 1.8-2.2 mm, 3.2-3.5 times longer than wide.

**Female.** Frons broadly flattened on a large subcircular area extending from epistomal margin to well above eyes and extending laterally nearly from eye to eye; surface shining, otherwise obscured by pubescence; vestiture abundant, consisting of densely placed, long, yellowish, incurved setae on periphery of flattened area and slightly shorter setae in central portion. Antennal club small, nearly circular, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy slightly more than half of total club length. Pronotum 1.3 times longer than wide, widest on posterior one-fourth; sides weakly arcuate; asperities on anterior slope numerous, low, blunt, scattered in no apparent order; summit more distinctly elevated than in related species; posterior area of disc densely punctured, with minute points and fine punctures intermixed, these dense on discal area, becoming gradually less dense toward lateral margin; surface between punctures shining and smooth. Elytra 1.9 times longer than wide; apex subacuminate; discal striae punctured in regular rows, punctures large, deep, almost touching; discal interstriae about equal in width to striae, surface shining, impunctate, with numerous fine, scattered points. Declivity steep; interstriae 1 weakly, narrowly elevated, unarmed; interstriae 2 strongly impressed, narrowed at base then broadened to apex, densely and randomly punctured over surface; interstriae 3 distinctly elevated, distinctly higher than 1, bearing a pair of distinct, acute granules, several smaller, supplementary denticles may also be present on lower third; all interstriae (except 2) bearing a median row of rather long, fine, hairlike setae, the row extending from base of declivity to apex; punctures in striae 1 nearly obsolete, those in 2 distinct.

**Male.** Frons convex to slightly flattened, densely punctured, punctures large, deep, and very close. Pronotum and elytra essentially as in female. Declivity as in female except more deeply sulcate, striae punctures slightly larger and deeper and granules in interstriae 3 distinctly larger.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: Volcan Chiriqui, Panama, 5500 ft., 1-11-1964, S.L.W./Quercus/HOLOTYPE *Pityophthorus scitulus* S.L. Wood, 1976. The allotype and 18 paratypes bear the same data. Five additional paratypes are labeled: Tapanti, Cart., Costa Rica, 4000 ft., VII-2-1963, S.L. Wood/Quercus.



Most of the type material is in the SLWC, 2 paratypes are in the CNC.

HOST. *Quercus* spp.

DISTRIBUTION. Known only from the type-series localities in Costa Rica and Panama.

REMARKS. Adults of this species are readily recognized by the slender body, by the characters of the female frons mentioned in the diagnosis, by the densely punctured posterior portion of the pronotum which bears minute and fine intermixed punctures, by the steep elytral declivity which bears a pair of acute denticles on the third interstriae and punctures in the second, and by the subacuminate elytral apex.

80. *Pityophthorus (P.) conspectus* Wood

*Pityophthorus conspectus* Wood, 1976, p. 360.

Length 1.6-1.8 mm, 2.9 times longer than wide.

**Female.** Frons flattened on a narrow, suboval area that extends from epistomal margin to well above eyes and laterally occupies about 70% of the distance between eyes; surface densely, finely punctured; vestiture abundant, consisting of a dense fringe of moderately long, incurved, yellowish setae on periphery of flattened area and slightly shorter, sparser setae in central area. Antennal club large, 1.1 times longer than wide, widest through segment 2; suture 1 strongly arcuate, 2 less strongly so; segment 1 slightly but distinctly narrower than segment 2; segments 1 and 2 together occupy about half of total club length. Pronotum 1.1 times longer than wide, widest on posterior third; sides moderately arcuate; asperities on anterior slope of moderate size, erect, usually isolated but several may be basally joined, scattered in no apparent order; summit not evident; posterior area of disc densely punctured, punctures large and deep; surface between punctures moderately dull, finely, densely and minutely reticulate. Elytra 1.8-1.9 times longer than wide; apex narrowly rounded; discal striae punctured in regular rows, punctures smaller than those on posterior area of pronotum and moderately deep; discal interstriae about as wide or slightly wider than striae, surface shining, densely, minutely and randomly sculptured with fine lines, points and scratches. Declivity evenly convex, not impressed; interstriae 1 very weakly elevated if at all, bearing a median row of 3 or 4 very fine granules, each with a short, fine seta; interstriae 2 not widened, unarmed, surface as on disc; interstriae 3 not elevated, bearing a median row of 6 or 7 very fine granules, each with a seta as on interstriae 1; remaining interstriae bearing a median row of short, fine setae over declivital region; punctures in striae 1 and 2 distinct, weakly impressed, smaller than those on discal striae.

**Male.** Frons weakly, broadly flattened, with a central, median, smooth space about the size of the antennal club; surface around smooth space densely, strongly punctured, setae short, fine, inconspicuous over punctured area, longer and denser along epistomal margin. Pronotum and elytra essentially as in female except declivital granules slightly larger.

TYPE MATERIAL. The holotype (♀) in the SLWC bears the data: Volcan Irazu, Cart., Costa Rica, IX-26-1963, 7000 ft., S.L. Wood/ Unknown broken branch/HOLOTYPE *Pityophthorus conspectus* S.L. Wood, 1976. The allotype and 1 paratype bear the same data.

All type material is in the SLWC.

HOSTS. Unknown broken branch, probably *Quercus* sp.

DISTRIBUTION. Known only from type locality in Costa Rica.

REMARKS. Adults of this species are distinguished by the evenly convex elytral declivity which bears a few very fine granules on declivital interstriae 1 and 3, by the flattened, sparsely punctured male frons, by the more limited pubescent area with less abundant setae on the female frons, and by the densely and minutely sculptured elytral interstriae.

81. *Pityophthorus (P.) medialis* Wood

*Pityophthorus medialis* Wood, 1976, p. 361.

Length 1.9-2.4 mm, 2.6 times longer than wide.

**Female.** Frons flattened on a suboval area extending from epistomal margin to well above eyes (slightly less than half the total area above eyes) and occupying about 80% of the distance between eyes; surface largely hidden by dense pubescence; vestiture consisting of densely placed setae, those on periphery longer, denser and incurved, those in median area moderately long but shorter than those on periphery. Antennal club about as long as wide, widest through segment 2; sutures 1 and 2 moderately arcuate; segments 1 and 2 together occupy slightly more than half of total club length. Pronotum 1.1 times longer than wide, widest near middle; sides moderately arcuate; asperities on anterior slope low, broad, generally isolated but several may be basally joined, scattered in no apparent order; summit not evident; posterior area of disc subasperate to base, punctures obscure, shallow, moderately large, lateral margin of each slightly elevated and smooth; surface between punctures shining, minutely reticulate and bearing numerous, fine points. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures rather large, moderately deep; discal interstriae 1.0-2.0 times wider than striae, surface moderately dull, marked with numerous fine points, lines and surface irregularities; interstriae 1, 3, 5, 7, 9 each bearing a median row of sparse, setiferous punctures, these occurring usually to base, other interstriae frequently with 3 or 4 setiferous punctures but these not occurring to base, the interstitial setae about 1.5 times longer than interstitial width. Declivity convex, weakly impressed; interstriae 1 weakly elevated, bearing a row of fine, setiferous granules; interstriae 2 not widened, only very weakly impressed, if at all, usually devoid of granules but occasional specimens may bear a median row of small, setiferous granules; interstriae 3 not elevated, similar to 1; remaining interstriae bearing a median row of setae but no granules; punctures in striae 1 and 2 usually visible but may be obsolete, punctures, if visible, smaller than those on discal striae.

**Male.** Frons narrowly, transversely impressed above epistoma, strongly convex above; surface densely punctate-granulate, punctures deep and close; vestiture inconspicuous except setae on epistomal margin very long and dense. Pronotum and elytra essentially as in female except declivity steeper, interstriae 2 more deeply impressed, granules on interstriae 1 and 3 larger and punctures in declivital striae 1 and 2 larger and more obvious.

**Type MATERIAL.** The holotype (♀) in the SLWC is labeled: Volcan Irazu, Cart., Costa Rica, IX-26-1963, 7000 ft., S.L. Wood/Unknown broken branch/HOLOTYPIC *Pityophthorus medialis* S.L. Wood, 1976. The allotype and 52 paratypes bear the same data. Fifteen additional paratypes are labeled: Cerro de la Muerte, Costa Rica, 10,000 ft., VII-1-1964, S.L.W./ *Quercus*.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

**HOST.** *Quercus* spp.

**DISTRIBUTION.** Known only from the type-series localities in Costa Rica.

**REMARKS.** Adults of *medialis* rather closely resemble those of *guatemalensis* but the adults of *medialis* differ by the more evenly convex declivity with smaller granules on the first and third interstriae, by the less strongly impressed male frons, and by the more densely placed setae on the female frons.

82. *Pityophthorus (P.) guatemalensis* Blandford

Figs. 60-62; Map 10

*Pityophthorus guatemalensis* Blandford, 1904, p. 239; Hagedorn, 1910, p. 71; Bright, 1976c, p. 184 (lectotype desig.).

*Pityophthorus quercinus* Wood, 1967, p. 40; Bright, 1977, p. 515 (= *guatemalensis*).

Length 2.25-3.0 mm, about 2.8 times longer than wide.

**Female.** Frons flattened, very faintly concave in median portion; surface finely punctate-granulate, sometimes with a smooth, circular, median spot or faint longitudinal carina just above epistoma; vestiture abundant, consisting of long, hairlike setae, all of equal length, these

sometimes absent on smooth space or on carina above epistoma. Antennal club 1.2 - 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum 1.2 - 1.3 times longer than wide, widest just behind summit; sides subparallel on basal two-thirds; asperities on anterior slope low, indistinct, joined into short, broken and randomly placed rows, surface between rows appearing punctate; summit not evident; posterior area of disc opaque, punctures close and deep; surface between punctures densely microreticulate and micropunctate. Elytra 1.8 times longer than wide; apex rather narrowly rounded; discal striae punctured in regular rows, punctures rather large, deeply impressed; discal interstriae about 1.5 - 2.0 times wider than striae, surface rather brightly shining, smooth with scattered, minute points, impunctate. Declivity convex; interstriae 1 distinctly elevated, higher than 3, bearing a median row of sparse granules; interstriae 2 as wide as on disc, weakly impressed; interstriae 3 weakly if at all elevated, also bearing a median row of small granules; punctures in striae 1 and 2 distinct, slightly smaller than those on disc.

**Male.** Similar in size and proportions to female. Frons rather deeply, transversely impressed above epistoma, convex above impression; surface of convex portion deeply, closely punctured, less deeply punctured on lateral areas of transverse impression, impunctate in median portion. Declivity abrupt, steep; interstriae 1 equal in height to 3, bearing a median row of rather large, acute tubercles; interstriae 2 distinctly wider than on disc, deeply impressed, smooth; interstriae 3 arcuate, tubercles slightly smaller than those on interstriae 1; striae punctures obsolete.

**TYPE MATERIAL.** *P. guatemalensis*. Blandford described this species from a series of 20 specimens, now in the BMNH. The lectotype, designated by Bright (1976c), bears the labels: a yellow bordered, circular disk printed "Cotype"/Guatemala City, Champion/F.W. Sampson Coll, B.M. 1926-482 (label upside down)/B.C.A. Col. IV.6. *Pityophthorus guatemalensis* Blandf/*Pityophthorus guatemalensis* Bld. in Blandford's handwriting/and my lectotype label. Eight other specimens from the type series were examined. The lectotype is deposited in the BMNH.

*P. quercinus*. The holotype (♀) is in the SLWC and bears the data: 3 mi. W. El Salto, Dr., Mexico, VI-7-1965, 7500 ft., S.L. Wood/ *Quercus*/HOLOTYPE *Pityophthorus quercinus* S.L. Wood, '66. The allotype and 41 paratypes bear the same data. Twelve additional paratypes were collected 33 miles east of Morelia, Michoacán, Mexico, on June 14, 1965, also from *Quercus* sp. by S.L. Wood and 12 paratypes were collected 10 miles west of El Salto, Durango, Mexico, in July 1964, from *Quercus* sp. by J.B. Thomas.

The type material collected by Wood is in the SLWC and that collected by Thomas is in the CNC.

**HOST.** *Quercus* spp. The *Pinus ayacahuite* record noted below is an accidental occurrence or an error.

**DISTRIBUTION.** Known definitely from Durango to Guatemala (Map 10). One specimen from the Davis Mountains of Texas is tentatively referred to this species (see below). Specimens (113) examined from:

#### UNITED STATES

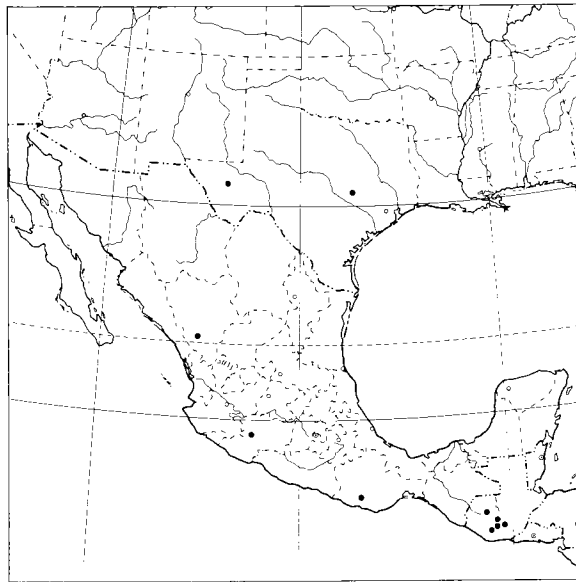
**Texas:** Davis Mountains, 9.VI.54, D.J. & J.N. Knull (CNC) 1 (ident.?).

#### MEXICO

**Durango:** 5 mi W of El Salto, 7.VI.65, *Pinus ayacahuite*, S.L. Wood (SLWC) 7.

**Michoacán:** See type material. **Oaxaca:** 184 km S of Oaxaca, 12.V.71, *Quercus* sp., 6300', D.E. Bright (CNC) 13; 115 mi S of Oaxaca, 27-30.V.71, *Quercus* sp., 6000', D.E. Bright (CNC) 9.

**GUATEMALA:** Calderas, Champion (BMNH) 1; Capetillo, Champion (BMNH) 4; Quiche Mtns., 7-9000', Champion (BMNH) 1; Zapote, Champion (BMNH) 1.



MAP 10. Collection localities for *P. (Pityophthorus) guatemalensis*.

**BIONOMICS.** Wood (1967) reports that the type series of *quercinus* was taken from the phloem tissues of the bole of a large oak tree. The Oaxaca specimens were taken from under the bark of large limbs.

**REMARKS.** Adults of this species are easily distinguished from other species in the genus. In the males, the elytral declivity is steep, interstriae 1 and 3 are distinctly elevated and each bears from three to five large, acute granules (Fig. 62); declivital interstriae 2 is distinctly impressed below interstriae 1 and 3 and is wider than it is on the disc (Fig. 62) and the frons is evenly convex, rather deeply impressed above epistoma and the surface is strongly punctate (Fig. 61). In the females, the elytral declivity is more sloping, interstriae 1 and 3 are only weakly elevated and bear very small granules; declivital interstriae 2 is not deeply impressed, and is not wider than it is on the disc and the frons is very weakly concave or flattened, densely pubescent in the central portion only except for a median smooth space just above the epistoma (Fig. 60).

Wood (pers. corresp.) considers *quercinus* as a distinct species based on certain anatomical differences seen on the frons of the type and on the geographic distribution. In his analysis, females of *guatemalensis* have a more distinctly convex frons, with finer punctures and a distinct carina on a smooth, median area. The females of *quercinus* have a flattened frons, with coarse punctures and no carina. These differences are present on the types but when additional specimens of *guatemalensis* were examined it was found that the frons of a few specimens displayed characters intermediate between *guatemalensis* and those of *quercinus*. It appears that the differences noted by Wood are individual variations and cannot be used to indicate the existence of two species.

The one specimen from the Davis Mountains in Texas is a female and differs somewhat from other females of this species by the smaller granules on the first and third declivital interstriae, by the more obscure stria punctures, and by the more shining pronotal surface. I consider these differences to be within the limits of variation of this species and tentatively refer this specimen to *guatemalensis*.

## DELETUS GROUP

The species in this group are characterized by the presence of from two to four sharp, rather large, serrations on the anterior margin of the pronotum (Fig. 63), by the prominent pronotal summit with the asperities clustered near the summit and by the convex, generally unmodified elytral declivity. Two species occur in the western and southwestern United States and northern Mexico.

KEY TO SPECIES IN THE *Deletus* group

1. Declivital interstriae 2 not sulcate, much wider than discal width, surface smooth, opaque to brightly shining; punctures in declivital striae 2 absent; male carina on frons very weakly elevated or absent; female frons flattened; declivital interstriae 1 elevated higher than remainder of declivital surface; New Mexico . . . . . 83. *woodi* Bright (p. 109)
- Declivital interstriae 2 very weakly to moderately impressed, equal to discal width, surface not especially smooth and shining (Fig. 65); punctures in declivital striae 2 visible to obsolete; male carina on frons absent, or if present, varying from distinctly to weakly elevated or toothlike (Fig. 64); declivital interstriae 1 equal in height to 3 or lower (Fig. 65); western United States and northern Mexico . . . . . 84. *deletus* LeConte (p. 110)

83. *Pityophthorus (P.) woodi* Bright

*Pityophthorus woodi* Bright, 1977 p. 531.

Length 1.2-1.6 mm, 2.7 times longer than wide.

**Female.** Frons broadly flattened from epistoma to well above eyes, weakly concave in median portion; surface sparsely punctured, except more strongly so at margins of flattened area; setae short and inconspicuous. Antennal club broad, 1.1 times or less longer than wide, widest through segments 2 and 3; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide or slightly longer than wide; sides arcuate; summit high and prominent; asperities on anterior slope erect, acute, clustered near summit; posterior area of disc smooth, punctures large and close; surface between punctures shining. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures fine and shallow; discal interstriae minutely subrugulose; interstriae 1, 3, 5, 7, 9 each with a median row of sparse, setiferous punctures. Declivity convex; interstriae 1 weakly elevated, especially at midpoint of slope; interstriae 2 very wide, encompassing entire declivital surface, the surface opaque to shining, glabrous; striae punctures not visible except on extreme lateral areas.

**Male.** Similar to female except frons flattened and more strongly punctured, sometimes a faint, longitudinal, median carina may be present.

**TYPE MATERIAL.** The holotype (♀) in the CNC bears the data: N. MEX., Sierra Co., 7 mi. W. Kingston, VII.22.1974, D.E. Bright/*Pinus edulis*/HOLOTYPE *Pityophthorus woodi* D.E. Bright, CNC No. 13728. The allotype and 8 paratypes bear the same data. Two paratypes were collected at the same locality and from the same host by S.L. Wood on 5 June 1969.

The holotype, allotype, and most of the paratypes are in the CNC, additional paratypes are in the KESC and the SLWC.

**HOST.** Known only from *Pinus edulis*.

**DISTRIBUTION.** Known only from the type locality in New Mexico but certainly occurs much more extensively.

**REMARKS.** Adults of this unique species are easily recognized by the completely impunctate, opaque to shining, evenly convex, elytral declivity.

84. *Pityophthorus (P.) deletus* LeConte

Figs. 63-65; Map 11

- Pityophthorus deletus* LeConte, 1879, p. 519; Hagedorn, 1910, p. 71; Chamberlin, 1939, p. 364; Bright, 1976c, p. 185 (lectotype desig.); Wood, 1977b, p. 387.
- Pityophthorus inquietus* Blackman, 1928, p. 46; Chamberlin, 1939, p. 364; Wood, 1971a, p. 425; Wood, 1977b, p. 387 (= *deletus*).
- Pityophthorus monophyllae* Blackman, 1928, p. 47; Chamberlin, 1939, p. 365; Bright & Stark, 1973, p. 107; Wood, 1977b, p. 387 (= *deletus*).
- Pityophthorus socius* Blackman, 1928, p. 48; Chamberlin, 1939, p. 365; Bright, 1971, p. 67 (= *monophyllae*).
- Pityophthorus dolus* Wood, 1964, p. 65; Bright & Stark, 1973, p. 107. **New synonymy.**
- Pityophthorus piceus* Bright, 1966, p. 297; Bright, 1971, p. 67 (= *monophyllae*).
- Pityophthorus praealtus* Bright, 1966, p. 303; Bright & Stark, 1973, p. 106; Wood, 1977b, p. 387 (= *deletus*).
- Pityophthorus brucki* Bright, 1971, p. 63; Bright & Stark, 1973, p. 106; Wood, 1977b, p. 388 (= *deletus*).

Length 1.4-2.0 mm, 2.8-2.9 times longer than wide.

**Female.** Frons flattened to weakly convex from above upper level of eyes to epistoma, sometimes weakly transversely impressed or weakly concave above epistoma; surface brightly to weakly shining, weakly punctured, punctures fine, widely separated, space between punctures somewhat roughened or reticulate; vestiture sparse to abundant, varying from short, fine setae scattered over surface to setae more abundant, those on periphery of flattened area long and incurved. Antennal club oval, about 1.4 times longer than wide, widest through segment 3; segment 1 narrower than others; suture 1 straight, transverse, 2 more angulate to arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide, widest behind summit; sides evenly arcuate; summit high and prominent; asperities on anterior slope erect, acute, arranged into about three broken, irregular, concentric rows or scattered in no apparent order, all somewhat clustered near summit; posterior area of disc densely punctured, punctures deep and close; surface between punctures varying from brightly shining and smooth to more opaque and minutely reticulate. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures varying from fine to moderately large and moderately impressed; discal interstriae shining to opaque, smooth to minutely reticulate; interstriae 1, 3, 5, 7, 9 each with a median row of sparse, setiferous punctures. Declivity convex, impressed or not; interstriae 1 not impressed to moderately impressed below elytral surface, with a median row of extremely fine granules; interstriae 2 weakly to moderately sulcate, width equal to discal width; interstriae 3 not elevated, equal in height to 1 or higher, with a median row of granules as in 1; punctures of striae 1 and 2 obsolete to moderately distinct.

**Male.** Frons convex, surface shining, more deeply punctured than on female; carina variable, either absent, or very weakly indicated or prominent, if prominent then either toothlike and occurring just above epistoma or extending from epistoma to upper eye level. Otherwise closely resembles female.

**TYPE MATERIAL.** *P. deletus*. The MCZ has 4 specimens under the name *deletus*. The first specimen (female) was designated as the lectotype by Bright (1976b) and is labeled: Veta Pass, Col., 21-6/Type 1286/668 (in pencil)/*P. deletus* Lec./LECTOTYPE *Pityophthorus deletus* LeConte, D.E. Bright, 1976. Two of the remaining specimens in the MCZ bear identical labels; the fourth specimen is labeled: Garland, Col., 22-6/ *deletus* 4. Eight additional specimens in the USNM bear identical labels but were evidently not seen by LeConte.

*P. inquietus*. The holotype (♀) is in the USNM and bears the data: Las Vegas H.S., N.M./Coll. Hubbard and Schwarz/*Pinus edulis*/Holotype *Pityophthorus inquietus* Blackman, No. 41272. The allotype and 148 paratypes bear the same data.

The type series has been broken up so paratypes are now in the DFEC, the CNC, and the USNM.

*P. monophyllae*. The holotype (♀) in the USNM bears the data: Argus Mtns., May 91, K/Coll. on *Pinus monophyllae*/Through C.V. Riley/ ♀/Holotype Pityophthorus monophyllae Blackman, No. 41273. The allotype and 9 paratypes bear identical data.

All of the type material is in the USNM.

*P. socius*. The holotype (♀) in the USNM bears the same data as that of *monophyllae* cited above except for the holotype label. The allotype and 13 paratypes also bear the same data. One additional paratype is labeled: Hopk. U.S. 5520/Reared Apr. 29, '09/J.L. Webb, Colr./*Pinus ponderosa*; 2 paratypes are labeled: Hopk. U.S. 5525/Bred July 24-7/Capitan Mt., Boreal, N.M./*Pinus strobiformis*.

The holotype, allotype, and most of the paratypes are in the USNM, additional paratypes are known to be in the DEFC and the CNC.

*P. dolus*. The holotype (♀) is in the SLWC and bears the data: McCloud, Siskiyou Co., Calif., June 14, 1961/*Pinus ponderosa*/S.L. Wood, J.B. Karren and D.E. Bright, collrs/HOLOTYPY Pityophthorus dolus S.L. Wood, 1964. The allotype and 24 paratypes bear the same data.

The holotype, allotype, and most of the paratypes are in the SLWC, additional paratypes are in the DEBC.

*P. piceus*. The holotype (♀) of this species is in the CASC and bears the labels: Mt. Pinos, Ventura Co., Cal., IX-9-65/*Pinus flexilis*/ D.E. Bright and D.N. Kinn, collrs/HOLOTYPY Pityophthorus piceae D.E. Bright. The allotype and 5 paratypes bear the same data.

The holotype and allotype are in the CASC, paratypes are in the CISC and the DEBC.

*P. praealtus*. The holotype (♀) is in the CASC and bears the data: Mt. Shasta, Siskiyou Co., Calif., VII-15-63/*Pinus albicaulis*/D.E. Bright and B.A. Barr coll/HOLOTYPY Pityophthorus praealtus Bright. The allotype and 6 paratypes bear the same data.

The holotype and allotype are in the CASC, paratypes are in the CISC and the CNC.

*P. brucki*. The holotype (♀) in the OSUC bears the data: Mt. Hawkings, Cal., VI-23-1940/*Pinus lambertiana*/C.R. Bruck Collection/J.N. Knull collection/Holotype Pityophthorus brucki D.E. Bright. The allotype and 10 paratypes bear the same data. Two additional paratypes are labeled: Idyllwild, Riverside Co., California, 24 October 1941/*Pinus lambertiana*/D. DeLeon, collr.

The holotype, allotype, and 4 paratypes are in the OSUC, additional paratypes are in the CNC, the CISC, and the DEBC.

HOSTS. *Pinus* spp. and rarely *Abies* spp., *Picea* spp., *Pseudotsuga* sp.

DISTRIBUTION. California to Colorado, south to Durango, Mexico (Map 11). Specimens (774) examined from:

#### UNITED STATES

**Arizona:** Bear Wallow, Santa Catalina Mtns., 11.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 5; Carr Canyon, Santa Cruz Co., 8.VIII.62, *Pinus flexilis*, S.L. Wood (SLWC) 15; Chiricahua Mtns., 18.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 25; Dragoon Mtns., Cochise Co., 17.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 10; Jacob Lake, 3.VIII.74, *Pinus edulis*, D.E. Bright (CNC) 5; Madera Canyon, Santa Rita Mtns., 29.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 13 and *Pinus cembroides*, D.E. Bright (CNC) 13; Montezuma Pass, Cochise Co., 25.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 4; Mount Lemmon, Pima Co., 5.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 11; Parker Canyon Lake, Cochise Co., 25.VII.68, *Pinus cembroides*,

D.E. Bright (CNC) 13; Pinery Canyon, Chiricahua Mtns., 20.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 18; Rustlers Park, Chiricahua Mtns., 7.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 7; San Francisco Mtns., 18.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 4; Santa Catalina Mtns., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 25; Santa Rita Mtns., 29.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 34; 8 mi E of Sedona, 13.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1; 12 mi N of Sedona, *Pinus ponderosa*, D.E. Bright (CNC) 2; Spencer Canyon, Santa Catalina Mtns., 11.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 6. **California:** Callahan, X.1967, *Pinus balfouriana*, B.A. Barr (CNC) 9; Devils Post Pile, 8.VIII.40, *Abies magnifica* C.R. Bruck (OSUC) 1; 10 mi N of Westgard Pass, Inyo Co., 6.IX.68, *Pinus aristata*, D.E. Bright (CNC) 7 and *Pinus monophylla*, D.E. Bright (CNC) 9 and *Pinus flexilis*, D.E. Bright (CNC) 3. **Colorado:** 2 mi E of Gould, 12.VI.68, *Pinus contorta*, S.L. Wood (SLWC) 2; Poudre Canyon, Larimer Co., 12.VI.68, Douglas fir, S.L. Wood (SLWC) 1. **New Mexico:** Bingham Summit, 1.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 1; Clines Corners, 9.VII.68, *Pinus edulis*, D.E. Bright (CNC) 8; Cloudcroft, 3.VI.69, *Picea pungens*, S.L. Wood (SLWC) 6 and *Pinus strobiformis*, S.L. Wood (SLWC) 2 and *Pinus edulis*, S.L. Wood (SLWC) 12; 7 mi W of Kingston, 5.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 14 and 22.VII.74, *Pinus edulis*, D.E. Bright (CNC) 6; 5 mi W of Roberts, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 2; La Placita, 29.V.69, *Pinus edulis*, S.L. Wood (SLWC) 5; 5 mi W. of Magdalena, 10.VII.68, *Pinus edulis*, D.E. Bright (CNC) 3; Nogal Lake Forest Camp, 1.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 4; Sandia Mtns., 30.V.69, *Picea engelmannii*, S.L. Wood (SLWC) 5 and 31.V.69, *Pinus edulis*, S.L. Wood (SLWC) 11 and 8.VII.74, *Picea engelmannii*, D.E. Bright (CNC) 8; Sandia Peak, 9.VII.68, *Pinus flexilis*, D.E. Bright (CNC) 4; 5 miles W of San Lorenzo, 6.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 4; Santa Fe, 7.VI.76, P. Martinez (CNC) 1. **South Dakota:** 2 miles E of Cheyenne Crossing, 18.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 1; 7 mi W of Custer, 16.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 1. **Texas:** Big Bend National Park, 4.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 10; Guadeloupe Mountains National Park, 17.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 42; Madera Canyon, 23 mi N of Fort Davis, 19.VII.74, *Pinus edulis*, D.E. Bright (CNC) 28; McDonald Observatory, Jeff Davis Co., 5.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 25. **Utah:** Beaver, 16.IV.46, *Pinus edulis*, S.L. Wood (SLWC) 7; Convulsion, Fishlake National Forest, 9.VI.60, *Pinus flexilis*, S.L. Wood (SLWC) 1; Gooseberry, Fishlake National Forest, 9.VI.60, *Pinus edulis*, S.L. Wood (SLWC) 2; Iron Mountain, 13.V.50, *Pinus monophylla*, S.L. Wood (SLWC) 1; Logan Canyon, various dates, *Pinus flexilis*, W.P. Nye (SLWC, USNM) 9 and *Pinus contorta*, S.L. Wood (SLWC) 9; McKee Draw, Ashley National Forest, 16.VI.60, *Pseudotsuga taxifolia*, S.L. Wood (SLWC) 3; 8 mi E of Monticello, 29.V.69, *Pinus edulis*, S.L. Wood (SLWC) 2. **Wyoming:** 5 mi W of Buffalo, 20.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 5.

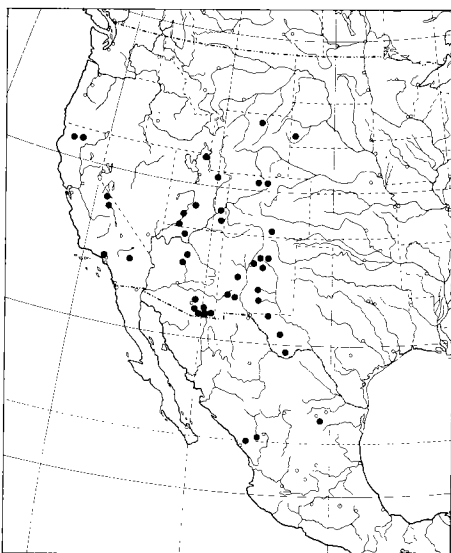
#### MEXICO

**Coahuila:** 18 mi SE of Saltillo, 21.V.71, *Pinus cembroides*, D.E. Bright (CNC) 6. **Durango:** 23 mi W of Durango, 4.VI.65, *Pinus cembroides*, S.L. Wood (SLWC) 1; 40 km W of Durango, 14.VI.71, *Pinus cembroides*, D.E. Bright (CNC) 1; 9 mi E of El Palmito, 15.VI.71, *Pinus ayacahuite*, D.E. Bright (CNC) 4.

REMARKS. This is an extremely variable species and my treatment here may include more than one species or subspecies. Some of the synonyms given above may actually represent distinct species, but at present, I am not able to determine the limits of variation. Additional specimens plus biological studies are needed to unravel this complex.

The longitudinal carina on the male frons is very variable. It may be distinctly elevated to very weakly elevated, extending from the epistoma to the upper level of



MAP 11. Collection localities for *P. (Pityophthorus) deletus*.

the eyes or beyond, or it may be a small, toothlike elevation located just above the epistomal margin or in the middle of the frons, or it may be absent. All three conditions intergrade into one another so that it is impossible to detect breaks in the continuum. Those conditions listed above are only the most obvious expressions of the character. All three conditions plus the intergrades can often be found in one population.

The female frons is also extremely variable. It may be evenly flattened and more or less weakly, transversely impressed above the epistomal margin, or flattened and weakly concave in the middle, or it may be weakly convex. The setae may be short, scattered and generally inconspicuous to abundant, long and incurved on the periphery of the flattened area. As in the males, these conditions represent only the ends of a continuum of character expression. Usually the entire range of variation is not present in any one population, so that one population may have short setae on the female frons, another may have long setae, and a third may be somewhere in between.

The elytral declivity also shows diversity. Generally the declivity is evenly convex and interstriae I may or may not be weakly impressed. As above, the expression of this character occurs in a continuous range from one end of the cline to the other, with no distinct breaks or steps detectable.

An analysis of the host preference in conjunction with anatomical characters was performed. I was unable to correlate host preference with any of the variations. Likewise no distinction of species could be detected using geographical distribution.

A comment on the names placed in synonymy should be made here. The type material of all the names was examined during this study. *P. dolus* was distinguished by Wood by the reticulate or subreticulate posterior portion of the pronotum, by the fine male carina, and by the abundant setae on the female frons. These characters were also seen in varying degrees in other specimens from throughout the range and from numerous host species. Therefore, I feel that *dolus* represents one of the variations in the same degree that other names in synonymy represent other variations. *P. praealtus* has no carina on the male frons (on some specimens an extremely fine ridge can be detected) and very sparse setae on the female frons. This form has been

found only in pine species at high elevations in California. It may be a distinct species but at present its range of variation fits into that attributed to *deletus* as at present understood. *P. monophyllae* represents a possible third species. Its adults are characterized by a small, toothlike carina on the male frons and by the moderately abundant setae on the female frons. It is found in the pinyon and related pines in more xeric habitats. It too fits within the variation limits of *deletus* and is here considered a synonym.

Further studies, concentrating on behavioral or biological aspects, are needed to fully understand this complex.

#### CRISTATUS GROUP

Only one species is in this group and it is easily distinguished by the acute, elevated ridge that forms almost a complete circle on the elytral declivity (Fig. 68).

#### 85. *Pityophthorus (P.) cristatus* Wood

Figs. 3, 66-68; Map 12

*Pityophthorus cristatus* Wood, 1964, p. 68; Bright, 1971, p. 68.

Length 1.8-2.3 mm, 2.6 times longer than wide.

**Female.** Frons weakly flattened on an area from epistoma to level above upper margin of eye, sometimes very weakly, transversely concave above epistoma and sometimes with a low median epistomal elevation; surface rather finely, densely punctured on the flattened area, more deeply punctured above and on the sides; vestiture inconspicuous. Antennal club elongate-oval, 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1 times or less longer than wide, widest just behind summit; sides straight to weakly arcuate; summit prominent, transverse impression moderately well developed; asperities on anterior slope small, acute, scattered in no apparent order; posterior area of disc moderately dull, punctures rather large, deep; surface between punctures reticulate. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae and interstriae rather strongly punctured, punctures large, deep, rather confusedly placed, making recognition of striae and interstriae difficult; surface between punctures shining, finely reticulate. Declivity oblique, excavated; an acute, strongly elevated, suberrate, arcuate ridge extends from interstriae 2 to apex, and around to the opposite interstriae 2; interstriae 1 weakly elevated, with a median row of fine granules; striae 1 and 2 distinctly punctured; interspace 2 wider than on disc.

**Male.** Identical with female except frons bears a very faint longitudinal carina extending across flattened area and punctures in flattened area slightly larger and deeper.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: 9 mi. N. Perote, Vera Cruz, Mexico, 7200 ft./Taken on *Pinus* sp./HOLOTYPE *Pityophthorus cristatus* S.L. Wood, 1964. The allotype and 4 paratypes bear the same data; 6 additional paratypes are labeled: Las Vigas, Veracruz, Mex., 5 June 1962, R. Coronado P./*Pinus*, and 2 paratypes are labeled: Tulancingo, 19 mi. E. Hdgo., Mex., VI-24-58, 6500 ft./Taken on *Pinus* sp.

All of the type material is in the SLWC.

**HOSTS.** *Pinus ayachuite*, *engelmannii*, *leiophylla*, and *lumholtzi* and probably numerous other species of *Pinus*.

**DISTRIBUTION.** Southern Arizona to Oaxaca, Mexico (Map 12). Specimens (101) examined from:

#### UNITED STATES

**Arizona:** Carr Canyon, Cochise Co., 23.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 10; Miller Canyon, Huachuca Mtns., 23.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 4; Santa Rita Mtns., Santa Cruz Co., 29.VII.68, *Pinus engelmannii*, D.E. Bright (CNC) 4; Santa Rita Mtns., Madera Canyon, 29.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 2.

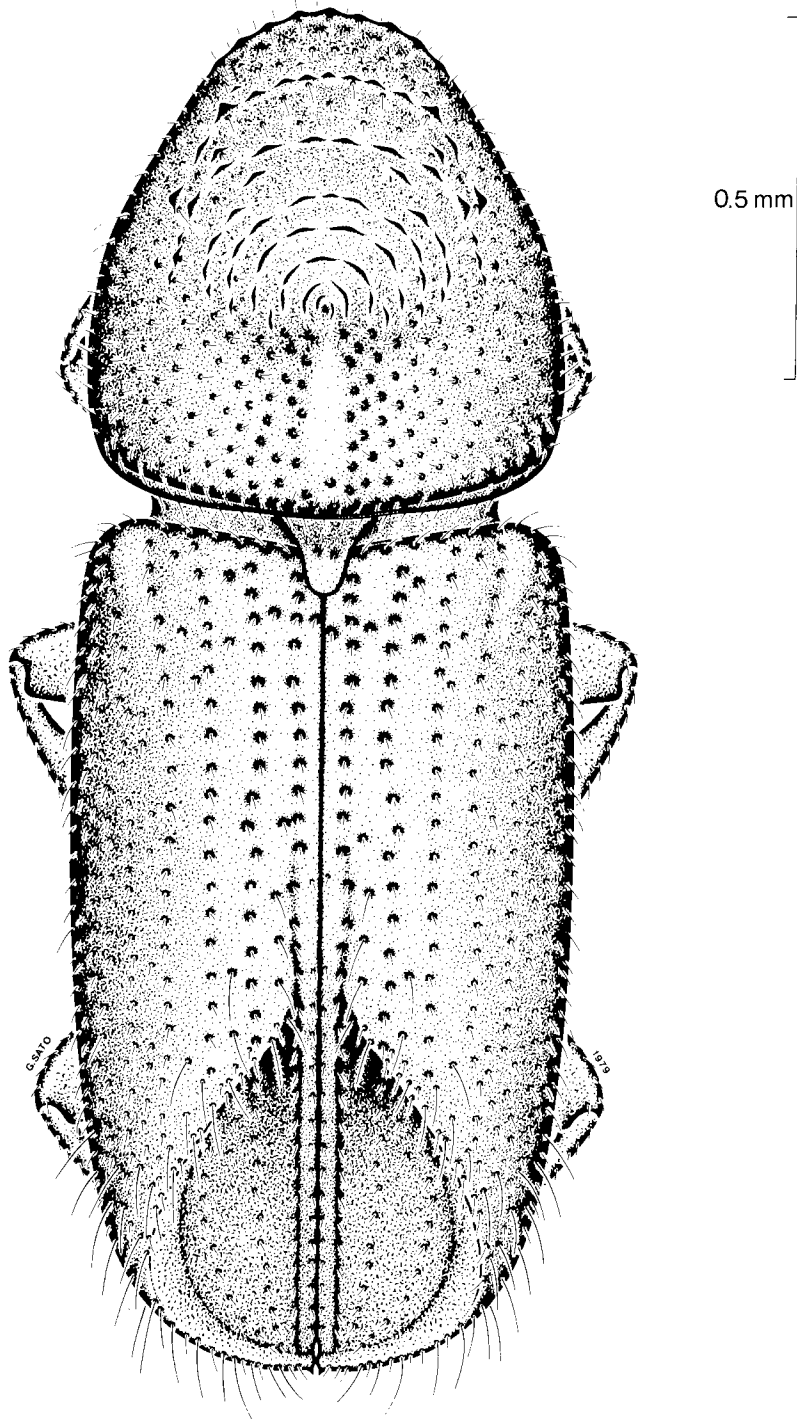
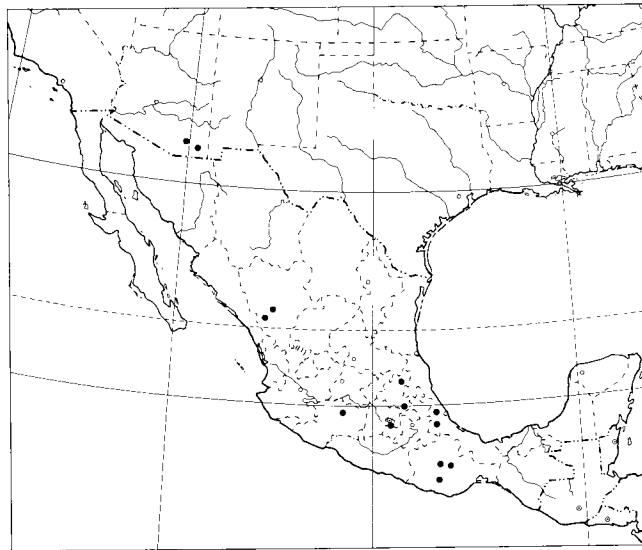


FIG. 3. *Pityophthorus cristatus* Wood.

## MEXICO

**Durango:** 9 mi E of El Palmito, 15.VI.71, *Pinus lumholtzi*, D.E. Bright (CNC) 26; 3 mi E of El Salto, 21.VI.64, H.F. Howden (CNC) 1; 10 mi W of El Salto, 29.VI.64, *Pinus ayacahuite*, J.B. Thomas (CNC) 1. **Hidalgo:** 8 mi S of Durango, 29.VI.69, *Pinus* sp., D.E. Bright (CNC) 2. **Mexico:** Ocoyoacac, 16.VII.69, *Pinus leiophylla*, D.E. Bright (CNC) 2. **Michoacán:** Quiroga, 21.III.54, *Pinus* sp., R.L. Furniss (USNM) 7. **Oaxaca:** 32 mi SE of Nochixtlán, 14.VII.69, *Pinus* sp., D.E. Bright (CNC) 1; 33 mi NE of Oaxaca, 8.VI.71, *Pinus* sp., D.E. Bright (CNC) 11; 75 mi S of Oaxaca, on highway 131, 30.V.71, *Pinus* sp., D.E. Bright (CNC) 11. **Veracruz:** 25 mi W of Orizaba, 29.IV.69, *Pinus* sp., D.E. Bright (CNC) 5.

REMARKS. This very odd species is not closely related to any known species of *Pityophthorus*. Adults are easily recognized by the sharply elevated, arcuate lateral margins of the declivity. It is evidently common in Mexico.



MAP 12. Collection localities for *P. (Pityophthorus) cristatus*.

## DIGLYPHUS GROUP

This group is characterized by the straight, usually elevated, declivital interstriae 3 which is joined to interstriae 9 near the elytral apex. If, as in some cases, interstriae 3 and 9 are not elevated or are only weakly so, then the second and third rows of strial punctures can be seen joining the ninth and tenth rows respectively. Other characters that, in combination with the above, may be useful are: the regular, even strial rows on the elytral disc, the impunctate elytral interstriae on the disc, the narrow segment 1 of the antennal club and the reticulate, interpuncture surface on the posterior portion of the pronotum. Five species are placed in this group.

## KEY TO SPECIES IN THE Diglyphus group

1. Male frons distinctly transversely impressed above epistoma with a distinct, longitudinal carina or a tubercle on epistoma; setae on female frons abundant, much longer on periphery ..... 2

- Male frons convex, with a moderately elevated, longitudinal carina (Fig. 70); setae on female frons moderately abundant, those on periphery slightly longer (Fig. 69); Oaxaca to Guatemala . . . . . 86. *glabratulus* (Schedl) (p. 117)
- 2. Male frons without distinct carina, frequently a weak elevation or small, laterally flattened tooth is present on epistoma; declivital interstriae 2 weakly impressed, 1 and 3 weakly elevated; Veracruz to Oaxaca . . . . . 87. *ineditus* Bright (p. 118)
- Male frons with a distinct, longitudinal carina; declivital interstriae 2 distinctly impressed, 1 and 3 distinctly elevated . . . . . 3
- 3. Female frons usually glabrous and impunctate on a narrow, longitudinal area which usually extends from epistoma to vertex, remainder of surface punctate and pubescent; carina on male frons more strongly elevated and toothlike on lower half; declivital interstriae 3 distinctly elevated . . . . . 4
- Female frons punctured and pubescent over entire surface; carina on male frons weakly, evenly elevated from epistoma to upper level of eye; declivital interstriae 3 weakly elevated; Durango . . . . . 88. *vespertinus* Bright (p. 119)
- 4. Setae on declivital interspace 3 shorter than width of interstriae; Michoacán to Veracruz and Oaxaca . . . . . 89. *leiophylla* Blackman (p. 120)
- Setae on declivital interstriae 3 at least 3 or more times longer than interstitial width in female, at least 2 times longer in male; Guatemala . . . . 90. *diglyphus* Blandford (p. 121)

86. *Pityophthorus* (*P.*) *glabratulus* (Schedl)

Figs. 69-71

*Ctenyophthorus glabratulus* Schedl, 1956, p. 26.

*Neodrycoetes glabratulus*: Schedl, 1964, p. 310.

*Pityophthorus glabratulus*: Bright, 1976c, p. 186 (lectotype desig.).

Length 1.8-2.3 mm, about 2.6 to 2.7 times longer than wide.

**Female.** Frons flattened from epistoma to well above upper margin of eyes; surface shining, densely punctured, sometimes with a wide, impunctate, median, longitudinal space, the lower end of which is sometimes slightly elevated into a weak, subcarinate elevation; vestiture on surface abundant except on median, impunctate area, and consisting of rather long, fine setae, those on periphery longer and incurved. Antennal club 1.2 times longer than wide, widest through segment 3; suture 1 only weakly arcuate, 2 much more strongly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide, widest near base; sides rather weakly arcuate; asperities on anterior slope rather small, low, scattered in no apparent order; summit prominent; posterior area of disc with indistinct, rather shallow punctures, these separated by a distance about equal to their own diameter; surface between punctures opaque, minutely reticulate. Elytra 1.5 times longer than wide; apex broadly rounded; discal striae punctures large, close, not deeply impressed; discal interstriae about 2.0 times wider than striae, flat to weakly convex, surface minutely reticulate, opaque, with several punctures in interstriae 1, 3, 5, 7, and 9. Declivity convex; interstriae 2 impressed, glabrous, impunctate, as wide as on disc; interstriae 1 and 3 elevated, 3 more so, each with a row of fine granules; interstriae 9 distinctly elevated and joined with 3 just before apex; striae punctures distinct, smaller and less impressed than those on disc. Vestiture very sparse, consisting of minute, striae setae and longer, sparser, interstitial setae, the latter about as long as the interstitial width.

**Male.** Frons convex, divided by a prominent, shining, moderately elevated, longitudinal, median carina, which extends from epistoma to well above upper level of eyes; surface on each side of carina finely punctate-granulate, with fine, short, hairlike setae. Antennal club slightly smaller than in female. Pronotum and elytra essentially as in female.

**TYPE MATERIAL.** The original type series of this species is divided between the collections of K.E. Schedl, Lienz, Austria, and F. Schwerdtfeger, Göttingen, Germany. Since no holotype was designated, I (1976c) have designated a specimen in the Schedl collection as lectotype. It bears the labels: 58, Quezaltenango, Pin. rud.; 6.91951; 2350 m, Guatemala, leg F. Schwerdtfeger/ ♀ /TYPE, *Ctenyophthorus*

*glabratulus* Schedl/ LECTOTYPE *Ctenyophthorus glabratulus* Schedl, D.E. Bright, 1976. The remaining specimens are now labeled paralectotypes: 3 have been returned to Schedl and 2 to Schwerdtfeger.

HOSTS. Known from *Pinus ayacahuite*, *montezumae*, *ochoterenai*, *oocarpa*, *pringlei*, and *pseudostrobus*. Probably occurs in all species of pines in its range.

DISTRIBUTION. Southern Mexico and Guatemala, and probably into Honduras. Specimens (80) examined from:

#### MEXICO

**Chiapas:** 8 mi E of San Cristobal, 6.VI.69, *Pinus ochoterenai*, *P. ayacahuite* and *P. montezumae*, D.E. Bright (CNC) 30; 20 mi N of Yerba Buena, Bochil, 21.V.69, *Pinus oocarpa*, D.E. Bright (CNC) 6. **Oaxaca:** 32 mi E of Nochixtlán, 14.VII.69, *Pinus pringlei*, D.E. Bright (CNC) 30.

GUATEMALA: Guatemala City, 30.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 1; Quezaltenango, 26.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 5; Totonicipán, 28.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 2.

REMARKS. Adults of this species are very similar to those of *diglyphus* and *leiophyllae*. The differences mentioned in the key are the most obvious. In addition, the very fine setae on the third declivital interstriae (Fig. 71) will assist in distinguishing adults of *glabratulus* from those of *diglyphus*. The characteristics of the female frons mentioned in couplet 1 of the key will also separate *leiophyllae* from *glabratulus*, and the more strongly, distinctly elevated third declivital interstriae and the geographical distribution will separate adults of *glabratulus* from those of *vespertinus*.

#### 87. *Pityophthorus (P.) ineditus* Bright

*Pityophthorus ineditus* Bright, 1976b, p. 434.

Length 1.9-2.2 mm, about 2.8-2.9 times longer than wide.

**Female.** Frons broadly flattened nearly from eye to eye and from epistoma to well above upper level of eye, weakly concave on a small median area; surface rather brightly shining, with widely separated, fairly deep punctures, these more abundant around indented peripheral margin; vestiture consisting of abundant, long, incurved setae around margin and shorter, much less abundant setae over remainder of flattened area. Antennal club about 1.3 times longer than wide, widest through segment 3; suture 1 arcuate, 2 more strongly so; segments 1 and 2 together occupy about half total club length. Pronotum almost as long as wide, widest behind summit; sides rather broadly arcuate; asperities on anterior slope small, numerous, closely placed, scattered in no apparent order; posterior area of disc with close, deep punctures; surface between punctures minutely reticulate, dull. Elytra 1.7 times longer than wide; apex narrowly rounded; discal striae punctures close, deeply impressed, giving appearance of striae being impressed; discal interstriae about 2.0 times wider than striae, weakly convex, surface smooth, shining, with very faint, minute lines or scratches and sometimes 1 or 2 punctures, these equal in size to those in striae. Declivity convex; interstriae 2 weakly impressed, glabrous, impunctate; interstriae 1 and 3 distinctly but weakly elevated, 3 more so, each with a median row of fine granules; interstriae 9 elevated and distinctly joined to 3 just before apex; striae punctures distinct, somewhat smaller than on disc, impressed. Vestiture mostly confined to declivity, consisting of very long setae on interstriae 3, 5, 7, and 9, those on 3 as much as 3 or more times longer than interstitial width, a few very short interstitial setae are located on disc, striae setae absent.

**Male.** Frons rather deeply, transversely impressed, more so on lateral areas; median carina elevated just above epistomal margin, reduced to a line or elevated crease above this; surface on each side of carina closely, densely punctured with abundant, long setae. Pronotum as in female except punctures on posterior portion larger, deeper, and closer. Elytra as in female except striae punctures may be somewhat larger; declivity with interstriae 3 and 9 not

as strongly elevated, junction more obscure, interstitial granules smaller or absent. Vestiture on declivity shorter.

**TYPE MATERIAL.** The holotype (♀) in the CNC bears the data: MEX., Oax., 32 mi. S. Valle Nacional, 7000', V.21-71, Bright/Pinus sp./HOLOTYPE *Pityophthorus ineditus* D.E. Bright, CNC No. 15084. The allotype and 23 paratypes bear the same data. In addition, 6 paratypes are labeled: 1 mi. W. Las Vigas, V.C., Mex., VII-5-1967, S.L. Wood/Pinus and 4 paratypes bear the labels: MEX. Vera Cr., 7 mi. SE. of Las Vegas, XII-18-1948/H.B. Leech collector.

Most of the type material is in the CNC; paratypes are also in the SLWC and the KESC.

**HOSTS.** *Pinus* spp.

**DISTRIBUTION.** Known only from the type-series localities in Veracruz, Oaxaca, but probably also occurs in extreme southern Mexico and into Central America.

**REMARKS.** The extremely long setae on the third declivital interstriae and the absence of a distinct, longitudinal carina on the male frons will easily distinguish the adults of this species from others of the group.

#### 88. *Pityophthorus (P.) vespertinus* Bright

*Pityophthorus vespertinus* Bright, 1978, p. 83.

Length 1.9-2.0 mm, 2.4-2.5 times longer than wide.

**Female.** Frons weakly flattened on a semicircular area extending from epistoma to slightly above upper level of eyes; surface shining, densely, minutely punctured and clothed with erect, moderately long, yellowish setae. Antennal club nearly circular, widest through segment 3; segment 1 distinctly narrower than others; sutures 1 and 2 arcuate, 2 more strongly so; segments 1 and 2 together occupy slightly less than half of total club length. Pronotum about 1.1 times longer than wide, widest at posterior angles; sides broadly, weakly arcuate; asperities on anterior slope small, erect, scattered in no apparent order; summit prominent; posterior area of disc bearing large, shallow, close punctures; surface between punctures dull, densely minutely-reticulate. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures rather large, deep and close; discal interstriae about 1.5-2.0 times wider than striae, generally impunctate but sometimes bearing a few, widely separated punctures, surface opaque, densely, minutely reticulate. Declivity convex, very weakly impressed; interstriae 1 weakly elevated, with a median row of fine granules; interstriae 2 as wide as discal width, weakly impressed; interstriae 3 weakly elevated, about equal in height to 1, bearing a median row of fine granules; punctures in striae 1 and 2 distinct, nearly equal in size and depth to those on disc. Vestiture sparse, short.

**Male.** Frons weakly concave or flattened on each side of a distinctly elevated, longitudinal carina which extends from epistomal margin to near upper level of eyes; surface on each side of carina densely punctured, the punctures large and shallow. Otherwise similar to female.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the data: 23 mi. W. Durango, Du., MEXICO, VI-4-1965, 6000 ft., S.L. Wood/ Pinus/HOLOTYPE *Pityophthorus vespertinus* D.E. Bright. The allotype and 2 paratypes bear the same data.

All type material is in the SLWC except one paratype is in the CNC.

**HOST.** *Pinus* sp.

**DISTRIBUTION.** Known only from the type locality in Durango.

**REMARKS.** Adults of *vespertinus* are most easily distinguished from those of *diglyphus* and *leiophyllae* by the much less strongly elevated carina on the male frons, by the less strongly elevated third and ninth elytral interstriae, by the nearly circular antennal club, and by the more northerly distribution.

89. *Pityophthorus (P.) leiophyllae* Blackman

*Pityophthorus leiophyllae* Blackman, 1942, p. 205; Bright, 1977, p. 515 (= *diglyphus*).  
*Pityophthorus auctor* Blackman, 1942, p. 214; Bright, 1977, p. 515 (= *diglyphus*).

Length 2.2-2.5 mm, about 2.5 times longer than wide.

**Female.** Frons somewhat flattened on a large central area extending from epistoma to above upper margin of eye, this area divided by a faint, median longitudinal carina which extends from epistoma to about midpoint of flattened area; surface shining, rather densely punctured except along median carina; vestiture rather abundant, equally placed over entire surface except on glabrous, impunctate median space, setae on periphery only slightly longer than those in center. Antennal club 1.3 times longer than wide, widest through segment 3; sutures 1 and 2 arcuate, 2 more strongly so; first two segments together occupy about half of total club length. Pronotum about as long as wide, widest at posterior angles; sides broadly, weakly arcuate; asperities on anterior slope scattered, erect, sometimes basally contiguous; posterior area of disc bearing rather large, deep punctures; surface between punctures opaque and densely, minutely reticulate. Elytra about 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctures rather large, deep, and close; discal interstriae about 1.5-2.0 times wider than striae, surface opaque, densely, minutely reticulate. Declivity convex; interstriae 2 weakly impressed, impunctate, shining; interstriae 1 and 3 weakly but distinctly elevated, 3 more strongly so, each with a median row of fine granules, those on 3 larger; interstriae 9 weakly but distinctly elevated and joined to 3 near apex; striae punctures as on disc except slightly smaller. Vestiture sparse or absent, if present consisting of minute to very short striae and interstitial setae.

**Male.** Frons weakly concave on each side of a strongly elevated, laterally flattened, toothlike carina which extends from epistoma to upper level of eyes; surface on each side of carina densely punctured, clothed with fine, moderately long, scattered setae. Pronotum and elytra as in female except punctures slightly larger. Declivity as in female except interstriae 3 and 9 somewhat more distinctly elevated.

**TYPE MATERIAL.** *P. leiophyllae*. This species was described from one specimen (♀) which bears the data: 668-1/Chalco, Mex. 1-27-36/Pinus leiophylla/D. De Leon Colr/Type No. 55981 U.S.N.M./♀.

*P. auctor*. The holotype (♀) in the USNM bears the labels: 690/Perote, V.C., 11-9-36/Pinus teocote/D. De Leon collector/Type No. 55988 USNM. The allotype and 5 paratypes bear the same labels.

Most of the type material is in the USNM, 1 paratype is in the CNC.

**HOSTS.** *Pinus cembroides*, *leiophylla*, and *teocote*. Probably occurs in most species of pines in its range.

**DISTRIBUTION.** Michoacán to Veracruz and Oaxaca. Specimens (18) examined from:

## MEXICO

**Michoacán:** Parácuaro, 10.IX.61, *Pinus*, R. Coronado P. (SLWC) 2. **Oaxaca:** 26 mi SE of Nochixtlán, 17.VI.67, *Pinus*, S.L. Wood (SLWC) 1. **Puebla:** Limon, 9.II.36, *Pinus cembroides*, D. DeLeon (USNM) 1. **Veracruz:** 1 mi W of Las Vigas, 5.VII.67, *Pinus*, S.L. Wood (SLWC) 6.

**REMARKS.** Adults of this species are readily recognized by the elevated, toothlike carina on the male frons, by the flattened, densely pubescent, weakly carinate female frons, and by the very short setae on the third declivital interstriae.

I (1977) have previously placed *leiophyllae* and *auctor* as synonyms of *diglyphus*. Wood (pers. comm.) suggested that *diglyphus* and *leiophyllae* should be considered distinct and that the length of the setae on the third declivital interstriae would distinguish them. Recently, the type material of *diglyphus* was re-borrowed and re-examined. The lectotype (♂) of *diglyphus* does bear moderately long setae on declivital interstriae 3 but the female paralectotype does not bear any setae but



it is probably abraded. A few other specimens of *diglyphus* that I have seen are also abraded. Because of the characters of the declivity on the male lectotype of *diglyphus*, I tentatively accept *diglyphus* and *leiophyllae* as distinct species. More specimens from Central America are needed before a definitive answer can be reached.

90. *Pityophthorus (P.) diglyphus* Blandford

*Pityophthorus diglyphus* Blandford, 1904, p. 240; Hagedorn, 1910, p. 71; Bright, 1976c, p. 184 (lectotype desig.); Bright, 1977, p. 515.

Length 2.3-2.5 mm, about 2.8 times longer than wide.

**Female.** Frons weakly convex on a broad, semicircular area extending from epistoma to well above eyes and laterally occupying about 80% of distance between eyes; surface shining, densely and finely punctured except on a broad, longitudinal space; vestiture abundant, consisting of moderately long setae densely scattered over surface except on longitudinal, impunctate space, setae on periphery much longer than others. Antennal club not visible in specimen examined. Pronotum about 1.1 times longer than wide, widest at middle; sides moderately arcuate; asperities on anterior slope of moderate size, scattered in no apparent order; posterior area of disc with moderately fine, shallow, rather widely separated punctures; surface between punctures minutely reticulate, dull. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures rather weakly impressed and close; discal interstriae about 2.0 times wider than striae, surface moderately shining with numerous fine lines and points, sometimes with several large, setiferous punctures equal in size to those in striae. Declivity convex; interstriae 2 distinctly impressed, impunctate, shining; interstriae 1 and 3 distinctly elevated, 3 higher than 1, each with a median row of fine setiferous granules, those on 3 larger; interstriae 9 weakly elevated and distinctly joined to 3 near apex; striae punctured as on disc. Vestiture on declivital interstriae 3 long, at least 3.0 times longer than interstitial width.

**Male.** Frons weakly concave or impressed on each side of a distinctly elevated, toothlike, longitudinal carina. Otherwise resembles female except setae on declivital interstriae 3 shorter.

**TYPE MATERIAL.** This species was described from 4 specimens, all of which are in the BMNH. The lectotype, designated by Bright (1976c), bears the data: a circular, purple bordered disk printed "LECTOTYPE"/Quiche Mts., 7-9000 ft., Champion/B.C.A. Col. IV.6, *Pityophthorus diglyphus* Blandf./*Pityophthorus diglyphus* Bld. (label upside down)/LECTOTYPE *Pityophthorus diglyphus* Bland., D.E. Bright 1976. Three other specimens, all from Balheu, Vera Paz, are labeled paralectotypes.

**HOSTS.** *Pinus pseudostrabus* and probably many other pines in its range.

**DISTRIBUTION.** Known only from Guatemala but undoubtedly extends into southern Mexico and Honduras. Specimens (5) examined from:

GUATEMALA; Guatemala City, 30.V.64, *Pinus pseudostrabus*, S.L. Wood (SLWC) 1.

**REMARKS.** Adults of this species are most readily recognized by the long setae on declivital interstriae 3 and by the prominent, toothlike, longitudinal carina on the male frons. See discussion under *leiophyllae*.

**THOMASI GROUP**

This group is characterized by the narrow, elongate body shape, by the first segment of the antennal club being narrower than the others, by the distinctly arcuate antennal sutures, by the even striae rows on the elytral disc, and by the first, third,

and alternate interstriae being punctured and setose. Only one species is included in this group.

91. *Pityophthorus (P.) thomasi* Bright

*Pityophthorus thomasi* Bright, 1976b, p. 443.

Length 1.3-1.6 mm, about 3.0 times longer than wide.

**Female.** Frons rather narrowly but strongly flattened from epistoma to well above eyes, occupying about 75% of distance between eyes; surface shining, densely, minutely punctured, usually concealed by vestiture; vestiture abundant, consisting of a brush of long, yellowish setae arising on the vertex above flattened area and extending nearly to base of mandibles and much shorter but still rather long, yellowish setae scattered over flattened portion, those on periphery longer and incurved. Antennal club 1.2-1.3 times longer than wide, widest through segment 3 or sometimes 2; sutures 1 and 2 distinctly arcuate; first two segments together occupy more than half of total club length. Pronotum about 1.2 times longer than wide, widest behind summit; asperities on anterior slope rather small, erect, scattered in no apparent order; posterior area of disc brightly shining, punctures fine, small; surface between punctures with sparsely placed, minute points. Elytra 1.2 times longer than wide; apex broadly rounded; discal stria punctures very small, very weakly impressed to unimpressed, rather widely spaced, in even rows; discal interstriae much wider than striae, surface moderately shining, densely, finely sculptured by minute lines and points, almost giving appearance of minute reticulations; interstriae 1 and sometimes 3 with sparse setae extending nearly to base, 5, 7, and 9 with sparse setae only on apical half or less, these setae about equal in length to interstitial width. Declivity convex, dull, entire surface minutely reticulate-punctate; interstriae 1 weakly elevated; interstriae 2 not widened, very weakly impressed if at all; interstriae 3 not elevated; interstriae 1 and 3 not bearing a median row of granules; punctures in striae 1 and 2 distinct to obsolete.

**Male.** Frons flattened on a semicircular area extending from epistoma to slightly above upper margin of eyes, with a distinct, slightly elevated, longitudinal carina (absent in some specimens), flattened area narrowly, transversely impressed just above the arcuate epistomal margin; pubescence longer and denser in impressed area, very short and sparse over remainder. Pronotum and elytra essentially as in female. Declivity as in female except interstriae 2 even less strongly impressed and stria punctures may be completely obsolete.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: 10 mi. SW El Salto, Dgo., Mex., 8000', 7.VII.1964, J.B. Thomas #490/*Pinus cooperi* Blanco/**HOLOTYPE** *Pityophthorus thomasi* D.E. Bright CNC No. 15092. The allotype and 22 paratypes bear the same data.

Most of the type material is in the CNC; paratypes are in the SLWC and the KESC.

**HOSTS.** *Pinus cooperi*.

**DISTRIBUTION.** Known only from the type locality in Durango.

**REMARKS.** This unique species is easily recognized by the dense brush of setae which arises on the vertex of the female head and extends nearly to the base of the mandibles, by the punctate-reticulate elytral (including declivital) surface, by the sparsely punctured and setiferous alternate elytral interstriae, and by the group characters mentioned earlier.

**MODICUS GROUP**

Members of this group are distinguished by the rather stout body shape, by the first segment of the antennal club being narrower than the others, by the evenly punctured stria rows, by the very sparsely punctured and setiferous alternate declivital interstriae, and by the convex, weakly impressed interstriae 1 on the elytral declivity (Fig. 74). Only one species is known in this group.

92. *Pityophthorus (P.) modicus* Blackman

Figs. 72-74; Map 13

*Pityophthorus modicus* Blackman, 1928, p. 94; Chamberlin, 1939, p. 385; Bright & Stark, 1973, p. 112.

*Pityophthorus navus* Blackman, 1928, p. 95; Bright, 1966, p. 304 (= *modicus*).

Length 1.6-2.1 mm, 2.6-2.7 times longer than wide.

**Female.** Frons broadly flattened on more than a semicircle extending from epistomal margin to well above upper margin of eyes, usually somewhat concave in median portion; surface smooth and shining in median area, densely punctured around periphery and on a short median extension extending from vertex of punctured area toward center of glabrous area, punctures large, deep and close; vestiture consisting of long, yellowish, incurved setae confined to the punctured peripheral area and to the median extension described above. Antennal club oval, 1.2-1.3 times longer than wide, widest through segment 3; sutures 1 and 2 arcuate, more strongly so; segments 1 and 2 together occupy about half of total club length. Pronotum as long as wide, widest near posterior angles; sides weakly arcuate, more strongly converging on anterior half; asperities on anterior slope smaller than the median pair on anterior margin, scattered in no apparent order, decreasing in size toward summit; summit prominent; posterior area of disc rather deeply, closely punctured; surface between punctures brightly shining, smooth to densely, minutely punctured. Elytra 1.5 times longer than wide; apex broadly rounded; discal striae punctures fine, close, deep, in even rows; discal interstriae about 2.0-3.0 times wider than striae, surface moderately shining, minutely reticulate, with sparse punctures on interstriae 1, 3, 5, 7, and 9, these punctures equal in size to those in striae. Declivity steep, convex; interstriae 1 weakly impressed below level of 3, with a median row of fine granules; interstriae 2 only slightly widened if at all, moderately shining, slightly sulcate, sometimes with a few small granules at or near the summit; interstriae 3 very weakly elevated, higher than 2, with a median row of fine granules; punctures in striae 1 and 2 usually much reduced but still visible, sometimes obsolete.

**Male.** Frons transversely impressed above epistoma, upper margin of impression swollen into a narrow, transverse callus, sometimes with a fine, sharp, longitudinal carina extending from callus to epistoma, this carina may also extend above callus for a short distance; surface convex to weakly flattened, densely punctured; vestiture inconspicuous. Pronotum and elytra essentially as in female. Declivital granules on interstriae 1 and 3 absent to very small, smaller than in female.

**TYPE MATERIAL.** *P. modicus*. This species was described from two females. The holotype (♀) is in the USNM and bears the labels: Las Vegas H.S., N.M., 4-8/Barber and Schwarz, coll. TYPE *Pityophthorus modicus* Blackman/TYPE No. 41290 USNM. One paratype is labeled: Williams, Ar., 9-7/Barber and Schwarz, coll.

*P. navus*. The holotype (♀) is in the USNM and bears the data: Morgan Hills, Cal., III-25-27/M.W. Blackman, collector/K-264/TYPE *Pityophthorus navus* Blackman/Type No. 41300 USNM. The allotype and 18 paratypes bear the same data or instead of "K-264" are labeled "K-265". Seven additional paratypes are labeled: Morgan Hill, Cal., III-26-27/M.W. Blackman, collr./K-269 and 3 paratypes are labeled: Mt. Hamilton, Calif., II-9-27, Digger Pine/M.W. Blackman, collr./K-245.

Most of the type material is in the USNM, paratypes are known to be in the USNM, the CNC, and the DFEC.

**HOSTS.** *Pinus cembroides*, *edulis*, *leiophylla*, *monophylla*, and *sabiniana*.

**DISTRIBUTION.** Upper Sonoran Zone from southern California to southern Utah, south to Durango, Mexico (Map 13). Specimens (257) examined from:

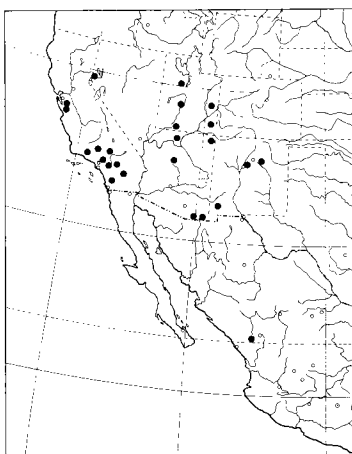
**UNITED STATES**

**Arizona:** Ash Canyon, Huachuca Mtns., 7.VI.69, *Pinus cembroides*, S.L. Wood (SLWC) 2; Chiricahua Mtns., 18.VII. 68, *Pinus leiophylla*, D.E. Bright (CNC) 9;

10 mi NW of Jacob Lake, 30.V.69, *Pinus edulis*, W. Harwood (SLWC) 1; 10 mi SW of Jerome, 12.VIII.68, *Pinus edulis*, D.E. Bright (CNC) 37; Parker Canyon Lake, 25.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 35 and Sweetwater, Apache Co., 24.IX.36, P. Phillips (USNM) 5. **California:** Big Bear, 1.IX.28, *Pinus monophylla*, F.P. Keen (RMSC) 2; Frazier Mtn., 6.IX.40, *Pinus monophylla*, C.R. Bruck (OSUC) 4; Frazier Park, 20.VII.53, *Pinus edulis*, G.L. Downing (USNM) 4; Sandstone Camp, 3 mi S of Pine Mountain Summit, 15.IV.62, *Pinus monophylla*, D.E. Bright and B.A. Barr (DEBC, SLWC) 4; Valyermo, 24.VIII.40, *Pinus monophylla*, C.R. Bruck, (OSUC) 10; Walker Pass, 3.IX.68, *Pinus monophylla*, D.E. Bright (CNC) 1 and Wrightwood, 14.IV.62, *Pinus monophylla*, D.E. Bright (CNC) 5. **Nevada:** Steamboat, 5.VIII.71, *Pinus monophylla*, R.C. Bechtel (SLWC) 2. **New Mexico:** 8 mi E of Central City, 15.VII.71, Black light, J.R. McClellan (SLWC) 11; 7 mi W of Kingston, 22.VII.74, *Pinus edulis*, D.E. Bright (CNC) 2; 5 mi W of Lake Roberts, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 1; Sandia Mtns., 17.VII.52, *Pinus* sp. (SLWC) 1 and 10 mi NE of San Lorenzo, 25.VII.74, *Pinus edulis*, D.E. Bright (CNC) 35. **Utah:** Devils Garden, Arches National Monument, 29.VII.68, *Pinus edulis*, W.G. Harwood (SLWC) 3; Gooseberry, Fishlake National Forest, 9.VI.60, *Pinus edulis* (DEBC) 5; La Sal Mtns., 4.VII.58, *Pinus edulis*, D.E. Bright (DEBC) 3; Mercur, 1.XII.57, *Pinus monophylla*, D.E. Bright (DEBC) 11 and Orderville, *Pinus edulis*, J. Kartchner (DFEC) 2.

#### MEXICO

**Durango:** 30 km W of Durango, 19.VI.71, *Pinus cembroides*, D.E. Bright (CNC) 30.



MAP 13. Collection localities for *P. (Pityophthorus) modicus*.

**REMARKS.** Adults of this species can be recognized by the characters of the female frons as mentioned in the key and description, by the evenly convex declivity with the weakly impressed interstriae 1 and weakly sulcate interstriae 2, by the rather stout body, and by the characters mentioned in the group diagnosis.

#### ELATINUS GROUP

This distinctive group is characterized by the elongate-oval antennal club on which segment 1 is only slightly narrower than the others, by the distinct longitudinal carina on the male frons (Figs. 76, 79), by the densely pubescent female frons which bears very long, incurved setae around the periphery, by the deeply impressed first and second declivital interstriae on the male, and by the most and distribution. Two species are now included in the group.

KEY TO SPECIES IN THE *Elatinus* group

1. Color light brown or light to dark reddish brown, pronotum usually darker than elytra; posterior portion of pronotal disc granulate between punctures; declivital interstriae 3 of male abruptly elevated on upper half (Fig. 77); central Mexico . . . . . 93. *elatinus* Wood (p. 125)  
 Color very dark reddish brown to black, pronotum and elytra usually same color; posterior portion of pronotal disc minutely punctate-reticulate between punctures, not granulate; declivital interstriae 3 of male not as strongly or abruptly elevated (Fig. 80); northern Mexico . . . . . 94. *speculum* Bright (p. 126)

93. *Pityophthorus* (*P.*) *elatinus* Wood

Figs. 75-77

*Pityophthorus elatinus* Wood, 1964, p. 66.

Length 2.0-2.2 mm, 2.9 times longer than wide. Color light brown or light to dark reddish brown, elytra usually lighter than pronotum.

**Female.** Frons flattened from epistoma to well above upper level of eyes and laterally from eye to eye; surface smooth, sparsely, finely punctured; vestiture consisting of short, sparse setae on each side of a glabrous, median, longitudinal area, and very long, abundant, yellowish setae around periphery, setae arising on vertex extending to epistomal margin or slightly beyond. Antennal club elongate-oval, 1.2 times longer than wide, widest through segment 2, segment 1 narrower than others; suture 1 straight, weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum 1.0-1.1 times longer than wide, widest behind summit; sides weakly arcuate on posterior half; asperities on anterior slope rather low, numerous, arranged in no apparent order; posterior area of disc weakly shining to dull, minutely reticulate, punctures obscure near median line, more evident laterally; surface between punctures reticulate-granulate, granules rather obvious, replacing punctures near median line. Elytra 1.8 times longer than wide; apex rather narrowly rounded; discal striae punctures small, shallow, arranged in definite rows; discal interstriae about 2.0 times wider than striae, surface smooth, shining, generally impunctate except near declivity. Declivity steep, narrowly sulcate; interstriae 1 rather deeply impressed below elytral surface, with a row of very fine granules; interstriae 2 wider than on disc, sulcate, smooth, shining, interstriae 3 strongly elevated on upper half, much higher than 1, bearing a few very fine granules which may be absent in some specimens; punctures of striae 1 and 2 obsolete.

**Male.** Frons flattened to weakly convex, divided by an acute, fine, low, median, longitudinal carina; surface on each side of carina deeply and densely punctured. Antennal club slightly narrower than in female. Pronotum and elytra as in female except elytral declivity much more deeply impressed; interstriae 1 and 2 deeply impressed; interstriae 3 much more strongly elevated on upper half, inner slopes almost vertical, summit ridge bearing a few fine granules.

**TYPE MATERIAL.** The holotype (♀) in the SLWC bears the data: 25 mi. west Ciudad Hidalgo, Micho., Mexico, VII-16-52, 8900 ft.,/Taken on *Abies*/HOLOTYPE *Pityophthorus elatinus* S.L. Wood, 1964. The allotype and 5 paratypes bear the same data.

All of the type material is in the SLWC.

**HOSTS.** *Abies religiosa*.

**DISTRIBUTION.** Central Mexico. Probably occurs wherever its host tree occurs from central Mexico to Guatemala. Specimens (123) examined from:

## MEXICO

**Mexico:** Izta-Popo National Park, 7.V.71, *Abies religiosa*, D.E. Bright (CNC) 27; Salazar, 16.VII.69, *Abies religiosa*, D.E. Bright (CNC) 23. **Michoacán:** 33 miles E of Morelia, 14.VI.65, *Abies religiosa*, S.L. Wood (SLWC) 50. **Tlaxcala:** 11 mi N of Tlaxco, 9.VII.67, *Abies religiosa*, S.L. Wood (SLWC) 16.

REMARKS. This pretty species is readily recognized by the narrowly, deeply sulcate elytral declivity (Fig. 77), by the long, dense pubescence on the female frons (Fig. 75), by the longitudinally carinate male frons (Fig. 76), and by the host and distribution. It is closely related to the following species but *elatinus* differs by the more deeply sulcate declivity, by the lighter color of the elytra and pronotum, by the presence of isolated granules on the posterior portion of the pronotum, by the short interstitial setae, and by the distribution.

94. *Pityophthorus* (*P.*) *speculum* Bright

Figs. 78-80

*Pityophthorus speculum* Bright, 1976b, p. 440.

Length 2.3-2.7 mm, about 2.5 times longer than wide. Color dark reddish brown to black, pronotum and elytra of same color.

**Female.** Frons identical with *elatinus* described above except peripheral setae may be slightly longer. Antennae as in *elatinus*. Pronotum as in *elatinus* except posterior area of disc more distinctly punctured, punctures large and deeper; surface between punctures dull, reticulate, with numerous fine points, granules absent. Elytra as in *elatinus* except interstitial setae near declivity much longer. Declivity steep; interstriae 1 impressed but not as deep as in *elatinus*, with a row of somewhat larger granules; interstriae 2 wider than on disc, sulcate, smooth, shining; interstriae 3 elevated, less so than in *elatinus*, bearing somewhat larger granules; punctures of striae 1 and 2 obsolete.

**Male.** Frons essentially as in *elatinus* except carina slightly more strongly elevated. Pronotum and elytra as in female except declivity more deeply impressed; interstriae 3 more strongly elevated but not as high as in *elatinus*, inner slope nearly vertical and summit ridge bearing larger granules.

TYPE MATERIAL. The holotype (♀) in the CNC bears the data: MEX., N.L., Cerro Potosi, V.3.71. 1100', D.E. Bright/*Abies religiosa*/ HOLOTYPE *Pityophthorus speculum* D.E. Bright '77, CNC No. 15090. The allotype and 25 paratypes bear the same data. Twelve paratypes bear the same data except the host label is *Pseudotsuga menziesii*; 8 paratypes are labeled: *Abies*/Cerro Potosi, Nuevo Leon, Mix., 111-21-1974/M.M. Furniss, Hopk. #58615-B.

Most of the type material is in the CNC; paratypes are in the SLWC and the KESC.

HOSTS. *Abies religiosa* and *Pseudotsuga menziesii*.

DISTRIBUTION. Along the Sierra Madre Oriental from Nuevo León to Hidalgo. Specimens (55) examined from:

MEXICO

**Hidalgo:** El Chico, 3.IX.77, *Abies religiosa*, E. Hdej. V. (CNC, PRFC) 8. **Nuevo León:** See type material.

BIONOMICS. The only information recorded for this species is that it was collected from under the bark of a 12-14" diam. log (M. Furniss, pers. comm.).

REMARKS. Adults of *speculum* closely resemble those of *elatinus* but differ by the longer interstitial setae on the apical portion of the elytra, by the more shallowly impressed declivity (Fig. 80), by the darker and more uniform pronotal and elytral color, and by the absence of granules on the posterior portion of the pronotum.

NITIDUS GROUP

This group of species is characterized by the narrow first segment of the antennal club (Fig. 8), by the longitudinally carinate male frons, by the slightly

elevated ninth elytral interstriae, and by the convex, broadly sulcate elytral declivity. Seven species are recognized in the present work.

Most of the species in this group are extremely similar in appearance and are therefore very difficult to distinguish. The characters given below in the key are obscure and intergrade to some degree but are valid for the majority of specimens. It must be realized, however, that not all specimens will key-out properly. Specimens of both sexes, accompanied by host and locality data, are necessary for successful distinction of several species.

#### KEY TO SPECIES IN THE Nitidus group

1. Posterior portion of pronotum granulate-punctate, the granules formed by the elevated lateral margins of punctures; elytral surface smooth, often with irregular lines; female frons weakly convex to weakly concave, vestiture variable . . . . . 2
  - Posterior portion of pronotum punctate only, granules absent; elytral surface weakly reticulate; female frons shallowly to deeply concave, vestiture long, conspicuous . . . . . 6
2. Discal interstriae 2 and 4 impunctate and glabrous; female frons broadly concave, surface sparsely punctured in center, setae very long and dense on periphery of concavity; British Columbia to Colorado . . . . . 95. *scalptus* Bright (p. 127)
  - Discal interstriae 2 and 4 sparsely punctured and bearing short setae; female frons flat to weakly convex or shallowly, transversely impressed, setae variable . . . . . 3
3. Pronotal and elytral punctures minute; discal interstriae at least 6.0 times wider than striae; Colorado . . . . . 96. *indigus* Wood (p. 128)
  - Pronotal and elytral punctures coarse; discal interstriae not more than 2.0 times wider than striae . . . . . 4
4. Female frons weakly to moderately convex, setae varying from short to very long; male carina weakly elevated; Newfoundland to Alaska, south to Oregon and Colorado . . . . . 97. *nitidus* Swaine (p. 129)
  - Female frons flattened to distinctly, weakly concave, setae long and incurved on periphery; male carina moderately elevated . . . . . 5
5. In *Larix lyallii*: male frons more shallowly impressed above epistoma, carina usually complete from epistoma to upper level of eyes, not interrupted; female frons dull, finely, densely punctured, setae abundant; Alberta and Idaho . . . . . 98. *alpinensis* G. Hopping (p. 132)
  - In *Pinus*: male frons strongly impressed above epistoma, carina frequently interrupted across impression; female frons shining, roughly granulate-punctate, setae more sparse and shorter; British Columbia and Alberta to California, Utah and Wyoming . . . . . 99. *toralis* Wood (p. 133)
6. Female frons flat to shallowly concave on a small median area, setae evenly distributed, those on periphery only slightly longer than others; tubercles on declivital interstriae 1 and 3 slightly coarser; California . . . . . 100. *leechi* Wood (p. 134)
  - Female frons deeply, broadly concave, impression extending above upper level of eyes, setae sparse in central area, dense and very long on periphery; tubercles on declivital interstriae 1 and 3 usually smaller; British Columbia to California . . . . . 101. *scalptor* Blackman (p. 135)

#### 95. *Pityophthorus* (*P.*) *scalptus* Bright

*Pityophthorus scalptus* Bright, 1978, p. 82.

Length 2.3-3.0 mm, about 2.7 times longer than wide.

**Female.** Frons slightly but distinctly and broadly concave on an almost circular, broad, median area; surface moderately shining, with close, deep, moderately large punctures, these sparser in central area, and bearing short, erect setae over most of area, setae on periphery much longer, coarser and incurved. Antennal club oval, about 1.3 times longer than wide, widest through segment 3; suture 1 nearly transverse, 2 weakly arcuate; first two segments together occupy less than half of total club length. Pronotum as long as wide, widest

on posterior half; sides moderately arcuate; asperities on anterior slope generally large and erect, usually isolated but several may be basally contiguous, scattered in no apparent order; summit distinct; posterior area of disc deeply, closely punctured, punctures of moderate size, lateral margin of each puncture elevated into a distinct granule, these granules usually larger and more distinct posteriorly and laterally to summit; surface between punctures moderately shining to dull, bearing minute points or minute reticulations. Elytra 1.5-1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures small, deep and close, each bearing a minute, erect seta; discal interstriae 2.0-3.0 times wider than striae, surface moderately shining, microrugulose or smooth, with numerous fine points and microreticulation; interstriae 1, 3, 5, 7 each with a few scattered, median punctures, each of which bears a minute, erect seta, each seta equal in length to those in striae, 2 and 4 impunctate and glabrous. Declivity broadly convex, weakly impressed; interstriae 1 weakly impressed below level of 3, bearing a median row of close, fine granules; interspace 2 flat, about as wide as on disc, surface as on disc; interstriae 3 not elevated, bearing a median row of extremely fine granules; interstriae 9 weakly elevated, joining interstriae 3 near elytral apex; punctures in striae 1 and 2 distinct, much smaller than those on disc, striae 1 moderately, narrowly impressed.

**Male.** Frons broadly, shallowly impressed below upper level of eyes, with a distinct, longitudinal carina extending from the epistoma to above upper eye level; surface moderately shining, densely, closely punctured. Antennal club narrower than in female. Pronotum and elytra essentially as in female. Declivity essentially as in female except interstriae 3 very slightly elevated, granules in interstriae 1 and 3 slightly larger, and junction of interstriae 3 and 9 slightly more distinct.

**TYPE MATERIAL.** The holotype (♀) in the CNC bears the labels: 17360, Lot 16/Aspen Grove, B.C., VII-8-31, H. Richmond/Pinus ponderosa/R. Hopping collection/HOLOTYPE *Pityophthorus scalptus* D.E. Bright, CNC No. 15486. The allotype and 61 paratypes bear the same data except the dates of collection vary throughout July, 1931.

The holotype, allotype, and 10 paratypes are in the CNC, 10 paratypes are in the SLWC, 2 are in the KESC, 2 in the USNM, and the remainder are in the CASC.

**HOST.** *Pinus ponderosa*.

**DISTRIBUTION.** British Columbia to Colorado: Specimens (69) examined from:

**CANADA**

**British Columbia:** See type material.

**UNITED STATES**

**Colorado:** Estes Park, 31.VIII.36, *Pinus ponderosa* (RMFRES) 2. **Montana:** Stevensville, 31.VIII.67, P. Pine, R. McEwan and M. McGregor (MDFM) 4.

**REMARKS.** Adults of this species are very similar to those of *scalptor*. The most obvious distinguishing character is the presence of granules on the lateral margins of the pronotal punctures on adults of *scalptus* vs. the absence of granules on adults of *scalptor*. Other differences that will distinguish *scalptus* from *scalptor* are the larger and deeper punctures on the female frons, the slightly lower carina on the male frons, and the slightly smaller size of the antennal club.

96. *Pityophthorus (P.) indigus* Wood

*Pityophthorus indigus* Wood, 1977a, p. 214 (preoccupied).

*Pityophthorus indigus* Wood, 1978b, (1979), p. 398.

*Pityophthorus irritans* Schedl, 1979, p. 127. **New synonymy.**

Length 2.0-2.3 mm, about 2.8 times longer than wide.

**Female.** Frons broadly, weakly convex and weakly transversely impressed just above epistomal margin, weakly flattened to above upper eye level; surface closely, densely



punctured, with a small, elevated callus on midpoint of epistoma and with a fine, barely visible carina extending above callus; vestiture minute. Antennal club essentially as in *nitidus*. Pronotum essentially as described for *nitidus*; punctures on posterior portion of disc, minute, close and deep, lateral margins elevated; surface between punctures moderately shining. Elytra essentially as described for *nitidus*; discal interstriae at least 6.0 times wider than striae; strial and interstitial punctures minute, obsolete; surface subrugulose, shining. Declivity essentially as described for *nitidus*; interstriae 3 and 9 joined and weakly elevated at apex; interstriae 3 higher than 9, granules on both interstriae distinct, equal in size; strial punctures obsolete.

**Male.** Very similar to female except median carina on frons more weakly elevated, elevated callus on epistoma absent.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the labels: 2 mi. E. Gould, Jackson Co., Colo., VI-12-1968, S.L. Wood/Pinus contorta/HOLOTYPE Pityophthorus indigens S.L. Wood. The allotype and 3 paratypes bear the same data.

All of the type material is in the SLWC.

**HOST.** Known only from *Pinus contorta* but undoubtedly occurs in other species of *Pinus*.

**DISTRIBUTION.** Known only from the type locality in Colorado but probably occurs much more widely.

**REMARKS.** In the original description, Wood compares this species to *fuscus*, but in this study I have placed it in the group containing *nitidus* and related forms, *fuscus* having been placed in a different group. It may well be related to both species.

*P. indigus* is most easily distinguished by the minute, almost obsolete strial and interstitial punctures. In other features it closely resembles *nitidus*.

Schedl (1979) proposed *irritans* as a replacement name for *indigens* Wood 1977, not *indigens* Wood 1976. A replacement name was already proposed by Wood (1978b) so Schedl's action was unnecessary.

### 97. *Pityophthorus (P.) nitidus* Swaine

Figs. 8, 81-83; Map 14

*Pityophthorus nitidus* Swaine, 1917, p. 25; Swaine, 1918, pp. 94, 98; Blackman, 1928, pp. 30, 35; Chamberlin, 1939, pp. 357, 358; Bright, 1967, p. 678 (lectotype desig.); Bright, 1977, p. 516.

*Pityophthorus borealis* Swaine, 1925, p. 195; Blackman, 1928, pp. 30, 35; Chamberlin, 1939, p. 357, Wood, 1957, p. 401; Bright, 1967, p. 678; Bright, 1977, p. 516 (= *nitidus*).

*Pityophthorus anceps* Blackman, 1928, p. 31; Chamberlin, 1939, p. 357; Bright, 1977, p. 516 (= *nitidus*).

*Pityophthorus varians* Schedl, 1930, p. 196; Chamberlin, 1939, pp. 368, 369; Wood, 1957, p. 401 (= *borealis*).

*Pityophthorus aquilonius* Bright, 1968, p. 604; Bright, 1977, p. 516 (= *nitidus*).

Length 1.8-2.3 mm, about 2.1-2.2 times longer than wide.

**Female.** Frons weakly to moderately concave from above epistoma to above upper level of eyes, convex on vertex; surface densely punctured except for a small, sometimes elevated, shining callus at midpoint on epistoma; vestiture variable, consisting either of short, recumbent or erect setae, all of equal length, or very long, erect setae, those on periphery much longer and incurved, or various intermediate combinations. Antennal club elongate-oval, 1.3 times longer than wide; suture I subtransverse, 2 weakly arcuate; first two segments together occupy half of total club length. Pronotum very slightly longer than wide, widest just behind summit; sides arcuate; asperities on anterior slope low, sometimes arranged in very vague concentric rows or more usually, arranged in no apparent order; summit distinct,

but usually not strongly elevated; posterior area of disc bearing coarse, shallow punctures, lateral or posterior edge of these elevated into fine granules; surface between punctures smooth, shining, with fine lines and points. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures shallow, rather indistinct; discal interstriae about 2.0 times wider than striae, surface minutely reticulate to minutely rugulose, all interstriae punctured but interstriae 1, 3, 5, 7, 9 more abundantly so; interstriae 9 rather prominently elevated laterally. Declivity sloping; interstriae 1 narrowly elevated, bearing a median row of fine granules; interstriae 2 weakly sulcate, weakly impressed, equal to or slightly wider than discal width; interstriae 3 not elevated above elytral surface, bearing a median row of fine granules; interstriae 1 and 3 of equal height or interstriae 1 only slightly lower than 3; punctures of striae 1 and 2 reduced in size and indistinct.

**Male.** Frons convex, usually faintly, transversely impressed above epistoma; surface deeply, closely punctured and glabrous or bearing very short setae, and divided by a fine weakly elevated longitudinal carina extending to near upper level of eyes, this carina usually more strongly elevated on lower portion. Pronotum and elytra essentially as in female except declivital granules slightly larger.

**TYPE MATERIAL.** *P. nitidus*. This species was described from two specimens. The lectotype (♀) in the CNC bears the labels: 113, Tullochgoram, [Quebec], 20-IX-10/♀/Pityophthorus nitidus Swaine/TYPE, *P. nitidus* Sw. No. 3151/Lectotype CNC No. 3151/J.M. Swaine collection. The other specimen is a male and bears the labels: 113, Tullochgoram, 20-IX-10/ Pityophthorus nitidus n. sp/Type of description/♂/Type, *P. nitidus* Sw. No. 3151.

*P. borealis*. Twelve specimens have been identified as belonging to the type series. The holotype (♀) in the CNC bears the labels: Coppermine River, Spruce, C.A.E. Johannsen/Type, Pityophthorus borealis Sw., No. 1368. Six paratypes are simply labeled: 2510/Paratype No. 1368. Five other paratypes are labeled the same with the additional label C.A.E. '15, Coppermine Rv.

*P. anceps*. The holotype (♀) is in the USNM and bears the data: Hopk. US 6117a/Clyde, Colo./A.D. Hopkins, collector/Picea engelmannii/TYPE Pityophthorus anceps Blackman/Type No. 41266 U.S.N.M. The allotype and 17 paratypes bear the same data.

*P. varians*. The holotype (♂) (mis-labeled ♀ by Schedl) in the CNC bears the labels: Truro, N.S., 29 June 14/No. 235, S-1/Type ♀, varians Schedl, No. 3133. One specimen is labeled exactly as above including the red "type" label except that the symbol "♂" is inserted instead of "♀". The paratypes (2♀2♂) also bear the same data as the holotype and are in the CNC.

*P. aquilonius*. The holotype (♀) in the CNC bears the labels: Rampart House, Y.T., V-24-1951, J.E.H. Martin/Slide, antennae, No. 55/Holotype Pityophthorus aquilonius D.E. Bright, CNC No. 9733. The allotype and 11 paratypes bear the same data except for the "slide" label.

**HOSTS.** Probably all species of *Pinus* and *Picea* in its range are suitable hosts.

**DISTRIBUTION.** Throughout the northern coniferous forests from Alaska to Newfoundland, southward along the western mountain chains to Oregon and Colorado (Map 14). Specimens (488) examined from:

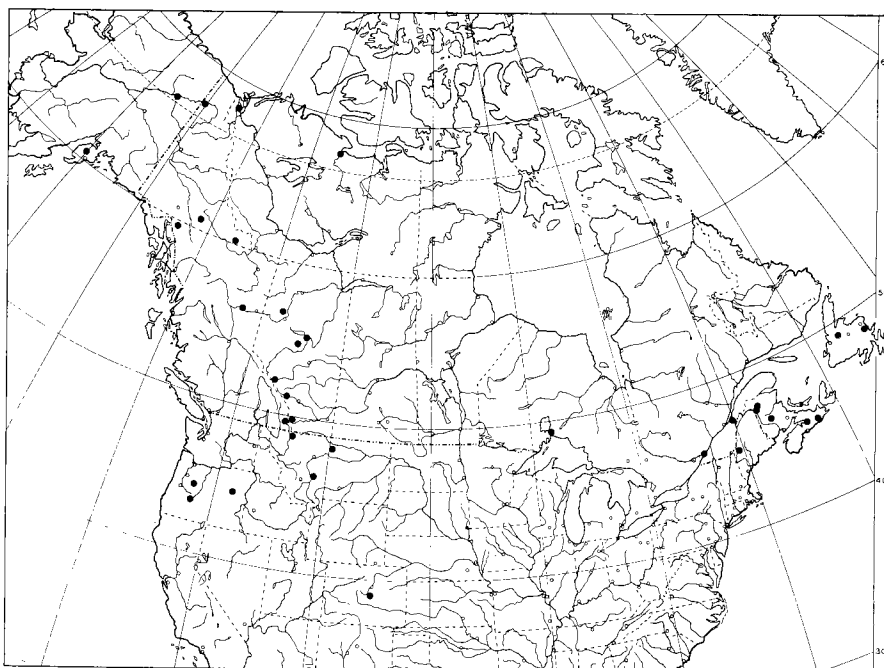
#### CANADA

**Alberta:** Banff, IX.7.67, *Pinus contorta*, D.E. Bright (CNC) 3; 15 mi N of Chinook Valley, 12.VII.72, *Pinus contorta*, D.E. Bright (CNC) 12; Columbia Ice Fields, 16.VI.61, *Picea engelmannii* (CNC) 8; Highwood Pass, 8.IX.67, *Picea engelmannii*, D.E. Bright (CNC) 60 and *Pinus contorta* (CNC) 7; Johnson Canyon, Banff National Park, 3.IX.67, *Pinus contorta*, D.E. Bright (CNC) 9; 35 mi S of Seebe, 12.VII.65, *Larix laricina* (CNC) 2; 10 mi NE of Smith, 15.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 12; Swan Hills, 15.VII.72, *Pinus contorta*, D.E. Bright (CNC) 37. **British**

**Columbia:** Atlin, 23.VI.55, *Picea*, H. Huckel (CNC) 23; 5 mi E of Chetwynd, II.VII.72, *Pinus contorta*, D.E. Bright (CNC) 1; Pine Pass, II.VII.72, *Picea*, D.E. Bright (CNC) 5; Wycliff, 30.V.62, *Picea engelmannii* (PFRC) 8. **New Brunswick:** Kedgwick Portage, 20.II.67, *Pinus resinosa* (CNC) 10; 10 mi W of McGraw Brook, 7.VII.70, *Pinus strobus*, D.E. Bright (CNC) 5; Parkers Ridge, York Co., 8.VI.65, ex branches white pine (CNC) 70; Riley Brook, 6.VII.70, *Pinus strobus*, D.E. Bright (CNC) 3. **Newfoundland:** 12 mi NE of Deer Lake, 23.VII.70, *Picea mariana*, D.E. Bright (CNC) 8; Middle Brook Provincial Park, 27.VII.70, *Pinus resinosa*, D.E. Bright (CNC) 11; Sandy Lake, 22.VII.70, *Pinus resinosa*, D.E. Bright (CNC) 4. **Northwest Territories:** Aklavik, 1931, O. Bryant (SLWC) 30; Tununuk, 10.VII.30, O. Bryant (SLWC) 17. **Nova Scotia:** Middle County Harbor, 13.VII.66, Red pine (CNC) 1. **Ontario:** Beardmore, 6.VII.64, *Pinus strobus* (CNC) 3; Sand Lake, 22.VI.39, Scots pine (CNC) 1. **Quebec:** St. Annes, J.M. Swaine (CNC) 2; St. Gabriel, 8.VII, *Picea glauca*, C. Chantal (Chantal) 18. **Yukon Territory:** Hunker Creek Road, Mile 28, 13.VII.61 *Picea glauca* (CNC) 5; Johnsons Crossing, 17.VII.61, *Picea glauca* (CNC) 1; Watson Lake, 14.VII.60, *Pinus contorta* (PFRC) 1.

#### UNITED STATES

**Alaska:** Fort Yukon, 25.VII.55, *Picea glauca*, G.L. Downing (DEBC, SLWC) 6; Seward Highway, 31.VII.59, *Picea glauca*, G.L. Downing (CNC) 8. **Colorado:** See type material. **Maine:** Rangeley, 6.VIII.70, *Picea* sp., D.E. Bright (CNC) 1. **Montana:** Gallatin Co., 12.X.35, *Picea*, W. Shockley (USNM) 3 and 28.VII.35, *Pinus flexilis* (USNM) 6; Glacier National Park, 30.VI.72, *Pinus contorta*, D.E. Bright (CNC) 4; Rocky Boy Indian Reservation, Hill Co., 25.IX.67, *Pinus contorta*, D.E. Bright (CNC) 2. **Oregon:** Dixie Pass, Malheur Co., 23.VI.61, *Picea engelmannii*, S.L. Wood (SLWC) 11; 4 mi W of Suttle Lake, 10.VI.40, *Picea engelmannii*, Schuh & Scott (DEBC) 5; Willamette Pass, Lane Co., 9.VII.64, *Picea engelmannii*, D.E. Bright (CNC) 12.



MAP 14. Collection localities for *P. (Pityophthorus) nitidus*.

REMARKS. The type material of all the names listed above was compared directly with one another and with numerous other specimens from throughout North America. Each type series appears to represent a distinct entity, but when compared with large numbers of other specimens and with specimens in the other type series a complete range of variation can be noted. This is especially true of the females; males generally display much less variation. Only one very variable species can therefore be recognized.

For further remarks, including a comparison of the polymorphic females, see Bright (1977). That discussion is still valid except I have taken *alpinensis* out of synonymy and recognize it as a valid, if somewhat questionable, species.

98. *Pityophthorus (P.) alpinensis* G. Hopping

*Pityophthorus alpinensis* G. Hopping, 1960, p. 865; Bright, 1977, p. 516 (= *nitidus*).

Length 2.3-2.7 mm, about 2.1-2.2 times longer than wide.

**Female.** Frons planoconcave from eye to eye and from epistoma to well above eyes, surface dull, densely, finely punctured; vestiture abundant, consisting of a brush of yellowish setae densely scattered over flattened area, setae on periphery much longer and incurved. Antennal club as in *nitidus*. Pronotum about 1.1-1.2 times longer than wide; essentially as in *nitidus*. Elytra about 1.8 times longer than wide; essentially as in *nitidus*. Declivity as in *nitidus*.

**Male.** Frons convex, more strongly, transversely impressed; surface coarsely, closely punctate-rugose, bearing a prominent, moderately elevated, longitudinal carina which is usually complete from epistoma to upper level of eyes. Otherwise as in female.

TYPE MATERIAL. The holotype (♀) in the CNC bears the data: 56-A-913-01, Reared 24-IX-56, Highwood Pass, Alta/A. Larch/Holotype ♀/HOLOTYPE *Pityophthorus alpinensis* Hopp., No. 7485. The allotype and 16 paratypes bear the same data. Additional paratypes are as follows: 2, 58A-1202-01, Sunshine Ski Lodge, Banff, Alta., Em. 3-IX-58; 1, same as above except Em. 5-IX-58 and 29, same data as holotype except for survey number.

Most of the type material is in the CNC, additional paratypes are in the CASC, NFRCE, UBCZ, and the USNM.

HOST. *Larix lyallii*.

DISTRIBUTION. Alberta and Idaho. Probably occurs throughout the range of Alpine larch. Specimens (103) examined from:

CANADA

**Alberta:** Moraine Lake, Banff National Park, 12.IX.67, *Larix lyallii*, D.E. Bright (CNC) 34; Seebe, 12.V.67, *Larix lyallii* (NFRCE) 13.

UNITED STATES

**Idaho:** Salmon Mtn., Bitterroot National Forest, 8.VII.74, *Larix lyallii*, M.M. Furniss (SLWC) 6.

REMARKS. This species was placed by me (1977) as a synonym of *nitidus* based on the similarity of anatomical characters. I regarded it as simply a form of *nitidus* which occurred in Alpine larch. After a re-consideration and re-examination of the entire complex, I have re-instated it as a valid species. My reasons are as follows: *P. nitidus* is a very variable species, usually with several forms in each population. The population of *nitidus* at Highwood Pass, Alberta, from *Pinus contorta* displays the typical characteristics of the species. The population of *alpinensis* from the exact same locality but collected from *Larix lyallii* differs from specimens of *nitidus* in a consistent way. All female specimens of *alpinensis* bear long, incurved setae on the frons, while those of *nitidus* bear only short, even length

setae. Specimens of *nitidus* have been seen with long setae on the female frons as in *alpinensis*, but these specimens generally occur in the more eastern parts of its range.

In addition, different populations of *alpinensis* do not display the same type or amount of variation as is seen in populations of *nitidus*. *P. alpinensis* appears morphologically to be a more stable species, perhaps originating from *nitidus* stock that became successful in Alpine larch.

#### 99. *Pityophthorus (P.) toralis* Wood

Figs. 84-86; Map 15

*Pityophthorus toralis* Wood, 1964, p. 59; Bright & Stark, 1973, p. 105.

*Myeloborus confusus* Bright, 1966, p. 295; Bright & Stark, 1973 p. 105 (= *toralis*).

*Pityophthorus collinus* Bright, 1968, p. 605; Bright, 1977, p. 518 (= *toralis*).

Length 2.1-2.8 mm, 2.6 times longer than wide.

**Female.** Frons flattened nearly from eye to eye, broadly, shallowly concave in center; surface shining, roughly granulate-punctate, except for a smooth, impunctate area on epistomal margin, punctures in center very close, those on periphery of flattened area deeper and slightly larger; vestiture abundant, consisting of long, incurved, yellowish setae on periphery, and shorter setae toward center. Antennal club broadly oval, 1.1 times longer than wide; suture 1 transverse or very slightly arcuate, 2 more strongly arcuate; first two segments together occupy half of total club length. Pronotum about as long as wide, widest behind summit; sides moderately arcuate; asperities on anterior slope low, blunt, arranged in no apparent order; summit distinct; posterior area of disc punctate-granulate, punctures close, almost touching, rather large, with upraised lateral edges resulting in a sparsely granulate appearance; surface between punctures shining, with fine lines and points. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures coarse, shallow; discal interstriae wider than striae, smooth, usually all interstriae sparsely punctured but occasionally only 1, 3, 5, etc. bear fine punctures, these punctures equal in size to those in striae; interstriae 9 prominently elevated laterally, granulate at apex. Declivity convex; interstriae 1 weakly elevated above 2, moderately impressed below level of 3, distinctly granulate along median line; interstriae 2 about as wide as on disc, weakly sulcate, impunctate; interstriae 3 may or may not be elevated above elytral surface but is definitely higher than interstriae 1; punctures of striae 1 and 2 very small, almost obsolete.

**Male.** Frons convex above eyes, strongly, transversely impressed just above epistoma, impression sometimes reaching near the upper level of eyes and divided by a moderately elevated, longitudinal carina, this usually more strongly elevated on epistomal margin, frequently interrupted across transverse impression, then usually distinct to above the eyes; surface of frons strongly punctate-granulate, moreso in transverse impression. Pronotum and elytra essentially as in female except declivital granules slightly larger and interstriae 1 less deeply impressed.

**TYPE MATERIAL.** *P. toralis*. The holotype (♀) in the SLWC bears the data: Logan Canyon, Ut., 14 June 1947, S.L. Wood/Pinus flexilis/ Holotype Pityophthorus toralis S.L. Wood, 1964. The allotype and 56 paratypes bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

*M. confusus*. The holotype (♀) in the OSUC bears the labels: Mt. Talac, Cal., VII-2-1930/Pinus albicaulis/A.T. McClay, collector/ Holotype Myeloborus confusus, D.E. Bright. The allotype and 30 paratypes bear the same data and are deposited in the CASC, CISC, OSUC, CNC, DEBC, and the UCDC. One paratype was collected at Tioga Pass, Yosemite National Park, California on 28 July 1936 from *Pinus albicaulis*.

*P. collinus*. The holotype (♀) is in the CNC and is labeled: Can. B.C., Nahun, 15 miles W., Terrace Mtn., IX-21-1967/Pinus albicaulis/D.E. Bright collector/ Holotype, CNC No. 9734, Pityophthorus collinus D.E. Bright, '68. The allotype and 39 paratypes bear the same data and are deposited in the CNC, the USNM, and the SLWC.

HOSTS. *Pinus albicaulis*, *contorta*, *flexilis*, and *monticola*.

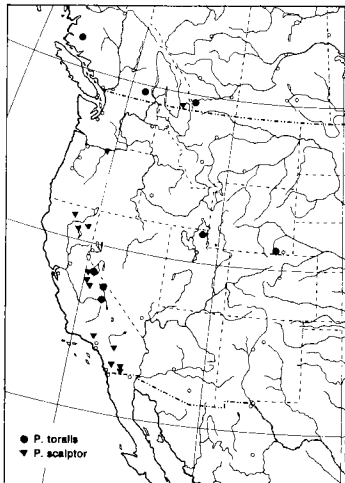
DISTRIBUTION. Southern British Columbia and Alberta, south along the mountain chains to the central Sierra Nevada in California and into northern Utah and southeastern Wyoming (Map 15). Specimens (248) examined from:

CANADA

**Alberta:** Burmis, 12.VIII.64, *Pinus flexilis* (CNC) 4; Cowley, 8.VIII.64, *Pinus flexilis* (CNC) 1; High. R. (Highwood River?), 9.VII.58, L.p. pine (CNC) 4. **British Columbia:** Anahim Lake, 18.VIII.65, *Pinus albicaulis* (CNC) 5.

UNITED STATES

**California:** Ebbetts Pass, 12.VII.34, *Pinus contorta* (DEBC) 1; 1 mi S of Onion Valley, 4.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 35; 10 mi N of Westgard Pass, 4.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 1. **Oregon:** 25 mi SW of Hood River, 25.VI.64, *Pinus monticola*, D.E. Bright (CNC) 1. **Utah:** Logan Canyon, 14.VI.47, *Pinus flexilis*, S.L. Wood (SLWC) 58. **Wyoming:** 7 mi E of Laramie, 3.VIII.69, *Pinus flexilis*, D.E. Bright (CNC) 6.



MAP 15. Collection localities for *P. (Pityophthorus) toralis* and *P. scalptor*.

REMARKS. Adults of this species resemble those of *nitidus* most closely but are readily distinguishable since declivity interstriae 1 of *toralis* is distinctly impressed below the level of interstriae 3. In addition the male frons of *toralis* is transversely impressed above the epistoma and the carina is usually tuberclelike on the epistoma but may be extended into a longer carina. The female frons is flattened and broadly shallowly concave only in the median portion. Occasionally there is an impunctate, elevated, shining spot on the epistomal margin which may be extended into a transverse epistomal process.

100. *Pityophthorus (P.) leechi* Wood

*Pityophthorus leechi* Wood, 1977a, p. 215.

Length 2.0-2.5 mm, about 2.8 times longer than wide.

**Female.** Frons weakly transversely impressed from epistoma to near upper level of eyes, flat to shallowly on median half of impressed area with a weakly elevated epistomal callus usually present; surface smooth, shining, with moderately coarse punctures; vestiture abundant but less so than in *scalptor*, rather short, those setae on periphery only slightly longer than others. Antennal club as in *scalptor*. Pronotum as described for *scalptor*. Elytra

essentially as described for *scalptor* except setae very slightly longer and granules on declivital interstriae 1 and 3 slightly coarser.

**Male.** As described for *scalptor* except transverse impression not as deep and median carina less strongly elevated.

**TYPE MATERIAL.** The holotype (♀) is in the CASC and bears the data: 2 miles NNE Angwin, N. side of Howell Mt., Napa Co., California, 5.VI.1977/reared from shaded-out branch of *Pinus ponderosa*, H.B. Leech/ **HOLOTYPE** *Pityophthorus leechi* S.L. Wood, 1977. The allotype and 27 paratypes bear the same data.

Most of the type material is in the CASC, additional paratypes are in the CNC and the SLWC.

**HOST.** *Pinus ponderosa*.

**DISTRIBUTION.** Known only from the type locality in California.

**REMARKS.** Adults of this species are very similar in appearance to those of *scalptor* but are most easily distinguished by the characters of the female frons as mentioned in the key and description.

#### 101. *Pityophthorus (P.) scalptor* Blackman

Map 15

*Pityophthorus scalptor* Blackman, 1928, p. 30, Chamberlin, 1939, p. 356; Bright & Stark, 1973, p. 105.

Length 2.2-2.7 mm, about 2.7 times longer than wide.

**Female.** Frons broadly, deeply concave from epistomal margin to well above eyes and nearly from eye to eye; surface shining, finely punctate except for a small, impunctate space just above epistomal margin, punctures small, closely placed, these much denser around periphery of concave area; vestiture abundant, consisting of a fringe of very long, incurved, yellowish setae around periphery of concavity and a much shorter, sparser, erect seta arising from each puncture in the concavity. Antennal club broadly oval, 1.1 times longer than wide; suture 1 weakly arcuate, 2 more strongly so; first two segments together occupy less than half of total club length. Pronotum 1.2 times longer than wide, widest behind summit; sides weakly arcuate; asperities on anterior slope scattered, low, not arranged in any apparent order; summit moderately elevated; posterior area of disc bearing small, close punctures; surface between punctures smooth, shining, with fine points and lines. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures shallow, rather indistinct; discal interstriae about 2.0 times wider than striae, surface minutely reticulate, all interstriae bearing a median row of punctures, these slightly smaller and sparser than those in striae; interstriae 9 rather prominently elevated laterally. Declivity convex; interstriae 1 weakly elevated, with a median row of fine granules; interstriae 2 weakly impressed, impunctate, equal to or slightly wider than discal width; interstriae 3 not elevated or only very weakly so, equal in height or slight higher than 1, with median row of fine granules; punctures of striae 1 and 2 small, widely separated, those in 1 more strongly impressed; interstriae 3 and 9 appearing to be joined at apex in some specimens.

**Male.** Frons convex at about upper level of eyes, weakly, transversely impressed above epistoma, this impression divided by a fine, longitudinal carina which extends from epistoma to or beyond upper level of eyes, equally elevated for entire length but appearing more prominently elevated across transverse impression; surface much more strongly and deeply punctured than in female, glabrous or with fine setae. Pronotum and elytra essentially as in female. Declivity as in female.

**TYPE MATERIAL.** The holotype (♀) in the USNM, bears the labels: Hopk. U.S. 13282g/Reared Sept. 2,-15/F.P. Keen, Colr./Julian, Calif/*Pinus coulteri*/Nov. 30-16/TYPE, *Pityophthorus scalptor* Blackman/Type No. 41265 USNM. Five paratypes bear the same data. The allotype and 6 paratypes bear the data: Hopk. U.S. 2775/Hopkins, colr./Ventura Co., Cal./*Pinus jeffreyi*/Paratype (or allotype)

*Pityophthorus scalptor* Blackman/Paratype No. 41265 USNM. Twenty paratypes are labeled: Northfork, Calif., X-6-26/M.W. Blackman, collector/*Pinus ponderosa*/K-236/Paratype *Pityophthorus scalptor* Blackman/Paratype No. 41265 USNM.

Most of the type material is in the USNM, paratypes are also in the CNC and the DFEC.

HOSTS. *Pinus contorta*, *coulteri*, *jeffreyi*, and *ponderosa*.

DISTRIBUTION. Southern California to southern British Columbia (Map 15). Specimens (56) examined from:

CANADA

**British Columbia:** Elko, 19.IX.67, *Pinus ponderosa*, D.E. Bright (CNC) 3.

UNITED STATES

**California:** Ebbetts Pass, 12.VII.34, *Pinus contorta* (DEBC, USNM) 3; Hat Creek, 18.X.47, *Pinus jeffreyi*, S.L. Wood (SLWC) 8; Lake Arrowhead, 25.VII.32, R.P. Allen (CASC) 1; McCloud, 8.IX.72, sticky trap on *Pinus ponderosa*, H.A. Moeck (CNC) 2; Mount Laguna, 30.X.40, *Pinus contorta*, D. DeLeon (DEBC) 1; Old Station, Lassen Co., 29.X.47, *Pinus jeffreyi*, S.L. Wood (SLWC) 1; Palomar Mountain, 26.VIII.68, *Pinus coulteri*, D.E. Bright (CNC) 2; Yosemite Valley, IV, *Pinus ponderosa*, A.D. Hopkins (USNM) 1.

REMARKS. Adults of *scalptor* are easily recognized by the broadly concave, densely pubescent female frons, by the convex, deeply punctured, finely carinate male frons, by the convex, very weakly sulcate elytral declivity of both sexes, by the structure of the antennal club described above, and by the elevated ninth elytral interstriae.

Specimens from British Columbia are much smaller than specimens originating from California. The average length of the British Columbia specimens seen was 2.3 mm, while those from California averaged about 2.5 mm.

LITOS GROUP

This group contains one species at this time. Adults are characterized by the flattened female frons that bears long setae on the periphery, by the longitudinally carinate male frons, and by the declivital characters.

102. *Pityophthorus (P.) litos* Bright

*Pityophthorus litos* Bright, 1976b, p. 435.

Length 1.6-1.7 mm, about 2.8 times longer than wide.

**Female.** Frons flattened from eye to eye and from epistoma to slightly above upper level of eyes; surface shining, densely punctured, punctures small, very close; vestiture abundant, consisting of long, yellowish setae, one seta arising from each puncture, those setae on periphery much longer and incurved. Antennal club 1.2-1.3 times longer than wide, widest through segment 3; segment 1 slightly narrower than 2; sutures 1 and 2 weakly arcuate; first two segments together occupy slightly less than half of total club length. Pronotum about as long as wide, widest behind middle; asperities on anterior slope small, erect, acute, scattered in no apparent order; posterior area of disc opaque, punctures distinct, rather deep; surface between punctures densely and minutely reticulate. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures rather large, deep; discal interstriae equal to or slightly wider than striae, surface minutely reticulate; interstriae 1, 3, 5, 7, 9 sparsely punctured and setose; interstriae 9 not elevated. Declivity convex; interstriae 1 broad, slightly elevated, with a median row of very fine granules; interstriae 2 about as wide as on disc, slightly but distinctly impressed; interstriae 3 not elevated above elytral surface, slightly higher than 1, with a median row of fine granules, these larger than those on



1, each granule with a longer seta arising from lower base; punctures of striae 1 and 2 visible, reduced in size, those in striae 1 more deeply impressed.

**Male.** Frons convex, divided by a fine, weakly elevated, longitudinal carina which extends from epistoma to upper level of eyes; surface densely, deeply punctured with a few, fine granules between them; vestiture inconspicuous. Pronotum and elytra essentially as in female.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: MEX., 25 mi. W. Orizaba, V.C., IV-29-1969, D.E. Bright/Pinus sp./HOLOTYPE *Pityophthorus litos* D.E. Bright, CNC No. 15085. The allotype and 6 paratypes bear the same data.

Most of the type material is in the CNC, 2 paratypes are in the SLWC.

**HOSTS.** *Pinus* sp.

**DISTRIBUTION.** Known only from the type locality in Veracruz.

**REMARKS.** This rather nondescript species can be most readily recognized by the narrow first antennal segment, by the weakly elevated longitudinal carina on the convex male frons, by the large, deep punctures on the posterior portion of the pronotum, and by the very fine granules in interstriae 1 and 3 on the declivity.

#### CARMELI GROUP

This group includes one species which is endemic to the coastal regions of central and southern California. Adults are easily recognized by the deeply concave, densely pubescent female frons (Fig. 87) and by the transversely impressed male frons which bears an elevated, median callus on the upper margin of the impression and sometimes a weak longitudinal carina across the impression (Fig. 88).

### 103. *Pityophthorus* (*P.*) *carmeli* Swaine

Figs. 87-89; Map 16

*Pityophthorus carmeli* Swaine, 1918, p. 100; Blackman, 1928, p. 97; Burke, 1932, p. 366; Chamberlin, 1939, p. 385; Keen, 1952, p. 37; Bright & Stark, 1973, p. 111. *Pityophthorus torreyanae* Swaine, 1918, p. 101; Blackman 1928, p. 98 (= *carmeli*).

Length 2.4-2.9 mm, 2.9 times longer than wide.

**Female.** Frons deeply, broadly concave from epistomal margin to well above eyes and laterally from eye to eye; surface of concavity shining, closely, finely punctured; vestiture abundant, setae on periphery of concavity much longer than others and incurved. Antennal club elongate-oval, 1.2 times longer than wide, widest through segment 2; first two sutures arcuate, 2 somewhat more so than 1; first two segments together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest near posterior angles; sides broadly arcuate; asperities on anterior slope small, broad, generally separated from each other, arranged in no apparent order; posterior area of disc dull, opaque, densely and closely punctured, punctures rather large, deep; surface between punctures densely, minutely reticulate. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures deep, close, each puncture bearing a short, fine seta about as long or slightly longer than the diameter of a puncture; discal interstriae about 1.5-2.0 times wider than striae, surface shining, densely microreticulate and micropunctate; interstriae 1, 3, 5, 7, 9 bearing a median row of moderately abundant, setiferous punctures, each puncture bearing a moderately long, hairlike seta. Declivity convex; interstriae 1 weakly elevated, with a median row of very fine setiferous granules; interstriae 2 flat, weakly impressed, about as wide as discal width; interstriae 3 not elevated, equal in height to 1, bearing a median row of fine setiferous granules; punctures in striae 1 and 2 generally distinct, easily visible, slightly smaller than those in discal striae.

**Male.** Frons transversely impressed from epistoma to slightly below upper eye level; a faint median, longitudinal carina frequently present across impression and a distinct, elevated, median callus or protuberance occurs on upper margin of impression, sometimes this callus

extends upwards onto vertex as on elevated carina; surface densely, closely punctured. Pronotum similar to female except asperities on anterior slope and serrations on anterior margin larger, sharper, and more erect. Elytra and declivity essentially as in female.

**TYPE MATERIAL.** *P. carmeli*. The holotype (♀) in the CNC bears the data: Carmel, Cal., V-19-1913/2934/♀/TYPE *Pityophthorus carmeli*/*Pityophthorus carmeli* Sw. mss., J.M.S./TYPE *Pityophthorus carmeli*, No. 1372. The allotype bears the same data with the exception of the type labels. Swaine (1918) states that 3 paratypes were at hand when he described the species, 2 ♀♀ 1 ♂, but only the male paratype (allotype) is in the CNC.

*P. torreyanae*. The holotype (♀) is missing from the pin in the CNC. The pin bears the labels: *Pinus torreyana*, Lot 46/San Diego, Calif./2945/♀/TYPE *Pityophthorus torreyanae*/TYPE *Pityophthorus torreyanae*, ♀, No. 1370. The allotype bears the same labels except for the type label. Nine paratypes with the same labels were in the original type series. Only one specimen could be located in the CNC. There are however 5 specimens with similar data among other Swaine material in the CNC. These were identified as *carmeli* by Schedl and could be part of the original type series. Even though the holotype of *torreyanae* is missing, there is no doubt of the synonymy of this species under *carmeli*.

**HOSTS.** *Pinus attenuata*, *coulteri*, *muricata*, *radiata*, and *torreyana*.

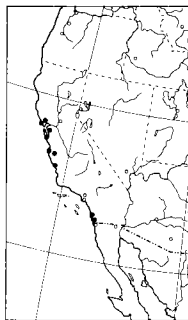
**DISTRIBUTION.** Endemic along the California coast from Marin County to San Diego County (Map 16). Specimens (47) examined from:

#### UNITED STATES

**California:** Cotati, 6.III.68, bull pine, W.J. Foerstler (USNM) 2; Jamesburg, 17.VI.67, *Pinus coulteri* (CNC) 3; Loch Lomond, 4.X.47, *Pinus attenuata*, S.L. Wood (SLWC) 1; Point Reyes, 11.IX.61, *Pinus muricata* (CNC) 8; San Diego, 2.I.45, *Pinus torreyana* (CNC) 11; San Diego Co., 9.VI.25, H.H. Kelfer (CASC) 10; Torrey Pines State Park, 11.IX.41, *Pinus torreyana*, T.O. Thatcher (CNC) 12.

Additional records in literature:

**California:** Berkeley, *Pinus radiata*; Cambria Pines; Carmel, *Pinus radiata*; Coronado; Felton; Inverness, *Pinus muricata*; Monterrey, *Pinus radiata*; Pacific Grove, *Pinus radiata*; San Simeon, *Pinus muricata*, and Stanford University (Bright and Stark 1973).



MAP 16. Collection localities for *P. (Pityophthorus) carmeli*.

**BIONOMICS.** This species attacks only the smaller twigs and tops of pines weakened by drought or by attacks of other bark beetles. It is generally considered to be of secondary importance but may become primary when the host tree is under stress, such as in drought. It has killed, or helped to kill, many Monterrey and other pines in the coast region of central California. Adults are polygamous and construct a typical

radiate type of gallery. There are at least two generations a year but since adults may be found throughout the year the suggestion is that more may be produced.

REMARKS. Adults are easily distinguished by the characters given in the group discussion (p. 137) and by the characters given in the key to groups.

#### ACICULATUS GROUP

Only one species included in this group. The adults are readily distinguished by the aciculate sculpturing on the male frons (Fig. 91) and by the flattened, weakly impressed second declivital interstriae (Fig. 92).

#### 104. *Pityophthorus (P.) aciculatus* Bright

Figs. 90-92

*Pityophthorus aciculatus* Bright, 1977, p. 519.

Length 2.1-2.6 mm, 2.5-2.6 times longer than wide.

**Female.** Frons flattened to weakly concave on a broad area from epistoma to just above upper eye level; surface strongly, roughly punctured, punctures deep and almost touching, interpuncture spaces forming ridges which converge toward midpoint on epistoma; a weak, longitudinal carina extends from epistoma to about half the distance to upper eye level. Antennal club oval, 1.3 times longer than wide, widest through segment 2; first two sutures nearly transverse; first two segments together occupy about two-thirds of total club length. Pronotum less than 1.1 times longer than wide; summit very weakly elevated; posterior area of disc strongly punctured, punctures deep, very close, surface between punctures shining. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal surface densely, randomly punctured, punctures large and deep. Declivity convex; interstriae 1 weakly impressed, bearing a row of large, shallow punctures; interstriae 2 broad, flat, weakly impressed, sometimes bearing a few large punctures; lateral margin of declivity slightly elevated, convex, with numerous punctures.

**Male.** Frons more deeply impressed, more strongly aciculate, punctures smaller except above transverse impression. Otherwise resembles female.

TYPE MATERIAL. The holotype (♀) is in the SLWC and bears the data: San Cristobal, Hw., Guatemala, 7000 ft., V-28-1964, S.L.W./*Pinus pseudostrobus*/HOLOTYPE *Pityophthorus aciculatus* D.E. Bright, 1976. The allotype and 44 paratypes bear the same data. Two additional paratypes are labeled: MEX. Ocoyoacac, Mex., VII-16-1969, D.E. Bright/*Pinus leiophylla* and the paratype labels.

Most of the type material is in the SLWC, additional paratypes are in the CNC.

HOSTS. *Pinus leiophylla*, *pseudostrobus*, and probably other species of pines in its range.

DISTRIBUTION. Known only from the type-series localities in central Mexico and Guatemala.

REMARKS. Adults of this species are very similar to those of *solus* and the two would be included in one species group except for the distinctive difference of the second declivital interstriae. Adults of *aciculatus* differ from those of *solus* by the absence of punctures in the second declivital interstriae (Fig. 92), by the more deeply impressed, aciculate sculpturing on the male frons, and by the larger punctures on the female frons.

#### SOLUS GROUP

This group is characterized by the abundantly punctured second declivital interstriae (Fig. 95), by the deep, abundant, randomly scattered elytral punctures, and by the rather deeply emarginate epistomal margin. The group contains one species.

105. *Pityophthorus (P.) solus* Blackman

Figs. 93-95; Map 17

*Pityophthorus solus* Blackman, 1928, p. 64.*Pityophthorus cribratus* Blackman, 1942, p. 217; Bright 1977, p. 518 (= *solus*).

Length 2.0-3.0 mm, 2.6 times longer than wide.

**Female.** Frons weakly convex to weakly flattened or weakly transversely impressed from epistoma to upper level of eyes, strongly convex above eyes; surface moderately shining, densely, coarsely punctured, sometimes weakly aciculate and sometimes with a low, impunctate, longitudinal carina of varying length, punctures deep, rather large, usually almost touching, larger and deeper on upper convex area; epistomal margin broadly, deeply emarginate; vestiture moderately abundant, consisting of fine, yellowish setae of generally uniform length. Antennal club elongate-oval, about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy almost two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest at or near posterior angles; sides weakly arcuate; anterior slope with rather sparse asperities, these scattered in no apparent order; summit not prominent, transverse impression behind summit weak; posterior area of disc deeply, closely punctured; surface between punctures smooth, shining, with few to numerous very fine, minute points. Elytra 1.7 times longer than wide; apex broadly rounded; surface brightly shining, deeply, closely, coarsely punctured, punctures randomly placed with little or no indication of striae or interstriae, surface between punctures smooth. Declivity sloping; interstriae 1 broad, only moderately elevated, with a median row of fine setaceous punctures or small granules; interstriae 2 weakly to moderately sulcate, wider than on disc, distinctly, abundantly punctured, punctures as large as on disc; interstriae 3 weakly elevated, about as high as interstriae 1, arcuate, distinctly punctured and occasionally bearing a few very fine granules; punctures in striae 1 and 2 as large as on disc, deeply impressed.

**Male.** Frons more deeply impressed above epistoma, longitudinal carina, if present, more strongly elevated, punctures deeper than in female. Pronotum and elytra essentially as in female except declivity may be more deeply sulcate.

**TYPE MATERIAL.** *P. solus*. The holotype in the USNM bears the data: Pinal Mts., Arizona, Wickham/147/*Pityophthorus nitidulus* Mann. 9074 (folded)/TYPE *Pityophthorus solus* Blackman/Type No. 41283 USNM. No other specimens are in the type series.

*P. cribratus*. The holotype ( $\delta$ ) is in the USNM and bears the labels: In wood crate bark, Mexico, IV-3-41, Nogales 44720/Lot No. 41-6638/Type No. 55990 USNM. The allotype and 7 paratypes bear the same data but some paratypes bear the date VI-29-41.

**HOSTS.** *Pinus ayacahuite*, *edulis*, *greggii*, *hartweggii*, *lawsonii*, *leiophylla*, *montezumae*, *oocarpa*, and probably others.

**DISTRIBUTION** Southwestern United States to Chiapas, Mexico, and probably occurs to the southern limit of pine growth in Honduras (Map 17). Specimens (197) examined from:

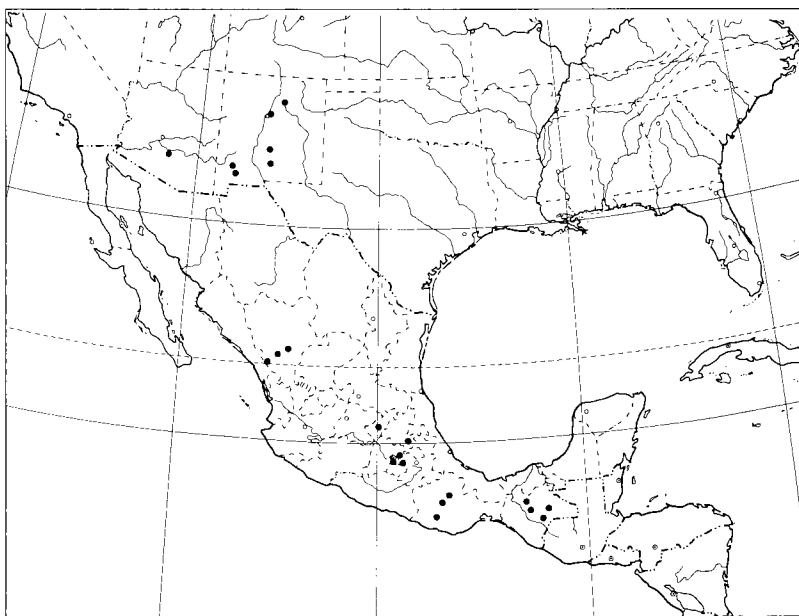
## UNITED STATES

**Arizona:** See type locality. **New Mexico:** Bingham summit, 1.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 7; Cloudcroft (RMSC) 1; 7 mi W of Kingston, 4.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 4; 5 mi W of Lake Roberts, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 7; Nogal Lake Forest Camp, 1.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 18; Porvenir, A. Fenyes (CASC) 1; Sandia Mountains, 31.V.69, *Pinus edulis*, S.L. Wood (SLWC) 13.

## MEXICO

**Chiapas:** 20 mi N of Bochil, 10.VI.69, *Pinus oocarpa*, D.E. Bright (CNC) 11; 20 mi NW of Comitán, 17.VI.64, *Pinus*, S.L. Wood (SLWC) 1; 8 mi N of Ocosingo, 2.VI.69, *Pinus oocarpa*, D.E. Bright (CNC) 1; San Cristobal de las Casas (and

vicinity), various dates 1969, *Pinus ayacahuite* and *Pinus montezumae*, D.E. Bright (CNC) 21. **Durango:** Durango, 29.X.42, Bark and sapwood, Pitch pine lumber, intercepted at Brownsville (USNM) 9; 9 mi E of El Palmito, 15.VI.71, *Pinus ayacahuite*, D.E. Bright (CNC) 5; 4 mi W of El Salto, 15-17.VI.71, S. Peck (CNC) 2. **Hidalgo:** 13 mi E of Tulancingo, 24.VI.53, *Pinus* sp., S.L. Wood (SLWC) 2. **Mexico:** Nepantla, 9.V.71, *Pinus leiophylla*, D.E. Bright (CNC) 1. **Oaxaca:** 20.5 km N of Oaxaca, 31.V.71, *Pinus* sp., D.E. Bright (CNC) 7; 115 mi S of Oaxaca on highway 131, 27-30.V.71, *Pinus lawsonii*, D.E. Bright (CNC) 1; 52 mi N of Oaxaca, 17.V.71, *Pinus ayacahuite*, D.E. Bright (CNC) 5; 70 mi N of Oaxaca, 18.V.71, *Pinus leiophylla*, D.E. Bright (CNC) 2; 3 mi N of Suchixtepec, 4.VI.71, Valle Nacional, 21.V.71, *Pinus* sp., D.E. Bright (CNC) 11; 37 mi S of Valle Nacional, 24.V.71, *Pinus* sp., D.E. Bright (CNC) 6; 40 mi S of Valle Nacional, 25.V.71, *Pinus hartwegii*, D.E. Bright (CNC) 10. **Puebla:** Ixta-Popo National Park, 8.V.71, *Pinus hartwegii*, D.E. Bright (CNC) 27. **Querétaro:** 2 mi E of Pinal de Amoles, 9.VI.71, *Pinus greggii*, D.E. Bright (CNC) 2. **Tlaxcala:** 11 mi N of Tlaxco, 9.VII.67, *Pinus* sp., S.L. Wood (SLWC) 1.



MAP 17. Collection localities for *P. (Pityophthorus) solus*.

**REMARKS.** This unique species is easily recognized by the strongly punctured second declivital interstriae (Fig. 95), by the strongly emarginate epistomal margin, and by the strongly punctured elytra and pronotum. Adults sometimes show a characteristic color pattern which is light reddish brown to light red on the dorsal surface of the pronotum and elytra and dark reddish brown on the lateral portions of the elytra and pronotum.

Adults of this species display considerable variation in size and sculpture. Generally, the punctures in the second declivital interstriae are randomly scattered but they may be arranged in a single median row. The frons of both sexes may be punctured or aciculate and occasionally there is a distinct callouslike elevation at the lateral angles just above the epistoma. The longitudinal carina may or may not be present. Very fine granules may or may not be present on declivital interstriae 1 and 3.

A series of specimens from the slopes of Volcan Popocatepetl at 13,000 ft in elevation are conspicuously larger than specimens from other localities. Other size differences strictly correlated with geographical distribution were not noted. Other variations were noted in the depth of the impressed second declivital interstriae and in the height of interstriae 3 but no distinct breaks in the range of variation were detected.

#### RECENS GROUP

This group is erected to contain a rather peculiar species from northern British Columbia and the Yukon Territory. Adults belonging to this group are characterized by the glabrous, very densely punctate-granulate frons of the female. Other characteristics are mentioned below.

#### 106. *Pityophthorus (P.) recens* Bright

*Pityophthorus recens* Bright, 1976b, p. 438.

Length 1.9-2.1 mm, 2.8-2.9 times longer than wide.

**Female.** Frons very strongly convex, may be narrowly, transversely flattened or impressed just above epistoma; surface glabrous, very densely granulate-punctate on a large, semicircular, median area that extends from epistoma to upper level of eyes, punctures very small and close, surface between punctures shining and slightly elevated. Antennal club oval, 1.3 times longer than wide, widest through segment 2; sutures weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1 times longer than wide; asperities scattered on anterior slope; posterior portion of disc finely punctured, punctures small, deep and widely separated; surface between punctures shining, bearing numerous fine points. Elytra 1.8 times longer than wide; discal striae punctured in regular rows; discal interstriae shining, with dense fine lines; discal interstriae 1, 3, 5, 7, etc. bearing sparse, fine punctures. Declivity steep; interstriae 1 and 3 equal in height, both bearing a median row of fine granules; interstriae 2 widened, moderately sulcate; setae on interstriae 1, 3, 5, 7, and 9 long.

**Male.** Frons convex and evenly, densely punctured over entire surface, punctures moderate to large, deep and close; a very fine, median, longitudinal elevation present on epistoma. Otherwise resembles female.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: CAN., B.C., Pine Pass, VII-II-1972, D.E. Bright/On *Picea*/♀/HOLOTYPE *Pityophthorus recens* D.E. Bright, 1977, CNC No. 15088. The allotype and 4 paratypes bear similar labels except for sex and type labels. Two additional paratypes bear the data: Rampart House, Y.T., V.24.1951, J.E.H. Martin.

Most of the type material is in the CNC, 1 paratype each are in the SLWC and the KESC.

**HOST.** *Picea engelmannii* and *glauca*. Probably occurs in all species of *Picea*.

**DISTRIBUTION.** Western Canada. Specimens (13) examined from:

#### CANADA

**British Columbia:** Trinity Valley, 6.VIII.54, *Picea engelmannii*, J.M. Kinghorn (SLWC) 2. **Yukon Territory:** Teslin, 19.VII.61, *Picea glauca* (CNC) 3.

**REMARKS.** Adults of this species are most easily recognized by the densely granulate-punctate median area on the strongly convex female frons, by the strongly convex, evenly punctured male frons, by the sparsely punctured posterior portion of the pronotum, and by the microsculpturing of the elytral interstriae and the pronotum.

## PUNCTIFRONS GROUP

This unique group is characterized by the fact that only the first suture of the antennal club is chitinized. Additional characters are given below.

107. *Pityophthorus (P.) punctifrons* Bright

*Pityophthorus punctifrons* Bright, 1966, p. 299; Bright & Stark, 1973, p. 106.

Length 1.4-1.9 mm, about 2.6 times longer than wide.

**Female.** Frons flat, sometimes divided by a very faint, longitudinal carina which may only be evident just above epistomal margin or may extend to near upper level of eyes; surface distinctly, strongly punctured, punctures fine, close and deep; vestiture inconspicuous. Antennal club elongate-oval, 1.5 times longer than wide, widest through segment 2; suture 1 nearly straight, transverse, chitinized at lateral margins; suture 2 arcuate, not chitinized; segments 1 and 2 together occupy more than two-thirds of total club length. Pronotum about 1.1 times longer than wide, widest at about middle; sides arcuate; asperities on anterior slope erect, acute, arranged in barely discernible concentric rows but frequently scattered in no apparent order; posterior area of disc shining, punctures large, deep, and close; surface between punctures smooth, shining. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures small (except in first row); discal interstriae about 2.0 times or less wider than striae, 1, 3, 5, 7, 9 each bearing a row of widely separated, setiferous punctures, otherwise surface marked by scattered fine lines and minute points. Declivity evenly convex; interstriae 1 weakly elevated, with a median row of very fine granules; interstriae 2 wider than 1, about as wide as its own discal width, unmodified; interstriae 3 not elevated, unmodified but may bear a few very fine granules at or near apex; punctures in striae 1 and 2 obsolete, much smaller than those on disc.

**Male.** Virtually indistinguishable from female except by abdominal segmentation. Frequently differs by having the longitudinal carina on the frons slightly more obvious and the granules on declivital interstriae 3 may be slightly stronger.

**TYPE MATERIAL.** The holotype (♀?) in the CAS bears the labels: Frazier Park, Kern Co., Calif., IX-9-65/Pinus monophylla/D.E. Bright and D.N. Kinn, collectors/HOLOTYPE *Pityophthorus punctifrons*, D.E. Bright. Three paratypes bear the same data. The allotype and 5 paratypes bear the data: Juniper Hills, near Valyermo, Calif. VII-30-50/Hopk U.S. 34059/Pinus monophylla/G.C. Trosale, collector. Nineteen additional paratypes are labeled: Hopk. US 32525B/Mt. Laguna, Calif. III-19-41/Pinus quadrifolia/D. DeLeon collector and 10 paratypes are labeled: Hopk US 33654A/Wrightwood, Calif. X-21-41/Pinus monophylla/J.M. Miller, collector/D. DeLeon, collector.

Most of the type material is in the CASC, paratypes are in the CNC, USNM, PSFR, CISC, SLWC, and the DEBC.

**HOSTS.** *Pinus edulis*, *monophylla*, and *quadrifolia*.

**DISTRIBUTION.** Southwestern United States from southern California to New Mexico. Specimens (53) examined from:

## UNITED STATES

**California:** Sugarloaf Mountain, San Bernardino Co., I.VIII.32, Pinyon pine, C.R. Bruck (OSUC) 4. **New Mexico:** Sante Fe, *Pinus edulis* (USNM) 10.

Additional records in literature:

**California:** 6 mi N of Westgard Pass, *Pinus monophylla* and Walker Pass, *Pinus monophylla* (Bright and Stark 1973).

**REMARKS.** Adults of this species resemble those of *Pityophthorus keeni* very closely. The only reliable way I have found to distinguish the two species is by the differences in the antennal club. The adults may be distinguished from those of

other species by the evenly convex, unmodified elytral declivity, by the obsolete stria punctures on the declivity, and by the distinctly, strongly punctured frons which bears a faint longitudinal carina in both sexes.

#### FURNISSI GROUP

Species belonging to this group are characterized by the very narrowly rounded to subacuminate elytral apex of the female and the broadly rounded elytral apex of the male, by the very short, recumbent setae on the female frons, by the frequently elevated midline on the female frons which may be more densely pubescent, and by the distribution. Two species are known in this group.

#### KEY TO SPECIES IN THE Furnissi group

1. Setae on female frons fine, not scalelike; declivital interstriae 2 usually punctured and setiferous along entire length; granules and setae on lateral elevations of declivity of both sexes randomly placed; declivity of male weakly sulcate, interstriae 3 nearly equal in height to 1; central Mexico . . . . . 108. *furnissi* Bright (p. 144)
- Setae on female frons narrowly scalelike; declivital interstriae 2 not punctured or setiferous in female except sometimes on upper level or at apex; granules and setae on lateral elevations of declivity of both sexes placed in even rows, stria punctures usually evident; declivity of male more deeply sulcate, interstriae 3 distinctly higher than 1; Nuevo León . . . . . 109. *brevicomatus* Bright (p. 145)

#### 108. *Pityophthorus (P.) furnissi* Bright

*Pityophthorus furnissi* Bright, 1976b, p. 433.

Length 2.0-2.5 mm, 3.0 times longer than wide.

**Female.** Frons either broadly flattened or weakly concave on each side of a weakly elevated longitudinal carina; surface densely, minutely punctate and bearing fine, short, recumbent setae, those on or near median line longer and somewhat denser. Antennal club about 1.1 times longer than wide, widest through segments 2 and 3; sutures transverse, strongly chitinized at lateral margins. Pronotum about 1.1 times longer than wide, widest at posterior angles; asperities on anterior slope scattered in no apparent order, smaller than serrations on anterior margin; posterior area of disc densely, deeply punctured, punctures very close; surface between punctures dull, minutely reticulate. Elytra 2.0 times longer than wide; apex narrowly rounded to subacuminate; discal stria punctures large, deeply impressed, in regular rows; discal interstriae largely impunctate but 3 and 5 may bear a few, widely separated, setiferous punctures. Declivity weakly bisulcate; interstriae 1 moderately elevated, bearing a row of numerous small granules; interstriae 2 moderately impressed, as wide as discal width, usually bearing a row of scattered fine granules and setae; interstriae 3 equal in height to 1; median area lateral to interstriae 3 weakly elevated, densely and randomly punctured, granulate and setose, stria punctures obsolete; punctures in striae 1 and 2 distinct.

**Male.** Frons weakly, transversely impressed or flattened, bearing a distinct, low, longitudinal carina and a short, more strongly elevated transverse carina at upper eye level. Pronotum and elytra resemble those of female except more broadly rounded. Declivity essentially as in female except area lateral to interstriae 2 more strongly elevated, more strongly punctured, granulate, and setose.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Amecameca, Mex., 111-17-54/Pinus hartwegii/R.L. Furniss, collector/Hopk. N.S. 33327D/♀/HOLOTYPE *Pityophthorus furnissi* D.E. Bright. The allotype and 9 paratypes bear the same data.

Type material is in the USNM, the CNC, and the SLWC.

**HOST.** *Pinus hartwegii* and probably other high altitude pines in central Mexico.



DISTRIBUTION. Known only from the type locality in central Mexico.

REMARKS. This species is closely related to *brevicomatus*. Adults of *furnissi* may be most easily distinguished by the characters in the key. In addition, males may be distinguished from those of *brevicomatus* by the sharper, longer, and more distinct longitudinal and transverse carinae on the frons.

109. *Pityophthorus (P.) brevicomatus* Bright

*Pityophthorus brevicomatus* Bright, 1976b, p. 430.

Length 2.2-2.5 mm, 2.9 times longer than wide.

**Female.** Frons essentially as in *furnissi* except setae denser and definitely narrowly scalelike. Antennal club as in *furnissi* except much more narrowly oval, 1.5 times longer than wide. Pronotum essentially as in *furnissi*. Elytral as in *furnissi*. Declivity sloping; interstriae 1 distinctly elevated above 2, slightly impressed below 3, bearing a median row of numerous, close granules; interstriae 2 slightly sulcate, only slightly wider than discal width, wider than in *furnissi*, impunctate but sometimes bearing 3 or 4 setiferous punctures at upper level or at apex; interstriae 3 higher than 1, with a median row of distinct punctures; punctures in striae 1 and 2 obsolete, if visible, then much smaller and shallower than those on disc.

**Male.** Generally as in *furnissi* except longitudinal carina on frons broader and transverse carina less obvious and sometimes obsolete, declivity more deeply, broadly sulcate and granules and setae on lateral elevations in an even row, not randomly placed.

TYPE MATERIAL. The holotype (♀) is in the CNC and bears the labels: MEX., N.L., Cerro Potosi, V.4.71, 11,500', D.E. Bright/Pinus strobiformis/HOLOTYPE *Pityophthorus brevicomatus* D.E. Bright, CNC No. 13731. The allotype and 11 paratypes bear the same data.

Most of the type material is in the CNC, some paratypes are in the SLWC and the KESC.

HOST. *Pinus strobiformis*.

DISTRIBUTION. Known only from Cerro Potosi in Nuevo León, Mexico and is probably endemic.

REMARKS. This very pretty species is closely related to *furnissi* but can be distinguished by the characters given in the key, in the diagnosis, and in the discussion of *furnissi*.

MONTIVAGUS GROUP

Representatives of this group are characterized by the concave, glabrous female frons that bears short, stout setae only on the lateral margins proximal to the eyes (Fig. 96), by the transversely impressed and longitudinally and transversely carinate male frons (Fig. 97), and by the regular rows of striae punctures.

Only one species is known in this group.

110. *Pityophthorus (P.) montivagus* Bright

Figs. 96-98

*Pityophthorus montivagus* Bright, 1977, p. 527.

Length 2.0-2.5 mm, 3.0-3.2 times longer than wide.

**Female.** Frons broadly, deeply, arcuately concave from epistomal margin to well above eyes, frequently with the central portion longitudinally elevated and the surface more deeply concave on each side between the elevation and the eyes, upper margin abrupt; surface brightly shining, with widely scattered, extremely fine points, completely glabrous except for a fringe of short, stout, yellowish setae at lateral margin next to eye. Antennal

club nearly circular, less than 1.1 times longer than wide, widest through segments 2 and 3; suture 1 transverse, 2 weakly sinuate. Pronotum 1.3 times longer than wide, widest just behind summit; sides evenly arcuate; asperities on anterior slope small, acute, scattered in no apparent order; punctures on posterior portion of disc moderate in size, close; surface between punctures dull, densely microreticulate-punctate. Elytra 2.0 times longer than wide; apex narrowly rounded, almost subacuminate; discal striae punctured in regular rows, punctures rather large and deep; discal interstriae about as wide or slightly wider than striae, moderately shining, with numerous, close, fine points; interstriae 1, 3, 5, 7, etc. with a few large punctures. Declivity steeply convex; interstriae 1 slightly impressed below level of 3, as wide as on disc, with a median row of fine granules; interstriae 2 as wide as on disc, not noticeably impressed but sloping downwards toward striae 1; interstriae 3 higher than 1 but not elevated above general elytral surface, with a median row of fine granules; striae punctures in striae 1 equal to those on disc, obsolete to greatly reduced in 2.

**Male.** Frons transversely impressed from upper level of eyes to epistoma, impression divided by a weak, broad, longitudinal elevation, upper margin of impression elevated into a broad, transverse carina; surface moderately shining, more strongly punctured. Pronotum and elytra essentially as in female. Declivity convex; essentially as in female except for a strongly elevated elevation which appears to be located in the middle portion of interstriae 2, this elevation is much higher than suture, nearly vertical on its inner face, sloping on its outer face, sometimes with weak granules on summit, elevations parallel or converging at their apex, area between the elevations and the elytral apex more strongly granulate-punctate.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: Km. 77, Oax. Hwy. 175, 53 mi. N. Oaxaca, MEX., 10,500', 22.V.1969, J.E.H. Martin/*Pinus patula*/HOLOTYPE *Pityophthorus montivagus* D.E. Bright, CNC No. 13730. The allotype and 79 paratypes bear the same data. Numerous additional paratypes are listed in Bright (1977).

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.

**HOSTS.** *Pinus ayacahuite* (Bright 1977) and *patula*. Probably occurs in several to many species of pines in southern Mexico.

**DISTRIBUTION.** Known only from the mountains north of Oaxaca, Oaxaca, MEXICO (see under Type Material)

**REMARKS.** This is a very distinctive species in which the females are easily recognized by the concave, shining frons which bears setae only on the lateral margins near the eye (Fig. 96). The males are recognized by the transversely and longitudinally carinate frons (Fig. 97) and by the peculiar elytral declivity (Fig. 98) as described above.

#### INTEXTUS GROUP

The most distinctive feature of representatives of this group is the more or less dense brush of erect, equal-length setae on the female frons (Figs. 99, 102). Other characters of value, when used in combination, are: the convex, shallowly sulcate elytral declivity which bears a few stout setae and small granules on interstriae 3 (Figs. 101, 104), the even rows of striae punctures, the very sparsely punctate-setose alternate odd elytral interstriae, and the transversely impressed or flattened male frons.

Two species are placed in this group.

#### KEY TO SPECIES IN THE *Intextus* group

1. Male frons distinctly transversely impressed, usually with a narrow, longitudinal, median smooth space or a very weakly indicated longitudinal carina (Fig. 100); declivity inter-

striae 1 of male impressed below level of 3 (Fig. 101); granules on declivital interstriae 1 and 3 fine in both sexes, may be absent on 1 in male (Fig 101); transcontinental, south to Colorado and New York . . . . . 111. *intextus* Swaine (p. 147)  
 Male frons convex to weakly flattened, not transversely impressed, with a distinct but weakly elevated longitudinal carina (Fig. 103); declivital interstriae 1 equal or nearly equal in height to 3 in both sexes (Fig. 104); granules on declivital interstriae 1 and 3 distinct, large, especially on 3 in both sexes (Fig. 104); Alberta to Maine . . . . .  
 . . . . . 112. *cascoensis* Blackman (p. 150)

### 111. *Pityophthorus* (*P.*) *intextus* Swaine

Figs. 99-101; Map 18

*Pityophthorus intextus* Swaine, 1917, p. 29; Swaine, 1918, p. 102; Chamberlin, 1939, p. 386; Chamberlin, 1958, p. 153; Wood 1971a, p. 426; Bright, 1977, p. 515.

*Pityophthorus shepardi* Blackman, 1922b, p. 124; Blackman, 1928, p. 100; Chamberlin, 1939, p. 386; Craighead, 1950, p. 332; Baker, 1972, p. 255; Bright, 1977, p. 515 (= *intextus*).

*Pityophthorus tonsus* Blackman, 1928, p. 101; Chamberlin, 1939, p. 386; Craighead, 1950, p. 332; Bright, 1977, p. 515 (= *intextus*).

*Pityophthorus ornatus* Blackman, 1928, p. 102; Chamberlin, 1939, p. 387; Wood, 1977c, p. 516. **New synonymy.**

*Pityophthorus kenti* Blackman, 1928, p. 141; Chamberlin, 1939, p. 401; Bright, 1977, p. 515 (= *intextus*).

*Pityophthorus limatus* Wood, 1964, p. 65; Wood, 1977c, p. 516 (= *ornatus*). **New synonymy.**

Length 1.5-2.1 mm, about 2.6-2.8 times longer than wide.

**Female.** Frons flattened, sometimes weakly concave in middle, extending from epistoma to above upper level of eyes and occupying a space of about 85% of the distance between eyes; surface of flattened area very densely, finely punctured, covered with a dense brush of erect, yellowish setae, all of equal or very nearly equal length, those on periphery only slightly longer and incurved, if at all, setae sometimes abraded and therefore absent; surface above and lateral to flattened area sparsely punctured, glabrous, shining. Antennal club nearly circular, about 1.1 times longer than wide, widest through segment 2; first two sutures transverse to weakly arcuate; first two segments occupy about two-thirds of total club length. Pronotum 1.1 times longer than wide, widest at about level of summit; sides subparallel on posterior one-half; asperities on anterior slope acute, erect, some basally contiguous forming vague arcuate rows but mostly isolated and scattered in no apparent order; posterior area of disc shining, punctures rather large, deep; surface between punctures bearing numerous very fine points and lines, sometimes minutely reticulate. Elytra 3.0 times longer than wide; apex broadly rounded; discal strial punctures rather large, deeply to shallowly impressed; discal interstriae at least 2.0 times as wide as striae, surface shining to opaque, varying from densely minutely reticulate to smooth with numerous fine lines and points; interstriae 1, 3, 5, 7, etc. with a few scattered punctures. Declivity convex; interstriae 1 about as wide as on disc, weakly impressed below level of 3 to equal in height to 3, with a median row of fine granules; interstriae 2 equal to or slightly wider than discal width, moderately sulcate, surface shining to opaque; interstriae 3 not elevated above elytral surface, rounded, bearing a row of fine granules; punctures of striae 1 and 2 distinct to obsolete.

**Male.** Frons distinctly transversely impressed, upper margin of impression distinctly to weakly elevated into a distinct transverse carina; surface distinctly punctured, punctures deep and close except on the occasionally present, narrow, longitudinal, median space or on the sometimes present, weakly elevated longitudinal carina which may extend from the epistomal margin to upper level of eyes. Pronotum and elytra essentially as in female except pronotal asperities and declivital granules somewhat larger (declivital granules may be absent on interstriae 1) and declivital setae slightly longer and stouter.

TYPE MATERIAL. *P. intextus*. The holotype ( $\sigma$ ) in the CNC bears the data: 2679/Pityophthorus intextus n.sp./Type of description/ $\sigma$ /TYPE/TYPE *P. intextus* Sw., No. 3147. The allotype bears the same labels except that the "Pityophthorus intextus n.sp." label is omitted. Twelve paratypes (?) are simply labeled "2679", 1 is labeled "2677", and 1 is labeled "2187".

All type material is in the CNC.

*P. shepardii*. The holotype ( $\varphi$ ) in the USNM is labeled: Me. Agr. Exp. Sta. 7-R-12, 28 July 1919/M.W. Blackman, collector/M-45/Type/Type No. 53849 USNM. The allotype and 5 paratypes in the USNM and 3 paratypes in the DFEC all bear the same data.

*P. tonsus*. The holotype ( $\varphi$ ) in the USNM bears the data: Hopk U.S. 3785 c/W.F. Fiske, collector/Grand Isl. Mich./Picea/TYPE Pityophthorus tonsus Blackman/Type No. 41304 U.S.N.M. Six paratypes, 5 in the USNM and 1 in the DFEC, bear the same data. The allotype and 22 paratypes (in the USNM, DFEC, CNC) bear the labels: Hopk. U.S. 3780c/W.F. Fiske collector/Grand Isl. Mich./Pinus resinosa and the appropriate paratype labels. Eight additional paratypes in the USNM are labeled: Hopk. U.S. 3771-a/W.F. Fiske, colr./Webster, N.H. Picea.

*P. ornatus*. The holotype ( $\varphi$ ) in the USNM bears the data: Hopk. U.S. 9902v/Reared May 22.14, H.B. Kirk/W.D. Edmonston, colr./Manitou, Colo./Pinus edulis/TYPE *Pityophthorus ornatus* Blackman/Type No. 41305 USNM. The allotype and 2 paratypes bear the same data except for the appropriate type labels.

*P. kenti*. The holotype ( $\varphi$ ) in the USNM bears the data: Hopk. U.S. 482 b/Hopkins, colr., Black Hills, Wy./Pinus/TYPE Pityophthorus kenti Blackman/Type No. 41325 U.S.N.M. The allotype and 14 paratypes bear the same data. An additional label on the allotype reads: Big Horn Forest Reserve, Kent, colr. Most of the type material is in the USNM, some paratypes are in the CNC.

*P. limatus*. The holotype ( $\varphi$ ) in the SLWC is labeled: Sanford Cyn., Dixie N.F., Ut., June 22, 1960/Picea pungens/B.Y.U. Bark Beetle Expd./HOLOTYPE Pityophthorus limatus S.L. Wood, 1964. The allotype and 20 paratypes bear the same labels. Ten paratypes are labeled: Parowan Cyn., Iron Co., Utah, June 20, 1960/Picea pungens/B.Y.U. Bark Beetle Expd and 4 paratypes are labeled: McKee Draw, Ashley N.F., Utah, June 16, 1960/Picea pungens/B.Y.U. Bark Beetle Expd.

Most of the type material is in the SLWC, some paratypes are in the CNC.

All the holotypes and paratypes mentioned above have been examined and compared with hundreds of specimens from all across Canada and from numerous areas in the northeastern and western United States. All are considered representative of one widespread species.

HOSTS. *Pinus banksiana*, *contorta*, *edulis*, *ponderosa*, and *resinosa*; *Picea glauca*, *mariana*, *pungens*, and *rubens*; *Pseudotsuga menziesii*.

DISTRIBUTION. Transcontinental across northern North America, south in the west to Colorado and southern Utah and in the east to northern New York and New England (Map 18). Specimens (1079) examined from:

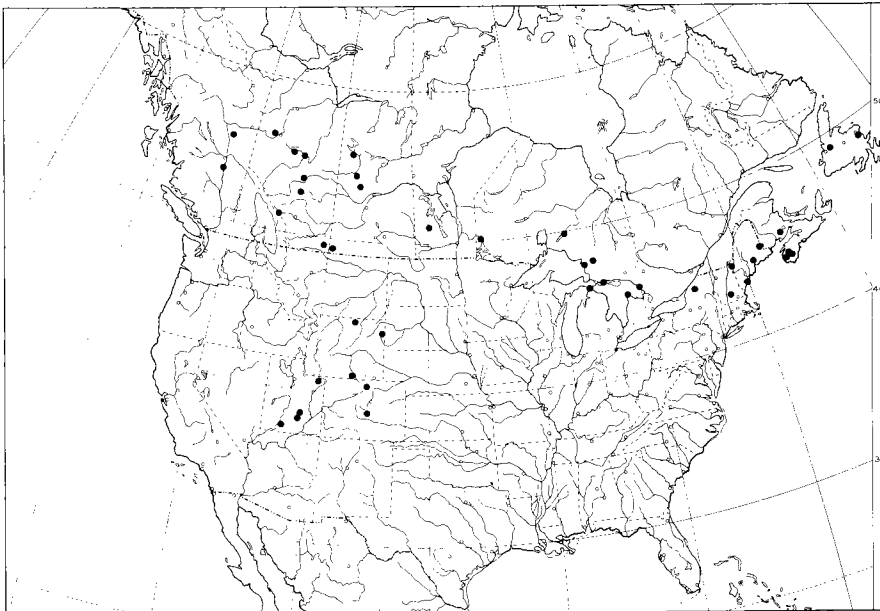
#### CANADA

**Alberta:** Banff, 5.VII.58, Spruce (CNC) 4; Cypress Hills, VI.30, F.S. Carr (DFEC) 4; Edmonton, VIII.28 (USNM) 7; Lesser Slave Lake, VIII.15 (CNC) 10; Massive Siding, 5.VII.57, *Picea glauca* (NFRCE, CNC) 9; 10 mi W of Peace River, 12.VII.72, *Pinus contorta*, D.E. Bright (CNC) 49; Ponoka, 9.VIII.50, White spruce (NFRCE) 5; Red Deer Crossing, 24.VI.66, *Picea glauca* (NFRCE) 5; Slave Lake,

16.XI.78, White spruce (NFRCE); 10 mi NE of Smith, 15.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 26. **British Columbia:** Hixon, 11.VII.72, *Picea*, D.E. Bright (CNC) 33; Pine Pass, 11.VII.72, *Picea*, D.E. Bright (CNC) 12; Smithers, 28.VII.69, Spruce, J. Chapman (PFRC) 4, **Manitoba:** Riding Mountains, 19.V.12, Jack pine, J.M. Swaine (CNC) 1. **New Brunswick:** Portage Vale, 14.VII.70, *Picea glauca*, D.E. Bright (CNC) 3. **Newfoundland:** Middle Brook Provincial Park, 27.VII.70, *Pinus resinosa*, D.E. Bright (CNC) 43; Pasadena, 23.VII.70, *Picea mariana*, D.E. Bright (CNC) 26. **Nova Scotia:** Greenfield, 11.VII.61, *Pinus resinosa* (CNC) 3; Kejimikujik National Park, 16-17.VII.70, *Picea glauca*, D.E. Bright (CNC) 64; Kemptville, 7.VII.59, Red spruce (CNC) 16. **Ontario:** Chapleau, 16.IX.63, *Picea mariana*, F. Livesey (CNC) 9; Ferndale, 5.VII.63, *Picea glauca*, R. Bowser (CNC) 10; Frater, 22.VII.25, *Picea mariana*, E.B. Watson (CNC) 5; Frater, 8.VII.25, *Picea canadensis*, E.B. Watson (CNC) 44; Kenora, 10.VII.63, *Picea mariana*, G. Jackson (CNC) 34; Longlac, 15.VII.65, *Picea mariana*, V. Jansons (CNC) 25; Parry Sound, 4.VII.60, *Pinus resinosa*, C. Barnes (CNC) 5; Sand Lake, 22.VI.39, Scots Pine (CNC) 6; Thessalon, 11.65, *Picea glauca*, J.B. Thomas (CNC) 75. **Saskatchewan:** Big River, 23.VII.72, *Picea glauca*, D.E. Bright (CNC) 18; 40 mi NW of Big River, 22.VII.72, *Picea glauca*, D.E. Bright (CNC) 7; Canoe Lake, 21.VII.72, *Picea glauca*, D.E. Bright (CNC) 25; Cypress Hills, 19.VII.24, Spruce, J.J. deGryse (CNC) 4.

#### UNITED STATES

**Colorado:** Pingree Creek Road, Larimer Co., 14.VI.68, *Picea pungens*, S.L. Wood (SLWC) 47; Poudre Canyon, Larimer Co., 9.VIII.67, *Picea pungens*, S.L. Wood (SLWC) 17. **Maine:** Topsfield, 4.VIII.70, *Picea*, D.E. Bright (CNC) 1; Wilson's Mill, 9.VIII.70, *Picea*, D.E. Bright (CNC) 27. **Michigan:** See type material. **New Hampshire:** See type material. **New York:** Cranberry Lake, 16.VI.21, M.W. Blackman (DFEC) 171. **Utah:** 24 mi S of Hanksville, 21.VII.68, *Pseudotsuga menziesii*, J.E.H. Martin (CNC) 39; Lonesome Beaver, Henry Mountains, 6.VIII.68, *Pinus ponderosa*, H.F. & A.T. Howden (CNC) 67. **Wyoming:** Saratoga, 8.X.38, *Picea pungens* (RMSC) 2; Sheridan (USNM) 3.



MAP 18. Collection localities for *P. (Pityophthorus) intextus*.

**BIONOMICS.** Blackman (1922*b*) states that individuals of this species (under the name *shepardi*) breed in limbs from 1.5 to 2.5 cm in diameter. The galleries are of the usual polygamous, radiate type, with the individual egg galley extending up to 5 cm in length, although usually they are shorter.

**REMARKS.** As is the case with so many species in this genus, *intextus* is a very variable species. Because of this variability, numerous synonyms have been described in the past. It is only after an examination of hundreds of specimens from throughout the range of the species that the variation can begin to be appreciated.

The more usual condition, typified by specimens of *intextus*, *shepardi* and *tonsus*, is for the female frons to be flattened on a semicircular area and to bear a dense brush of setae of equal length. The male frons of these forms is transversely impressed from epistoma to near the upper level of the eyes. A slightly different variation found principally in *Picea pungens* but also in *Pinus ponderosa* in Utah, Colorado, and Wyoming is displayed by *limatus*, *ornatus*, and *kenti*. Here the female frons bears a very dense brush of equal length setae, the brush being denser than that on *intextus*, etc. In this case, the male frons is transversely impressed but also bears a longitudinal, impunctate, very weakly elevated or not, median carina. Various individuals in series of other "species" from other localities can be found which also show this type of variation. However, it may be appropriate to regard *ornatus* as a distinct species with *kenti* and *limatus* as synonyms.

Two specimens (♀♂) from Saratoga, Wyoming taken from *Picea pungens* (RMSC) display what might be a third variation. In these two specimens the setal brush on the frons is much smaller than usual, occupying only slightly more than 50% of the distance between the eyes.

The declivities of all the specimens represented by the synonyms do not show much noticeable variation. Individual variation was noted in the depth of the second declivital interstriae and in the size of the granules on the first and third declivital interspace.

Since it is not possible to correlate these variations with geographic distribution nor is it possible to separate species or subspecies, the only conclusion possible at this time is that only one very variable species is present.

#### 112. *Pityophthorus (P.) cascoensis* Blackman

Figs. 102-104

*Pityophthorus cascoensis* Blackman, 1928, p. 99; Chamberlin, 1939, p. 386; Craighead, 1950, p. 332; Bright 1977, p. 515 (= *intextus*); Wood, 1977*a*, p. 209 (re-instated). *Pityophthorus pilifer* Schedl, 1931, p. 166; Chamberlin, 1939, p. 378; Bright, 1977, p. 515 (= *intextus*); Wood, 1977*a*, p. 209 (= *cascoensis*).

Length 1.8-2.1 mm, about 2.6-2.7 times longer than wide.

**Female.** Virtually identical with female of *intextus* except setae on frons may, on some specimens, be shorter and more recumbent.

**Male.** Frons convex to weakly flattened, but not transversely impressed; surface deeply punctured, with a distinct but weakly elevated longitudinal carina extending from epistomal margin to upper level of eye, transverse carina weakly indicated or absent. Pronotum and elytra as in male *intextus*. Declivity as in *intextus* except interstriae 1 not as deeply impressed, equal or very nearly equal in height to 3, granules on 1 and 3 distinct, large, those in 3 larger than those in 1.

**TYPE MATERIAL.** *P. cascoensis*. The holotype (♀) in the USNM bears the data: Hopk U.S. 406b/♀/Hopkins colr., Peak Island, Me./*Picea*/TYPE *Pityophthorus cascoensis* Blackman/Type No. 41303 USNM. The allotype and 23 paratypes all bear the same data. Three of these paratypes are larvae which have

dried out and are mounted on points. Three additional paratypes are labeled: Hopk. U.S. 374-b/Boil Mt., Me./Picea/and the appropriate paratype label.

Most of the type material is in the USNM, additional paratypes are in the DEFC and the CNC.

*P. pilifer*. The holotype (♀) is in the CNC and bears the data: Frater, Ont., 8-VII-1925, E.B. Watson/Picea canadensis/TYPE Pityophthorus pilifer Schedl, No. 3170. The allotype bears identical data. Schedl states that 42 paratypes are included in the type series, but only seven specimens bear paratype labels. Two of these bear the same data as the holotype; the remainder are simply labeled: 14033/Picea canadensis/and the paratype label. There are an additional 37 specimens in the CNC bearing the same data as those mentioned just above. These are also paratypes but do not bear a paratype label.

HOSTS. *Picea* spp.

DISTRIBUTION. Alberta to Maine. Specimens (85) examined from:

CANADA

**Alberta:** Banff, 15.VII.58, spruce (CNC) 4; Massive Siding, Banff, 5.VII.57, *Picea glauca* (CNC) 11. **Ontario:** See type material.

UNITED STATES

**Maine:** See type material.

REMARKS. This species is very closely allied to *intextus*. The females of both species are almost identical, except that those of *cascoensis* have, in general, relatively larger granules on declivital interstriae 3. The males of *cascoensis* are more easily distinguished by the convex frons which bears a distinct longitudinal carina and a very weak to absent transverse carina, by the fact that declivital interstriae 1 and 3 are equal or very nearly equal in height and by the relatively smooth, not granulate (or only very finely granulate) declivital interstriae 1.

A moderate amount of variation is encountered in this species. The most obvious variation observed is the almost total lack of setae on the frons of some females, and the variation in the size of the declivital granules in specimens of both sexes.

NITIDULUS GROUP

Members of this group are recognized by the presence of a prominent to obscure transverse and longitudinal carina on the male frons (as in Fig. 118), by the presence of long, incurved setae on the periphery of the flattened area on the female frons (as in Fig. 108), by the median portion of the female frons varying from glabrous (Fig. 105) to densely pubescent, if pubescent, the setae are much shorter than those on the periphery (Fig. 108), and by the sparsely punctured to impunctate elytral interstriae.

Ten species are included in the group.

KEY TO SPECIES IN THE Nitidulus group

- 1. Declivity flattened, broadly, shallowly sulcate, interstriae 2 definitely wider than on disc (Fig. 107); central portion of female frons entirely glabrous to sparsely pubescent, setae entirely to largely limited to periphery (Fig. 105); lateral margin of ridge surrounding female oral cavity bearing a prominent, blunt tooth; longitudinal carina on male frons weak (Fig. 116); transcontinental . . . . . 113. *pulchellus* Eichhoff (p. 152)
- Declivity convex, narrowly but more deeply sulcate, interstriae 2 only slightly if at all wider than on disc; pubescence of female frons not limited to periphery, pubescent over entire surface (as in Fig. 108); lateral margin of ridge surrounding the female oral cavity smooth, not bearing a tooth; longitudinal carina on male frons obsolete to conspicuous . . . . . 2

2. Strial punctures arranged in definite, even rows; setae on female frons sparse; male frons shallowly impressed; Arizona, New Mexico . . . . . 114. *immanis* Blackman (p. 159)
  - Strial punctures arranged in even or uneven, irregular rows; setae on female frons dense, longer on periphery; male frons moderately to deeply impressed . . . . . 3
3. Declivital interstriae 1 and 3 equal or nearly equal in height in both sexes . . . . . 4
  - Declivital interstriae 3 much higher than 1 in male, slightly but definitely higher in female . . . . . 6
4. Punctures on posterior portion of pronotum very small, fine, shallow, separated by a distance much greater than their own diameters; transverse carina on male frons weak, longitudinal carina obsolete; southwestern United States . . . . .
  - . . . . . 115. *infulatus* Blackman (p. 160)
  - Punctures on posterior portion of pronotum much larger, deeper, separated by a distance equal to or less than their own diameters; transverse carina on male frons prominent, longitudinal carina weak . . . . . 5
5. Female frons densely pubescent to well above eyes, setae longer and more abundant (Fig. 108); interstriae 2 only slightly wider on declivity than on disc and only weakly sulcate (Fig. 110); elytral striae less deeply and evenly punctured; western North America . . . . . 116. *pseudotsugae* Swaine (p. 162)
  - Female frons sparsely pubescent only to upper eye level, setae shorter and much less abundant (Fig. 111); interstriae 2 wider on declivity than on disc and more strongly sulcate (Fig. 113); elytral striae deeply and more evenly punctured; Arizona . . . . .
    - . . . . . 117. *malleatus* Bright (p. 164)
6. Elytral apex broadly rounded; body stouter, usually less than 3.0 times longer than wide . . . . . 7
  - Elytral apex narrowly rounded, almost subacuminate; body slender, at least 3.0 or more times longer than wide . . . . . 10
7. United States and Canada, in *Picea*, *Pinus*, *Pseudotsuga*, and *Larix* . . . . . 8
  - Central and southern Mexico; in *Abies religiosa* . . . . . 118. *abiegus* Wood (p. 165)
8. Elytral declivity moderately sulcate, declivital interstriae 2 only slightly wider than on disc, interstriae 2 usually not abruptly elevated, the inner slope sloping, usually not precipitous (Fig. 116); western North America . . . . . 9
  - Elytral declivity deeply sulcate, declivital interstriae 2 much wider than on disc, interstriae 3 more abruptly elevated, especially in female, the inner slope precipitous in female (Fig. 119); southwestern United States . . . . . 119. *sulcatus* Bright (p. 166)
9. Setae on declivital interstriae 3 of female at least as long as interstitial width; punctures of discal striae and interstriae larger; male declivity deeply sulcate, strongly granulate on interstriae 3; Alaska to California, east to Alberta, Utah and Arizona . . . . .
  - . . . . . 120. *nitidulus* (Mannerheim) (p. 167)
  - Setae on declivital interstriae 3 of female absent or very short, if present then shorter than interstitial width; punctures of discal striae and interstriae smaller; male declivity more shallowly sulcate and more finely granulate on interstriae 3; southern Wyoming to New Mexico . . . . . 121. *occidentalis* Blackman (p. 171)
10. Body size larger, usually over 2.8 mm in length; pin *Pinus hartwegii* in central Mexico . . . . . 122. *cortezi* Bright (p. 172)
  - Body size smaller, usually less than 2.7 mm in length; in *Pinus culminicola* in northern Mexico . . . . . 123. *viminalis* Bright (p. 173)

### 113. *Pityophthorus* (*P.*) *pulchellus* Eichhoff

Figs. 9, 105-107; Map 19

- Pityophthorus pulchellus* Eichhoff, 1869, p. 275; Swaine, 1909, p. 138; Hagedorn, 1910, p. 74 (additional references); Swaine, 1918, p. 102; Blackman, 1928, p. 110; Dodge, 1938, p. 45; Chamberlin, 1939, p. 389; Beal & Massey, 1945, p. 129; Craighead, 1950, p. 332; Baker, 1972, p. 255; Bright, 1978, p. 73 (neotype desig.).
- Pityophthorus pusio* LeConte, 1878b, p. 623; Swaine, 1909, p. 140; Hagedorn, 1910, p. 75 (additional references); Swaine, 1918, p. 102 (= *pulchellus*).



*Pityophthorus hirticeps* LeConte, 1878*b*, p. 623; Swaine, 1909, p. 138 (= *pulchellus*); Hagedorn, 1910, p. 74 (additional references); Bright 1976*c*, p. 185 (lectotype desig.).

*Pityophthorus pulchellus tuberculatus*, **new status**.

*Pityophthorus tuberculatus* Eichhoff, 1878, p. 498; Swaine, 1909, p. 140; Hagedorn, 1910, p. 75 (additional references); Swaine, 1918, p. 99; Blackman, 1928, p. 92; Chamberlin, 1939, p. 384; Keen, 1952, p. 37; Chamberlin, 1958, p. 153; Wood, 1971*a*, p. 426; Bright & Stark, 1973, p. 112; Bright, 1978, p. 73 (neotype desig.).

*Pityophthorus rugicollis* Swaine, 1925, p. 193; Blackman, 1928, p. 93 (= *tuberculatus*).

Length 1.5-2.3 mm, about 2.7 times longer than wide.

**Female.** Frons broadly flattened to weakly concave from epistomal margin to well above eyes and laterally from eye to eye; central portion of surface very brightly shining, mirrorlike, glabrous to sparsely pubescent, sometimes with a few scattered points or fine lines; vestiture entirely or mostly limited to periphery of flattened area, consisting of from one to several rows of long, incurved, yellowish setae. Antennal club about 1.1 times longer than wide, widest through segment 2 or 3; first two sutures weakly arcuate; first two segments together occupy about two-thirds of total club length. Lateral margin of ridge surrounding oral cavity bearing a laterally flattened, obtuse toothlike projection, this situated just below or posterior to the mandible. Pronotum about 1.1 times longer than wide, widest at about middle; sides very weakly arcuate to subparallel on posterior one-half; asperities on anterior slope erect, rather large, acute, scattered in no apparent order except that sometimes the first row is roughly concentric; posterior area of disc shining to weakly opaque, punctures usually large, deep, and close; surface between punctures smooth to minutely punctate, with fine points or lines, sometimes opaque and minutely reticulate. Elytra about 1.4 times longer than wide; apex broadly rounded; discal striae usually punctured in regular rows but sometimes the rows are irregular due to the displacement of some punctures, punctures rather large, deep and close; discal interstriae about 2.0 times as wide as striae, surface opaque to weakly shining, minutely reticulate to very finely micropunctate; interstriae 1, 3, 5, 7, 9 bearing 3-5 setiferous punctures equal in size to those in striae. Declivity somewhat flattened, broadly, shallowly sulcate; interstriae 1 as wide as on disc, slightly elevated and bearing a median row of fine, setiferous granules, these granules varying considerably in size; interstriae 2 broader than discal width, weakly sulcate, glabrous, opaque to weakly shining; interstriae 3 slightly elevated, as high as interstriae 1, arcuate, bearing a median row of distinct, setiferous, acute granules, these varying in size, often with a few supplementary granules scattered near strial punctures and near apex; punctures of striae 1 and 2 distinct to obsolete.

**Male.** Frons weakly to distinctly, transversely impressed above epistoma to upper level of eyes, bearing a distinct, transverse carina at upper level of impression with a weakly elevated, impunctate, longitudinal extension extending toward vertex, and a weak longitudinal carina across impression (this carina sometimes absent); surface deeply, closely, punctured. Projection on lateral margin of ridge around oral cavity absent. Pronotum and elytra essentially as in female except serrations, asperities, punctures, and granules may be slightly larger and more prominent.

This species forms two easily recognizable subspecies which can be recognized as follows:

1. Frons of female bearing a few long setae in central portion; projection on lateral margin of ridge around female oral cavity small; interstitial punctures of both sexes more numerous; southern Yukon Territory and eastern British Columbia east to New Brunswick and south to North Carolina . . . . . *pulchellus pulchellus* Eichhoff, **new status**
- Frons of female completely glabrous in central portion, setae strictly confined to periphery; projection on lateral margin of ridge around female oral cavity rather large, prominent; interstitial punctures of both sexes sparse; Alaska, western Canada to northern Mexico . . . . . *pulchellus tuberculatus* Eichhoff, **new status**

**TYPE MATERIAL.** *P. pulchellus pulchellus*. The type material of this species was evidently in the Hamburg Museum and was therefore lost when the museum was destroyed during World War II. My concept of the species is based on a specimen

(♀) in the USNM that was compared with Eichhoff's type by Eggers in 1927 and designated as neotype by Bright (1978). This specimen bears the data: Marquette, Mich./Coll. Hubbard and Schwarz/♀/13/"Pityophthorus pulchellus Eichh. m. type in coll. Eichhoff verglichen, 1927" (in Eggers' handwriting)/NEOTYPE Pityophthorus pulchellus Eichhoff, D.E. Bright 1977. A second specimen was compared to the type but the specimen is now missing from the point. The pin bears the labels: Washington, D.C., Apr. 23/13/"Pityophthorus pulchellus Eichh. m. type in coll. Eichh. verglichen 1927" (in Eggers' handwriting). Two other specimens were compared with the type by Eggers and declared "nicht *Pityophthorus pulchellus* Eichh." but appear to me to fall within the range of variation of this subspecies. These 2 specimens are labeled: 7657 Hopk. W. Va./Mineral Co., W. Va./Pinus virginiana/13/"nicht Pityophthorus pulchellus Eichh.", Eggers 1927 and Brunswick, Maine, 29 June 19/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. M-62a/"nicht Pityophthorus pulchellus Eichhoff 1927" Eggers. Blackman (1928) states that 8 specimens were compared with the type by Eichhoff but only the 4 (3) mentioned above are so labeled in the USNM.

*P. pusio*. Described from one specimen (♂) that is now in the LeConte collection at the MCZ. It is labeled: Marquette, Mich., 3.7/128/Type 1287/P. pusio Lec./HOLOTYPE Pityophthorus pusio LeConte.

*P. hirticeps*. Two specimens of this species are now in LeConte's collection at the MCZ. The first specimen (♂) was designated the lectotype (Bright 1976c) and bears the data: Marquette, Mich. 3-1 ♀/Type 1285/P. hirticeps Lec. and my lectotype label. The second specimen (♀) is labeled: Marquette, Mich. 26.7/♀/127/Type 1285/hirticeps 2 and my paralectotype label. The sexes were reversed by LeConte.

*P. pulchellus tuberculatus*. As with *pulchellus pulchellus* discussed above, the type material of this subspecies was evidently destroyed with the Hamburg Museum during World War II. The USNM has 4 specimens that were compared with Eichhoff's type by Eggers. The first of these is labeled: 2939 Hopk. U.S./Hopkins, coll, Ventura Co., Cal./6/"Pityophthorus tuberculatus Eichh. m. type in coll. Eichh. vergleichen 1927" (in Eggers handwriting)/NEOTYPE Pityophthorus tuberculatus Eichhoff, D.E. Bright, 1977. The second specimen is labeled: 2929-7dl Hopk. U.S./Baldwin, colr., Ventura Co., Cal/6/. The third is labeled: 471a Hopk. U.S./Hopkins colr., Black Hills, S.D./"Pityophthorus tuberculatus Eichh. m. type in coll. Eichhoff vergleichen 1927" Eggers/5 and a very large red label "P. tuberculatus Eichh. compared with type and found to be typical by Eggers" (in Blackman's handwriting?). The fourth specimen bears the data: 2797a Hopk. U.S./Hopkins colr., Wawona, cal./Pinus ponderosa/6/nicht Pityophth. tuberculatus Eichh., 1927" Eggers. All 4 of these specimens are *tuberculatus* regardless of the label on the fourth specimen.

*P. rugicollis*. The holotype (♀) in the CNC bears the data: Gin Alpne, Cal., July, Dr. A. Fenyess/Pityophthorus/TYPE Pityophthorus rugicollis Sw. No. 1371. One paratype with the same data is also in the CNC.

All the types and authentic specimens described above have been examined.

**HOSTS.** Occurs in all species of *Pinus* in its range, rarely recorded from *Picea* and *Larix*. Also recorded from *Abies* and *Pseudotsuga* but these may be accidental occurrences.

**DISTRIBUTION.** Throughout the pine growing regions of Canada and the United States to northern Mexico (Map 19). Apparently absent in the southeastern United States. Specimens (2181) examined from:

***P. pulchellus pulchellus***

## CANADA

**Alberta:** Ricinus, 9.VII.65, *Pinus contorta* (CNC) 6; 17 mi NW of Rocky Mountain House, 26.VII.66, *Pinus contorta* (NFRCE, CNC) 6; 10 mi E of Smith, 15.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 19. **British Columbia:** Chetwynd, 11.VII.72, *Pinus contorta*, D.E. Bright (CNC) 5. **Manitoba:** Bellsite, 2.VIII.63, *Pinus banksiana* (NFRCE) 1; Fairford River, 26.VIII.63, *Pinus banksiana* (NFRCE) 9; Grass River Provincial Park, 27.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 1; Marchand, 5.VI.64, *Pinus banksiana* (NFRCE) 5; Menisino, 19.II.70, Red pine (CNC) 2; Richer, *Pinus banksiana* (NFRCE) 1; Sandilands, 21.VII.69, Scots pine (CNC) 3; Woodridge, 29.VII.64, *Pinus banksiana* (NFRCE) 14. **New Brunswick:** 1 mi W of Big Cove Indian Reserve, Kent Co., 2.VIII.67, White pine (CNC) 5; Kouchibouguac National Park, VIII.77, D.E. Bright (CNC) 1; 4 mi E McGraw Brook, 7.VII.70, *Pinus banksiana*, D.E. Bright (CNC) 7; Nector Lake, 2.VII.21, *Pinus banksiana*, M.B. Dunn (CNC) 1; Nepisiquit River, 28.VII.21, *Pinus banksiana*, M.B. Dunn (CNC) 18; Portage Vale, 14.VII.70, *Pinus banksiana*, D.E. Bright (CNC) 1. **Northwest Territories:** 60 mi N of Fort Providence, 13.VI.66, *Pinus banksiana* (NFRCE, CNC) 2. **Ontario:** Chapleau, 6.VI.65, *Pinus banksiana*, D. Ropke (CNC) 16; Cochrane, 14.VI.65, *Pinus sylvestris*, H. Foster (CNC) 5; Connaught, 24.VII.66, *Pinus resinosa* (CNC) 4; Cree Lake, 16.VII.65, *Pinus sylvestris*, G. Atkinson (CNC) 17; 30 mi N of Dryden, 6.VIII.72, *Pinus banksiana*, D.E. Bright (CNC) 2; Elmira, 4.X.60, *Pinus resinosa*, P.J. Pointing (CNC) 2; Fort William, 27.V.64, *Pinus strobus* (CNC) 15; Gogama, 5.X.66, *Pinus resinosa* (CNC) 12; Iroquois Falls, 11.VIII.60, *Pinus banksiana*, D. Grisdale (CNC) 13; Kakabeka Falls, 27.V.64, *Pinus strobus* (CNC) 53; Kapuskasing, 16.VII.65, *Pinus strobus*, G. Atkinson (CNC) 29; Longlac, 4.VI.65, *Pinus banksiana*, V. Jansons (CNC) 14; Mobert, 13.VIII.64, *Pinus banksiana* (CNC) 4; Nighthawk, 16.VII.66, *Pinus resinosa* (CNC) 7; Sand Lake, 22.VI.39, Scots pine (CNC) 1; Stevens, 25.V.65, *Pinus banksiana*, V. Jansons (CNC) 29; Tarswell, 6.VI.65, *Pinus banksiana*, H. Foster (CNC) 16; White River, 2.IX.65, *Pinus resinosa*, D. Constable (CNC) 13. **Quebec:** Kazabazua, 13.XII.17, *Pinus banksiana* (CNC) 5; Lac St. Jean, 25.VII, *Pinus banksiana* (LFRC) 6; Mitchinomecus, 4.VII.78, *Pinus banksiana* (LFRC) 5. **Saskatchewan:** Canoe Lake, 21.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 1; Meadow Lake Provincial Park, 20.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 3; Prince Albert, *Pinus banksiana* (NFRCE) 1. **Yukon Territory:** Mile 898, Alaska Highway, 4.VII.60, *Pinus contorta* (CNC) 3.

## UNITED STATES

**District of Columbia:** See type material. **Maine:** Brunswick, 25.VI.19, M.W. Blackman (DFEC) 9. **Michigan:** See type material. **Minnesota:** Cloquet, 4.VII.36 and 8.IX.36, Norway pine, H.R. Dodge (SLWC) 20. **North Carolina:** Asheville (DFEC) 1; Cherokee, 19.VII.51, *Pinus*, S.L. Wood (SLWC) 5; Graysburg, 9.VI.42, *Pinus taeda*, R.H. Beal (RMSC) 1; Mt. Mitchell, 22.VIII.41, *Pinus pungens*, R.H. Beal (RMSC) 3. **Pennsylvania:** Chambersberg, 6.VIII, J.N. Knull (SLWC) 7; Charter Oak, 19.VIII (DFEC) 3; Fayetteville (USNM) 11; Mt. Alto, 1.VIII.31, J.N. Knull (CASC) 9. **Virginia:** Falls Church, 22.VII.24, *Larix* (USNM) 8; Great Falls, 5.VIII.24, M.W. Blackman (DFEC) 7. **West Virginia:** Aurora, 20.VIII.04, O. Heldemann (USNM) 1; Hampshire Co., Hopkins (DEFC) 1. **Wisconsin:** Lac du Flambeau, J.A. Howarth (DFEC) 1.

***P. pulchellus tuberculatus***

## CANADA

**Alberta:** Burmiss, various dates 1964-67, *Pinus flexilis* (NFRCE) 31; 29 mi N of Cowley, *Pinus flexilis* (NFRCE) 1; Girouxville, *Pinus contorta* (NFRCE) 1; Hotchkiss, *Pinus contorta* (NFRCE) 1; Nantan, 6.VIII.69, *Pinus flexilis*, A.K. Raske (CNC) 2;

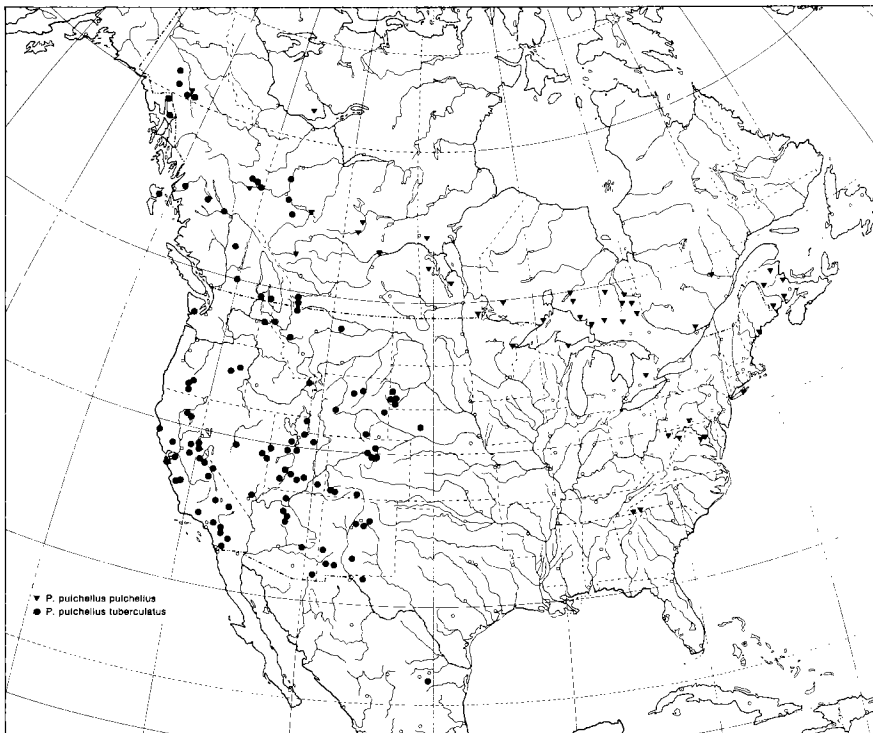
Porcupine Hills, *Pinus flexilis* (NFRCE) 1; Red Rocks Canyon, Waterton Lakes National Park, 19.VII.61, *Pinus flexilis* (CNC) 4; Robb, 1.VI.60, *Pinus flexilis* (CNC) 4; Waterton Lakes National Park, various dates 1961-66, *Pinus flexilis* (NFRCE) 15; N of Wolf Creek, *Pinus contorta* (NFRCE) 1. **British Columbia:** Aspen Grove, 14.VIII.31, *Pinus ponderosa*. H. Richmond (CASC) 1; Copper Mountain, 14.XI.29, *Pinus contorta*, G. Smith (UBC) 3; Creston, 9.V.49, evening flight, G. Stace Smith (UBC) 2; Endako, 10.VI.58, *Pinus contorta* (PFRC) 6; Groundbirch, 4.VI.59, *Pinus contorta* (PFRC) 2; Mile 200, Hart Highway, 10.V.60, *Pinus contorta* (PFRC) 1; Hudson Hope, 9.IX.75, *Pinus contorta* (PFRC) 1; Isle Pierce Ferry, 25.VIII.60, *Pinus contorta* (PFRC) 1; Lake Bennet, 7.VIII.52, *Pinus contorta* (PFRC) 7; Little Oliver Creek, 14.VII.58, *Pinus contorta* (PFRC) 2; Mapes, 31.V.62, *Pinus contorta* (PFRC) 19; Mile 28, Monson Creek Road, 8.VI.61, *Pinus contorta* (PFRC) 3; Nazko Road, 11.IX.58, *Pinus contorta* (PFRC) 3; Port Clements, 11.VII.64, *Pinus contorta* (PFRC) 1; Port Douglas, 15.V.56, *Pinus contorta* (PFRC) 2; Rossland, 21.IX.67, *Pinus ponderosa*, D.E. Bright (CNC) 1; Stanley, 22.VIII.31, *Abies lasiocarpa*, W.G. Mathers (PFRC) 3; Terrace Mountain, M.E. Clark (OSUC, UBC) 4; Tintagel Creek, 15.VIII.78, *Pinus contorta*, A. Waters (PFRC) 3; Tunkwa Lake Road, 30.V.62, *Pinus contorta* (PFRC) 1. **Yukon Territory:** Mile 898, Alaska Highway, 4.VIII.60, *Pinus contorta* (PFRC) 13; Mile 917, Alaska Highway, 26.VI.58, *Pinus contorta* (PFRC) 7; Mile 25, Carmacks Highway, 19.VII.60, *Pinus contorta* (PFRC) 4; Whitehorse, 18.VI.62, *Pinus contorta* (PFRC) 4.

#### UNITED STATES

**Alaska:** Haines, 16.VI.59, *Pinus contorta*, G.L. Downing (DEBC) 1; Juneau, 10.V.59, *Pinus contorta*, D.E. Bright (CNC, DEBC) 55; Skagway, 3.VII.46, O. Bryant (CASC) 1. **Arizona:** 21 mi N of Cliften, 12.VII.68, D.E. Bright (CNC) 2; Flagstaff, 7.VI.19, *Pinus ponderosa*, W.J. Chamberlin (CNC) 4; 7 mi N of Flagstaff, 18.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 8; 7 miles N and 4 mi W of Flagstaff, 1.V.69, *Pinus ponderosa*, W. Harwood (SLWC) 6; Jacob Lake, 3.VIII.74, *Pinus ponderosa*, D.E. Bright (CNC) 11; 10 mi NW of Jacob Lake, 30.V.69, *Pinus edulis*, W. Harwood (SLWC) 2; Kaibab National Forest, various dates, *Pinus ponderosa*, M.W. Blackman (CNC, DFEC, USNM) 238; Oak Creek Canyon, 21.VII.50, D.J. & J.N. Knull (OSUC) 2; 12 mi N of Sedona, 13.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 2; 8 miles E of Sedona, 13.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1; Williams, 22.VII.50, D.J. & J.N. Knull (OSUC) 19. **California:** Argus Mountains, V.91, *Pinus monophylla* (DFEC) 4; Berkeley, *Pinus attenuata*, A.D. Hopkins (DFEC) 1; Bridgeport, 18.X.63, *Pinus monophylla*, H.B. Leech (CASC) 100+; "Brtltt" Springs, June, A. Fenyés (CASC) 2; Chester, various dates, D.J. & J.N. Knull (OSUC) 34; Devils Post Pile, 8.VIII.40, *Pinus contorta*, C.R. Bruck (OSUC) 4; Echo Lake, Eldorado Co., 27.V.31, *Abies magnifica* (CNC) 1; Fallen Leaf Lake, Eldorado Co., 9.VI.61, *Pinus jeffreyi*, S.L. Wood (SLWC) 1; 17.5 mi E of Foresthill, 25.IV.66, *Pinus attenuata*, H.B. Leech (CASC) 81; Frazier Mountain, Ventura Co., 20.V.19, *Pinus jeffreyi*, A.D. Hopkins (CNC, CASC) 6; Gasquests, 13.VIII.14, *Pinus contorta*, J.M. Miller (DFEC) 3; Gin Alpine, VII, A. Fenyés (CASC) 4; Hat Creek, 24.VI.61, *Pinus jeffreyi*, S.L. Wood (DEBC, SLWC) 7; Junipero Serra Peak, Monterey Co., 31.VIII.56, *Pinus coulteri*, H.B. Leech (CASC) 9; Keen Camp, 3.VII.46, D.J. and J.N. Knull (OSUC) 5; Lake Arrowhead, 20.VII.32, R.P. Allen (CASC) 11; Lake Tahoe, Hubbard and Schwarz (DFEC) 1; Lake Tenaya, 11.VIII.18, *Pinus murrayanae*, J.E. Paterson (DFEC) 1; Loch Lommond, 4.X.47, *Pinus attenuata*, S.L. Wood (SLWC) 8; Lockwood, 20.IV.63, *Pinus sabiniana*, D.E. Bright (DEBC) 4; 15 mi W of Mineral King, 3.VII.51, D.J. and J.N. Knull (OSUC) 1; Mokel Hill, F.E. Blaisdell (CASC) 1; Mount Diablo, various dates and collectors, *Pinus sabiniana* (CASC, SLWC) 100; Mount Hawkins, 23.VII.40, *Pinus jeffreyi* and *P. lambertiana*, C.R.

Bruck (OSUC) 5; Mount Laguna, various dates, *Pinus jeffreyi* (DEBC, CNC) 5; Norval Flats, Lassen Co., 30.V.20, *Pinus lambertiana*, J.O. Martin (CASC) 40; Onion Valley, 4.IX.68, *Pinus balfouriana*, D.E. Bright (CNC) 1; Palm Springs, 20.VI.46, D.J. & J.N. Knull (OSUC) 1; Pine Canyon, 24.VIII.40, *Pinus sabiniana*, C.R. Bruck (OSUC) 8; Pine Valley, 19.VIII.41, *Pinus ponderosa*, T.O. Thatcher (SLWC) 6; Pope Valley, 17.III.35, Van Dyke (CASC) 15; Santa Rosa Mountains, 25.VI.46, D.J. & J.N. Knull (OSUC) 1; Sequoia National Park, 17.VI.29, Van Dyke (CASC) 1; Shasta Co., 4.V.13 (SLWC) 6; Sugar Loaf Mountain, San Bernardino Co., 1.VIII.32, *Pinus ponderosa*, C.R. Bruck (OSUC) 5; Tahoe City, A. Fenyes (CASC) 4; Tunitas Creek at Highway 1, San Mateo Co., 2.XII.66, *Pinus radiata*, H.B. Leech (CASC) 14; Ventura Co., 31.V.05, *Pinus edulis*, Baldwin (DFEC, USNM) 5; Wawoma, June, A. Fenyes (CASC) 1; 10 mi N of Westgard Pass, 6.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 10; Wrightwood, 14.IV.62, *Pinus monophylla*, D.E. Bright (CNC) 23. **Colorado:** Antonita, 8.V.38, *Pinus ponderosa*, J.A. Beal (RMSC) 14; Bayfield, 7.I.19, *Pinus edulis*, Bethel and Hunt (DFEC) 1; Boulder, 17.VI.61, M.R. MacKay (CNC) 2; Denver, *Pinus* (DFEC) 4; Durango 21.VII.68, E.C. Becker (CNC) 1; Estes Park, 31.VIII.38, *Pinus ponderosa*, C.L. Massey (RMSC) 16; Fort Collins, 15.VI.38, *Pinus ponderosa*, D. DeLeon (RMSC) 8; Fort Collins, 15.VII.38, *Pseudotsuga taxifolia*, D. DeLeon (RMSC) 6; 5 mi N of Glade Park, 15.VII.68, H. Howden (CNC) 1; Mancos, 7.VI.35, *Pinus edulis*, L.G. Baumhofer (RMSC) 22; Mesa Verde, 1.VIII.27, *Pinus edulis*, J.M. Miller (DFEC) 5. **Idaho:** Ashton, 30.VII.71, A.C. Valcarce and C.P. Maycock (CNC) 9; Coeur d'Alene, 26.VI.31, *Pinus contorta*, H.J. Rust (UMMZ) 1; Tetonia, 10.VIII.71, R. Hauver (CNC) 3. **Montana:** Missoula, 7.VIII.71, *Pinus contorta*, S. Kohler (MDFC) 1; Rocky Boy Indian Reservation, Hill Co., 25.IX.67, *Pinus ponderosa*, D.E. Bright (CNC) 1; West Glacier, 20.VII.72, *Pinus contorta*, D. Wood (MDFC) 1; Whitepine, 5.VI.67, H.V. Toko (USNM, MDSPF) 30. **Nebraska:** Halsey, 27.IV.45, *Pinus ponderosa*, C.L. Massey (RMSC) 1. **Nevada:** 5 mi ESE of Austin, 5.VIII.64, H.B. Leech (CASC) 7; Baker, 13.IV.40, *Pinus ponderosa*, T.O. Thatcher (DEBC) 4; La Madre Mountains, 40.VII.49, D.J. & J.N. Knull (OSUC) 23; 25 mi NW of Las Vegas, 10.VI.69, *Pinus monophylla*, W. Harwood (SLWC) 6; Murry Summit, White Pine Co., 3.VIII.57, *Pinus monophylla*, D.E. Johnson (CNC) 10. **New Mexico:** 10 mi E of Aragon, 10.VII.68, *Pinus edulis*, D.E. Bright (CNC) 2; Boreal, Capitan Mountains, 10.VIII., *Pinus edulis*, J.L. Webb (DFEC) 2; Central City, 21.VI.71, Blacklite, J.R. McClellan (SLWC) 2; Clines Corners, 9.VII.68, *Pinus edulis*, D.E. Bright (CNC) 6; Cloudcroft, 4.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 6; Coolidge, Barber and Schwarz (DFEC) 4; Emery Pass, Sierra Co., 24.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 1; 4 mi W of High Rolls, 13.VII.74, at light, D.E. Bright (CNC) 4; 5 mi W of Lake Roberts, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 24; Las Vegas Hot Springs, Schwarz & Barber (DFEC) 3; Luna, 11.VII.68, *Pinus edulis*, D.E. Bright (CNC) 2; Quernado, 12.VIII.62, *Pinus edulis*, S.L. Wood (SLWC) 4; Reserve, 11.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 16; Sandia Mountains, 17.VII.53, *Pinus* (SLWC) 11. **Oregon:** Blue Mountains, 1.?.14, *Picea engelmannii*, W.J. Chamberlin (CNC) 1; Chemult, 16.VII.61, *Pinus contorta*, D.E. Bright (CNC) 3; Crater Lake, -26, *Pinus contorta*, W.J. Chamberlin (CNC) 1; Dixie Pass, Malheur National Forest, 23.VI.61, *Pinus contorta*, D.E. Bright (CNC) 22; Logan Valley, Grant Co., 6.XI.58, *Pinus contorta*, J. Schuh (MSUC) 6. **South Dakota:** Black Hills, 7.VII.75, *Pinus ponderosa*, D.E. Bright (CNC) 32; 2-3 mi S of Blue Bell, 10-12-VII.61, Pine, H. & A. Howden (CNC) 9; Custer 15.VI.35, A. Thrupp (CASC) 20; 7 mi W of Custer, 16.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 2; 19 mi N of Hill City, 17.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 3; Hot Springs, 10.VII.61, H. & A. Howden (CNC) 1. **Texas:** Guadalupe Mountains, 17.VII.74, *Pinus ponderosa*,

D.E. Bright (CNC) 2. **Utah:** Beaver, 14.V.49, *Pinus ponderosa*, S.L. Wood (SLWC) 4; Bull Mountain, Henry Mountains, 27.VII.68, H. Howden (CNC) 2; Deep Creek Mountains, Juab Co., 24.VII.57, *Pinus monophylla*, D.E. Bright (DEBC) 5; Dixie National Forest, 16.VI.48, *Pinus ponderosa*, S.L. Wood (SLWC) 2; 2 mi W of Duchesne, 21.VII.68, *Pinus edulis*, W. Harwood (SLWC) 23; Gooseberry, Fishlake National Forest, 9.VI.69, *Pinus edulis*, D.E. Bright (CNC) 4; 14 mi S of Hanksville, 28.VII.68, Light, H. & A. Howden (CNC) 1; Kamas, *Pinus murrayanae* (DFEC) 1; La Sal Mountains, San Juan Co., 4.VII.48, *Pinus edulis*, D.E. Bright (CNC) 8; Logan Canyon, Cache Co., 14.VIII.75, *Pinus contorta*, D.E. Bright (CNC) 16; Lonesome Beaver, Henry Mountains, 6.VIII.68, *Pinus ponderosa*, H.F. Howden (CNC) 12; Long Hollow, Dixie National Forest, 23.VI.60, *Pinus aristata*, S.L. Wood (SLWC) 8; Mercur, 27.IV.60, *Pinus monophylla*, D.E. Bright (CNC) 42; Mount Nebo, Juab Co., 20.VII.58, *Pinus monophylla*, D.E. Bright (CNC) 3; North Fork Provo River, 8.VI.58, *Pinus contorta*, D.E. Bright (CNC) 20; Oak Creek Canyon, Millard Co., 4.VII.57, *Pinus ponderosa*, D.E. Bright (CNC) 19; Panguitch, *Pinus edulis*, H.E. Burke (DFEC) 1; Richfield, 15.VII.30, Light trap (USNM) 1; Sanford Canyon, Dixie National Forest, 22.VI.60, *Picea pungens*, S.L. Wood (SLWC) 1; Wolf Creek Pass, 17.VI.60, *Picea engelmannii*, D.E. Bright (SLWC) 2; Yellowstone Ranger Station, Ashley National Forest, 16.VI.60, *Pinus ponderosa*, S.L. Wood (SLWC) 2. **Washington:** Humptulips, 28.V.14, Van Dyke (CASC) 1. **Wyoming:** 2 mi E of Atlantic City, 21.VI.68, *Pinus flexilis*, S.L. Wood (SLWC) 2; 5 mi W of Buffalo, 20.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 3; 11 mi S of Lusk, 15.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 38; Saratoga, 7.VI.38, *Pinus flexilis*, D. Deleon (RMSC) 22; 16 mi NE of Tensleep, 21.VI.68, *Pinus flexilis*, S.L. Wood (SLWC) 2.



MAP 19. Collection localities for *P. (Pityophthorus) pulchellus pulchellus* and *P. pulchellus tuberculatus*.

## MEXICO

**Nuevo León:** 15 mi E of San Roberto, 5.V.71, *Pinus cembroides*, D.E. Bright (CNC) 2.

**BIONOMICS.** Other than statements of its occurrence in limbs of certain host plants, very little is recorded. The galleries of *p. pulchellus* are illustrated by Hopkins (1899). Beal and Massey (1945) state that *p. pulchellus* is polygamous, the egg galleries being formed around a central nuptial chamber and varying in number from two to five.

**REMARKS.** This is probably the most widely distributed species of *Pityophthorus* in North America. It is also one of the most variable species in the genus. The reader should consult Blackman (1928) for a discussion of the variations encountered in *p. tuberculatus* and in *p. pulchellus*.

Only two subspecies are designated in the present work but possibly several more could be described. A long series of specimens from the Kaibab Forest in northern Arizona displays a considerably smaller size, the pronotal asperities are somewhat sharper and the general surface of the posterior portion of the pronotum is somewhat more brightly shining. Blackman (1928) designated these specimens as the variety *australis* and I seriously considered elevating it to a subspecies. However, after examining over a thousand specimens from all areas of western United States, I decided to leave this population unnamed. Specimens from throughout the western range can be found which match very closely the Kaibab Forest specimens. The only distinctive feature of the Kaibab Forest population is the relatively small degree of variation when compared with other populations.

A second distinctive population occurs in southeastern Alaska and coastal British Columbia. A series of over 50 specimens are consistently larger and much darker than the average specimens from western North America. This variation could be a reflection of the environmental conditions of the region or could indicate something of a more fundamental nature. This population is also left unnamed.

Other populations throughout the range of the species show somewhat consistent but minor variations which may indicate a fragmentation of the species into discernible populations (subspecies). For the present, I prefer to recognize only the two distinctive subspecies and to leave the remainder of populations as representing variations within one of the two subspecies.

The two currently recognized subspecies overlap in northeastern British Columbia and northwestern Alberta, where the host trees *Pinus contorta* and *P. banksiana* overlap. An examination of a limited number of specimens from the zone of contact shows some intergradation of characters which indicates that some gene flow is occurring. It is because of the obvious anatomical similarity and because of the intergradation in the zone of contact that I consider these two taxa as subspecies.

114. *Pityophthorus (P.) immanis* Blackman

*Pityophthorus immanis* Blackman, 1928, p. 98; Chamberlin, 1939, p. 385.

Length 1.9-2.8 mm, about 2.8 times longer than wide.

**Female.** Frons somewhat flattened to weakly concave on a semicircular area extending from epistomal margin to just above upper level of eyes; surface shining, densely punctured, punctures moderate in size, rather deep; a median, longitudinal, impunctate space extending a short distance from the epistomal margin sometimes present; vestiture sparse, consisting of moderately long, erect setae all of equal or nearly equal length but usually those on periphery are longer and incurved. Projection on oral ridge absent. Antennal club elongate-oval, 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum about 1.1 times longer than wide, widest just behind summit; sides weakly arcuate; asperities on anterior

slope low, acute, not arranged in any apparent order (in vague concentric rows near summit); posterior area of disc moderately shining, punctures large and deep; surface between punctures micropunctate-reticulate. Elytra about 1.8 times longer than wide; apex rather broadly rounded; discal striae punctured in regular rows, punctures large and deep; discal interstriae slightly wider than striae, surface shining, with fine lines and points; all interstriae with several widely scattered punctures, these equal to or nearly equal to those in striae. Declivity convex, narrowly, more deeply impressed; interstriae 1 impressed much below level of 3, about as wide as on disc, with a few fine granules, especially near apex and near upper summit; interstriae 2 slightly wider than discal width, rather deeply sulcate, surface shining, minutely reticulate; interstriae 3 elevated only on upper half, distinctly higher than 1, with a median row of rather large, acute granules; punctures of striae 1 and 2 obsolete.

**Male.** Frons distinctly, shallowly transversely impressed, upper margin of the impression rather strongly elevated into a distinct, somewhat arcuate, sharp, transverse carina located at level of upper margin of eye; surface of impression finely punctate-setose except for an impunctate, glabrous, median, longitudinal, smooth space which may be weakly elevated into an indistinct carina, usually elevated just above epistomal margin into a low, blunt callus; surface above impression deeply, densely punctured except for a weakly elevated, longitudinal extension of the transverse carina. Pronotum and elytra essentially as in female except asperities, punctures and granules slightly larger and more conspicuous.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the labels: Chiric. Mts., Ar., 10-5/coll. Hubbard and Schwarz/♀/TYPE *Pityophthorus immanis* Blackman/Type No. 41302 U.S.N.M. The allotype and 2 paratypes bear the same data as the holotype; 3 paratypes bear the data: 3953 Hopk. U.S./W.F. Fiske collector/Captain, N.M./*Pinus strobus*; 1 paratype has the labels: 5033 Hopk. U.S./Hopkins colr., Flagstaff, Ar./*Pinus ponderosa*, A.D. Hopkins, bred July 15-18 and 1 paratype bears the data: 5489 Hopk. U.S./J.L. Webb, colr./Bred Feb. 08. All type material is in the USNM.

**HOSTS.** *Pinus ponderosa* and *strobiformis*.

**DISTRIBUTION.** Arizona and New Mexico. Known only from the type-series localities.

**REMARKS.** Adults of this species are easily recognized by their large size, by the setae of equal length on the female frons, by the rather strongly elevated, transverse carina on the male frons, by the declivital characters brought out in the description, and by the distribution.

Wood (1977c) suggests that *sulcatus* as a synonym of this species. I consider *sulcatus* a distinct species (see remarks, p. 166).

#### 115. *Pityophthorus (P.) infulatus* Blackman

*Pityophthorus infulatus* Blackman, 1928, p. 103; Chamberlin, 1939, p. 387.

*Pityophthorus mollis* Blackman, 1928, p. 104; Chamberlin, 1939, p. 387; Bright, 1977, p. 515 (= *infulatus*).

*Pityophthorus hubbardi* Blackman, 1928, p. 105; Chamberlin, 1939, p. 387; Bright, 1977, p. 515 (= *infulatus*).

Length 1.6-2.0 mm, about 2.8 times longer than wide.

**Female.** Frons weakly concave on a broad circular area extending from eye to eye and from epistomal margin to well above eyes; surface of concave area moderately shining, closely punctured, punctures very small and close; vestiture abundant, consisting of moderately long setae over surface of concave area with denser, longer, incurved setae around periphery. Projection on oral ridge absent. Antennal club about 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 straight, transverse; first two segments together occupy at least two-thirds of total club length. Pronotum 1.1 times longer than wide, widest just behind summit; sides weakly arcuate; asperities on anterior slope of moderate size, rather



low, scattered in no apparent order; posterior area of disc moderately shining, punctures very small, fine and shallow; surface between punctures bearing a network of fine lines. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in uneven, nearly regular rows, punctures rather large and deep; discal interstriae about 1.5-2.0 times wider than striae, moderately shining, with numerous fine lines. Declivity convex; interstriae 1 weakly elevated, bearing a median row of fine, acute granules; interstriae 2 weakly sulcate, about equal in width to discal width; interstriae 3 weakly elevated, equal in height to interstriae 1, bearing a median row of fine granules; punctures in striae 1 similar in size, depth and placement to those on disc, those in 2 slightly smaller than those on disc.

**Male.** Frons moderately, transversely impressed above epistoma, strongly convex above, but sometimes flattened on a small median area; longitudinal carina very faint to obsolete, shown sometimes by a slightly elevated area on midpoint of epistoma; transverse carina more obvious, may be weak to moderately prominent, usually seen only at midpoint of frons at level of midpoint of eyes. Pronotum and elytra as in female except declivital interstriae 3 slightly more strongly elevated and granules on declivital interstriae 1 and 3 stronger.

**TYPE MATERIAL.** *P. infulatus*. The holotype (♀) in the USNM is labeled: Hopk. U.S. 5753a/J.L. Webb, collector/Sacramento Mtns., N.M./Pinus strobiformis/TYPE Pityophthorus infulatus Blackman/Type No. 41306 U.S.N.M. The allotype and 2 paratypes bear the same data.

*P. mollis*. The holotype (♀) is in the USNM and is labeled: Hopk. U.S. 5685/J.L. Webb, collector/Tortillo Canyon, N.M./Pinus ponderosa/TYPE Pityophthorus mollis Blackman/Type No. 41307 U.S.N.M. Three paratypes with the same data are supposed to be in the USNM but were not located at the time of this study. The allotype and 1 paratype bear the data: Hopk. U.S. 5785b/J.L. Webb, collector/White Mtns., N.M./Pinus ponderosa; 4 paratypes: Hopk. U.S. 5746/J.L. Webb, collector/Sacramento Mts., N.M./Pinus strobiformis; 1 paratype: Hopk. U.S. 5603/J.L. Webb, collector/Sta Catalina Mts., Ariz./Abies concolor; and 2 paratypes: Hopk. U.S. 5781/White Mtns., N.M.

All above type material is in the USNM except for one paratype labeled: Hopk. U.S. 5781a/J.L. Webb, collector/White Mtns., N.M./Pinus ponderosa in the DFEC.

The paratype listed above from the Santa Catalina Mtns. in *Abies concolor* is actually a specimen of *P. pseudotsugae* Swaine.

*P. hubbardi*. The holotype (♀) in the USNM bears the data: Chiric. Mts., Ariz., V-31/Coll. Hubbard and Schwarz/TYPE Pityophthorus hubbardi Blackman/Type No. 41308 U.S.N.M. The allotype and 12 paratypes bear the same data except the date differs, and on some paratypes the collector label is omitted.

**HOSTS.** *Pinus ponderosa* and *strobiformis*.

**DISTRIBUTION.** Arizona and New Mexico. This species may also occur in southern California (see *P. novellus* under "Incertae sedis"). Specimens (78) examined from:

#### UNITED STATES

**Arizona:** See type material. **New Mexico:** Cloudcroft, 11.VII.74, *Pinus strobiformis*, D.E. Bright (CNC) 50.

**REMARKS.** This species is closely related to *pseudotsugae*, however the adults of *infulatus* may be distinguished by the very small, widely separated punctures on the posterior portion of the pronotum, by the weak to obsolete carinae on the male frons, and by the host and distribution.

116. *Pityophthorus (P.) pseudotsugae* Swaine

Figs. 108-110; Map 20

*Pityophthorus pseudotsugae* Swaine, 1918, p. 99; Hopping, 1922, p. 133; Blackman, 1928, p. 106; Chamberlin, 1939, p. 387; Keen, 1952, pp. 36, 38; Chamberlin, 1958, p. 154; Bright & Stark, 1973, pp. 114, 136; Wood, 1971a, p. 426; Furniss & Carolin, 1977, pp. 401, 402.

*Pityophthorus thatcheri* Bright, 1976b, p. 442; Wood, 1977c, p. 516 (= *pseudotsugae*).

Length 1.8-2.3 mm, about 2.8 times longer than wide.

**Female.** Frons flattened to weakly concave on a large circular area extending from epistoma to well above upper level of eyes and laterally nearly from eye to eye; surface shining, closely and deeply punctured; vestiture abundant, consisting of moderately long setae over surface of flattened area with longer incurved setae around periphery. Projection on oral ridge absent. Antennal club about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 straight, transverse to slightly arcuate; first two segments together occupy at least two-thirds of total club length. Pronotum 1.2 times longer than wide, widest just behind summit; sides weakly arcuate to subparallel; asperities on anterior slope of moderate size, moderately high, isolated, scattered in no apparent order; posterior area of disc moderately shining, punctures large and rather deep; surface between punctures bearing a network of fine lines. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in uneven, irregular rows, punctures rather large, deep and close; discal interstriae about as wide as striae or slightly wider, moderately shining, with numerous fine lines and a few, scattered setiferous punctures in 1, 3, 5, etc. Declivity convex, weakly bisulcate; interstriae 1 weakly elevated, bearing a median row of very fine granules; interstriae 2 rather weakly sulcate, about equal in width to or only very slightly wider than discal width; interstriae 3 weakly elevated, equal in height to interstriae 1, bearing a median row of setiferous granules, these larger than those on interstriae 1; punctures in striae 1 and 2 usually obsolete, if visible, then the punctures are smaller than those on disc.

**Male.** Frons distinctly, transversely impressed above epistoma, strongly convex above; longitudinal carina faint but usually visible, extending across transverse impression; transverse carina stronger, distinct, located at upper margin of impression about at upper level of eyes. Pronotum and elytra essentially as in female except declivital interstriae 3 slightly more strongly elevated and granules on declivital interstriae 1 and 3 slightly stronger.

**TYPE MATERIAL.** *P. pseudotsugae*. The holotype (♀) is in the CNC and bears the labels: B.X. Mt., Vernon, B.C./29-VI-14, J.M.S./Pseudotsuga taxifolia/ ♀/ 2617/TYPE *Pityophthorus pseudotsugae*/J.M. Swaine collection/TYPE *Pityophthorus pseudotsugae* No. 1373. The allotype and 6 unlabeled paratypes are included in the series. The allotype bears similar data as the holotype, 1 of the paratypes bears the same locality, collection number, and host label as the allotype and the remaining 5 paratypes bear only the label "2617". All type material mentioned above is in the CNC. Swaine (1918) stated that 15 paratypes were in the type series but only those indicated above were located.

*P. thatcheri*. The holotype (♀) is in the SLWC and is labeled: Big Sandy Meadows, S28T5SR22E, Calif., July 9, 1945, T.O. Thatcher/*Pinus lambertiana*/ HOLOTYPE *Pityophthorus thatcheri* Bright. The allotype and 2 paratypes bear the same data.

One paratype is in the CNC, the remainder of the type series is in the SLWC.

**HOSTS.** *Abies amabilis*, *concolor*, *grandis*, *lasiocarpa*, *magnifica*, *nobilis*, and *procera*; *Pseudotsugae menziesii*; *Picea engelmannii* and *Pinus lambertiana*.

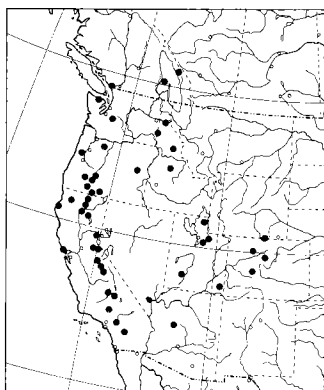
**DISTRIBUTION.** Southern British Columbia to western Colorado and Wyoming, south to southern California and Arizona (Map 20).

## CANADA

**British Columbia:** Beaver Cove, 24.VI.68, *Abies amabilis* (PFRC) 3; Field, *Abies lasiocarpa* (CFRC) 1; Nicomin Ridge, 28.VII.22, *Abies lasiocarpa*, R. Hopping (CNC) 30; Stanley, 6.IX.32, *Abies lasiocarpa*, K. Graham (CASC, CNC) 74.

## UNITED STATES

**Arizona:** Walker, 23.VII.68, *Pseudotsugae menziesii*, D.E. Bright (CNC) 8.  
**California:** Breckenridge Mountain, 22.V.13, *Abies concolor* (CNC) 1; Devils Post Pile, 8.VIII.40, *Abies magnifica*, C.R. Bruck (OSUC) 1; Echo Lake, Eldorado Co., 27.V.31 (DEBC, CNC) 12; Eldorado Co., VII, *Abies magnifica*, W.J. Chamberlin (CNC) 1; Fallen Leaf Lake, Eldorado Co., 13.VIII.63, *Abies concolor*, S.L. Wood (SLWC) 4; Grass Lake, Siskiyou Co., 14.VI.62, *Abies concolor*, D.E. Bright (DEBC) 4; Hat Creek, 12.VI.61, *Abies concolor*, D.E. Bright (DEBC, CNC) 4; Huckleberry Meadow, Fresno Co., 19.VIII, R. Hopping (CNC) 10; Mount Shasta, 15.VI.62, *Abies concolor*, D.E. Bright (CNC) 7; Mount Raymond Trail, 11.VI.46, *Abies concolor*, T.O. Thatcher (CNC) 3; Onion Valley, Inyo Co., 4.IX.68, *Abies* sp., D.E. Bright (CNC) 19; 5 mi W of Phillips, 1.VII.61, H. & A. Howden (CNC) 1; Pincrest, 12.VII.29, *Abies concolor*, Miller & Edmonston (DEBC) 4; Swarthout Valley, *Abies concolor* (DEBC) 3; Yosemite, 23.VIII.29, *Abies magnifica* (USNM) 44.  
**Colorado:** 9 mi SE of Aspen, 22.VI.68, *Abies lasiocarpa*, W. Harwood (SLWC) 5; Berthoud Pass, 4.X.38, *Abies lasiocarpa* (RMSC) 2; Rabbit Ears Pass, 11.VI.68, *Abies lasiocarpa*, S.L. Wood (SLWC) 4; West Portal, 4.X.38, *Abies lasiocarpa* (RMSC) 3. **Idaho:** Big Creek, Valley Co., 26.VI.72, *Abies grandis*, N. Kitibutr (SLWC) 5; Coeur d'Alene, *Abies grandis* (DFEC) 4; Lowell, VI.69, White fir (SLWC) 1; Moscow Mountain (DFEC) 2. **Nevada:** Lyle Canyon, near Las Vegas, 1.IV.74, M.M. Furniss (SLWC) 1. **Oregon:** Crater Lake, 14.VI.31, Hemlock, C.R. Bruck (OSUC) 7; Diamond Lake, 9.VII.64, *Abies* sp., D.E. Bright (CNC) 4; Klamath Falls, 16.VII.29 *Pseudotsuga taxifolia*, J.A. Beal (RMSC) 1; Klamath Falls, 3.VII.31, *Abies concolor*, C.R. Bruck (OSUC) 7; Lake of the Woods, Klamath Co., 18.VI.64, *Abies* sp., D.E. Bright (CNC) 2; Lost Lake, Clackmus Co., 25.VI.64, *Abies concolor*, D.E. Bright (CNC) 8; Mary's Peak, Benton Co., 27.VIII.62, *Abies nobilis*, D.E. Bright (CNC) 7; Robinson Springs, near Bly, 23.V.26, *Abies concolor*, F.P. Keen (SLWC) 2; 4 miles W of Suttle Lake, 3.IX.39, *Picea engelmannii*, Schuh & Gray (SLWC) 1; Umpqua National Forest, 21.VIII.21 (DFEC) 12. **Utah:** near Alta, 24.VIII.57, *Abies concolor*, D.E. Bright (CNC) 3; Beaver, 10.IX.49, *Abies lasiocarpa*, S.L. Wood (SLWC) 6; LaSal Mountains, 5.VII.58, *Abies lasiocarpa*, D.E. Bright (DEBC) 12; Logan Canyon, various dates and collectors, *Abies lasiocarpa* (CNC, SLWC) 40; Mirror Lake, Summit Co., 8.VI.58, *Abies lasiocarpa*,



MAP 20. Collection localities for *P. (Pityophthorus) pseudotsugae*.

D.E. Bright (CNC) 17; Mount Logan, 6.VI.37, *Abies lasiocarpa*, R.E. Nye (SLWC) 9; Park City, 17.VI (CNC, DFEC) 5; Wolf Creek Pass, 12.VII.60, *Abies lasiocarpa*, S.L. Wood (SLWC) 5. **Washington:** Mount Rainier, 21.VIII.62, silver fir, D.E. Bright (CNC) 16; Port Angeles, *Abies grandis* (DFEC) 1; Port Williams, *Abies grandis* (DFEC) 1. **Wyoming:** Saratoga, various dates 1938, *Abies lasiocarpa* (RMSC) 10.

**BIONOMICS.** Adults of this species construct the typical "radiate" type of gallery. From four to seven egg galleries radiate from the central nuptial chamber. Bright and Stark (1973) give a photograph of several galleries and Chamberlin (1939, 1958) gives a drawing of the completed gallery; Furniss and Carolin (1977) also give a photograph of typical galleries.

**REMARKS.** Adults of this species closely resemble those of *nitidulus* and *malleatus*. Adults of *pseudotsugae* may be distinguished from those of *nitidulus* by the shallower elytral declivity and by the fact that declivital interstriae 1 and 3 are nearly equal in height. See remarks under *malleatus* for further information. Knowledge of the species of host plant or the locality may also assist in distinguishing this species.

#### 117. *Pityophthorus (P.) malleatus* Bright

Figs. 111-113

*Pityophthorus malleatus* Bright, 1978, p. 79.

Length 1.7-2.2 mm, 2.0 times longer than wide.

**Female.** Frons flattened on a small area extending from epistomal margin to upper level of eyes and laterally occupying about 73% of the distance between eyes; surface of flattened area densely punctured, punctures moderate in size, surface above flattened area with deeper, larger, closer punctures; vestiture confined to flattened area, consisting of moderately long, relatively sparse setae, these much sparser and shorter than those on *pseudotsugae*. Projection on oral ridge absent. Antennal club as in *pseudotsugae*. Pronotum as in *pseudotsugae*. Elytra as in *pseudotsugae* except striae punctures slightly more regularly placed, discal interstriae (except 1) devoid of setiferous punctures and surface of interstriae more brightly shining. Declivity convex, moderately bisulcate; interstriae 1 rather strongly elevated, bearing a median row of moderately sized, setiferous granules; interstriae 2 moderately sulcate, distinctly wider than discal width and more impressed, flat; interstriae 3 arcuate, moderately elevated, equal in height to 1 or very slightly lower, bearing a median row of moderately sized, setiferous granules, these equal in size to those on 1; punctures in striae 2 distinct, those in 1 obsolete.

**Male.** Frons as in male *pseudotsugae* except transverse carina slightly more strongly elevated. Pronotum and elytra as in female. Declivity more deeply sulcate than in female, interstriae 3 more strongly elevated and granules on interstriae 1 and 3 larger.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: Walker, Ariz., Yavapai Co., VIII-23-1968, D.E. Bright/*Pseudotsuga menziesii*/ HOLOTYPE *Pityophthorus malleatus* D.E. Bright, CNC No. 15483. The allotype and 6 paratypes bear the same data.

The holotype, allotype, and 4 paratypes are in the CNC and 2 paratypes are in the SLWC.

**HOST.** *Pseudotsuga menziesii*.

**DISTRIBUTION.** Known only from Arizona. Specimens (36) examined from:  
UNITED STATES  
**Arizona:** Prescott National Forest, 31.VII.30, *Pseudotsuga taxifolia*, M.W. Blackman (USNM) 28.

REMARKS. Adults of this species bear a very close resemblance to those of *pseudotsugae* but on close examination several distinctive characters can be noted. The frons of female *malleatus* is much more sparsely pubescent, the pubescent area is much less extensive and the setae are much shorter than in the female *pseudotsugae* (Fig. 111). The elytral striae of both sexes of *malleatus* are slightly more evenly punctured and the discal interstriae (except 1) are completely impunctate, while in *pseudotsugae*, discal interstriae 1, 3, 5, 7 each bear from 1 to 3 or 4 setiferous punctures. The declivity of *malleatus* (Fig. 113) is also more deeply sulcate, with interstriae 2 broader than the discal width, while in *pseudotsugae* (Fig. 110), interstriae 2 is very weakly impressed and is not wider (or only slightly so) than the discal width.

118. *Pityophthorus (P.) abiegnus* Wood

*Pityophthorus abiegnus* Wood, 1964, p. 67.

Length 2.2-2.6 mm, 2.6 times longer than wide.

**Female.** Frons broadly flattened on a large semicircular area extending from epistomal margin to well above eyes and laterally from eye to eye; surface shining, moderately densely punctured, punctures fine and close; vestiture abundant, consisting of moderately long setae scattered over flattened surface with those on periphery much longer and incurved. Projection on oral ridge absent. Antennal club elongate-oval, about 1.4-1.5 times longer than wide, widest through segment 2; suture 1 straight, transverse, 2 weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest at middle; sides weakly arcuate; asperities on anterior slope low, isolated, scattered in no apparent order; posterior area of disc densely punctured, punctures large, deep, and close; surface between punctures weakly shining, closely reticulate, with numerous very fine points. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in distinct rows, punctures large and deep; discal interstriae about 1.5-2.0 times wider than striae, surface moderately shining, minutely reticulate; interstriae 1, 3, 5, 7, etc. each with a few setiferous punctures. Declivity deeply bisulcate; interstriae 1 narrow, deeply impressed below level of 3, with a median row of minute granules; interstriae 2 deeply sulcate, wider than discal width, smooth; interstriae 3 strongly elevated, especially on upper half, bearing a median row of 5 or 6 very large granules; punctures in striae 1 and 2 generally distinct.

**Male.** Frons distinctly, transversely impressed, impression extending from epistoma to upper level of eyes, upper margin of impression bearing a distinct, strongly elevated, transverse carina; a distinct, strongly elevated, toothlike, longitudinal carina is present in median area of impression; surface strongly punctured, punctures deep and close. Pronotum, elytra, and declivity essentially as in female.

TYPE MATERIAL. The holotype (♀) is in the SLWC and bears the labels: 4 miles west of Rio Frio, Mexico, Mexico, VII-14-1953, 9800 ft., S.L. Wood/*Abies* sp./HOLOTYPE *Pityophthorus abiegnus* S.L. Wood, 1964. The allotype and 10 paratypes bear the same data.

All of the type material is in the SLWC.

HOST. *Abies religiosa*.

DISTRIBUTION. Central and southern Mexico. Probably occurs throughout the range of the host plant. Specimens (39) examined from:

MEXICO

**Mexico:** See type material. **Oaxaca:** 53 mi S of Valle Nacional, 24.V.71, *Abies religiosa*, D.E. Bright (CNC) 3. **Tlaxcala:** 11 mi N of Tlaxco, 9.VII.67, *Abies religiosa*, S.L. Wood (SLWC) 24.

REMARKS. Adults of this species are very similar to those of *cortezii* and *viminalis*. The only readily detectable differences are those mentioned in the key

to species. In addition, the elytral apex of adults of *abiegnus* is broadly rounded whereas in *cortezii* and *viminalis* the apex is narrowly rounded, almost subacuminate. Also, the adults of *abiegnus* are stouter than those of *cortezii* and *viminalis*.

119. *Pityophthorus (P.) sulcatus* Bright

Figs. 117-119

*Pityophthorus sulcatus* Bright, 1977, p. 529; Wood, 1977c, p. 515 (= *immanis*).

Length 1.8-2.4 mm, 2.6-2.7 times longer than wide.

**Female.** Frons essentially as in *nitidulus*, setae in central portion slightly longer and slightly more densely placed than in *nitidulus*. Projection on oral ridge absent. Antennal club essentially as in *nitidulus*. Pronotum about 1.1 times longer than wide, essentially as in *nitidulus* except surface between punctures on posterior portion more brightly shining than in *occidentalis* and microsculpture consisting mostly of fine points, not lines as in *occidentalis*. Elytra about 1.7 times longer than wide, as in *nitidulus* except interstriae more brightly shining. Declivity convex, rather deeply sulcate, much more so than in *nitidulus*; interstriae 1 slightly elevated, with a median row of very fine granules; interstriae 2 rather deeply impressed, much wider than discal width and shining; interstriae 3 abruptly elevated, the inner slope precipitous, summit bearing a median row of small but prominent granules; punctures of striae 1 large, weakly impressed, not particularly obvious, those in striae 2 obsolete except near apex.

**Male.** Frons as in *nitidulus* except transverse and longitudinal carina usually stronger and general sculpture somewhat rougher. Pronotum and elytra as in female except punctures larger and deeper. Declivity sulcate, less so than in female; interstriae 3 less abruptly elevated, the inner slope less precipitous, otherwise closely resembles that of female.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the labels: Mt. Lemmon, Pima Co., Ariz., VII.5.1968, D.E. Bright/Pinus strobiformis/HOLOTYPE *Pityophthorus sulcatus* D.E. Bright, CNC No. 13742. The allotype and 43 paratypes bear the same data. Seventeen additional paratypes bear the data: Hannagan Camp, Greenlee Co., Ariz., VII.12.1968, D.E. Bright/Pinus strobiformis; 18 paratypes are labeled: Rustler Park, Chiricahua Mtns., Ariz., VII-7-1969, S.L. Wood/Pinus strobiformis and 6 are labeled: Bear Wallow, Sta. Catalina Mtns., Ariz., VI-11-1969, S.L. Wood/Pinus strobiformis.

The holotype, allotype, and paratypes collected by me are in the CNC, additional paratypes are in the SLWC and the KESC.

**HOST.** *Pinus leiophylla* and *strobiformis* but probably occurs in other pines as well.

**DISTRIBUTION.** Arizona and New Mexico. Specimens (105) examined from:

UNITED STATES

**Arizona:** See type localities. **New Mexico:** Capitan Mountains, *Pinus strobiformis*, J.L. Webb (USNM) 3; Cloudcroft, 11-13.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 16.

**REMARKS.** Wood (1977c) places this species as a synonym of *immanis*. My re-examination of the type specimens of *sulcatus* and comparison with the type material of *immanis* showed that the suggested synonymy should be questioned. The elytral declivity of the female *sulcatus* is much deeper and the third interstriae are abruptly elevated and precipitous on the inner slope; the declivity of female *immanis* is much shallower and the third interstriae are much lower and are sloping on the inner slope. The declivity of the male *immanis* is distinctly elevated only on the upper half and the second interstriae is only moderately sulcate and is not distinctly widened; the declivity of the male *sulcatus* is elevated almost to the apex, and the second interstriae is more deeply sulcate and definitely widened.

120. *Pityophthorus (P.) nitidulus* (Mannerheim)

Figs. 4, 114-116; Map 21

*Bostrichus nitidulus* Mannerheim, 1843, p. 298; (Mannerheim, 1852, p. 359; Mannerheim, 1853, p. 273; Bright, 1976c, p. 186 (lectotype desig.).

*Cryphalus nitidulus*: LeConte, 1868, p. 157.

*Pityophthorus nitidulus*: LeConte & Horn, 1876, p. 354; Swaine, 1909, p. 136; Hagedorn, 1910, p. 73 (additional references); Chamberlin, 1917, p. 355; Chamberlin 1918, p. 16; Swaine 1918, pp. 96, 100; Blackman, 1928, p. 108; Chamberlin, 1939, p. 388; Keen, 1952, p. 37; Chamberlin, 1958, p. 154; Schedl, 1963, p. 158; Bright & Stark, 1973, p. 113; Wood, 1971a, p. 426; Furniss & Carolin, 1977, p. 402.

*Cryphalus atratulus* LeConte, 1868, p. 156; LeConte & Horn, 1876, p. 354 (= *nitidulus*); Bright, 1976c, p. 185 (lectotype desig.).

*Cryphalus puncticollis* LeConte, 1874, p. 71; Bright, 1976c, p. 185 (lectotype desig.).

*Pityophthorus puncticollis*: LeConte & Horn, 1876, p. 354; Hagedorn, 1910, p. 75 (additional references); Chamberlin, 1917, p. 355; Swaine 1918, p. 100 (= *nitidulus*).

Length 1.7-2.7 mm, about 2.8 (♂) - 2.9 (♀) times longer than wide.

**Female.** Frons flattened to weakly concave on a large circular area extending from epistomal margin to well above eyes and laterally from eye to eye; surface brightly shining and moderately punctured, punctures fine; vestiture abundant, consisting of long, yellowish setae over entire surface, those on periphery of flattened area much longer and incurved. Projection on oral ridge absent. Antennal club about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; first two segments together occupy at least two-thirds of total club length. Pronotum about 1.1 times longer than wide, widest at about level of summit; sides weakly arcuate to subparallel; asperities on anterior slope of moderate size, acute, isolated, scattered in no apparent order; posterior area of disc moderately shining to opaque, punctures rather large and deep; surface between punctures with a network of moderately deep to shallow fine lines. Elytra about 1.7-1.8 times longer than wide; apex broadly rounded; discal striae punctured in nearly regular rows, punctures rather large, deep and close; discal interstriae about as wide as striae or slightly wider, with numerous fine lines. Declivity moderately bisulcate; interstriae 1 rather weakly elevated, bearing a median row of very fine granules; interstriae 2 moderately sulcate, slightly wider than discal width; interstriae 3 weakly elevated, evenly convex, equal or nearly equal in height to interstriae 1, bearing a median row of fine, acute granules, these usually larger than those on interstriae 1 and a row of long setae, these equal to or longer than width of interstriae; punctures in striae 1 and 2 visible, not as deeply impressed as on disc and slightly smaller.

**Male.** Stoutier than female. Frons rather strongly, transversely impressed above epistoma; transverse and longitudinal carina prominent, the transverse carina more so, but height of carinas variable. Pronotum and elytra essentially as in female, except interstriae 3 on declivity distinctly higher than interstriae 1 and granules on interstriae 1 and 3 stronger; interstriae 3 appearing frequently to have a double row of granules, the inner row is actually in interstriae 2.

**TYPE MATERIAL.** *P. nitidulus*. The lectotype for this species was designated by Bright (1976c). It bears the labels: Blaschke/Sitka/coll. Mannerheim/*Bostrichus nitidulus* Mannerh. n. sp., Blaschke - Sitka/Mus. Hifors, Spec. typ. No. 1186, *Bostrichus nitidulus* Mann./LECTOTYPE *Bostrichus nitidulus* Mannerheim, D.E. Bright, 1974. Two other specimens collected by Frankhauser were seen that may have been part of the type series.

The type is in the Zoological Museum, Helsinki, Finland.

*P. atratulus*. The original type series consisted of 2 specimens, both of which are still in LeConte's collection at the MCZ. The first specimen (♂), designated the

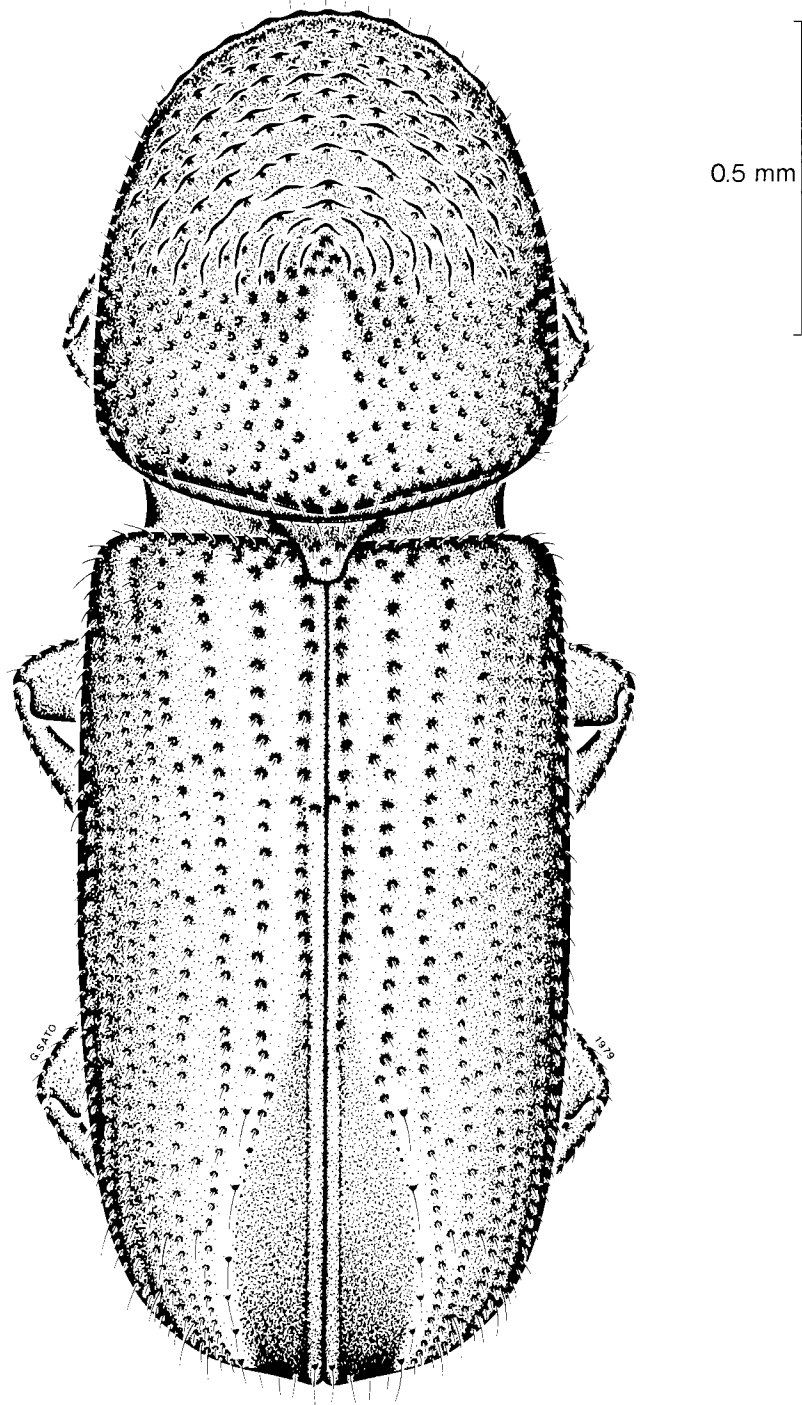


FIG. 4. *Pityophthorus nitidulus nitidulus* (Mannerheim).



lectotype by Bright (1976c), bears the following labels: a gold disk/Type 1000/C. atratulus Lec./nitidulus 4./LECTOTYPE Cryphalus atratulus LeConte, D.E. Bright, 1976. The second specimen bears the labels: a gold disk/Type 1000/atratus/nitidulus 5.

*P. puncticollis*. Four specimens are under this name in the LeConte collection at the MCZ. The first of these (?), designated the lectotype by Bright (1976c), bears the labels: Cala./Type 999/C. puncticollis Lec./LECTOTYPE Cryphalus puncticollis LeConte, D.E. Bright 1976. The second specimen is labeled: Veta Pass, Col., 24-6/puncticollis 2/Pityophthorus poss. occidentalis Blkm., D.E. Bright, 1974; the third specimen is labeled: Veta Pass, Colo., 27-6/puncticollis 3/Pityophthorus not puncticollis Lec., D.E. Bright, 1974, and the fourth specimen bears the labels: Garland, Col., 22-6/669/puncticollis 4/Pityophthorus tuberculatus (Eichh.), D.E. Bright, 1974.

HOSTS. *Picea breweriana*, *engelmannii*, *glauca*, and *sitchensis*; *Pinus aristata*, *contorta*, *flexilis*, *lambertiana*, *muricata*, *ponderosa*, and *radiata*.

DISTRIBUTION. Coastal areas from southern California to Alaska, inland to Alberta, Wyoming, Utah, and Arizona (Map 21). Specimens (786) examined from:

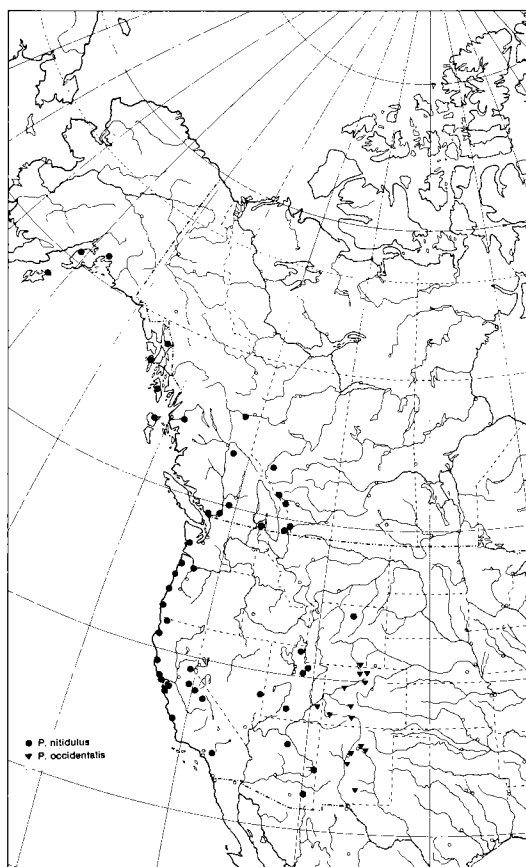
#### CANADA

**Alberta:** Banff, 16.IX, white spruce (CNC) 2; Highwood Pass, 40 mi S of Exshaw, 17.IX.67, *Picea engelmannii* (CNC) 7; Moraine Lake, Banff, 12.IX.67, *Picea*, D.E. Bright (CNC) 4; Robb, 2.VIII.56; L.p. pine (NFRCE) 6. **British Columbia:** Fernie, 12.VII.68, flight trap (NFRCE) 7; Hope Trail, 2.VII.30, *Abies subalpina* (?), G. Stace Smith (UBC) 1; Kerry Lake, 19.VI.64, *Picea glauca* (PFRC) 3; Kootenay Pass, 1.VII.72, *Picea engelmannii*, D.E. Bright (CNC) 35; Lorna, 4.VII.26, *Picea engelmannii*, H. Richmond (CASC) 20; Massett, various dates and collectors (UBC, USNM) 15; Nicomin Ridge, 28.VII.22, *Picea engelmannii*, R. Hopping (CNC) 10; North Vancouver, *Pinus contorta* (CNC) 2; Pine Pass, 11.VII.72, *Picea*, D.E. Bright (CNC) 2; Stanley, various dates, *Picea engelmannii*, W.G. Mathers (CASC) 15; Terrace (CNC) 2; Trinity Valley, 6.VIII.54, *Picea engelmannii*, J.M. Kinghorn (SLWC) 3.

#### UNITED STATES

**Alaska:** Afognak Island, 29.VI.59, *Picea sitchensis*, G.L. Downing (DEBC) 5; Hollis, 2.IX.56, *Picea sitchensis*, D.E. Bright (DEBC) 7; Juneau, 23.V.59, *Picea sitchensis*, D.E. Bright (DEBC) 10; Kenai, 14-25.VI.74, M.M. Furniss (SLWC) 4; Matanuska, various dates 1944-45, rotary trap, J.C. Chamberlin (USNM) 30. **Arizona:** Agassiz Peak, San Francisco Mountains, 16.VIII.68, *Pinus aristata*, D.E. Bright (CNC) 37 and *Picea engelmannii* (CNC) 38; Hannagan Camp, Greenlee Co., 12.VII.68, *Picea engelmannii*, D.E. Bright (CNC) 33; Pinaleno Mountains, Graham Co., 15.VII.68, *Pinus ponderosa*. D.E. Bright (CNC) 15 and *Picea engelmannii* (CNC) 23. **California:** Albion, 9.VI.62, *Pinus muricata*, D.E. Bright (CIS) 1; Berkeley, various dates, *Pinus radiata* (CASC, CIS, CNC) 57; Cambria Pines, 16.II.36, A.T. McClay (CNC) 16; Carmel, 17.VI.26 (CASC) 17; Ferndale, 10.VI.62, *Picea sitchensis*, D.E. Bright (CIS) 1; Forest Hill, IV.98, Van Dyke (CASC) 1; Fort Bragg, 9.VI.62, *Pinus muricata*, D.E. Bright (CNC) 6; 18 mi N of Happy Camp, 31.VII.63, *Picea breweriana*, C.J. Wray (CIS) 1; Inverness, 16.V.52, *Pinus muricata*, H.B. Leech (CASC) 6; Lake Arrowhead, 25.VII.32, R.P. Allen (CASC) 2; Mokel. Hill, Calaveras Co., F.E. Blaisdell (CASC) 17; Oakland, 3.IV.31, Monterrey pine, E.C. Zimmerman (USNM) 4; Pacific Grove, June, A. Fenyes (CASC) 5; Placer Co., Van Dyke (CASC) 13; 4 mi W of Plantation, 5.IX.56, *Pinus muricata* (CIS) 1; Point Reyes, 11.XI.61, *Pinus muricata*, D.E. Bright (CNC) 52; San Simeon,

14.IV.62, *Pinus muricata*, D.E. Bright (CIS) 1; Sequoia National Park, 21.X.33 (USNM) 1; Standford University, various dates, *Pinus radiata* (CNC, CASC) 100; Yosemite National Park, 30.IV.38, sugar pine (CASC) 1. **Nevada:** Wheeler Peak, White Pine Co., 8.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 21 and *Pinus aristata* (CNC) 2. **Oregon:** Bandon, 13.VIII.62, *Picea sitchensis*, D.E. Bright (CNC) 23; Cascade Head Experimental Forest, near Otis, 24.V.61, *Picea sitchensis*, S.L. Wood (SLWC) 40; Florence, 12.VI.36, Van Dyke (CASC) 14; Portland, 15.V.99, on pine (USNM) 1; Sandlake, 24.VI.61, *Pinus contorta*, D.E. Bright (CNC) 7. **Utah:** Beaver, 15.IX.49, *Picea engelmannii*, S.L. Wood (SLWC) 4; Logan Canyon, 9.VIII.46, *Pinus contorta*, S.L. Wood (SLWC) 2; Mirror Lake, Summit Co., 8.VI.58, *Pinus contorta*, D.E. Bright (CNC) 5 and *Picea engelmannii* (CNC) 6; Wolf Creek Pass, 12.VII.60, *Picea engelmannii*, D.E. Bright (SLWC) 9. **Washington:** Hoquiam, *Picea sitchensis*, A.D. Hopkins (USNM) 1. **Wyoming:** 16 mi SW of Buffalo, 20.VI.68, *Picea engelmannii*, S.L. Wood (SLWC) 7.



MAP 21. Collection localities for *P. (Pityophthorus) nitidulus* and *P. occidentalis*.

**BIONOMICS.** The galleries of *nitidulus* have been described or illustrated by Keen (1952), Chamberlin (1939), and Bright and Stark (1973). The gallery system is the typical radiate type in which three or four egg galleries branch from the irregular shaped central chamber. Each egg gallery is constructed by one female. Eggs are laid in small niches cut out of the gallery wall, then are covered with frass.

The larvae mine away from the egg gallery in all directions and pupate in the bark. Mature adults may feed under the bark for a short while before leaving the brood tree.

Schedl (1956) placed *nigricans* Blandford in synonymy under *nitidulus*. An examination of the types of these two species showed that this synonymy was in error (see remarks under *nigricans*). Because of this synonymy, Schedl extended the distribution of *nitidulus* to Central America. No specimens of this species were seen during this study from farther south than southern Arizona.

### 121. *Pityophthorus (P.) occidentalis* Blackman

Map 21

*Pityophthorus occidentalis* Blackman, 1920, p. 4; Blackman, 1928, p. 110; Chamberlin, 1939, p. 389; Wood, 1971a, p. 426; Bright, 1976c, p. 183 (lectotype desig.).

Length 1.9-2.4 mm, about 2.8 (♂) - 2.9 (♀) times longer than wide.

**Female.** Essentially as described for *nitidulus* except setae in declivital interstriae 3 much shorter or absent, if present these are much shorter than width of interstriae; punctures usually visible in striae 2 on declivity and the declivity is more shining.

**Male.** As described for *nitidulus* except declivity less strongly sulcate.

**TYPE MATERIAL.** Blackman did not record the number of specimens in the series before him when he wrote the description. Nineteen specimens have been located in the USNM and the DFEC. A specimen (♂) in the USNM was designated the lectotype by Bright (1976c). It bears the labels: Pitkin, Colo., 14-5-15/Bassett, coll./N.Y.S. Coll. For. Lot No. 698/♀ type/Type No. 56920 U.S.N.M./LECTO-TYPE *Pityophthorus occidentalis* Blackman, D.E. Bright, 1976. The paralectotypes bear the same data.

**HOSTS.** *Picea engelmannii*, rarely *Pinus contorta* and *flexilis*.

**DISTRIBUTION.** Southern Wyoming, Colorado, New Mexico, and the southeast region of Utah (Map 21). Specimens (199) examined from:

#### UNITED STATES

**Colorado:** Bear Lake, Rocky Mountain National Park, 16.VIII.58, *Pinus contorta*, D.E. Bright (DEBC) 2; 15 mi W and 17 mi S of Del Norte, 25.VI.68, *Picea engelmannii*, F.B. Knight (RMSC) 3; Gould, various dates 1956-57, *Picea engelmannii* (RMSC) 15; Illinois River, Routt National Forest, 6.VII.59, *Picea engelmannii*, F.B. Knight (RMSC) 5; Newcastle, 18.VII.45, *Picea engelmannii*, C.L. Massey (RMSC, USNM) 23; Pingree Park, 24.VIII.53, *Pinus flexilis*, S.L. Wood (SLWC) 4; Pitkin, 16.IX.15, Barrett (DFEC, USNM) 19; Rio Grande National Forest, 12.VIII.58, *Picea engelmannii*, F.B. Knight (RMSC) 2; Steamboat Springs, *Picea engelmannii* (RMSC) 5. **New Mexico:** Las Vegas (CNC) 1; Las Lunas, 10.VI.35, Van Dyke (CASC) 1; El Porvenir, A. Fenyas (CASC) 6; Sanda Peak, Bernalillo Co., 9.VII.68, *Pinus flexilis*, D.E. Bright (CNC) 30; Sandia Mountains, 8.VII.74, *Picea engelmannii*, D.E. Bright (CNC) 35; Santa Fe Ski Basin, 13.VIII.62, *Picea engelmannii*, S.L. Wood (SLWC) 18. **Utah:** LaSal Mountains, 5.VII.58, *Picea engelmannii*, S.L. Wood (SLWC) 2. **Wyoming:** Saratoga, 10.IX.38, *Picea engelmannii* (RMSC) 9.

**BIONOMICS.** Probably very similar to *nitidulus*.

**REMARKS.** This species was originally considered to be a subspecies of *nitidulus*. The distinguishing characters, noted in the key and descriptions, were observed but considered too variable to be used to indicate species. A re-evaluation has cast doubts on this interpretation and full species status is maintained.

The range of *occidentalis* is the southern Rocky Mountain region which is a discrete landform in United States topography. It evidently replaces *nitidulus* in this region.

Adults of *occidentalis* are very similar to those of *nitidulus* but are readily distinguished by the characters given in the key and in the diagnosis.

## 122. *Pityophthorus* (*P.*) *cortezii* Bright

Figs. 120-122

*Pityophthorus cortezii* Bright, 1977, p. 523.

Length 2.5-3.5 mm, at least 3.0 times longer than wide.

**Female.** Frons broadly flattened from epistoma to well above eyes and laterally from eye to eye; surface shining, regularly, abundantly and distinctly punctured except on a smooth space just above the midpoint of the epistoma, space smaller than the size of antennal club, punctures of moderate size and close; vestiture abundant, consisting of long, yellowish setae over surface with longer, incurved setae around periphery. Projection on oral ridge absent. Antennal club 1.5 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; first two segments together occupy more than two-thirds of total club length. Pronotum about as long as wide, widest at posterior angles; sides nearly straight, weakly converging; asperities on anterior slope of moderate size, numerous, isolated, scattered in no apparent order; posterior area generally dull, opaque, punctures large, deep, and close; surface between punctures bearing a network of fine lines. Elytra about 2.0 times longer than wide, apex narrowly rounded, almost subacuminate; discal striae punctured in regular rows, punctures large, deep, and close; discal interstriae about as wide or slightly wider than striae, generally impunctate but a few scattered punctures may be present, surface moderately shining and bearing a network of fine lines. Declivity convex, sloping, sulcate; interstriae 1 rather prominently elevated, bearing a median row of fine granules; interstriae 2 broadly, moderately sulcate, somewhat wider than discal width, moderately shining; interstriae 3 more strongly elevated than 1, more so on upper half, bearing a median row of rather large granules, especially on the more abruptly elevated upper half of the interstriae a few scattered granules are also in interstriae 2 in line with those in 3; punctures of striae 1 and 2 obsolete, more so in 2.

**Male.** Frons strongly, transversely impressed from epistoma to upper level of eyes, divided by a prominent, longitudinal carina, transverse carina at upper level of impression also prominent, more elevated than longitudinal one; surface roughly punctured. Pronotum and elytra as in female except asperities, serrations and punctures stronger. Declivity more deeply impressed, granules on interstriae 1 and 3 more numerous and larger; interstriae 3 abruptly elevated, especially on upper half, bearing a partial double row of prominent granules on strongly elevated upper half.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: MEX., Mex.-Pue., Ixta-Popo N.P., 13,000', V.8.71, D.E. Bright/*Pinus hartweggii*/HOLOTYPE *Pityophthorus cortezii* D.E. Bright, CNC No. 13741. The allotype and 48 paratypes bear the same data.

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.

**HOST.** *Pinus hartweggii*.

**DISTRIBUTION.** Known only from the region near Volcan Popocatepetl. Specimens (52) examined from:

MEXICO

**Mexico:** Amecameca, 17.III.54, *Pinus hartweggii*, R.L. Furniss (USNM) 2.

**REMARKS.** Adults of this species are very similar to those of *viminalis* except that the adults of *cortezii* are much larger. Other anatomical differences are obscure and difficult to see. The declivity of *cortezii* is deeper than that of *viminalis* and

somewhat narrower on the upper half and the setae on the female frons are slightly longer.

123. *Pityophthorus (P.) viminalis* Bright

*Pityophthorus viminalis* Bright, 1977, p. 530.

Length 2.4-2.8 mm, 3.0 times longer than wide.

**Female.** Frons broadly flattened as in *cortezii*; surface brightly shining, densely punctured except for a median smooth space just above epistomal margin, space about equal to size of antennal club, punctures surrounding this space of moderate size, very close; vestiture abundant, covering portion only slightly shorter than those on periphery. Projection on oral ridge absent. Antennal club about 1.2 times longer than wide, widest through segment 2; first two sutures weakly arcuate, the second more so; first two segments occupy more than two-thirds of total club length. Pronotum 1.1 times longer than wide, widest at or near posterior angles; sides nearly straight, weakly converging; asperities on anterior slope of moderate size, numerous, isolated, scattered in no apparent order; posterior area of disc distinctly punctured, punctures large, deep, and close; surface between punctures generally dull, opaque, bearing a network of very fine lines. Elytra about 2.0 times longer than wide; apex narrowly rounded, almost subacuminate; striae and interstriae as in *cortezii*. Declivity as in *cortezii*.

**Male.** Frons as in *cortezii* but not as strongly punctured in and above the transverse impression. Pronotum and elytra as in *cortezii* except interstriae 2 wider and inner slope of the elevated interstriae 3 not as steep.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: MEX., N.L., Cerro Potosi, V.4.71, 11,500', D.E. Bright/Pinus culminicola/HOLOTYPE *Pityophthorus viminalis* D.E. Bright, CNC No. 13735. The allotype and 5 paratypes bear the same data.

Most of the type material is in the CNC, 2 paratypes are in the SLWC.

**HOST.** *Pinus culminicola*.

**DISTRIBUTION.** Known only from the type locality in Nuevo León.

**REMARKS.** See remarks under *cortezii*.

CARINICEPS GROUP

The species in this group are some of the most variable species in the genus. Specimens of the same species may differ radically in appearance. The most variable features are characters on the female frons and those on the male declivity. The systematics of this group is extremely complex and can be resolved only by genetic studies. The classification below is adequate for the present.

Members of this group are usually elongate (3.0 times longer than wide); the female frons is extremely variable and may be concavely impressed or variously carinate and ornamented with spongy patches of sensilla, or with patches of short to moderately long setae (Figs. 123-132); the male declivity is entirely devoid of granules and interstriae 3 is prominently elevated to almost spinelike in median area, the protuberance may be weakly to strongly extended or displaced mesally toward suture (Figs. 133-136).

Eight species are placed in this group.

KEY TO SPECIES IN THE *Cariniceps* group

1. Body length 2.0-3.0 mm, but usually ranges between 2.3-2.9 mm; declivital interstriae 3 of female usually more prominently elevated on upper half, granules large and acute; declivital protuberances of male generally prominent, varying from strongly bent inward over suture to directed caudad (Figs. 133, 134); frons of female variable, varying from flat to strongly longitudinally elevated on midline and moderately concave on each side

- of midline, densely pubescent over entire surface with very short to moderately long setae (Figs. 123-125)..... 124. *cariniceps* LeConte (p. 174)
- Body length usually 2.0 mm or less; declivital interstriae 3 of female evenly elevated to apex, granules small; declivital protuberances of male absent to moderately elevated; frons of female very variable but not as above ..... 2
2. Female frons distinctly concave on each side of a distinct longitudinally elevated carina ..... 3
- Female frons concave or sulcate in center, flattened or variously modified, not as above ..... 4
3. Female frons with longitudinal elevation between concave areas only weakly to moderately elevated, the elevation and the periphery of concave areas bearing moderately long, stiff setae, the central portion of each concave area glabrous (Fig. 126); declivital interstriae of male bearing a longitudinally elevated prominence in middle of declivity ..... 125. *biovalis* Blackman (p. 178)
- Female frons with longitudinal elevation between concave areas very strongly, sharply elevated, the elevation sometimes bearing short setae along summit, periphery of concave areas glabrous, the central portion of each concave area minutely pubescent (Fig. 127); declivital interstriae 3 of male bearing a blunt protuberance which is strongly extended inward to or over suture ..... 126. *carinatus* Bright (p. 179)
4. Occurs in British Columbia (and adjacent regions); female frons either weakly longitudinally sulcate or weakly protuberant ..... 127. *hesperius* Bright (p. 181)
- Occurs in eastern Canada and northeastern United States; female frons variable . . . . 5
5. Female frons weakly, broadly concave, flattened or weakly convex, broadly spongy, median line narrowly to broadly elevated, may be weakly sulcate; a small, laterally flattened tooth may be present on the epistoma (Fig. 128); protuberances on male declivity directed caudad or strongly displaced toward suture (Figs. 135, 136) ..... 128. *balsameus* Blackman (p. 181)
- Female frons moderately to deeply longitudinally concave or sulcate along median line; epistomal tooth frequently absent; protuberances on male declivity not displaced or turned inward towards suture ..... 6
6. Female frons protuberant or narrowly sulcate in median line, the sulcus either carried on a distinct longitudinal protuberance or not, and sometimes absent, area on each side of sulcus with an oval to circular patch of spongy pubescence, sulcus usually ends at epistoma in a weakly but sharply elevated, crescent-shaped carina that connects the two patches of pubescence (Figs. 129, 130); interstriae 3 of male with a blunt protuberance in median area ..... 129. *briscoei* Blackman (p. 184)
- Female frons deeply to moderately sulcate or concave, pubescence absent or moderately long ..... 7
7. Female frons longitudinally sulcate with lateral margins of sulcus elevated (Fig. 131); or, moderately concave on an oval to circular area extending to near upper level of eyes, lateral margins moderately elevated, densely, finely punctured, not pubescent; interstriae 3 of male with an elongate, blunt protuberance in middle of declivity ..... 130. *concavus* Blackman (p. 185)
- Female frons deeply concave, periphery of cavity with dense, moderately long setae, central portion of cavity pubescent or glabrous (or spongy) (Fig. 132); male declivity variable ..... 131. *cavatus* Bright (p. 187)

#### 124. *Pityophthorus* (*P.*) *cariniceps* LeConte

Figs. 123-125, 133, 134; Map 22

*Pityophthorus cariniceps* LeConte & Horn, 1876, p. 353; Hagedorn, 1910, p. 70 (additional references); Blatchley & Leng, 1916, p. 633; Swaine, 1918, p. 102; Blackman, 1928, p. 72; Dodge, 1938, p. 55; Chamberlin, 1939, p. 377; Craighead, 1950, p. 332; Baker, 1972, p. 255.

*Pityophthorus canadensis* Swaine, 1917, p. 24; Swaine, 1918, p. 102; Blackman, 1928, p. 72 (= *cariniceps*); Bright, 1967, p. 678 (lectotype desig.).

*Pityophthorus cognatus* Blackman, 1928, p. 69; Chamberlin, 1939, p. 376; Craighead, 1950, p. 332; Wood, 1977c, p. 514 (= *cariniceps*).

Length 2.0-3.0 mm, but usually ranges between 2.3 and 2.9 mm, 2.6-2.9 times longer than wide.

**Female.** Frons varying from flattened on a semicircular area to weakly, broadly convex in median line to moderately, longitudinally elevated, elevation varying from narrow to broad; surface either weakly to deeply concave between elevations and eyes, or, if elevation absent, then broadly, weakly concave on each side of median line and densely covered with very short, erect setae, these may be sparser along median line causing, in extreme examples, the appearance of two oval patches of setae; surface very finely, very densely punctured where pubescent. Antennal club broadly oval, 1.3-1.4 times longer than wide, widest through segments 2 and 3, segment 1 slightly narrower than others; suture 1 very slightly arcuate to sub-transverse, 2 distinctly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1-1.2 times longer than wide, widest at middle; sides moderately arcuate; asperities on anterior slope isolated, scattered, and rather numerous, arranged in no apparent order; posterior area of disc distinctly punctured, punctures rather large and deep; surface between punctures shining, with numerous fine lines and points or minutely reticulate; median line broad, not noticeably elevated. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae and interstriae punctures randomly placed, making discernment of striae difficult or impossible, punctures rather large and deeply impressed, usually somewhat larger than those on posterior portion of pronotum, striae sometimes apparent because striae punctures are closer together and form a row. Declivity rather deeply impressed; interstriae 1 deeply impressed below 3, bearing a median row of very fine granules, however, these may be absent; interstriae 2 not readily discernible, forming inner slope of interstriae 3; interstriae 3 strongly to weakly elevated on upper half, bearing 4-6 rather large, acute granules in median area, several additional granules may or may not occur from below elevation to apex; punctures in striae 1 smaller than those on disc, not impressed, those in striae 2 obsolete, not visible except sometimes near apex.

**Male.** Frons weakly flattened to weakly transversely impressed from epistoma to upper level of eyes, bearing a distinctly elevated, longitudinal, toothlike carina, this carina more strongly elevated at lower end just above epistomal margin; surface closely, roughly punctured, shining and glabrous. Antennal club oval, narrower than in female, about 1.3 times longer than wide. Pronotum as in female except asperities and punctures stronger. Elytra as in female except punctures larger and more deeply impressed. Declivity convex, deeply impressed; interstriae 1 narrow, weakly elevated, deeply impressed below level of interstriae 3; interstriae 2 usually not discernible; interstriae 3 varying from similar to female, that is, prominently elevated on upper half with several large, acute granules on prominence, or prominence more strongly elevated, directed inward toward suture and in some specimens extending over suture and nearly touching prominence on other elytron.

**TYPE MATERIAL.** *P. cariniceps*. This species was described from one specimen (♀) in the MCZ which bears the labels: Mic./1523/Type 1029/*P. cariniceps* Lec/HOLOTYPE *Pityophthorus cariniceps* LeConte. Three other specimens are under this name in the LeConte collection but were obviously added after the original description. None of these latter three specimens is conspecific with the type. The second specimen is from Veta Pass, Colo. and possibly *P. crassus* Blkm., the third and fourth specimens are from California and represent a species in *Conophthorus*.

*P. canadensis*. This species was described from an unrecorded number of specimens. The lectotype (♀) in the CNC bears the data: Ste. Anne's [Que.], 17-VIII-10/pine/TYPE *Pityophthorus canadensis*, No. 1378/LECTOTYPE *Pityophthorus canadensis* Sw., CNC No. 9319.

*P. cognatus*. The holotype (♀) in the USNM bears the data: Hopk. U.S. 2858a/Hopkins collr., Davidson R., N.C./Altitude 32000 (sic) ft./*Pinus resinosa*/TYPE *Pityophthorus cognatus* Blackman/Type No. 41281 U.S.N.M. The allotype and 3 paratypes bear the same data. One paratype is labeled: Asheville, N.C., 18-VI-27/*Pinus virginiana*/R.E. Balch, colr.; 3 paratypes are labeled: Hopk. U.S. 2874/Hopkins colr./Davidson's R., N.C./Sassafras; and 3 paratypes are labeled:

Asheville, N.C., 8-10-24, *Pinus strobus*, McAndrews. Type material is in the CNC, the DEFC, and the USNM.

HOSTS. *Abies balsamea*; *Picea glauca*; *Pinus banksiana*, *resinosa*, *rigida*, *strobus*, *sylvestris*, and *virginiana*. The sassafras record above is an error.

DISTRIBUTION. Northeastern United States and eastern Canada as far west as Alberta and Michigan and south to North Carolina (Map 22). Two specimens have been seen from British Columbia but the data should be questioned. Specimens (1079) examined from:

#### CANADA

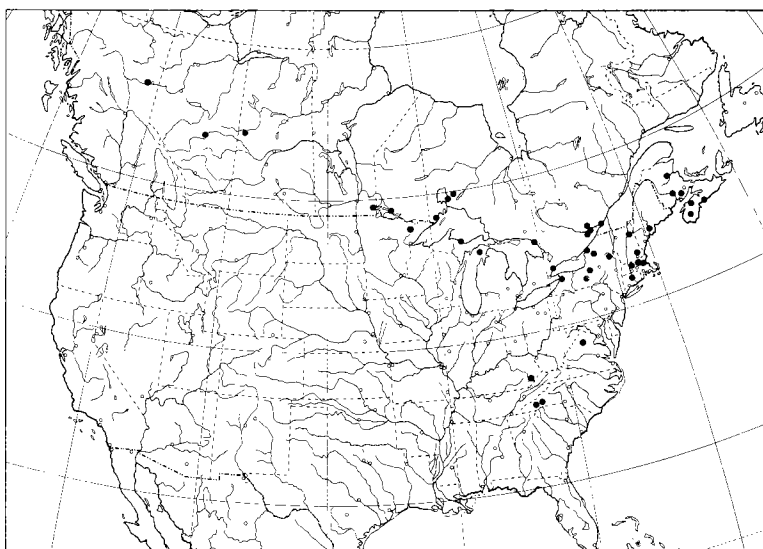
**Alberta:** Edmonton, *Picea canadensis* (CNC) 1. **British Columbia:** Mile 200, Hart Highway, 10.VI.65, *Pinus contorta* (CNC) 2 [?]. **Manitoba:** Whiteshell Provincial Park, 30.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 1. **New Brunswick:** Berwick, 2.VIII.66, *Pinus strobus*. L.A. Kelton (CNC) 8; 13 mi E of Fredericton, 13.VII.70, *Pinus strobus*, D.E. Bright (CNC) 20; 2 mi E of Jemseg, 21.V.65, White pine (CNC) 23; McGraw Brook, 7.VII.70, *Pinus strobus* and *P. banksiana*, D.E. Bright (CNC) 19. **Nova Scotia:** Halifax, 6.VIII.22, MacAloney (DFEC) 22; 3 mi W of Kingston, 15.VII.70, *Pinus rigida*, D.E. Bright (CNC) 1; Kejimikujik National Park, 16-17.VII.70, *Pinus strobus*, D.E. Bright (CNC) 14; Wilmot, 26.VII.60, Red pine (CNC) 2. **Ontario:** Beardmore, 6.VII.64, *Pinus strobus* (CNC) 8; 3 mi S of Bourget, 29.VI.67, *Abies balsamea*, D.E. Bright (CNC) 9; Carp, 24.V.54, *Picea glauca*, S.L. Wood (SLWC) 3; Geraldton, 25.VII.65, *Pinus resinosa*, V. Jansons (CNC) 5; Kakabeka Falls, 27.V.64, *Pinus strobus* (CNC) 3; Nestor Falls, 30.VI.64, *Pinus strobus* (CNC) 13; Ottawa, various dates and hosts (CNC) 30; Parry Sound, 4.VII.60, *Pinus resinosa*, C. Barnes (CNC) 3; Toronto, R.J. Crew (CNC) 2. **Quebec:** Isle Perrot, various dates, J.M. Swaine (CNC) 42; Old Chelsea, 23.VI.66, *Pinus strobus*, D.E. Bright (CNC) 14; Wychwood, 2.VI.17, Red pine, J.M. Swaine (CNC) 5. **Saskatchewan:** Meadow Lake Provincial Park, 20.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 12.

#### UNITED STATES

**Connecticut:** Rainbow, 10.VI.07, White pine, W.E. Britton (CNC) 2; Saltenstal, 29.VIII.59, White pine cones, W.R. Hensen (USNM) 2. **Kentucky:** Hazard, 6.VIII.64, *Pinus strobus*, L.M. Townsend (USNM) 2. **Maine:** Agriculture Experiment Station, various dates, M.W. Blackman (DFEC) 100; Orono, various dates, M.W. Blackman (DFEC, UMDE) 300. **Massachusetts:** Berlin, 23.VIII.46, C.A. Frost (CASC) 3; Farmingham, 7.IV.48, C.A. Frost (CASC) 5; Petersham, H.J. MacAloney (DFEC, RMSC) 4; Southborough, 8.II.28, C.A. Frost (CNC) 1. **Michigan:** Beaver Island, 9.IX.22, M.H. Hatch (DFEC, UMMZ) 65; Grand Island, *Pinus resinosa*, W.F. Fisk (DFEC) 1; Marquette (CNC) 1. **Minnesota:** Ely, 12.VI.36, White pine, L.W. Orr (USNM) 7. **New Hampshire:** Deerfield, 7.VII.21 (OSUC) 2; Littleton, 6.VII.22, M.W. Blackman (DFEC) 2. **New York:** Axton, 7.IX.24, M.W. Blackman (DFEC) 28; Buffalo (CNC) 1; Cranberry Lake, various dates, M.W. Blackman (DFEC) 204; Ithaca, various dates and collectors (CNC) 9; Rossie, 16.VIII.36, N.M. Downie (UADE) 3; Syracuse, various dates, M.W. Blackman (DFEC) 17; Thousand Islands, J.B. MacFarland (USNM) 5; Warrensburg, 9.X.24, H.J. MacAloney (DFEC) 1. **North Carolina:** 6 mi E of Cherokee, 27.VII.78, *Pinus strobus*, D.E. Bright (DEBC) 30. **Pennsylvania:** State record only (CNC) 1. **Virginia:** Luray, 22.IV.38, *Pinus strobus*, J.R. Lassiter (USNM) 8.

REMARKS. As is the case with all the species in this group, an immense amount of variability is encountered. The majority of the variability is found on the female frons and on the male declivity.





MAP 22. Collection localities for *P. (Pityophthorus) cariniceps*.

Three rather distinct forms of females can be recognized with numerous intergrades between forms. In one form, the female frons is generally convex on a broad median area, the area on each side of the convex median portion may be flat or weakly concave and densely clothed with very short, erect setae (Fig. 123) or in some cases, the setae are erect, long, and densely placed (*canadensis* form). In a second form, the median line of the frons is elevated and the area between the eye and the elevation is distinctly and rather deeply concave (*cariniceps* form) (Fig. 125). In this case, the elevation is rounded along the summit and varies from weakly to strongly elevated. An extreme modification of this form is the third recognizable variation in which the median elevation on the frons is moderately strongly elevated and the summit of the elevation is sharp. The lateral area between the eye and elevation is broadly, deeply concave and usually densely clothed with very short, erect setae.

Intergrades which link all these distinct forms into one continuous cline of variations can be found. Therefore, no distinct breaks or steps can be detected.

In the male the variation is most pronounced on the declivity. At one end of the cline, the declivity is convex and impressed along the suture so that interstriae 3 is elevated and forms the lateral margin. The central portion or the upper half of interstriae 3 may be weakly to moderately elevated, and is directed straight back toward the apex (*canadensis* form) (Fig. 133). This elevation is gradually bent inward toward the suture and becomes more elongate and blunt. At the end of the cline, the elevation has become a blunt protuberance that strongly projects over the suture and almost touches the protuberance on the opposite elytron (*cariniceps* form) (Fig. 134). As in the case of the female variation, no breaks have been detected in the cline.

In analyzing the distribution of the different variations within populations, it was found that the more boreal populations tend to have a greater proportion of "*canadensis*" form while the southern populations are more commonly the "*cariniceps*" form. However, a large series of specimens from Maine contained about

equal numbers of "*canadensis*" form and "*cariniceps*" form. The western populations appear to be the most variable. A population from western Ontario contained individuals of "*canadensis*" form, "*cariniceps*" form, the extreme form described above and a fair percentage of intermediate forms that could not be satisfactorily classified. The same is generally true of a population from Saskatchewan.

The specimens I have described as *carinatus* resemble in some respects the "extreme form" described above. In *carinatus*, however, the extreme variation is carried even further and a distinct break was observed in the development of the distinguishing character. In the "extreme form" of *cariniceps*, the female frons is moderately strongly elevated on the midline, while in *carinatus* the midline of the frons is extremely strongly elevated and variously pubescent or not on the summit. No intergrades in this character were found. In addition, almost all specimens of *cariniceps* observed ranged in size from 2.3 to 3.0 mm with less than 1% being smaller. Almost all specimens of *carinatus* were under 2.0 mm, only two specimens were up to 2.2 mm in length.

Wood (1977c) with some apparent hesitation placed *cognatus* as a synonym of *cariniceps*. Only a few specimens of "*cognatus*" were available for his examination and there are questions about the composition of Blackman's series. Recently I collected a sample of over 30 specimens of both sexes from near Cherokee, North Carolina. These unquestionably are identical with the type of variation exemplified by the "*canadensis*" form and the synonymy is verified.

#### 125. *Pityophthorus* (*P.*) *biovalis* Blackman

Fig. 126; Map 23

*Pityophthorus biovalis* Blackman, 1922b, p. 122; Blackman, 1928, p. 85; Craighead, 1950, p. 332; Baker, 1972, p. 255.

Length 1.7-2.0 mm, about 3.1 times longer than wide.

**Female.** Frons deeply, broadly biconcave, usually with a distinctly elevated, longitudinal carina separating the two concavities, this ridge usually weakly sulcate along summit; each concavity extending from the epistomal margin to well above eye, glabrous and shining in central portion; vestiture consisting of moderately long to very short setae arranged on the periphery of each concavity and along the median ridge. Antennal club oval, 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 transverse to weakly arcuate; segments 1 and 2 together occupy over half of total club length. Pronotum 1.3 times longer than wide, widest at middle; sides weakly arcuate; asperities on anterior slope low, broad, usually isolated and scattered in no apparent order; summit fairly distinct; posterior area of disc distinctly punctured, punctures of moderate size and depth; surface between punctures usually brightly shining, with numerous very fine points; median line narrow, impunctate. Elytra 1.8-1.9 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures about equal in size and depth to those on posterior portion of pronotum; discal interstriae wider than striae, with numerous punctures, these equal in size and depth to those in striae but much more widely separated. Declivity convex; interstriae 1 deeply impressed below level of 3, devoid of granules; interstriae 2 evidently not widened, weakly sulcate, lateral portions rising toward interstriae 3; interstriae 3 moderately elevated, much higher than 1, bearing a median row of 10 or more distinct, acute or rounded granules; punctures in striae 1 obsolete, but visible, those in striae 2 not visible except sometimes toward apex.

**Male.** Frons flattened from epistoma to upper level of eyes, divided by a distinct, longitudinal, laterally compressed carina; surface densely punctured; vestiture sparse, inconspicuous. Pronotum and elytra as in female. Declivity convex, with a large, blunt, longitudinal protuberance in mid portion, this protuberance placed in what is probably interstriae 3, and is projecting caudad but may be slightly directed inwards towards suture.

**TYPE MATERIAL.** This species was described from two specimens. The holotype (♀) in the USNM is labeled: Brunswick, Maine, 29 June 19/M.W. Blackman,

collector/N.Y.S. Coll. For. Lot No. m-62a/Type/Type No. 56916 USNM. The allotype bears the labels: Orono, Me. 19 Aug. 19/M.W. Blackman, collector/M-148/Allotype/Allotype No. 56916 USNM. The allotype is actually a female of *briscoei* Blkm.

HOSTS. *Picea glauca*, *mariana*, and *rubens*; *Pinus strobus*.

DISTRIBUTION. Eastern Canada, Maine, and probably throughout the north-eastern United States (Map 23). Specimens (50) examined from:

#### CANADA

**Nova Scotia:** 34 mi W of McGee Lake, 19.VII.67, *Pinus strobus* (CNC) 1; McGee Landing, 19.VI.67, *Pinus strobus*, D.E. Bright (CNC) 1; "Woods Road", Lunenburg Co., Black spruce (CNC) 1. **Ontario:** Kakabeka Falls, 27.V.65, *Pinus strobus* (CNC) 22; Lake Huron, 9.VIII.63, white spruce, R. Bowser (CNC) 3.

#### UNITED STATES

**Maine:** Orono, 19.VIII.19, M.W. Blackman (USNM) 1 and Peak Island, *Picea rubens*, A.D. Hopkins (USNM) 14.

REMARKS. The females of this species are easily distinguished by the two deeply concave, oval areas on the frons which are separated by a distinct, but sometimes low, longitudinal ridge (Fig. 126). This ridge is frequently narrowly sulcate or grooved on the summit. The periphery of the concave areas is frequently clothed with rather long setae. The central areas of the concavities are shining and glabrous.

Males are difficult to distinguish from those of the other species in this group. The declivity is convex, with an elongate, blunt, protuberance arising in the middle of interstriae 3. This protuberance may be directed directly caudad or may be bent inward toward the suture. Interstriae 2 is usually slightly broadened and weakly sulcate but may be difficult to observe due to the inpushing of the protuberance in the adjacent interstriae.

Variation in this species is much less pronounced than in the other species of this group. In the females, the median ridge may be almost absent, resulting in the concavity appearing to be one large, broadly oval, deeply concave area, and the pubescence may, in some specimens, be very short to absent.

### 126. *Pityophthorus (P.) carinatus* Bright

Fig. 127; Map 23

*Pityophthorus carinatus* Bright, 1978, p. 73.

*Pityophthorus carinatus carinatus* Bright, 1978, p. 73.

*Pityophthorus carinatus monticolae* Bright, 1978, p. 73.

Length 1.9-2.2 mm, 3.0 times longer than wide.

**Female.** Frons moderately concave on each side of a very strongly elevated, longitudinal carina, this carina sharp to moderately broad on summit, sometimes bearing short setae along summit, carina usually more strongly elevated on epistomal area and extending to upper level of eyes; concave areas extending laterally nearly to eyes, surface moderately shining near eye, weakly and very finely punctured; an oval patch of extremely short setae forms a "spongy" patch in mid-area, this patch extending upward on slopes of elevated carina to summit. Antennal club oval, 1.2-1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate, 2 more strongly so; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.2 times longer than wide, widest at level of summit; sides subparallel on posterior half; asperities on anterior slope low, small, usually isolated, scattered in no apparent order; summit distinct, high, with transverse impression distinctly indicated; posterior area of disc distinctly punctured, punctures rather small and shallow; surface between punctures moderately shining and rather densely, minutely reticulate; median line narrow, sometimes weakly elevated on anterior

half or less. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae and interstriae with numerous intermixed punctures, making discernment of striae difficult, but striae discernible because striae punctures are more numerous and arranged in a regular row, punctures about equal in size and depth to those on posterior portion of pronotum. Declivity deeply impressed; interstriae 1 deeply impressed below level of interstriae 3; interstriae 2 slightly widened, distinctly sulcate, lateral portions rising abruptly toward interstriae 3; interstriae 3 distinctly elevated, much higher than 1, bearing a row of fine granules on summit; punctures in striae 1 and 2 obsolete.

**Male.** Frons flattened from eye to eye and from epistoma to upper level of eyes, divided by a strongly elevated, laterally flattened longitudinal carina, this carina more strongly elevated on lower portion on epistomal region; surface of flattened area strongly punctured, punctures rather large and deep. Pronotum and elytra as in female. Declivity convex; lateral protuberances strongly to weakly elevated, strongly turned or pushed inward toward suture.

This species occurs in two distinct populations, which I have designated as subspecies.

1. Summit of longitudinal, median elevation on female frons sharp, usually devoid of setae; protuberances on male declivity strongly elevated, blunt, extending inward over suture; occurs in northeastern United States and eastern Canada . . . . . *P. carinatus carinatus* Bright
- Summit of median elevation on female frons broad, with short setae; protuberances on male declivity not strongly elevated, pushed inward toward suture; occurs in British Columbia and Alberta . . . . . *P. carinatus monticolae* Bright

**TYPE MATERIAL.** *P. carinatus carinatus*. The holotype (♀), in the CNC is labeled: U.S., New York, Sevey, VIII.8.1970, D.E. Bright/♀/HOLOTYPE *Pityophthorus carinatus carinatus*, D.E. Bright, 1977, CNC No. 15489. Allotype and 2 paratypes with same data. Nine paratypes are labeled: 64-1340-01, Ex. branch white pine/2 mi. E. of Jemseg, Queen's Co., N.B. 21 May 1965 F.I.S. Paratypes are in the CNC and the SLWC.

*P. carinatus monticolae*. The holotype (♀) in the CNC is labeled: No. 70-569-01, Date II.VI-1970, F.I.S./*P. contorta*, Hazelton, B.C./♀/HOLOTYPE *Pityophthorus carinatus monticolae* D.E. Bright, CNC No. 15490. Two paratypes bear the same data. Allotype and 3 paratypes are labeled: Edmonton, Alta., VII-5-1924/A. T. McClay collection. All type material is in the CNC.

**HOSTS.** *Picea* sp.; *Pinus contorta* and *strobos*.

**DISTRIBUTION.** Northeastern United States and eastern Canada; British Columbia and Alberta (Map 23). Specimens (22) examined from:

***P. carinatus carinatus***

**CANADA**

**New Brunswick:** See type material. **Quebec:** Ste. Ann du Lac (Labelle), 4.VII.78, *Pinus strobus* (LFRC, CNC) 2.

**UNITED STATES**

**New York:** See type material.

***P. carinatus monticolae*** (see type material).

**REMARKS.** This species represents a very distinctive form that is readily recognized by the very strongly elevated, median carina on the female frons (Fig. 127). The area on each side of the median carina is moderately concave and "spongy" on the inner portions and on the carina. In the eastern population the carina is very sharp along the summit and usually not pubescent (abraded in type material?),

while in the western population the carina is broader and pubescent on the summit. The two specimens from Quebec have setae on the elevated carina.

The male declivity of the eastern population resembles that of *cariniceps*, but is more variable in the western series.

This species probably is related to *cariniceps* and could conceivably represent an extreme variation of that species. However, no intergrades between *carinatus* and *cariniceps* have been seen and in the size difference seems consistent.

### 127. *Pityophthorus* (*P.*) *hesperius* Bright

Map 23

*Pityophthorus hesperius* Bright, 1978, p. 76.

Length 2.1-2.3 mm, about 3.0 times longer than wide.

**Female.** Frons variable, varying from weakly, longitudinally sulcate in median area, with lateral elevations of sulcus weakly to moderately elevated and spongy, to frons moderately protuberant in median area and spongy over entire surface; a small, laterally flattened tooth is usually located on epistoma of all forms; surface of remainder of frons moderately deeply punctured. Antennal club as in *concavus*. Pronotum, elytra, and declivity as in *balsameus* and *concavus*.

**Male.** Frons flattened from epistoma to upper level of eyes, divided by a small, laterally flattened, distinct carina, upper margin of flattened area elevated into a transverse, moderately to weakly elevated ridge; surface moderately punctured, shining. Pronotum and elytra as in *balsameus* and *concavus*. Declivity convex; median protuberances arising on interstriae 3 pushed inward toward suture or appearing that interstriae 1 are pinched together.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: No. 74-1571-01, Date: 21-VIII-74, F.I.S. 1974/P. contorta, Hudson Hope, B.C./Holotype *Pityophthorus hesperius* D.E. Bright, 1977, CNC No. 15491. The allotype bears the same data except the date is 3-IX-1974. Paratypes as follows: 3, same as holotype except dated 6-IX-1974; 5, same except dated 21-VIII-74; 1, same except dated 9-IX-1974; 1, same except dated 16-VIII-74, 1, Hixon, B.C., VII-9-1972, D.E. Bright/Pinus contorta; 1, Prince George, B.C., Pinus contorta/No. 72-1143-01, 14-XI-72, F.I.S. 1972; 4, Blackwater R., 21-VIII-57/57-7671-01, Pinus contorta and 1, 57-7672-02, Pinus contorta/158 Mile House, B.C., 15-VIII-57, F.I.S.

The holotype, allotype, and most of the paratypes are in the CNC. Additional paratypes are in the SLWC and the KESC.

**HOST.** *Pinus contorta*.

**DISTRIBUTION.** Known only from the type localities in British Columbia (Map 23).

**REMARKS.** This species contains females that resemble those of both *balsameus* and *concavus*. In the earlier stages of this study I considered it as a subspecies of *balsameus*. Wood (personal correspondence) was inclined to associate it with *concavus*. A re-examination of the series showed that forms resembling both species were present, even within populations from one locality. After careful consideration, I decided to treat it as a separate species. More collecting is needed, particularly in British Columbia, Alberta, and adjacent regions in order to definitely establish its status.

### 128. *Pityophthorus* (*P.*) *balsameus* Blackman

Figs. 128, 135, 136; Map 23

*Pityophthorus balsameus* Blackman, 1922b, p. 119; Blackman, 1928, p. 88; Chamberlin, 1939, p. 381; Craighead, 1950, p. 332; Baker, 1972, p. 255.

*Pityophthorus patchi* Blackman, 1922*b*, p. 120; Blackman, 1928, p. 82; Chamberlin, 1939, p. 379; Craighead, 1950, p. 332; Baker 1972, p. 255; Wood, 1977*c*, p. 514 (= *balsameus*).

*Pityophthorus angustus* Blackman, 1928, p. 83; Chamberlin, 1939, p. 380; Craighead, 1950, p. 332. **New synonymy.**

Length 1.8-2.0 mm, 2.9-3.0 times longer than wide.

**Female.** Frons very variable, either weakly, broadly concave in center, or flattened, or weakly protuberant on an elongate-oval portion in center, protuberant area or broad, transverse oval area very densely, very minutely pilose, pilose area divided by a strongly to weakly elevated median line, ending in a small but distinct, laterally flattened, epistomal tooth, in some specimens median line may not be elevated and only epistomal tooth is evident; lateral non-pilose areas of surface shining, moderately punctured. Antennal club elongate-oval, about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate, 2 more so than 1; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.2-1.3 times longer than wide, widest at middle; sides weakly arcuate to nearly straight and subparallel; asperities on anterior slope numerous, small, isolated, scattered in no apparent order; summit prominent, transverse impression distinct; posterior area of disc strongly punctured, punctures of moderate size and depth; surface between punctures moderately shining, minutely reticulate or densely marked with minute lines and points; median line narrow, finely, sharply elevated on anterior third. Elytra 1.7 times longer than wide; apex broadly rounded, almost truncate; discal striae and interstriae abundantly and randomly punctured, making discernment of striae difficult to impossible, striae punctures usually more closely together, thereby forming a more discernible row, punctures in striae and interstriae equal in size, generally equal in size and depth to those on posterior portion of pronotum; surface between punctures moderately shining, usually densely reticulate or with numerous lines and points. Declivity convex; interstriae 1 distinctly impressed below level of 3, devoid of obvious granules; interstriae 2 distinctly sulcate, not wider than discal width, lateral portions rather steeply elevated toward interstriae 3; interstriae 3 strongly elevated, much higher than interstriae 1, bearing a median row of very fine granules; punctures in striae 1 and 2 obsolete.

**Male.** Frons flattened nearly from eye to eye and from epistoma to upper level of eyes and bearing a distinct, laterally compressed tooth on epistoma, this generally extending to upper margin of flattened area; surface on either side of carina shining, moderately punctured. Pronotum and elytra essentially as in female. Declivity convex; protuberances on mid portion generally obvious, appear pushed inward toward suture, generally extending to or over suture, these protuberances appear to arise on interstriae 3 and are strongly displaced toward suture; interstriae 2 obsolete.

**TYPE MATERIAL.** *P. balsameus*. The holotype (♀) in the USNM bears the data: Me. Agr. Exp. Sta., Orono, 12 July 1910/M.W. Blackman, collector/ M-86-6/ Type/Type No. 53848 U.S.N.M. The allotype and 6 paratypes bear the same data except for dates. One paratype is labeled: Orono, Me., 18 Aug. 19 /M.W. Blackman, collector/M-147/Paratype No. 53848 U.S.N.M. All specimens evidently collected from *Abies balsameus*.

All the type material is in the USNM except 2 paratypes which are in the DFEC.

*P. patchi*. The holotype (♀) in the USNM is labeled: Orono, Me., 20 Aug. 19 /M.W. Blackman, collector/M-155/Type/Type No. 53847 U.S.N.M. The allotype and 6 paratypes bear the same data.

The allotype and 3 paratypes are in the USNM, 2 paratypes are in the DFEC, and 1 is in the CNC.

*P. angustus*. The holotype (♀) of this species is in the USNM and is labeled: Cranberry Lake, N.Y., 7-17-23/M.W. Blackman, collector/ N.Y.S. coll. For. Lot. No. 1387/Type *Pityophthorus angustus* Blackman/ Type No. 41296 U.S.N.M. The allotype and 12 paratypes bear the same data; 8 paratypes bear the same data

except the date is 7-10-23 and the lot number is 1384; 2 additional paratypes bear the same data except the date is 7-5-23 and the lot number is 1378.

Type material is in the USNM, the DFEC, and the CNC.

**HOSTS.** *Abies balsamea*; *Picea glauca*; *Pinus banksiana*, *resinosa*, and *strobus*.

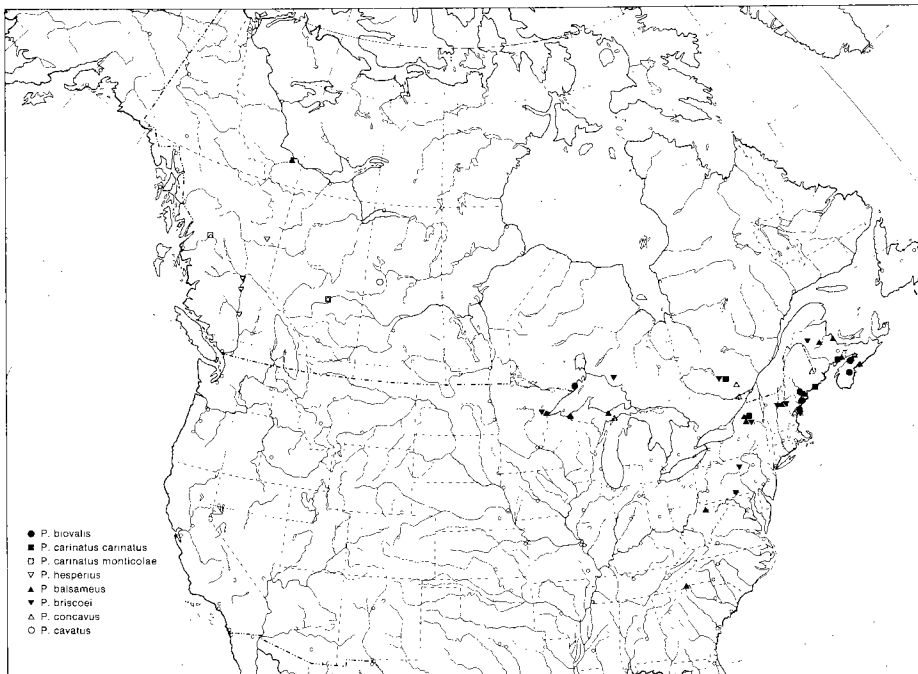
**DISTRIBUTION.** Eastern Canada, northeastern United States into the Lake States and south to North Carolina with one record from the Northwest Territories (Map 23). Specimens (214) examined from:

#### CANADA

**New Brunswick:** Bass River Road, 12.VIII.66, white pine (CNC) 45; Kouchibouguac National Park, VII.77, *Picea* sp., D.E. Bright (CNC) 271; Portage Vale, 14.VII.70, *Picea glauca*, D.E. Bright (CNC) 26. **Northwest Territories:** Ft. Simpson, 5.VII.72, *Picea*, A. Smetana (CNC) 1. **Nova Scotia:** Halifax (CNC) 1. **Ontario:** Lake Huron, 9.VIII.63, white spruce, R. Bowser (CNC) 2.

#### UNITED STATES

**Maine:** See type material. **Michigan:** Gibb City, 16.VIII.59 *Pinus resinosa*, D.M. Benjamin (CNC) 4; Shingleton, 27.VI.72, *Pinus banksiana*, D.E. Bright (CNC) 35. **Minnesota:** Cloquet, 8.IX.36, Norway pine, H.R. Dodge (DEBC) 1. **New Hampshire:** Crawford Notch, 7.VIII.70, *Picea*, D.E. Bright (CNC) 21. **New York:** Sevey, 8.VIII.70, *Picea*, D.E. Bright (CNC) 3. **North Carolina:** Tryon, *Pinus* (USNM) 5. **West Virginia:** Cranesville (USNM) 2. **Wisconsin:** State record only, red pine, C.B. Eaton (CNC) 1.



MAP 23. Collection localities for *P. (Pityophthorus)* spp.

**BIONOMICS.** In North America, this species is found in twigs and small limbs. The entrance hole is most commonly made at the base of a smaller twig or branchlet where the bark is usually rougher and thicker. The nuptial chamber is generally large and several egg galleries radiate from it. Eggs are placed in niches along the egg gallery wall or sometimes in the wall of the nuptial chamber. This

species is associated with *cariniceps*, *puberulus*, *opaculus*, and *Cryphalus ruficollis* Hopkins.

REMARKS. Under this name are included all the forms that have a more or less sharply elevated, laterally compressed tooth on the epistoma of the female. The remainder of the longitudinal elevation on the female frons, which extends from the elevated tooth toward the vertex may be weakly to distinctly elevated or may even be absent. This longitudinal carina extends through a variously shaped "spongy" area on the median portion of the frons. A great deal of variation is exhibited by the characteristics of the spongy area and by the elevation and extent of the longitudinal carina.

Blackman (1922*b*) described *balsameus* and *patchi* from material collected from the same place (Orono, Maine) and host at approximately the same time. An examination of all of his original type material showed that he had what I consider only variations of the same species. Later, in 1928, he described *angustus* which, as Blackman stated, was related to *patchi* but distinguished by the very prominent and beaklike longitudinal carina on the frons and by a difference in the character of the "spongy" oval area. An examination of the type material of *angustus* showed that these differences are not as distinctive as indicated by Blackman. The same characteristics that supposedly separate *angustus* from *patchi* are also found in other series of *patchi* and *balsameus*.

Since the hosts for all three "species" are the same, the localities are all very close and no distinctive morphological characters were observed, I consider all three names as representing varieties of one species.

#### 129. *Pityophthorus* (*P.*) *briscoei* Blackman

Figs. 129, 130; Map 23

*Pityophthorus briscoei* Blackman, 1922*b*, p. 123; Blackman, 1928, p. 84; Chamberlin, 1939, p. 380; Craighead, 1950, p. 332.

*Pityophthorus mundus* Blackman, 1928, p. 86; Dodge, 1938, p. 45; Chamberlin, 1939, p. 380; Craighead, 1950, p. 332; Wood, 1977*c*, p. 514 (= *briscoei*).

Length 1.7-2.1 mm, 3.0 times longer than wide.

**Female.** Frons varying from narrowly sulcate on longitudinal median line to strongly protuberant, if sulcate, then sulcus moderately narrow, deep to shallow and bordered laterally by an oval patch of extremely short, very dense pubescence, sulcus frequently bordered on epistomal area by a sharp, very narrow, crescent ridge which connects the oval patches, sometimes this crescent-shaped ridge is all that remains of sulcus, if surface protuberant, then sulcus is absent and pubescent area is combined into one large area, frequently the crescent-shaped ridge is visible just above epistoma. Antennal club oval, 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, straight, 2 may be slightly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.2-1.3 times longer than wide, widest at middle; sides weakly arcuate to straight and sub-parallel; asperities on anterior slope rather numerous, small, isolated, scattered in no apparent order; summit distinct, transverse impression strongly developed; posterior area of disc densely punctured, punctures moderately large and deep; surface between punctures moderately shining, finely minutely reticulate; median line narrow to broad, frequently narrowly elevated on anterior half. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae and interstriae punctures somewhat confusedly placed, striae vaguely discernible because striae punctures are closer together and form a vague row, punctures of striae and interstriae moderately large, deeply impressed, slightly larger than those on posterior portion of pronotum; surface between punctures shining, with numerous fine lines and points. Declivity convex, rather deeply impressed; interstriae 1 narrowly, weakly elevated, without granules; interstriae 2 sulcate, not wider than discal width; interstriae 3 distinctly elevated, higher than interstriae 1, bearing 3 or 4 fine granules in median area; punctures in striae 1 usually visible but not impressed, those in striae 2 usually obsolete.



**Male.** Frons flattened to weakly, transversely impressed to upper level of eyes, divided by a fine, sharp, longitudinal carina extending from epistoma nearly to upper level of eyes, upper margin of transverse impression transversely elevated nearly from eye to eye or elevated only in midarea; surface closely, roughly punctured, shining and glabrous. Pronotum as in female except sculpturing slightly stronger. Elytra as in female. Declivity as in female except sculpturing slightly stronger. Elytra as in female. Declivity as in female except mid-portion of interstriae 3 more strongly elevated, devoid of granules, sometimes slightly pushed inward toward suture.

**TYPE MATERIAL.** *P. briscoei*. The holotype (♀) in the USNM is labeled: Brunswick, Maine, 29 June 19/M.W. Blackman, collector/N.Y.S. coll. For. Lot. No. m-62a/Type/Type No. 56915 U.S.N.M. The allotype, also in the USNM, bears the same data. The specimens were taken from small limbs of red spruce (Blackman 1928).

*P. mundus*. The holotype (♀) bears the data: Littleton, N.H., 6-2-22/N.Y.S. coll. For. Lot. No. 1342/A.E. Fivaz, collector/Type *Pityophthorus mundus* Blackman/Type No. 41298 U.S.N.M. One paratype bears the same data. The allotype and 1 paratype are labeled: Spruce 14-5/8 Harrington; and 1 paratype is labeled: Cranberry Lake, N.Y., 7-5-23/M.W. Blackman, collector/N.Y.S. coll. For. Lot No. 1378 and the paratype labels.

**HOSTS.** *Picea mariana*, *rubens*; *Pinus banksiana*, *strobus*, and Norway pine.

**DISTRIBUTION.** Eastern Canada and northeastern United States west to Minnesota (Map 23). Specimens (113) examined from:

#### CANADA

**New Brunswick:** Riley Brook, 6.VII.70, *Pinus strobus*, D.E. Bright (CNC) 26. **Ontario:** Manitouwadge, 26.V.64, *Pinus banksiana* (CNC) 52. **Quebec:** Ste. Ann du Lac (Labelle), 4.VII.78, *Pinus strobus* (LFRC) 1.

#### UNITED STATES

**Maine:** See type material. **Minnesota:** Cloquet, 8.IX.36, Norway pine, H.R. Dodge (SLWC) 9. **New Hampshire:** Crawford Notch, 7.VIII.70, *Picea*, D.E. Bright (CNC) 7. **New York:** See type material. **Pennsylvania:** Mildred, 18.VIII.32, *Picea mariana*, J.N. Knull (CNC) 7; Mount Alto, 2.II.32, V.N. Knull (OSUC) 1; Ricketts, *Picea mariana*, J.N. Knull (OSUC) 4.

**REMARKS.** Two distinct varieties of this species can be readily distinguished. In one, the female frons is flat or weakly, broadly impressed, longitudinally sulcate and bears two oval patches of extremely dense, extremely short setae (Fig. 129). The sulcus on this variety may be wide or narrow, deep or shallow, and in a few specimens may be absent. The other variety is distinguished by the female frons being rather strongly convex or protuberant, with the pubescence in one transversely oval patch (Fig. 130). In the former variety, a small, sharply elevated, crescent-shaped ridge is usually evident at the epistomal end of the sulcus; this crescent-shaped ridge or remnants thereof is also frequently seen just above the epistoma of females of the latter variety.

The latter variety has only been seen in a population from Minnesota. Other populations from eastern North America contain only the former variety and its numerous subvarieties.

### 130. *Pityophthorus (P.) concavus* Blackman

Fig. 131; Map 23

*Pityophthorus concavus* Blackman, 1928, p. 85; Chamberlin, 1939, p. 380; Craighead, 1950, p. 332.

Length 1.8-2.0 mm, 2.9-3.0 times longer than wide.

**Female.** Frons moderately to deeply longitudinally sulcate, with lateral margins of sulcus elevated; or, frons more narrowly, ovally concave with lateral margins elevated or not and with a small, acute, laterally compressed tubercle frequently situated at midpoint of epistoma just above epistomal margin; surface of elevated lateral margin of concavity very finely, very densely punctured and apparently spongy, central area either spongy or glabrous, remainder of surface shining, sparsely punctured. Antennal club oval, 1.2-1.3 times longer than wide, widest through segment 2; suture 1 transverse, suture 2 weakly arcuate; segments 1 and 2 occupy more than half of total club length. Pronotum 1.2-1.3 times longer than wide, widest at about middle; sides weakly arcuate; asperities on anterior slope rather small, acute, isolated and scattered in no apparent order; summit distinctly elevated, transverse impression distinct; posterior area of disc distinctly punctured, punctures of moderate size, deep, and close; surface between punctures shining, densely reticulate; median line broad, impunctate, usually narrowly, weakly elevated just behind summit. Elytra 1.4 times longer than wide; apex broadly rounded; discal striae punctured in obscure rows, punctures about equal in size and depth to those on posterior portion of pronotum; discal interstriae about as wide or slightly wider than striae, bearing a median row of scattered punctures, these less dense than those in striae. Declivity convex; interstriae 1 impressed below level of 3, devoid of granules; interstriae 2 moderately sulcate, not distinctly widened; interstriae 3 elevated, distinctly higher than 1 and bearing a median row of 5 or 6 fine, acute granules; punctures of striae 1 and 2 obsolete.

**Male.** Frons flattened, weakly concave in central portion, with a distinct, laterally compressed, longitudinal, toothlike carina, this carina most strongly elevated on or near epistomal margin, upper margin of flattened portion of frons frequently transversely elevated; surface of flattened area moderately shining, densely, finely punctured, lateral and upper portions more deeply punctured. Pronotum and elytra essentially as in female except punctures and asperities stronger. Declivity convex; interstriae 1 narrow, not strongly elevated, weakly impressed below interstriae 3; an elongate, blunt protuberance is located in about middle of declivity which appears to arise on interstriae 3 and is displaced inward toward suture, in some specimens attaining suture.

**TYPE MATERIAL.** The holotype (♀) is in the USNM and is labeled: Hopk. U.S. 3795/W.F. Fische, collector/Seney, Mich./*Pinus resinosa*/Type *Pityophthorus concavus* Blackman/Type No. 41297 U.S.N.M. The allotype and 2 paratypes bear similar labels. One additional paratype is labeled: Hopk U.S. 406a/Peak Island, Me., Hopkins colr/*Picea*/Paratype No. 41297 U.S.N.M.

All type material is in the USNM except one female paratype is in the CNC.

**HOSTS.** *Picea glauca*, *Picea* spp.; *Pinus banksiana* and *resinosa*.

**DISTRIBUTION.** Eastern Canada and the northeastern United States (Map 23). Specimens (142) examined from:

#### CANADA

**Ontario:** Ottawa, 10.VIII.72, *Picea glauca*, A. Davis (CNC) 32. **Quebec:** Kazabazua, 24.VII.66, *Pinus banksiana* D.E. Bright (CNC) 2. **Nova Scotia:** Truro, 29.VI.19 (CASC) 1.

#### UNITED STATES

**Maine:** Topsfield, 4.VIII.70, *Picea*, D.E. Bright (CNC) 2. **Michigan:** See type material.

**REMARKS.** This species does not display the great variation such as that displayed by some of the other species in this group. The female frons is the most variable feature. It is either narrowly sulcate on the median line with the lateral margins of the sulcus elevated or it may be widely sulcate blending into an ovally concave configuration. In this latter case, the lateral margins may or may not be elevated. The surface is very densely covered with minute, stout, peglike sensilla

which are only visible at 450x or higher. These sensilla are so densely placed that the surface appears "spongy" when viewed at a normal viewing magnification of about 96-120x. The frons may be glabrous on the longitudinal sulcus or "spongy" over the entire median surface. Frequently a small, laterally compressed, toothlike, median elevation is present on the epistoma just above the epistomal margin (Fig. 131). This tooth may be reduced in size or absent on some specimens.

The male declivity also shows some variation in the size, shape, and placement of the median protuberance.

131. *Pityophthorus (P.) cavatus* Bright

Fig. 132; Map 23

*Pityophthorus cavatus* Bright, 1978, p. 74.

Length 1.9-2.3 mm, 3.0 times longer than wide.

**Female.** Frons deeply concave in central area, concavity fringed by a dense brush of erect, coarse setae, central portion of concavity glabrous but may also bear densely placed, erect setae, these setae usually equal in length to those on periphery but may be much shorter; an obscure to distinct, laterally flattened, acute tooth is usually present on midpoint of epistoma; surface above and lateral to concavity deeply punctured, punctures large and close, space between punctures shining. Antennal club nearly round, about as long as wide; suture 1 transverse or very weakly arcuate, 2 more strongly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.3 times longer than wide; weakly arcuate; asperities on anterior slope erect, of moderate size and scattered in no apparent order; summit distinct; transverse depression behind summit distinct; posterior area of disc densely punctured, punctures rather large, deep, and close; surface between punctures moderately shining, reticulate; median line narrow, impunctate. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae and interstriae punctured in regular rows, making discernment of striae or interstriae difficult, striae punctures much more numerous and each bears a very short seta, interstitial punctures much less numerous and each bears a longer erect seta; surface of interstriae shining, with numerous fine lines or very faintly reticulate. Declivity convex, bisulcate; interstriae 1 impressed below level of 3, devoid of granules; interstriae 2 weakly sulcate, slightly wider than discal width, surface as on disc; interstriae 3 weakly elevated, higher than 1, bearing a median row of 2-4 small, rounded granules; punctures in striae 1 and 2 obsolete.

**Male.** Only two male specimens of this species are known and each differs considerably from the other in the characters of the declivity.

Variety 1. Frons flattened from upper level of eyes to epistoma, divided by a strongly elevated longitudinal carina, highest at epistoma and slanting downwards on upper areas. Pronotum as on female. Elytra as on female except interstitial punctures more numerous and setae slightly longer. Declivity almost evenly convex, with a median, elongate rounded elevation that appears to arise in interstriae 2 and is slightly bent inward over interstriae 1; interstriae 3 not elevated or granulate; surface of declivity moderately shining, minutely reticulate with weak striae punctures. This specimen is from Charlottetown, Manitoba.

Variety 2. Frons distinctly impressed from epistoma to near upper level of eyes, divided by a strongly elevated, laterally flattened, toothlike carina; generally similar to variety 1. Pronotum and elytra as in variety 1. Declivity convex; interstriae 1 weakly impressed, devoid of granules; interstriae 2 weakly sulcate; interstriae 3 bearing a large, rounded protuberance in middle of declivity, this protuberance directed caudad, inner slope precipitous, outer slope oblique; surface of declivity as in variety 1. This specimen is from Canoe Lake, Saskatchewan.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: CAN., Sask., Canoe Lake, VII-21-1972, D.E. Bright/Pinus banksiana/♀/HOLOTYPE *Pityophthorus cavatus* D.E. Bright, CNC No. 75492. Four paratypes bear the same data. Six additional paratypes are labeled: Charlottetown, Man., Aug. 13, 1954, red pine.

The holotype and most of the paratypes are in the CNC. Additional paratypes are in the SLWC.

HOSTS. *Pinus banksiana* and *resinosa*.

DISTRIBUTION. Known only from type-series localities in Saskatchewan and Manitoba (Map 23).

REMARKS. This is a unique species that can be easily recognized by the characters given in the key and description. It is obviously a member of this group but its relationship to other species is not clear. Some female specimens bear a vague resemblance to some specimens of *biovalis* but this does not indicate a true relationship to that species.

Although the locality label on one series clearly says "Charlottetown, Man.," I have doubts about the data. No Charlottetown has been located in Manitoba despite extensive searching.

#### NIGRICANS GROUP

This group contains three species at present. Adults belonging to this group are very similar to those in the *Nitidulus* group but are distinguishable by the lack of a transverse carina on the male frons.

#### KEY TO SPECIES IN THE *Nigricans* group

1. Discal interstriae largely impunctate except sometimes on apical one-fourth, discal interstitial setae, when present, short; discal interstriae 1 devoid of granules; declivital interstriae 3 of male (and sometimes female) frequently more strongly elevated on upper half . . . . . 2
- Discal interstriae 1, 2, and 3 (sometimes 4) punctured and bearing long setae; discal interstriae 1 bearing a median row of acute granules almost to base (these more prominent in female); declivital interstriae 3 of both sexes evenly elevated almost to apex; Oaxaca (?) . . . . . 132. *micans* n. sp. (p. 188)
2. Declivital interstriae 3 of both sexes much higher than 1, usually more strongly elevated on upper half (Fig. 139); punctures in declivital striae 2 obsolete; male frons convex (Fig. 138); Guatemala to Chiapas . . . . . 133. *nigricans* Blandford (p. 189)
- Declivital interstriae 3 of female only slightly higher than 1, more evenly arched, that of male moderately elevated above 1 (Fig. 142); punctures in declivital striae 2 obvious; male frons frequently flattened or very weakly impressed on each side of carina (Fig. 141); Oaxaca to Veracruz . . . . . 134. *lepidus* Bright (p. 191)

#### 132. *Pityophthorus* (*P.*) *micans* n. sp.

Length 2.4-2.5 mm, 2.8 times longer than wide.

**Female.** Frons withdrawn into prothorax, majority of surface not visible, surface evidently flattened from eye to eye and bearing, abundant, long setae. Antennal club only partially visible, oval, about 1.3-1.4 times longer than wide, widest through segment 2; sutures 1 and 2 nearly straight, transverse; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.1 times longer than wide, widest near posterior angles; sides weakly arcuate, strongly converging to narrowly rounded anterior margin; asperities on anterior slope of moderate size, scattered in no apparent order; summit distinct, posterior impression distinct; posterior portion of disc with rather large, deep, and close punctures; surface between punctures dull, densely reticulate. Elytra 1.9 times longer than wide; apex narrowly rounded; discal striae punctured in irregular rows, punctures large, deeply impressed and close; discal interstriae about 2.0 times wider than striae, shining, each with a few, large, setiferous punctures except discal interstriae 1, 2, and 3 bearing abundant setiferous punctures, setae arising from these punctures long, 2 to 3 times longer than interstitial width; interstriae 1 also bearing a row of acute granules almost to base, these granules caused by acutely upraised anterior margin of punctures. Declivity sloping,

moderately bisulcate; interstriae 1 moderately impressed below 3, devoid of granules except for a few minute granules at declivital base; interstriae 2 moderately sulcate, wider than discal width, surface smooth and shining, with about 2 or 3 small setiferous granules on base; interstriae 3 moderately evenly elevated, distinctly higher than 1, bearing a row of large, rounded granules, each granule associated with a long, stout seta; punctures in stria 1 large, not impressed, those in 2 obsolete, much smaller than those on disc.

**Male.** Frons weakly flattened from epistoma to above upper eye level, divided by a weak longitudinal carina; surface shining, with large, close, shallow punctures, reticulate between punctures. Pronotum essentially as in female. Elytra as in female except long, interstitial setae also present on interstriae 4 and sparsely on 5, stria punctures larger and granules on interstriae 1 smaller. Declivity much more deeply sulcate; interstriae 1 narrowly elevated above 2, devoid of granules except for 1 or 2 small setiferous granules on base; interstriae 2 deeply sulcate, wider than discal width, surface smooth and shining; interstriae 3 strongly elevated, inner slope precipitous, summit bearing a row of large, rounded granules, each granule associated with a very long, stout seta.

**TYPE MATERIAL.** The holotype (♀) and allotype were collected at Chiltepec, Mexico in January 1971 from *Pinus montezumae* (CNC No. 15794).

**REMARKS.** The declivity of the adults of this species bears a deceptively strong resemblance to that of *bassetti* in the *Confertus* group. This resemblance however does not indicate any close relationship of the two species. The frons of the males are completely different as are other characteristics of the declivity, elytral striae, interstriae, etc.

Adults of *micans* are most easily recognized by the very deeply impressed elytral declivity of the males, by the weak longitudinal carina on the male frons, by the moderately deeply impressed female declivity, by the presence of long erect setae on discal interstriae 1, 2, 3, and by other characters mentioned in the key and description.

The two specimens available for study are in poor condition, especially the female. Both specimens were apparently collected dead in their galleries and disintegration had begun. The head of the female is withdrawn into the prothorax and only the long setae on the frons can be seen, one antenna is missing, the legs are missing, and portions of the pronotum are broken. The male is in better condition but both antennal clubs are missing, all tarsi are missing, and the specimen is generally scarred and rubbed. Fortunately, the important diagnostic characters (except the female frons) are intact and readily visible.

The type locality is believed to be in Oaxaca. Four Chiltepec's are recorded in the Index to Map of Hispanic America, two in Oaxaca and one each in Tabasco and Veracruz. The host tree does not occur in Tabasco nor in the area of Chiltepec, Veracruz but does occur in the area of Chiltepec, Oaxaca.

### 133. *Pityophthorus* (*P.*) *nigricans* Blandford

Figs. 137-139

*Pityophthorus nigricans* Blandford, 1904, p. 236; Hagedorn 1910, p. 73; Schedl, 1939, p. 348; Schedl, 1956, p. 18 (= *nitidulus*); Schedl, 1963, p. 158; Bright, 1976c, p. 184 (lectotype desig.); Schedl, 1977b, p. 42; Bright, 1978, p. 72.

*Pityophthorus nitidulus* (Mannerheim): Schedl, 1956, p. 18; Schwardtfeger, 1957, p. 497.

*Pityophthorus chiapensis* Bright, 1977, p. 511; Bright, 1978, p. 72 (= *nigricans*).

Length 2.2-2.6 mm, about 3.0 times longer than wide.

**Female.** Frons broadly flattened from eye to eye and from epistomal margin to well above eyes; surface finely, densely punctured except for a small, smooth space just above midpoint of epistoma; vestiture abundant, consisting of long, yellowish setae densely placed over surface, those setae on periphery of pubescent area longer and incurved. Antennal

club oval, about 1.4 times longer than wide, widest through segment 2; suture 1 and 2 weakly arcuate; segments 1 and 2 together occupy more than two-thirds of total club length. Pronotum about 1.1 times longer than wide, widest at posterior angles; sides subparallel; asperities on anterior slope of moderate size, erect, acute, scattered in no apparent order; posterior area of disc dull, punctures large, deep and close; surface between punctures opaque, closely, densely microreticulate. Elytra 1.7 times longer than wide; apex narrowly rounded; discal stria punctures arranged in fairly regular rows, of moderate size and depth; discal interstriae about 2.0 times (or slightly more) wider than striae, surface usually brightly shining, impunctate but with numerous very fine points and lines. Declivity sloping, bisulcate; interstriae 1 moderately elevated, narrower than on disc, bearing a median row of fine granules; interstriae 2 sulcate, usually wider than on disc, with a few fine granules on upper level; interstriae 3 strongly elevated, much higher than interstriae 1, usually more abruptly elevated on midportion or on upper half, bearing a median row of fine granules, these granules larger than those on interspace 1; stria punctures in striae 1 and 2 obsolete, usually more obvious in 1 than in 2.

**Male.** Frons convex, flattened slightly from upper level of eyes to epistoma; longitudinal carina moderately elevated, prominent; vestiture inconspicuous. Pronotum and elytra essentially as in female except stria punctures somewhat larger. Declivity more deeply bisulcate; interstriae 3 more abruptly, strongly elevated, granules slightly larger.

**TYPE MATERIAL.** *P. nigricans*. The lectotype (♀) of this species, designated by Bright (1976c) is in the BMNH. It bears the labels: Quiche Mts., 7-9000 ft., Champion/B.C.A. Col. IV-6, *Pityophthorus nigricans* Blandf./*Pityophthorus nigricans* Blandf. (in Blandford's handwriting)/LECTOTYPE *Pityophthorus nigricans* Blandford, D.E. Bright, 1976. Two additional specimens in the BMNH bearing the same data are designated as paralectotypes.

*P. chiapensis*. The holotype (♀) is in the CNC and is labeled: MEX. 8 mi. E. San Cristobal, Chis., VI-6-1969, D.E. Bright/Pinus ayacahuite/HOLOTYPIC *Pityophthorus chiapensis* D.E. Bright, CNC No. 13736. The allotype and 53 paratypes bear the same data. Twenty-two additional paratypes bear the data: MEX. 5 mi. E. San Cristobal, Chis., VIII-8-1969, D.E. Bright/Pinus ayacahuite.

Most of the type material is in the CNC, additional paratypes are in the KESC and the SLWC.

**HOSTS.** *Pinus ayacahuite*, *pseudostrobus*, and *rudis*.

**DISTRIBUTION.** Chiapas, Hidalgo, Guatemala, and El Salvador and undoubtedly extends into Honduras. Specimens (100) examined from:

**MEXICO**

**Chiapas:** See type material.

**GUATEMALA:** Encuentros, 17.IX.51, *Pinus ayacahuite*, F. Schwerdtfeger (FSC) 1; Las Trojadas, 20.IX.51, *Pinus rudis*, F. Schwerdtfeger (FSC) 6; San Cristobal, 28.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 3.

Additional localities in literature:

**MEXICO**

**Hidalgo:** Los Azufres, 1961, H. Moreno (Schedl 1963).

**EL SALVADOR:** Las Pilás, 28.I.75, *Pinus ayacahuite* (Schedl 1977b).

**BIONOMICS.** Under the name *P. nitidulus*, Schwerdtfeger (1957) gives the only information on the biology of this species.

The gallery pattern is a typical radiate system with 3 to 6 egg tunnels branching from the central nuptial chamber. The gallery is excavated deep into the wood and lightly scores the inner bark. The egg galleries are slightly curved and usually run transversely rather than with the grain. As a general rule, the galleries are kept free of frass and boring dust. These galleries are from 2 to 3 cm long, the longest

reported was 5.4 cm. The egg niches, cut deeply into the wood are about 0.7-0.8 mm wide and 0.9 mm deep. Up to 18 niches per gallery were reported.

The larval mines are exclusively in the inner bark, only lightly scoring the wood. On the average, they reach a length of about 3 cm.

At a temperature of 17°C, eggs hatched in about 6 days. The larvae took up to 6 weeks to complete development at the same temperature. Schwerdtfeger gave no information on the length of the pupal stage. No information is available on the number of generations produced per year.

REMARKS. Schedl (1956) placed this species as a synonym of *nitidulus* and Schwerdtfeger (1957) treated it under the latter name. After an examination and comparison of the type series of *nigricans* with Schwerdtfeger's specimens determined as *nitidulus* by Schedl and additional specimens from Guatemala, it was obvious that Schedl's synonymy was in error. The male of *nitidulus* has a distinct transverse carina at the upper level of the eyes. The male of *nigricans* does not have even a trace of a transverse carina on the frons. Other minor differences were also noted.

The specimens described as *chiapensis* are typical specimens of *nigricans*.

#### 134. *Pityophthorus* (*P.*) *lepidus* Bright

Figs. 140-142

*Pityophthorus lepidus* Bright, 1977, p. 526.

Length 2.1-2.5 mm, 2.7 times longer than wide.

**Female.** Frons flattened on a broad, semicircular area extending from epistomal margin to above upper level of eyes and laterally nearly from eye to eye, periphery indented; surface shining, densely, finely punctured except for a smooth, glabrous space just above midpoint of epistoma and densely pubescent, setae on periphery longer and incurved, surface readily visible through pile. Antennal club narrowly oval, 1.5 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, straight; first two segments together occupy more than one-half of total club length. Pronotum 1.1 times wider than long, widest at or near posterior angles; sides weakly converging, weakly arcuate; asperities on anterior slope erect, acute, usually isolated, but frequently two or three may be basally contiguous especially near summit; posterior area of disc strongly punctured, punctures deep, moderately large and close; surface between punctures dull, minutely reticulate to densely micropunctate. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep, and close; discal interstriae about 1.5 times wider than striae, largely impunctate but 1, 3, 5, 7 each may bear a median row of about 3-5 shallow punctures, these slightly smaller than those in striae, surface of interstriae shining, densely micropunctate to minutely reticulate. Declivity convex, bisulcate; interstriae 1 narrowly, weakly elevated, bearing a row of very fine granules; interstriae 2 moderately sulcate, equal to or only slightly wider than discal width; interstriae 3 weakly elevated, slightly higher than 1, bearing a row of moderate-sized granules; punctures of striae 1 and 2 reduced in size but still visible.

**Male.** Frons slightly flattened to weakly impressed on a large semicircular area, densely, strongly punctured on upper portion more finely punctured below; median carina prominent, weakly but distinctly elevated from epistoma to upper level of eyes. Pronotum similar to female except asperities and serrations slightly stronger. Elytra as in female except interstriae 1 slightly more deeply impressed, interstriae 3 moderately higher with larger granules on summit and interstriae 2 slightly more deeply sulcate.

TYPE MATERIAL. The holotype (♀) is in the CNC and is labeled: MEX., Oax., Hwy. 175, 3.5 mi. S. Suchixtepec, 8000', VI.2.71/D.E. Bright, collector/ Pinus sp./HOLOTYPE *Pityophthorus lepidus* D.E. Bright, CNC No. 13737. The allotype and 47 paratypes bear the same data. Additional paratypes are labeled: 5, MEX., Oax., Hwy. 131, 115 mi. S. Oaxaca, 6000', V.27-30,71/Pinus lawsonii/D.E. Bright, collector; 8, MEX., Oax., 20.5 km. N. Oaxaca, 9000', V.31.71, Bright/

*Pinus* sp.; 7, Las Vigas, 1 mi. W., V.C., Mex., VII.5-1967, S.L.W./*Pinus* and 1, Nochixtlan, 26 mi. SE, Oax., Mex., VI-17-1967, SLW/*Pinus*.

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.

HOSTS. *Pinus* spp.

DISTRIBUTION. Known only from the type localities in Oaxaca and Veracruz.

REMARKS. This species is evidently related to *nigricans* and the adults are very similar in many respects. The characters given in the key will distinguish the adults of the two species.

#### NOCTURNUS GROUP

The species in this group can be recognized by the distinct punctures on declivital striae 1 and 2, by the convex, weakly impressed elytral declivity, by the flattened to concave female frons, and by the weakly, transversely impressed male frons which bears a very faint, longitudinal carina or a distinct granule on the epistoma.

Two species are included in the group.

#### KEY TO SPECIES IN THE Nocturnus group

1. Female frons flattened or weakly concave, setae rather long over flattened surface, only slightly longer on periphery (Fig. 143); male frons weakly transversely impressed, longitudinal carina very weakly indicated or absent (Fig. 144); granules on declivital interstriae 3 minute (Fig. 145); lateral margins of oral cavity of female bearing 2 oval patches of very short, close setae . . . . . 135. *nocturnus* Schedl (p. 192)
- Female frons distinctly, moderately deeply concave, setae much longer and denser around periphery (Fig. 146); male frons flattened to weakly transversely impressed, longitudinal carina weakly but distinctly indicated (Fig. 147); granules on declivital interstriae 3 moderately large (Fig. 148); lateral margins of oral cavity of female devoid of patches of close, short setae . . . . . 136. *sapineus* n. sp. (p. 194)

#### 135. *Pityophthorus (P.) nocturnus* Schedl

Figs. 143-145; Map 24

*Pityophthorus nocturnus* Schedl, 1938, p. 185; Schedl, 1956, p. 23; Schwerdtfeger, 1957, p. 499.

*Pityophthorus hidalgoensis* Blackman, 1942, p. 215; Bright, 1977, p. 517 (= *nocturnus*).

Length 1.6-1.7 mm; about 2.7 times longer than wide.

**Female.** Frons broadly flattened or weakly, transversely impressed or weakly concave on a semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface shining, very densely and finely punctured; vestiture abundant, consisting of long, yellowish setae densely placed over flattened surface, with longer, incurved setae on periphery; lateral margins of oral cavity bearing two oval patches of very short, close setae. Antennal club broadly oval, about 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, straight; first two segments together occupy more than half of club length. Pronotum about 1.1 times longer than wide, widest near middle; sides weakly arcuate to subparallel; asperities on anterior slope low, broad, scattered in no apparent order; posterior area of disc finely, sparsely punctured; surface between punctures shining, densely, minutely reticulate. Elytra 1.7 times longer than wide; apex narrowly rounded; discal striae punctured in regular rows, punctures rather large, deep and close; discal interstriae about 2.0 times wider than striae, surface shining, smooth or very weakly marked with minute lines and points, impunctate except on posterior portion of 1, 3, 5, and 7. Declivity convex; interstriae 1 weakly elevated, sometimes bearing a median row of minute granules but usually smooth; interstriae 2 not impressed, not widened; interstriae 3 very weakly elevated, bearing a median row of minute granules; punctures in striae 1 and 2 visible, smaller than those on disc.



**Male.** Frons weakly, transversely impressed; surface densely punctured; median carina, if present, faintly elevated from epistoma to upper level of eyes but may be reduced to a blunt toothlike structure above midpoint of epistoma. Pronotum and elytra as in female except sculpturing slightly stronger. Declivity as in female except interstriae 1 more deeply impressed, definitely below level of interstriae 3, interstriae 3 slightly higher and granules slightly larger.

**TYPE MATERIAL.** *P. nocturnus*. The lectotype ( $\delta$ ) is in the BMNH, and is labeled: Type/San Geronimo, Vera Paz, Champion/Godman-Salvin coll./Pityophthorus nocturnus ( $\delta$ ), n. sp., Det. K.E. Schedl/LECTOTYPE Pityophthorus nocturnus Schedl, D.E. Bright, 1975. Three additional specimens are labeled as paralectotypes, 1 is in the BMNH and 2 are in the KESC.

*P. hidalgoensis*. The holotype ( $\varphi$ ) is in the USNM and bears the data: 666/Jacala, H., 1-18-36/Pinus lawsoni/D. DeLeon colr./Type No. 55989 U.S.N.M. The allotype and 7 paratypes bear the same data.

All type material is in the USNM.

**HOSTS.** *Pinus lawsoni*, *oocarpa*, *pseudostrobus*, *strobis* var. *chiapensis*, and *tenuifolia*. Probably occurs in all species of pines in its range.

**DISTRIBUTION.** Southern Mexico to Honduras (Map 24). Specimens (65) examined from:

#### MEXICO

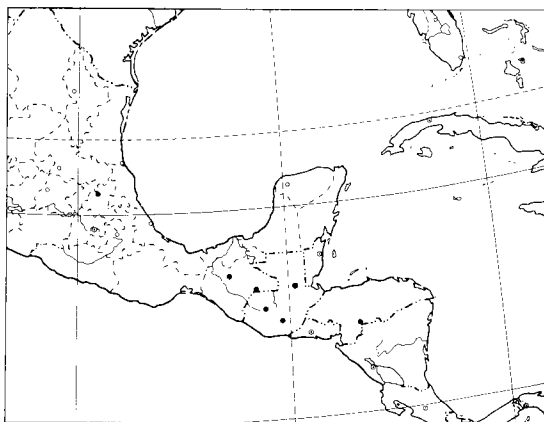
**Chiapas:** 5 mi N of Bochil, 3.VII.69, *Pinus strobus* var. *chiapensis*, D.E. Bright (CNC) 4; 5 mi SW of El Bosque, 3.VII.69, *Pinus* sp., D.E. Bright (CNC) 35; Lagos de Colores, 14.VI.69, *Pinus* sp., D.E. Bright (CNC) 3; 3 mi S of Lomantán, 4.III.53, at light, R.C. Bechtel & E.I. Schlinger (DEBC) 5. **Hidalgo:** See type material.

**GUATEMALA:** Guatemala, 14.VIII.51, *Pinus tenuifolia*, F. Schwardtfefer (FSC) 3; Volcan de Agua, 19.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 2.

Additional localities in literature:

**GUATEMALA:** Strasse Quezaltenango-Huehuetenango, 25.IX.51, *Pinus oocarpa* and *Pinus tenuifolia* (Schedl 1952).

**HONDURAS:** Finca Sta. Elena bei Tegucigalpa, 22.XI.51, *Pinus oocarpa* (Schedl 1952).



MAP 24. Collection localities for *P. (Pityophthorus) nocturnus*.

**BIONOMICS.** Schwerdtfeger (1957) gives a brief note on the biology of this species in Guatemala. The gallery pattern, found on small branches, is of the radiate shape and is deeply engraved into the wood. From two to five longitudinal egg galleries radiate from the central nuptial chamber. Egg niches are cut deeply into the wood and are widely spaced. In 10 egg galleries observed, egg niches were spaced about 2 mm apart. The egg galleries reach a maximum length of about 40 mm and are filled with boring dust and frass. Larval mines are generally transversely oriented and are primarily cut into the bark especially during the later instars.

This species occurs in the smaller twigs and shoots of various species of pines. In the very small shoots and twigs, the drying out of the host material has a very adverse effect on the development of the immature stages of the beetle. This rapid desiccation of the thin twigs apparently is an important ecological factor for the species.

**REMARKS.** Adults of this species can be readily identified by the characteristics mentioned under the key to the species of the group.

### 136. *Pityophthorus (P.) sapineus* n. sp.

Figs. 146-148

Length 1.7-2.0 mm, about 2.8 times longer than wide.

**Female.** Frons broadly, moderately deeply concave on a large semicircular area extending from epistoma to well above eyes, more than half of concavity extends above eyes; surface brightly shining, sparsely, finely punctured in concavity with short, fine setae, setae on periphery of concavity very long, closely placed, incurved; lateral margins of oral cavity glabrous. Antennal club oval, about 1.1-1.2 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, straight; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.1-1.2 times longer than wide, widest at middle; sides weakly arcuate; asperities on anterior slope small, erect, scattered in no apparent order; summit distinct; posterior area of disc moderately punctured, punctures rather small, widely separated, weakly impressed; surface between punctures dull, densely minutely reticulate. Elytra about 1.7 times longer than wide; apex rather narrowly rounded; discal striae punctured in regular rows, punctures small, widely separated, each bearing a minute seta; discal interstriae about 2.0 times wider than striae, surface smooth, shining, impunctate except sometimes one or two finely setiferous punctures are present on interstriae 3. Declivity weakly bisculate; interstriae 1 impressed below level of 3, with a median row of very fine granules; interstriae 2 weakly impressed, slightly wider than discal width; interstriae 3 not elevated, but slightly higher than 1, with a median row of small to moderately large granules; punctures in striae 1 and 2 distinct.

**Male.** Frons flattened to weakly transversely impressed, divided by a weakly elevated, longitudinal carina; surface more strongly punctured, punctures large, glabrous. Pronotum, elytra, and declivity similar to female except granules on declivital interstriae 1 and 3 stronger.

**TYPE MATERIAL.** The holotype (♀), allotype, and 51 paratypes were collected at Atenquique, Puebla, Mexico from *Pinus* sp. (CNC No. 15885). No other data are available.

The holotype, allotype, and most of the paratypes are in the CNC. Additional paratypes are in the SLWC.

**REMARKS.** Adults of this species may be distinguished by the presence of long, densely placed, incurved setae on the otherwise sparsely pubescent female frons (Fig. 146), by the impunctate elytral striae, by the weakly impressed elytral declivity (Fig. 148), and by the additional characters given in the key to species.

## SEGNIS GROUP

Members of this group may be recognized by the impunctate discal elytral interstriae, by the even rows of stria punctures, by the generally convex elytral declivity on which interstriae 2 are equal in width to interstriae 1 and 3 and is either not impressed or is only very weakly impressed, and by the low, rather indistinct, longitudinal carina on the opaque and reticulate male frons. In addition, the pronotal summit is high and the pronotal asperities are rather numerous.

Five species are included in this group, all occur in various species of *Pinus*.

## KEY TO SPECIES IN THE Segnis group

1. Female frons broadly, moderately concave, with abundant, long setae on surface, those on periphery much longer, more densely placed; male frons weakly convex, densely reticulate, sparsely punctured; stria punctures large, deep, distinctly visible on disc and declivity; declivital interstriae 2 punctured on apical half or less; Mexico . . . . . 137. *pubifrons* n. sp. (p. 195)
- Female frons flattened to weakly convex, very sparsely pubescent on surface; male frons variable, reticulate or smooth; stria punctures shallowly impressed, distinct to obsolete on declivity; declivital interstriae 2 not punctured . . . . . 2
2. Length 2.0-2.2 mm; posterior area of pronotum bearing large, deep, close punctures, the punctures almost touching; carina on male frons sharply elevated only on lower half or less, broadly flattened, impunctate and only slightly elevated above the sharply elevated lower portion; surface of male frons reticulate, distinctly punctured except on the median, slightly elevated space above the carina; female frons very sparsely pubescent, sometimes with a very fine longitudinal carina; Mexico . . . . . 138. *elimatus* Bright (p. 196)
- Length usually less than 2.0 mm (occasional specimens of *segnis* may reach 2.1 mm); posterior area of pronotum with smaller, more widely separated punctures, the punctures separated by a distance at least equal to their own diameters; male and female frons not as above . . . . . 3
3. Elytral declivity strongly, evenly convex, only striae 1 weakly impressed; stria punctures on declivity small to obsolete; interstriae 3 devoid of granules on declivity; Arizona . . . . . 139. *minus* Bright (p. 197)
- Elytral declivity convex but more sloping, or slightly flattened with interstriae 2 weakly impressed; stria punctures on declivity distinctly visible; interstriae 3 usually with fine granules on declivity . . . . . 4
4. Elytral declivity somewhat flattened between the third interstriae, interstriae 2 slightly impressed; pubescence on female frons on a broad semicircular area which extends well above upper level of eyes; male frons somewhat densely pubescent, the longitudinal carina only slightly but sharply elevated; surface of male frons shining; Mexico . . . . . 140. *impexus* Bright (p. 197)
- Elytral declivity convex, interstriae 2 may be slightly impressed (Fig. 151); pubescence of female frons limited to a subcircular area which does not extend above upper level of eyes or only very slightly beyond (Fig. 149); male frons not pubescent, median longitudinal carina usually more strongly elevated and usually not sharp along summit (Fig. 150); surface of male frons dull, reticulate, weakly punctured; Arizona to Mexico . . . . . 141. *segnis* Blackman (p. 198)

137. *Pityophthorus (P.) pubifrons* n. sp.

Length 2.0-2.2 mm, 2.2 times longer than wide.

**Female.** Frons broadly, moderately deeply concave from epistoma to well above eyes and laterally from eye to eye; surface moderately dull, finely, shallowly punctured, with abundant, long, erect setae, those on periphery much longer and incurved. Antennal club broadly oval, 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, straight or suture 1 very weakly arcuate; first two segments together occupy about

one-half of total club length. Pronotum about 1.1 times longer than wide, widest at about middle; sides broadly but weakly arcuate; asperities on anterior slope numerous, erect, scattered; posterior area of disc reticulate, punctures of moderate size, moderately deeply impressed, usually separated by less than their diameters, but more widely separated toward midline; surface between punctures moderately shining to dull. Elytra about 2.1 times longer than wide; apex broadly rounded; discal striae punctures very large, deeply impressed, placed in even rows; discal interstriae weakly convex or flattened, as wide as or slightly narrower than striae, surface reticulate, moderately shining, impunctate. Declivity convex; interstriae 1 weakly elevated, with a median row of fine granules; interstriae 2 distinctly but weakly impressed, as wide as or narrower than 1, impunctate except on apical half; interstriae 3 weakly but distinctly elevated, with a median row of fine granules; surface of interstriae reticulate, dull; punctures in striae 1 and 2 distinct, nearly equal in size to those on disc.

**Male.** Frons weakly convex, with a median, longitudinal carina on lower half varying from distinct, somewhat toothlike to only a smooth line; surface very dull, densely reticulate except on longitudinal remnant of carina, punctures rather large, close, deeply impressed; vestiture sparse, frequently longer on periphery. Pronotum and elytra essentially as in female except striae punctures larger, more distinct, especially on declivity and declivital granules slightly larger.

**TYPE MATERIAL.** The holotype (♀), allotype, and 7 paratypes bear the labels: Parque Nal. Zoquiapan, Edo. México, Dec. 79, Hos. *Pinus hartwegii*, T.H. Atkinson. One additional paratype is labeled: MEX., Mex-Pue., Ixta-Popo N.P., 13,000', V.8.71, D.E. Bright.

The holotype, allotype, and 1 paratype are in the CNC. Additional paratypes are in the SLWC and the collection of T.H. Atkinson, Chapingo, Mexico.

**REMARKS.** This is the only species in this group in which the females bear a dense brush of long, incurved setae on the frons. Adults of this species resemble those of *P. elimatus*, but are most easily distinguished by the more deeply impressed declivital interstriae 2, and by the characters of the female frons noted above.

### 138. *Pityophthorus (P.) elimatus* Bright

*Pityophthorus elimatus* Bright, 1976b, p. 432.

Length 2.0-2.2 mm, 2.8 times longer than wide.

**Female.** Frons arcuately flattened from epistoma to above upper level of eyes and laterally from eye to eye or very shallowly, broadly, transversely impressed on an arch from eye to eye, impression frequently divided by a weak, longitudinal carina; surface shining, finely and densely punctured, punctures shallow; vestiture sparse. Antennal club elongate-oval, 1.2-1.3 times longer than wide, widest through segment 2; sutures 1 and 2 nearly transverse; first two segments together occupy slightly more than one-half of total club length. Pronotum about 1.1 times longer than wide, widest at about middle; sides weakly arcuate; asperities on anterior slope of moderate size, erect, and placed in no apparent order; posterior area of disc moderately shining, punctures rather large, deep, and almost touching; surface between punctures minutely reticulate. Elytra 2.2 times longer than wide; apex somewhat narrowly rounded; discal striae punctures large, deep and very close, almost touching; discal interstriae weakly convex or flattened, as wide as or slightly narrower than striae, surface moderately shining, minutely reticulate. Declivity evenly convex; interstriae 1 weakly elevated, with a median row of very fine granules; interstriae 2 as wide as 1, not wider than discal width; interstriae 3 not elevated or only very slightly so, with a median row of very fine granules; surface of interstriae minutely reticulate, moderately dull; punctures of striae 1 and 2 easily visible, about equal in size to those on disc.

**Male.** Frons convex, very weakly impressed on each side of short, sharp, moderately elevated, longitudinal carina; surface moderately dull, minutely reticulate with shallow punctures scattered on each side and above carina except on an oval, frequently very weakly elevated area just above the longitudinal carina; vestiture sparse, inconspicuous, setae frequently longer on lateral margins of flattened area. Pronotum and elytra essentially as in female except declivital granules slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: MEX., Oax., 51 mi. NW Oaxaca, V-10-71, 7500', D.E. Bright/*Quercus* sp./HOLOTYPE *Pityophthorus elimatus* D.E. Bright CNC No. 15082. The allotype and 10 paratypes bear the same data.

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.

**HOST.** The host is questionable (see below).

**DISTRIBUTION.** Known only from the type locality in Oaxaca.

**REMARKS.** This species seems most similar to *segnis* but the adults are distinguishable by their larger size, by the different sculpturing of the frons of both sexes as brought out in the key and descriptions and by the more strongly and more closely punctured posterior portion of the pronotum.

The host label, "*Quercus* sp.", on the specimens is questionable. If this is the true host, then *elimatus* is the only species of this group known to occur in a deciduous tree. The remainder of species (except *minus*?) in this group occur in *Pinus* sp. and it is reasonable to assume that *elimatus* is no exception.

#### 139. *Pityophthorus* (*P.*) *minus* Bright

*Pityophthorus minus* Bright, 1976b, p. 437.

Length 1.9-2.0 mm, about 2.8 times longer than wide.

Holotype (♀). Head largely withdrawn into prothorax, however, frons appears flattened and sparsely pubescent; median carina not present. Antennal club elongate-oval, about 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 nearly transverse, very weakly arcuate; first two segments together occupy at least two-thirds of total club length. Pronotum about 1.1 times longer than wide; widest at about middle; asperities on anterior slope small, low, scattered in no apparent order; posterior area of disc dull, punctures shallow, obscure; surface between punctures densely, minutely reticulate. Elytra about 1.9 times longer than wide; apex broadly rounded; discal striae punctures somewhat obscure, shallow, close, almost touching; discal interstriae about as wide as striae or slightly narrower, surface dull, minutely reticulate. Declivity strongly convex; interstriae 1 weakly elevated, devoid of granules; interstriae 2 and 3 unmodified; 3 devoid of granules; punctures in striae 1 and 2 very faint, very small and shallow, only striae 1 impressed.

**Male.** Frons weakly convex, divided by a fine, low, longitudinal, median carina; surface moderately dull, minutely reticulate and very weakly punctured, punctures widely scattered. Pronotum essentially as in female holotype except serrations on anterior margin more erect, sharper and longer. Elytra as in female holotype except punctures in declivital striae 1 and 2 slightly more obvious and visible.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and is labeled: Hannagan Camp, Greenlee Co., Ariz., VII-12-1968, D.E. Bright/HOLOTYPE *Pityophthorus minus* D.E. Bright, CNC No. 15086. The allotype bears the same data. No other specimens are known.

**HOST.** Unknown, but probably *Pinus* sp.

**DISTRIBUTION.** Known only from type locality in Arizona.

**REMARKS.** Adults of this species are most easily distinguished by the very convex elytral declivity, by the very obscure striae punctures on declivital striae 1 and 2, by their smaller size, and by the other characters given in the key.

#### 140. *Pityophthorus* (*P.*) *impexus* Bright

*Pityophthorus impexus* Bright, 1978, p. 76.

Length 1.9-2.1 mm, about 3.1 times longer than wide.

**Female.** Frons weakly convex on a large semicircular area extending from epistomal margin to well above upper level of eyes and laterally nearly from eye to eye; surface shining, bearing large, deep punctures on periphery, these becoming smaller toward middle, median portion weakly flattened and impunctate on a small area just above epistomal margin; vestiture rather sparse, consisting of long, erect setae scattered over the surface, those on periphery somewhat longer and incurved. Antennal club large, about 1.2 times longer than wide, widest through segment 3; segment 1 small, narrower than 2 or 3; suture 1 weakly arcuate, 2 more strongly so; segments 1 and 2 together occupy less than half of total club length. Pronotum 1.1 times or less longer than wide; sides weakly arcuate on basal half; asperities on anterior slope moderately large, erect, usually isolated but occasionally two or three may be basally contiguous; summit distinct, high; posterior area of disc densely punctured, punctures large and deeply impressed; surface between punctures moderately shining, rather densely microreticulate; median line broad, not elevated, narrowed just behind summit. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures about equal in size to those on posterior portion of pronotum, rather deeply impressed; discal interstriae about 1.0 to 1.5 times wider than striae, impunctate (except 1), surface moderately shining, densely microreticulate. Declivity convex, somewhat flattened between the third interstriae; interstriae 1 equal in width to discal width, slightly elevated, bearing a median row of very fine granules and short setae; interstriae 2 flat, as wide as discal width, very weakly impressed below level of 1 and 3; interstriae 3 very weakly elevated, equal in height to 1, bearing a median row of fine granules and long setae, granules slightly larger than those in 1, and setae much longer; remaining alternate interstriae bear long setae on posterior third (or less) of elytra; punctures in striae 1 and 2 distinct, smaller than those on disc.

**Male.** Frons convex, narrowly, transversely impressed just above epistoma, this impression divided by a median, longitudinal, laterally flattened, small tooth or carina; surface of frons shining, rather densely pubescent and deeply, closely punctured, punctures smaller and finer in transverse impression. Pronotum as in female except asperities and serrations larger. Elytra essentially as in female.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and is labeled: 6 mi. S. Carapan, Mich., Mexico, VI-18-1965, 7000 ft., S.L. Wood/Pinus/HOLOTYPE *Pityophthorus impexus* D.E. Bright. The allotype and 9 paratypes bear the same data. Five additional paratypes are labeled: 3 mi. W. El Salto, Dur., Mexico, VI-7-1965, 7500 ft., S.L. Wood/Pinus ayacahuite and 2 paratypes are labeled: Tequesquinhua, Mexico, March 1962, R. Coronado P./Pinus.

The holotype, allotype, and most of the paratypes are in the SLWC. A pair of paratypes is in the CNC (No. 15480).

**HOST.** *Pinus* spp.

**DISTRIBUTION.** Known only from the type-series localities in the states of Durango, Mexico, and Michoacán.

**REMARKS.** Adults of this species resemble closely those of *segnis*. The adults of *impexus* differ from the latter species by the more flattened, more weakly impressed elytral declivity, especially between the third interstriae of each elytron, by the more densely pubescent male frons and the more sharply elevated longitudinal carina, and by the more extensive pubescent area on the female frons.

#### 141. *Pityophthorus (P.) segnis* Blackman

Figs. 149-151; Map 25

*Pityophthorus segnis* Blackman, 1928, p. 52; Chamberlin, 1939, p. 336.

*Pityophthorus segnis subopacus*, new status.

*Pityophthorus subopacus* Blackman, 1942, p. 210.

Length 1.7-2.1 mm, about 2.8 times longer than wide.

**Female.** Frons convex to slightly flattened; surface moderately dull, minutely reticulate, with scattered, shallow punctures, these closer and deeper at upper level of pubescent area; vestiture sparse, consisting of short, fine, hairlike setae scattered over flattened area,

or if frons convex, then vestiture extends nearly from eye to eye and from epistomal margin to a point at upper level of eyes. Antennal club elongate-oval, 1.3-1.4 times longer than wide; widest through segment 2; first 2 sutures transverse; first two segments together occupy less than half of total club length. Pronotum about 1.1 times longer than wide, widest at about the middle; sides arcuate; asperities on anterior slope small, erect, scattered in no apparent order; posterior area of disc moderately shining, punctures moderately large, deep, and moderately close; surface between punctures dull, minutely reticulate. Elytra about 2.0 times longer than wide; apex broadly, evenly rounded; discal striae punctures large, deeply impressed and close; discal interstriae equal to or slightly narrower than striae, surface moderately dull, densely minutely reticulate. Declivity convex; interstriae 1 weakly elevated, with a median row of fine granules; interstriae 2 as wide as interstriae 1, equal to its own discal width, unmodified; but may be weakly impressed; interstriae 3 convex, weakly elevated, with a median row of fine granules; punctures in striae 1 and 2 distinct, equal to or only slightly smaller than those on disc.

**Male.** Frons flattened to weakly concave on each side of a moderately elevated, sharp, longitudinal carina; surface moderately dull, densely, minutely reticulate with scattered, very shallow punctures; vestiture inconspicuous. Pronotum essentially as in female. Elytra essentially as in female except declivital interstriae 2 and 3 either punctured and setose, punctures equal in size and depth to those in striae, or impunctate except at apex, setae in interstriae 2 only slightly shorter than setae in other interstriae.

This species occurs in two populations which I have designated as subspecies. They may be distinguished as follows:

1. Punctures on declivity of both sexes in even, striae rows, interstriae 2 impunctate except at extreme apex; female frons usually convex, flattened, or weakly impressed; Arizona, New Mexico, and northwestern Mexico . . . . . *segnis segnis* Blackman, **new status**
- Punctures on male declivity appearing to be randomly placed, caused by interstriae 2 and 3 bearing large punctures that are equal in size to those in striae; punctures on female declivity in even, striae rows, interstriae 2 impunctate except at extreme apex; female frons flattened; central and eastern Mexico . . . . . *segnis subopacus* Blackman, **new status**

**TYPE MATERIAL.** *P. segnis segnis*. The holotype (♀) in the USNM bears the labels: Hopkins U.S. 5613a/Aug. 19, '07/J.L. Webb, collector/Santa Catalina Mts., Ariz./Pinus/TYPE Pityophthorus segnis Blackman/Type No. 41278 U.S.N.M. The allotype and 2 paratypes bear the same data. Three paratypes are labeled: Hopk. U.S. 5752/J.L. Webb, collector/Sacramento Mts N.M./Pinus strobiformis. One paratype is labeled: Hopk. U.S. 5792/J.L. Webb, collector/Bred Sept. 25, '07/Chiricahua Mts., Ariz/Pinus strobiformis.

All the type material is in the USNM.

*P. segnis subopacus*. The holotype (♀) in the USNM bears the labels: 668-1/ Chalco, Mex., I-27-36/Pinus leiophylla/D. DeLeon colr./♀/Type 55985 U.S.N.M. The allotype and 9 paratypes bear the same date. Additional paratypes are labeled: 2,683-3/Rio Frio, Pa., II-7-36/Pinus/D. DeLeon, colr.; 5,692/Rio Frio, Pa., II-10-36/Pinus leiophylla/D. DeLeon, colr.; 1, same labels except numbered 643, not 692; 2, 687/Jalapa, V.C., II-9-36/Pinus montezumae/D. DeLeon colr and 1, 68 (?) (undecipherable)/ El Seco, Pa., II-7-36/Pinus/D. DeLeon, colr.

All of the above type material is in the USNM.

**HOSTS.** *Pinus* spp. One record is from *Pseudotsuga menziesii*.

**DISTRIBUTION.** Arizona and New Mexico to Veracruz (Map 25). Specimens (341) examined from:

**P. segnis segnis**

UNITED STATES

**Arizona:** Agassiz Peak, San Francisco Mountains, 15.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 148; Bear Wallow, Santa Catalina Mountains, 31.VII.74,

*Pinus leiophylla*, D.E. Bright (CNC) 10; Mount Bigelow, Santa Catalina Mountains, 6.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 22; Mount Lemmon, Pina Co., 5.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 8; Santa Rita Mountains, Santa Cruz Co., 29.VII.68, *Pseudotsuga menziesii* and *Pinus strobiformis*, D.E. Bright (CNC) 11; Upper Sabino Canyon, Pima Co., 6.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 39; Walker, 23.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 4. **New Mexico**: See type material.

MEXICO

**Durango**: 68-70 km W of Durango, 14-18.VI.71, *Pinus engelmannii*, D.E. Bright (CNC) 17; 6 mi NE of El Salto, 23.VII.53, *Pinus*, S.L. Wood (SLWC) 3.

**P. segnis subopacus**

MEXICO

**Mexico**: See type material. **Michoacán**: 6 mi E of Volcan Paricutin, 19.VI.65, *Pinus*, S.L. Wood (SLWC) 7. **Nuevo León**: Cerro Potosi, 2.V.71, *Pinus* sp., D.E. Bright (CNC) 4; Chipinque Mesa, near Monterrey, 23.VI.71, *Pinus* sp., D.E. Bright (CNC) 14. **Oaxaca**: 8 mi SE of Cameron, 21.VI.67, *Pinus*, S.L. Wood (SLWC) 1; 75 mi S of Oaxaca on highway 131, 50.V.71, *Pinus michoacana*, D.E. Bright (CNC) 8. **Puebla**: 14 mi W of Texmelucan, 14.VII.53, *Pinus*, S.L. Wood (SLWC) 8. **Tlaxcala**: 11 mi N of Tlaxco, 9.VII.67, *Pinus*, S.L. Wood (SLWC) 7. **Veracruz**: See type material.



MAP 25. Collection localities for *P. (Pityophthorus) segnis segnis* and *P. segnis subopacus*.

**BIONOMICS.** Adults and larvae of this species bore in the pith of small twigs.

**REMARKS.** This species is closely related to *elimatus* and, in fact, *elimatus* may represent another subspecies. However, *elimatus* is maintained as a distinct species for the present.

Females of the two subspecies are difficult, if not impossible, to distinguish. The males may be distinguished by the fact that in *segnis segnis* the second and third declivital interstriae are not punctured except frequently at the extreme apex and the striae are punctured in easily discernible, regular rows on the declivity.



In the males of *segnis subopacus* the declivital punctures appear to be more randomly placed making discernment of the strial rows difficult. Distribution may also assist since present data indicates that *segnis segnis* occurs in northwestern Mexico and the southwestern United States while *segnis subopacus* occurs in central and eastern Mexico only.

#### RAMIPERDA GROUP

The species in this group are easily distinguished by the lack of chitin at the lateral margins of the sutures on the antennal club, by the subasperate to granulate appearance of the posterior portion of the pronotum and by the convex to moderately, shallowly impressed elytral declivity on which interstriae 3 and 9 are frequently elevated and joined at the apex. In some species, the antennal club of the female is much larger than that of the male, and has the first two segments much narrower than the third.

These species are those that previously were placed in the genus *Myeloborus* Blackman, but I (1977) have placed *Myeloborus* in synonymy under *Pityophthorus*. *Myeloborus* could have been reduced to a well-marked subgenus of *Pityophthorus* but I prefer to treat it as a species group, on an equal status with other distinctive species groups.

Nine species are included in this group.

#### KEY TO SPECIES IN THE Ramiperda group

1. Body length 3.1-3.6 mm; elytra randomly punctured, strial or interstitial rows not discernible; male frons strongly, transversely impressed above epistoma, impression divided by a moderately elevated, sharp, longitudinal carina; female frons only weakly impressed, carina indistinct; Mexico . . . . . 142. *deleoni* (Blackman) (p. 202)
- Body length usually less than 3.1 mm; elytral striae punctured in regular rows, at least some interstriae also punctured; male and female frons variable but not as above; United States and Canada . . . . . 2
2. All elytral interstriae punctured and setose on disc . . . . . 3
- Only interstriae 1, 3, 5, 7, etc. punctured and setose on disc, interstriae 2 may bear a few setae at commencement of declivity or sometimes on declivity . . . . . 5
3. Declivital interstriae 2 with an even, median row of fine setae; elytral declivity convex, not impressed; South Carolina . . . . . 143. *separatus* Bright (p. 203)
- Declivital interstriae 2 not bearing a median row of setae; elytral declivity weakly to moderately impressed . . . . . 4
4. Frons of both sexes very smooth, shining, punctures small to moderate in size, widely spaced; antennal club elongate-oval in both sexes, widest through segment 2; median line on posterior portion of pronotum frequently narrowly sulcate; southwestern United States . . . . . 144. *amplus* (Blackman) (p. 203)
- Frons of both sexes roughly punctured, punctures moderate to large, very close; antennal club small, oval in male, much larger in female, with first two segments narrower than the third; median line on posterior portion of pronotum narrowly elevated; western North America . . . . . 145. *boycei* Swaine (p. 204)
5. Antennal club of female much larger than in male, segments 1 and 2 narrower than 3; interstriae 2 weakly sulcate or impressed, interstriae 3 and 9 elevated, joined at apex; eastern North America . . . . . 146. *ramiperda* Swaine (p. 207)
- Antennal club similar in both sexes, oval to circular, widest through segment 2, segments 1 and 2 equal to nearly equal in width to 3; elytral declivity convex; interstriae 2 not impressed, interstriae 9 not elevated or only weakly so, not obviously joined to 3 at apex . . . . . 6
6. Interstitial setae on elytral disc very short, at most only very slightly longer than strial setae; granules on declivital interstriae 1 and 3 absent or very small; striae 1 impressed on declivity; California . . . . . 147. *trepidus* Bright (p. 208)
- Interstitial setae on elytral disc much longer than strial setae; granules on declivital interstriae 1 and 3 more prominent; striae 1 not impressed on declivity . . . . . 7

7. Declivital interstriae 2 bearing a median row of setae, these may be restricted to upper slope of interstriae and may not be present on male; frons smooth, punctures rather widely separated; California to Colorado and New Mexico . . . . . 148. *keeni* (Blackman) (p. 209)
- Declivital interstriae 2 not bearing a median row of setae; frons more coarsely, closely punctured; southwestern United States, north to Wyoming . . . 149. *pinguis* (Blackman) (p. 210)

142. *Pityophthorus* (*P.*) *deleoni* (Blackman)

*Myeloborus deleoni* Blackman, 1942, p. 201.

Length 3.1-3.6 mm, 2.6-2.8 times longer than wide.

**Female.** Frons convex, very weakly, transversely impressed above epistoma, with an indistinct, low, longitudinal carina extending from epistoma to upper level of eyes, this carina more strongly elevated on lower half; surface brightly shining, densely punctured on area below upper eye level, punctures close, moderate in size and shallow, area above upper level of eyes more sparsely punctured, punctures deeper; vestiture short and inconspicuous. Antennal club broadly oval, 1.2-1.3 times longer than wide, widest through segment 2; sutures 1 and 2 arcuate, 2 more strongly so; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest behind summit; sides moderately arcuate on posterior half; asperities on anterior slope large, erect, isolated, scattered in no apparent order; summit high, transverse impression distinct; posterior area of disc subasperate and punctate, punctures moderately large and deep, lateral or basal portion of the rim of each puncture elevated; surface between punctures shining, microreticulate; median line broad, weakly elevated just behind summit. Elytra 1.6 times longer than wide; apex broadly rounded; discal surface densely, randomly punctured, striae rows not readily discernible except striae 1, punctures moderately large, deep, and close; surface between punctures somewhat dull, rugulose. Declivity distinctly impressed; interstriae 1 devoid of granules or only with very minute granules, impressed below level of 3; interstriae 2 not widened, rugulose, rising on lateral portions toward elevated interstriae 3; interstriae 3 elevated, distinctly higher than 1, bearing a few minute granules; interstriae 9 very weakly elevated on lateral areas, the junction with interstriae 3 very weakly discernible; punctures in striae 1 and 2 visible, those in 2 smaller than those on disc and more shallowly impressed.

**Male.** Frons strongly, transversely impressed above epistoma, longitudinal carina more strongly developed; surface roughly punctured. Antennal club narrower, 1.4-1.5 times longer than wide. Pronotum and elytra essentially as in female except asperities, punctures, etc. stronger. Declivity as in female except interstriae 1 not as deeply impressed, interstriae 2 flatter, interstriae 3 more abruptly elevated.

**TYPE MATERIAL.** The holotype (♀) is in the USNM and is labeled: 685/EL Seco, Pa., II-7-36/Pinus sp. ?/D. DeLeon, colr/Type No. 55975 U.S.N.M. Seven paratypes bear the same data.

All type material is in the USNM.

**HOSTS.** *Pinus* sp.

**DISTRIBUTION.** Known from Nuevo León to Puebla, Mexico but undoubtedly occurs throughout eastern Mexico at least. Specimens (11) examined from:

**MEXICO**

**Nuevo León:** Chipinque Mesa, near Monterrey, 23.VI.71, *Pinus* sp., D.E. Bright (CNC) 3. **Puebla:** See type material.

**BIONOMICS.** The specimens from Chipinque Mesa were collected from the dying tips of branches on a large, unidentified pine tree. The needles on the terminal 4-6 cm of the twig tips had turned brown and the beetles were found in the pith of the dying twigs.

**REMARKS.** The adults of this species are the largest of any in this species group and, at present, this is the only species of this group that is known to occur

in Mexico. Adults differ from all other described species by the relatively deeply impressed male frons, by the densely, randomly punctured elytra, by the size and by the distribution.

143. *Pityophthorus (P.) separatus* Bright

*Pityophthorus separatus* Bright, 1977, p. 529.

Length 2.5 mm, 3.1 times longer than wide.

**Male.** Frons broadly flattened, with a weak, longitudinal carina extending from epistomal margin to about upper level of eyes; surface shining, moderately punctured, punctures small and shallow; vestiture very sparse. Antennal club broadly oval, to 1.1 times longer than wide, widest through segment 3; segment 1 distinctly narrower than 2, and 2 distinctly narrower than 3; first two sutures arcuate; first two segments together occupy distinctly less than half of total club length. Pronotum 1.1 times longer than wide, widest behind middle; sides weakly arcuate; asperities on anterior slope rather large, erect, isolated, scattered in no apparent order; summit prominent, high; posterior area of disc densely punctured, punctures large, deep and close; surface between punctures shining, smooth, with a few, very faint shallow lines; median line narrow, weakly elevated, impunctate. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures of moderate size and depth; discal interstriae about twice as wide as striae, each bearing a median row of sparse, setiferous punctures. Declivity evenly convex, not impressed; striae 1 narrowly, deeply impressed, remaining striae not impressed; all interstriae including 2, bearing a median row of fine granules and long, conspicuous setae, each setae 4-5 times longer than those in striae punctures; interstriae 2 equal in width to its discal width; punctures in striae 2 and 3 distinct, but slightly smaller than those on disc; interstriae 9 weakly elevated at its junction with interstriae 3.

**Female.** Unknown.

**TYPE MATERIAL.** The holotype ( $\delta$ ) is in the SLWC and bears the labels: Poinsett St. Pk., S.C., 20 July 1957, V.M. Kirk, Bl. Lt./*Pityophthorus* spp. WHA '60/HOLOTYPE *Pityophthorus separatus*, D.E. Bright '76.

**HOST.** Unknown, but undoubtedly occurs in *Pinus* spp.

**DISTRIBUTION.** Known only from the type locality in South Carolina but probably occurs throughout the southeastern United States.

**REMARKS.** Adults of this species are readily recognized by the distinct, median row of long setae and fine granules in the second declivital interstriae. This species is one of only a half dozen or fewer species in the genus that bears punctures or setae in the second declivital interstriae.

144. *Pityophthorus (P.) amplus* (Blackman)

*Myeloborus amplus* Blackman, 1928, p. 18; Chamberlin, 1939, p. 339; Furniss & Carolin, 1977, p. 398.

Length 2.3-3.0 mm, 2.6-2.7 times longer than wide.

**Female.** Frons convex, very smooth and shining, punctures very sparse to moderately abundant, shallow; longitudinal carina weakly indicated or absent; vestiture sparse, inconspicuous. Antennal club oval, 1.3-1.4 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest at or near middle; sides subparallel to weakly arcuate; asperities on anterior slope large, erect, decreasing in size toward summit, scattered in no apparent order; summit low, poorly defined, posterior impression weak to not evident; posterior area of disc strongly punctured and subasperate, punctures large and deep, lateral or basal portion of rim weakly elevated; surface between punctures shining, densely micropunctate; median line broad, frequently narrowly sulcate on anterior half. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, equal in size and depth to those on posterior portion of

pronotum; discal interstriae wider than striae, each with a median row of punctures, these smaller and sparser than those in striae and slightly less deeply impressed. Declivity steep; interstriae 1 weakly elevated, with a median row of several fine granules and setae; interstriae 2 weakly impressed, as wide as on disc; interstriae 3 weakly elevated, only very slightly higher than 1 if at all, bearing a median row of fine granules, these slightly larger than those on 1; punctures in striae 1 and 2 distinct but smaller than on disc.

**Male.** Frons essentially as in female except more strongly punctured and median carina more strongly elevated. Pronotum and elytra essentially as in female except more strongly, closely punctured. Declivity as in female except granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) in the USNM is labeled: Kaibab N.F., Ariz., 6-24-25/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. K-63/Pinus ponderosa/TYPE Myeloborus amplus Blackman/Type No. 41259 U.S.N.M. The allotype and 2 paratypes bear the same data. Additional paratypes are labeled: 4, Flagstaff, Ariz., V-12-27/Pinus ponderosa/M.W. Blackman, collector/K-284; 3, Kaibab N.F., Ariz., VIII-25-26/M.W. Blackman, color./K-219/Pinus ponderosa; 3, Hopk. U.S. 5793/J.L. Webb, color./Bred Sept. 26-7/Chiricahua Mts., Ariz./Pinus ponderosa; 2, Hopk. U.S. 5729/J.L. Webb, color./Sta. Catalina Mtns., Ariz./Pinus ponderosa; and 1, Hopk. U.S. 5764/J.L. Webb, color./Sacramento Mts., N.M. Pinus ponderosa.

Type material is known to be in the CNC and the USNM.

**HOSTS.** *Pinus flexilis* and *ponderosa*.

**DISTRIBUTION.** Southwestern United States. Specimens (22) examined from:

#### UNITED STATES

**Arizona:** Prescott National Forest, 24.VII.30, *Pinus ponderosa*, M.W. Blackman (USNM) 1. **Nevada:** Mercury, 9.VI.64 (CNC) 1. **New Mexico:** Lincoln National Forest, *Pinus flexilis* (USNM) 3.

**BIONOMICS.** Blackman (1928) states that the adults of this species attack the needle-bearing portions of small twigs of western yellow pine. The adults bore into the pith of the twig where egg galleries are constructed and in which eggs are laid. Larvae feed in the pith and wood, and often penetrate to the bark from within. Attacked twigs are conspicuous since the beetle's activities kill the distal portion of the twig and the needles turn brown while the needles on the remainder of the twig remain green.

**REMARKS.** Adults of this species are most readily recognized by the smooth and shining, weakly and sparsely punctured frons of both sexes, by their relatively larger and stouter body size, and by the distinctly punctured elytral interstriae.

#### 145. *Pityophthorus (P.) boycei* Swaine

Figs. 152, 153; Map 26

*Pityophthorus boycei* Swaine, 1925, p. 192.

*Myeloborus boycei*: Blackman, 1928, p. 26; Chamberlin, 1939, p. 342; Chamberlin, 1958, p. 145; Wood, 1971a, p. 424; Bright & Stark, 1973, p. 97; Bright, 1976a, p. 168; Furniss & Carolin, 1977, p. 398.

*Myeloborus catulus* Blackman, 1928, p. 21; Chamberlin, 1939, p. 341; Chamberlin, 1958, p. 144; Wood, 1971a, p. 424; Bright, 1976b, p. 426 (= *boycei*).

*Myeloborus iniquus* Blackman, 1928, p. 27; Chamberlin, 1939, p. 343; Bright, 1976b, p. 426 (= *boycei*).

*Pityophthorus siouxensis* Bright, 1976b, p. 439; Wood, 1977b, p. 387 (= *boycei*).

Length 2.0-3.1 mm, about 2.8 times longer than wide.

**Female.** Frons weakly convex or flattened or very weakly, broadly impressed from epistoma to upper level of eyes; median carina weakly elevated but distinct, extending from epistoma to upper level of eyes; surface shining, densely, roughly punctured, punctures moderate to large and close on area below upper eye level, larger and deeper above, surface between punctures frequently minutely granulate. Antennal club large, broadly oval, about 1.1 times longer than wide, widest through segment 3; suture 1 nearly transverse, 2 weakly arcuate; segments 1 and 2 together occupy less than half of total club length. Pronotum about 1.1 times longer than wide, widest behind summit; sides rather strongly arcuate; asperities on anterior slope large and erect, scattered in no apparent order; summit high, distinct, transverse impression generally distinct; posterior area of disc densely punctured and subasperate, punctures deep, large and close, lateral or basal edges slightly elevated, more so anteriorly; median line broad, narrowly elevated on anterior half. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures usually rather small and shallow; discal interstriae 2-3 times wider than striae, usually bearing a median row of small, shallow, widely separated, setiferous punctures, these usually much less numerous than those in striae; surface moderately shining, with numerous fine lines and points. Declivity convex, weakly impressed; interstriae 1 weakly impressed below 3, bearing a median row of fine granules; interstriae 2 only slightly widened, weakly sulcate, surface as on disc; interstriae 3 weakly elevated, slightly higher than 1, with a median row of fine granules; interstriae 9 weakly elevated, convex, joining 3 at apex; punctures in striae 1 and 2 very small, indistinct but generally visible.

**Male.** Frons as in female except punctures stronger and deeper, and median carina more strongly elevated. Antennal club smaller, narrower, 1.5-1.6 times longer than wide, widest through segment 2. Pronotum as in female except serrations on anterior margin larger and more erect, asperities on anterior slope larger, punctures on posterior portion deeper and median line usually more strongly elevated. Elytra essentially as in female. Declivity as in female except granules in interstriae 1 and 3 smaller or absent, interstriae 3 and 9 more strongly elevated, junction at apex more prominent.

**TYPE MATERIAL.** *P. boycei*. The holotype (♂) in the CNC is labeled: Pinus contorta var. murrayana, Lot 450/Cisco, Placer Co., Cal., 111-13-14, J.B. Boyce/HOLOTYPE Pityophthorus boycei ♂, No. 1367. The allotype is simply labeled: Pinus contorta var. murrayana, Lot 450 and the allotype label. Swaine states that there were 6 male and 3 female paratypes with the same data. Three paratypes are in the CNC, 1 paratype is in the USNM, and 4 specimens with the same data but not labeled as paratypes are in the CASC.

*M. catulus*. The holotype (♀) is in the USNM and is labeled: Hopk. U.S. 9189g/Aug. 22 '12/Clark Fork, Ida./TYPE Myeloborus catulus Blackman/Type No. 41262 U.S.N.M. The allotype and 7 paratypes bear the same data. Three additional paratypes are from Sheridan, Black Hills, Wyoming, collected by Hopkins on pine.

*M. iniquus*. The holotype (♀) in the USNM bears the data: Hopk. U.S. 2695/Keystone, Wyo./Pinus murrayana (sic)/J. Rehn, II/TYPE Myeloborus iniquus Blackman/Type No. 41264 U.S.N.M. The allotype bears the same labels. Two paratypes are labeled: Hopk. U.S. 6598/W.D. Edmonston/Bred Jan. 4, '08; 1 paratype is labeled: Hopk. U.S. 7002d/ Jefferson, Colo./Pinus murrayana (sic)/R. Edmonston/♀ and 2 paratypes are labeled: Hopk. U.S. 7002d/Pine, Colo./Pinus ponderosa.

*P. siouxiensis*. The holotype (♀) in the CNC is labeled: S. Dak., Black Hills, VII.7.75, D.E. Bright/Pinus ponderosa/♀/HOLOTYPE Pityophthorus siouxiensis D.E. Bright, CNC No. 15089. The allotype and 7 paratypes bear the same data.

The holotype, allotype, and 4 paratypes are in the CNC, 2 paratypes are in the SLWC, and 1 paratype is in the KESC.

**HOSTS.** *Pinus aristata*, *contorta*, *flexilis*, *monticola*, *ponderosa*, and probably other species of pines.

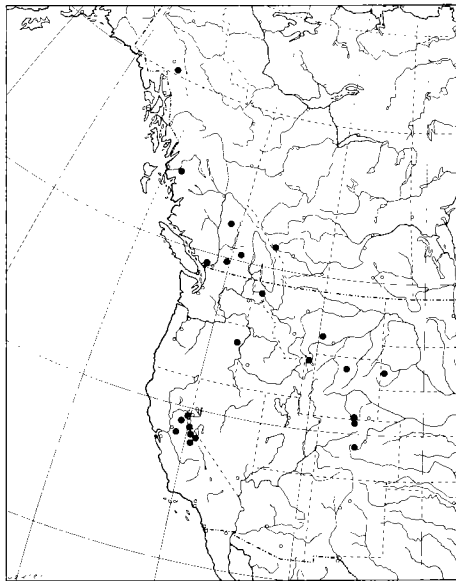
DISTRIBUTION. Western North America (Map 26). Specimens (181) examined from:

CANADA

**Alberta:** Eiffel Lake, Banff National Park, 18.VII.71, J.M. & B.A. Campbell (CNC) 1. **British Columbia:** Aspen Grove, 14.V.57, *Pinus contorta* (PFRC) 1; Cariboo, 13.VI.62, G.G.E. Scudder (UBC) 1; McLinchy Creek, 7.VIII.63, *Pinus contorta* (PFRC) 2; Salmon Arm, 1.XI.31, *Pinus monticola*, H.B. Leech (CASC) 7; Terrace, 4.IX.68, *Pinus contorta* (PFRC) 1; Vancouver, July, *Pinus contorta* (CASC) 5. **Yukon Territory:** Mile 717, Alaska Highway, 12.IX.61, *Pinus contorta* (PFRC) 1.

UNITED STATES

**California:** Bridal Vail Meadows, Yosemite National Park, *Pinus contorta* (PSFR) 1; Ebbetts Pass, 12.VII.34, *Pinus contorta* (USNM) 2; Kingvale, 18.V.63, *Pinus contorta*, D.E. Bright (CISC, DEBC) 13; Mono Hot Springs, 10.IX.65, *Pinus contorta*, C.L. Simola (USNM) 1; Myers, 13.VII.47, *Pinus murrayana*, J.M. Miller (USNM, SLWC) 7; Yosemite National Park, 3.X.33, Lodgepole pine (USNM) 4. **Colorado:** Fairplay, 12.VI.73, *Pinus aristata*, W.H. Kearby (CNC, SLWC) 37; Pike National Forest, Bristlecone pine, E.S. Keighley (USNM) 5; Poudre Canyon, Larimer Co., 12.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 7. **Idaho:** See type material. **Montana:** Melville, Sweetgrass Co., 21.VII.72, *Pinus flexilis*, S. Kohler (CNC, MDPC) 28. **Oregon:** Joseph, *Pinus ponderosa*, H.E. Burke (USNM) 3. **South Dakota:** See type material. **Wyoming:** 16 mi SE of Buffalo, 20.VI.68, *Pinus contorta*, S.L. Wood (SLWC) 6; Yellowstone National Park, II.VII.75, *Pinus contorta*, D.E. Bright (CNC) 10.



MAP 26. Collection localities for *P. (Pityophthorus) boycei*.

**BIOLOGY.** In California, adults of this species were found in dying twig tips of a standing, green, apparently healthy lodgepole pine.

**REMARKS.** Adults of this species are recognized by the sparsely punctured elytral interstriae, by the sexually dimorphic antennal club, by the elevated third and ninth interstriae that are joined at the apex, and by the western distribution.

146. *Pityophthorus (P.) ramiperda* Swaine

*Pityophthorus ramiperda* Swaine, 1917, p. 28; Swaine, 1918, p. 98.

*Myeloborus ramiperda*: Blackman, 1928, p. 22; Chamberlin, 1939, p. 341; Craighead, 1950, p. 331; Bright, 1976a, p. 168.

*Myeloborus fivazi* Blackman, 1928, p. 23; Chamberlin, 1939, p. 341; Bright, 1976a, p. 168; Bright, 1976b, p. 426 (= *ramiperda*).

Length 2.1-2.9 mm, about 2.8 times longer than wide.

**Female.** Frons moderately to strongly convex, shining, rather densely punctured, punctures moderate in size and depth; median carina weakly elevated to obscure, if elevated, then usually more so on epistomal region; vestiture short, scattered and inconspicuous. Antennal club large, nearly circular, widest through segment 3; sutures 1 and 2 weakly arcuate, 2 slightly more so than 1; segments 1 and 2 small, together occupying less than half of total club length. Pronotum 1.1 times longer than wide, widest behind summit; sides weakly arcuate on posterior half; asperities on the anterior slope smaller and less erect than those on anterior margin, basally contiguous forming scattered, broken concentric rows or asperities isolated and scattered; summit prominent; posterior area of disc densely punctured, punctures fairly large, deep and usually almost touching, basal or lateral edges of punctures elevated; surface between punctures shining, smooth; median line broad, impunctate, convex. Elytra 1.8-1.9 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, distinct and deep; discal interstriae about 2.0 times as wide as striae, 1, 3, 5, 7, 9 bearing a median row of sparse setiferous punctures, these punctures slightly smaller than those in striae; surface of interstriae moderately shining, smooth, with numerous fine lines and points. Declivity convex, steep; interstriae 1 moderately elevated, bearing a median row of fine granules; interstriae 2 not widened, weakly sulcate; interstriae 3 weakly elevated, equal in height to 1, bearing a median row of fine granules; interstriae 9 elevated, convex, joining interstriae 3 at apex and bearing a median row of fine granules; punctures in striae 1 and 2 reduced but still distinct.

**Male.** Frons essentially as in female except punctures and carina slightly stronger. Antennal club much narrower, 1.6-1.7 times longer than wide, widest through segment 2; segments 1 and 2 together occupy at least half of total club length. Pronotum, elytra, and declivity as in female except interstriae 2 less deeply sulcate on declivity, and granules on declivital interstriae 1 and 3 slightly smaller.

**TYPE MATERIAL.** *P. ramiperda*. The holotype (♀) is in the CNC and is labeled in red: 30-VII-10, W. pine, I.P., 100ax/*Pityophthorus ramiperda* n. sp./Type of description/TYPE *P. ramiperda* Sw., No. 3150. The type locality is Isle Perrot, Quebec ("I.P."). Two paratypes are simply labeled: PARATYPE (Yellow label)/100/PARATYPE 3150; 1 paratype is labeled: St. Annes, W. pine twig, 11-VIII-11/PARATYPE 3150; and 1 paratype is labeled: Stony Creek, June 29 (??), L.C./100 and the paratype label. The above paratypes are in the CNC, 1 additional paratype is in the USNM.

*M. fivazi*. The holotype (♀) in the USNM is labeled: Cranberry Lake, N.Y., 6-23-21/Blackman and Fivaz, collectors/N.Y.S. Coll. For. Lot No. 1264/TYPE *Myeloborus fivazi* Blackman/Type No. 41263 U.S.N.M. The allotype bears similar labels except the date is 8-6-21 and the Lot No. is 1309. Numerous paratypes from the same locality bear collection dates in 1921-23. Paratypes are in the USNM, CNC, DFEC, and probably other collections.

**HOSTS.** *Pinus strobus*.

**DISTRIBUTION.** Known from Quebec and New York west to Wisconsin. Specimens (41) examined from:

**CANADA**

**Ontario:** Bob's Lake, 7.IX.72, White pine (CNC) 15. **Quebec:** See type material.

**UNITED STATES**

**Maine:** Bar Harbor, 7.VIII.33, *Pinus strobus* (USNM) 2. **Massachusetts:** Belcher-

town, 24.IV.37, White pine, W. Becker (USNM) 2; Bevarly, *Pinus strobus* (USNM) 3; Wellesley, 31.VII.14, *Pinus strobus*, A.P. Morse (USNM) 2; West Roxbury, 8.VIII.38, White pine (USNM) 2. **Michigan:** Romeo, 11.I.28, *Pinus strobus*, R.H. Pettet (USNM) 2. **New York:** Niagara on the Lake, 21.VI.09, Pine twig, L. Caesar (USNM) 1. **Rhode Island:** Burrville, 4.IX.57, White pine twigs, J. Mathewson (USNM) 1. **Wisconsin:** Amery, VII.72, White pine, H. Coppel (USNM) 1.

**BIOLOGY.** The biology of this species is known in greater detail than that of any other species of this group, due to Blackman's observations during the summers of 1921-23.

Adults attack the small twig tips on the lower and middle branches of the host tree. The entrance hole is indicated by a small, white pitch-tube surrounding the entrance, which is situated among the needle-bearing portion of the twig.

The entrance gallery leads directly into the pith, where it is widened to form the nuptial chamber. One or two egg galleries are constructed in the pith extending away from the nuptial chamber. Eggs are laid in niches along the gallery wall and the larvae feed in the pith, wood, and inner bark. Individual larval mines are not constructed, the larvae extend the cavity of the egg gallery. Only a few eggs (12) are laid and after laying one complement of eggs, the adults leave the twig and attack another.

By the time the larvae are full grown, the entire pith and frequently the wood of the twig has been completely destroyed. Larval mines may extend even into the terminal bud. Pupation occurs in the twigs. Young adults remain in the twigs feeding until late summer. By this time the twig has been completely mined out and all that remains is a shell of bark. The needles have turned brown and the damage is conspicuous.

The activities of this insect hasten the natural pruning process and in this regard is considered beneficial to the forest. It is doubtful that the damage would have any adverse effect on individual trees even if a large percentage of the twig tips were killed.

**REMARKS.** This species is closely related to *boycei*. Adults of *ramiperda* may be distinguished by the shallowly sulcate declivital interstriae 2, by the unimpressed declivital interstriae 1, by the alternate elytral interstriae bearing setiferous punctures, and by the eastern distribution.

When more specimens are gathered, especially from the prairie provinces of Canada, it may be necessary to consider *boycei* and *ramiperda* as the same widespread species or possibly subspecies. They are retained as species in this present work because of the morphological differences and the geographical distinctness.

#### 147. *Pityophthorus (P.) trepidus* Bright

*Pityophthorus trepidus* Bright, 1978, p. 83.

Length 1.5-2.0 mm, about 2.7 times longer than wide.

**Female.** Frons generally flattened from well above eyes to epistomal margin and from eye to eye, very weakly transversely impressed at midlevel, sometimes a very weak, longitudinal carina is present; surface densely, closely punctured, punctures deep and distinct; surface between punctures smooth, shining; vestiture scattered, consisting of moderately long, erect setae. Antennal club oval, about 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 arcuate, 1 slightly more than 2; segments 1 and 2 together occupy more than half of total club length. Pronotum about as long as wide, widest just behind middle; sides broadly arcuate; asperities on anterior slope erect, of moderate size, scattered in no apparent order; summit distinctly elevated, transverse impression behind summit weak; posterior area of disc deeply, densely punctured, punctures rather large; surface between punctures brightly shining, smooth. Elytra about 1.8 times longer than wide; apex



broadly rounded; discal striae punctured in regular rows, punctures shallow and indistinct, somewhat obscured by the microrugulose sculpturing of surface, each puncture bearing a very short, erect seta; discal interstriae about 2.0 times wider than striae, surface roughened by microrugulose sculpturing; interstriae 1, 3, 5, 7, etc. each bearing a few, scattered, median punctures, each of which bears a very short, erect seta, these setae equal in length to those arising from striae punctures or only slightly longer. Declivity convex, weakly impressed along suture; interstriae 1 narrow, bearing a median row of extremely minute granules; interstriae 2 wider than discal width, otherwise as on disc; interstriae 3 essentially as on disc, bearing a few, very fine granules; punctures in striae 1 and 2 obsolete, stria 1 narrowly, weakly impressed.

**Male.** Almost identical with female except longitudinal carina on frons may be more evident. Distinguishable with certainty only by abdominal segmentation.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Hopk U.S. 20976/Pinus radiata/Ukiah, Cal./♀/HOLOTYPE *Pityophthorus trepidus* Bright, 1977. The allotype and 9 paratypes bear the same host and locality data.

The holotype, allotype, and 5 paratypes are in the USNM, 2 paratypes each are in the CNC and the SLWC.

**HOST.** *Pinus radiata*.

**DISTRIBUTION.** Known only from the type locality in California.

**REMARKS.** Adults of *trepidus* are very similar to those of *keeni*. They may be distinguished from these latter species by the very short interstitial setae on the disc and declivity, by the weakly, narrowly impressed striae 1 on the declivity and by the host. The host of *keeni* is the various species of pinyon pines in the west, while that of *trepidus* is *Pinus radiata*, a tree endemic to coastal California.

#### 148. *Pityophthorus* (*P.*) *keeni* (Blackman)

*Myeloborus keeni* Blackman, 1928, p. 19; Chamberlin, 1939, p. 340; Bright & Stark, 1973, p. 96; Bright, 1976b, p. 427.

Length 1.9-2.4 mm, 2.6-2.7 times longer than wide.

**Female.** Frons convex, densely, shallowly to moderately deeply punctured, punctures fairly large and close; a median carina not evident on most specimens or only weakly so in some specimens; surface shining, smooth; vestiture inconspicuous. Antennal club broadly oval, about 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest behind summit; sides distinctly arcuate; asperities on anterior slope smaller and less erect than serrations on anterior margin, basally contiguous and scattered in no apparent order; summit high, distinct; posterior area of disc strongly punctured, punctures large and deeply impressed; shining, smooth; median line broad, impunctate, surface between punctures weakly elevated. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures smaller than those on posterior portion of pronotum, moderately deep; discal interstriae 2-3 times wider than striae, smooth, shining, with interstriae 1, 3, 5, 7, 9 with a sparse row of setiferous punctures, punctures smaller and shallower than those in striae; striae and interstitial setae longer and more erect than in other species of group, striae setae almost as long as interstitial width and interstitial setae longer than striae setae. Declivity evenly convex; interstriae 1 weakly elevated, with a median row of very fine granules and long, erect setae; interstriae 2 not widened, not sulcate, bearing a median row of minute granules or long, fine setae; interstriae 3 not elevated, bearing a median row of very fine granules and setae as in 1; interstriae 9 not elevated or obviously joined to 3; punctures in striae 1 and 2 much reduced but usually visible.

**Male.** Almost identical with female except sculpturing slightly stronger. Antennal club slightly smaller than in female but essentially identical in most respects. Declivital interstriae 2 may not bear setae or granules.

TYPE MATERIAL. The holotype (sex unknown) is in the USNM and bears the data: Jacumba, Cal., Aug. 25-15/*Pinus monophylla*/230/TYPE *Myeloborus keeni* Blackman/Type No. 41260 U.S.N.M. Four paratypes bear the same data; 3 additional paratypes are labeled: Hopk. U.S. 13839/F.P. Keen Colr/Jacumba, Cal/Aug. 25/10/*Pinus monophylla* and the paratype labels.

The type material is in the USNM.

HOSTS. *Pinus cembroides*, *edulis*, and *monophylla*.

DISTRIBUTION. California to Colorado and New Mexico. Specimens (21) examined from:

#### UNITED STATES

**Arizona:** Dragoon Mountains, Cochise Co., 17.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 2. **California:** Lake Baldwin, *Pinus monophylla* (PSFR) 1. **Colorado:** Colorado National Monument, 25.X.35, *Pinus edulis* (USNM) 8. **New Mexico:** Clines Corners, 9.VII.68, D.E. Bright (CNC) 2.

REMARKS. Adults of this species are distinguished by their small size, by the evenly convex, unimpressed elytral declivity, on which the second interstriae bears a row of granules or fine setae, by the very faint or absent median carina on the frons, by the sparse punctures on the alternate interstriae, and by the distribution. Occasionally specimens are seen which lack the setae or granules in the second declivital interstriae. These can be distinguished from *pinguis* by the host.

#### 149. *Pityophthorus (P.) pinguis* (Blackman)

*Myeloborus pinguis* Blackman, 1928, p. 17; Chamberlin, 1939, p. 340; Wood, 1971a, p. 424.

*Myeloborus pinquis*: Blackman, 1928, p. 20; Chamberlin, 1958, p. 144; Bright, 1976b, p. 427 (= *keeni*).

Length 1.9-2.3 mm, about 2.6-2.7 times longer than wide.

**Female.** Frons as in *keeni* except punctures much larger, deeper, and closer. Antennal club as in *keeni*. Pronotum and elytra essentially as in *keeni*. Declivity weakly sulcate; essentially as in *keeni* except interstriae 2 does not bear a median row of setiferous punctures or very small granules.

**Male.** Almost identical with female except sculpturing slightly stronger.

TYPE MATERIAL. The holotype (♀) is in the USNM and is labeled: No. 3/D.W. Spangler, colr/Longmont, Colo./*Pinus flexilis*/TYPE *Myeloborus pinguis* Blackman/Type No. 41261 U.S.N.M. The allotype is labeled: Hopk. U.S. 5768/J.L. Webb, colr/Capitan Mtns., N.M./*Pinus strobiformis*. Paratypes are labeled: 8, same as allotype; 3, Hopk. U.S. 5792/J.L. Webb, collector/Bred Sept. 26-7/Chiricahua Mtns., Ariz./*Pinus strobiformis*; 2, Hopk. U.S. 5723/J.L. Webb, colr./Sta. Catalina Mtns., Ariz./*Pinus strobiformis*; and 1, same data as holotype.

Most of the type material is in the USNM, 1 paratype is in the CNC.

HOST. *Pinus flexilis* and *strobiformis*.

DISTRIBUTION. Southwestern United States north to Wyoming. Specimens (63) examined from:

#### UNITED STATES

**Arizona:** Carr Canyon, Cochise Co., 23.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 22. **Colorado:** Loveland, 10.VIII.38, *Pinus flexilis*, D. DeLeon (RMSC) 3. **Utah:** Logan Canyon, 26.VI.38, *Pinus flexilis*, W.P. Nye (DEBC) 3; Panguitch, 20.XI.38, *Pinus flexilis*, D. DeLeon (RMSC) 1; Widstoe, 22.III.38, *Pinus flexilis*, D. DeLeon (RMSC) 2. **Wyoming:** Casper, 20.VIII.75, 5-needle pine, E.W. Spackman (CNC) 6.

REMARKS. This species is very similar to *keeni* and was considered a synonym earlier in this study (Bright 1976b). The presence of setae or granules in the second declivital interstriae of specimens from pinyon pines was noticed earlier, but was considered to be only variations in the species. Further investigation has shown that the presence of these setae or granules is consistent in the populations from the southwestern United States in pines other than pinyons. Therefore, *pinguis* is recognized as a valid species.

In the key to *Myeloborus* (p. 17) and on several other pages, Blackman (1928) spelled the specific name *pinguis*. On page 20 of the same publication, the name was spelled *pinquis*. Subsequent authors have varied in their spelling of the name. The original spelling used in Blackman's key is used here.

#### OPACULUS GROUP

This group is a composite group of what seems to be at least two unrelated subgroups. This arrangement is not satisfactory but it serves to identify the various components and will enable a further refinement of the group.

Species in this group either bear a distinct longitudinal carina on the frons of both sexes or the carina may be reduced or lacking in some female specimens of several species. If the carina is absent, then the frons is convex to weakly flattened or weakly transversely impressed and the setae are sparse and equally short. In addition, only discal interstriae 1, 3, 5, 7, etc. bear setiferous punctures.

Six species are included in the group.

#### KEY TO SPECIES IN THE *Opaculus* group

1. Longitudinal carina on frons of both sexes distinct, strongly, sharply elevated in males, only slightly less so in females; western Canada and northwestern United States . . . . . 2
- Longitudinal carina on frons weakly elevated, sometimes absent in female (may appear to be strongly elevated, if so, then not sharply elevated); generally distributed . . . . . 3
2. Declivital interstriae 3 with a median row of fine, but prominent granules; declivital interstriae 2 distinctly impressed; sides of pronotum straight, converging; carina on frons only moderately elevated . . . . . 150. *fuscus* Blackman (p. 211)
- Declivital interstriae 3 devoid of granules (Fig. 155); declivital interstriae 2 not impressed or at most only very weakly so (Fig. 155); sides of pronotum weakly arcuate; carina on frons strongly elevated . . . . . 151. *aplanatus* Schedl (p. 212)
3. Longitudinal carina distinct, elevated, extending to above upper level of eyes (Fig. 156); frons convex in both sexes; southwestern United States and Mexico . . . . .
- . . . . . 152. *festus* Wood (p. 213)
- Longitudinal carina indistinct, frequently absent in female; frons flattened to weakly transversely impressed in female . . . . . 4
4. Declivital interstriae 3 more strongly elevated than 1 (Fig. 159); pronotal punctures large, deep, and close; northern Mexico at high elevations . . . 153. *culminicolae* Bright (p. 215)
- Declivital interstriae 3 and 1 equal or nearly equal in height; pronotal punctures small, more widely separated . . . . . 5
5. Declivital interstriae 2 very weakly sulcate (Fig. 162); declivital interstriae 3 weakly elevated and bearing a median row of very fine granules (Fig. 162); elytral pubescence usually conspicuous and abundant, striae setae longer than the diameter of a puncture and interstitial setae almost as long as interstitial width; southern Mexico and Guatemala . . . . . 154. *pellitus* Schedl (p. 216)
- Declivital interstriae 2 not sulcate (Fig. 165); declivital interstriae 3 not elevated and devoid of granules (Fig. 165); elytral pubescence short and relatively inconspicuous; North America north of Mexico . . . . . 155. *opaculus* LeConte (p. 218)

#### 150. *Pityophthorus* (*P.*) *fuscus* Blackman

*Pityophthorus fuscus* Blackman, 1928, p. 32; Chamberlin, 1939, p. 357; Wood, 1971a, p. 425.

*Pityophthorus smithi* Schedl, 1931, p. 163; Chamberlin, 1939, p. 369; Chamberlin, 1958, p. 150; Wood, 1971a, p. 425 (= *fuscus*); Wood, 1977c, p. 515 (= *fuscus*).

Length 2.0-2.3 mm, about 2.7 times longer than wide

**Female.** Frons flattened to weakly transversely impressed from epistoma to upper level of eyes; longitudinal carina weakly elevated but generally distinct, varying from a short elevation visible just above epistomal margin to a longer elevation extending from epistomal margin to upper level of flattened or impressed area; surface shining, densely punctured, punctures close and moderately deep; vestiture inconspicuous. Antennal club oval, about 1.5 times longer than wide, widest through segment 2; suture 1 transverse, 2 weakly arcuate; first two segments together occupy half of total club length. Pronotum about as long as wide, widest at posterior angles; sides straight, converging; asperities on anterior slope small, isolated, arranged in no apparent order; posterior area of disc deeply punctured, punctures large and close; surface between punctures dull, opaque, minutely reticulate. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, moderately deep and close; discal interstriae about 2.0 times as wide as striae, surface moderately dull, minutely reticulate. Declivity convex; interstriae 1 moderately elevated above 2, impressed below level of 3, bearing a median row of rather prominent granules; interstriae 2 smooth, distinctly impressed, as wide or slightly wider than discal width, distinctly wider than 1; interstriae 3 slightly elevated, higher than 1, bearing a median row of rather prominent granules; punctures of striae 1 and 2 much reduced in size to obsolete.

**Male.** Frons flattened to moderately concave on each side of a sharply elevated, toothlike, longitudinal carina, this carina more moderately elevated on lower portion near epistomal margin; surface on each side of carina deeply, closely punctured. Pronotum and elytral essentially as in female except declivital granules on elytral interstriae 1 and 3 usually slightly larger.

**TYPE MATERIAL.** *P. fuscus*. The holotype (♀) in the USNM bears the labels: Hopk US 16968A/Reared Aug. 30, '23/Glacier Natl. Park, Mont./Evenden, J.C., colr./Pinus murrayana/TYPE *Pityophthorus fuscus* Blackman/Type No. 41267 U.S.N.M. One paratype bears the same data.

Both specimens are in the USNM.

*P. smithi*. According to Schedl, this species was described from seven specimens but only two can now be located. The holotype (♀) in the CNC is labeled: Copper Mtn., B.C., 29-X-1929, G. Stace Smith/♀/Pinus contorta/579 M/TYPE *Pityophthorus smithi* Schedl, No. 3168. The allotype bears the same data.

Both specimens are in the CNC.

**HOST.** *Pinus contorta* and possibly other pine species.

**DISTRIBUTION.** Known only from the type localities.

**REMARKS.** Adults of this species are very similar in appearance to those of *aplanatus*. The characters given in the key to species are the most obvious ones for distinguishing the species.

#### 151. *Pityophthorus (P.) aplanatus* Schedl

Figs. 154, 155

*Pityophthorus aplanatus* Schedl, 1930, p. 195; Chamberlin, 1939, p. 369; Wood, 1978b, p. 398 (= *digestus*).

Length 1.9-2.2 mm, about 2.7-2.8 times longer than wide.

**Female.** Frons weakly convex, weakly flattened or weakly transversely impressed from epistoma to upper level of eyes; longitudinal carina moderately, sharply elevated, higher than in *fuscus*, extending from epistomal margin to upper level of eyes; surface densely, closely and deeply punctured; vestiture inconspicuous. Antennal club oval, about 1.5 times longer than wide; widest through segment 2; first two sutures transverse; first two segments

together occupy about two-thirds of total club length. Pronotum about as long as wide, widest at middle; sides weakly arcuate; asperities on anterior slope small, erect, scattered in no apparent order; posterior area of disc densely punctured, punctures small, (smaller than in *fuscus*), deep and fairly close; surface between punctures shining, bearing a few minute lines and points. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctures in fairly regular rows, punctures small, somewhat shallow and close; discal interstriae 2.0 to 3.0 times wider than the striae, surface moderately shining, rugulose, marked with numerous fine lines and points. Declivity convex frequently appearing flattened; interstriae 1 slightly elevated above 2; interstriae 2 very weakly or not at all impressed, wider than 1; interstriae 3 not elevated, lower than 1 and not granulate; all interstriae moderately shining and densely, minutely reticulate to minutely rugulose; punctures of striae 1 and 2 obsolete, if visible then much smaller than those on disc.

**Male.** Frons flattened to weakly concave on each side of a strongly elevated, sharp, toothlike, longitudinal carina, this carina more strongly elevated near middle; surface on each side of carina strongly punctured. Pronotum and elytra essentially as in female.

**TYPE MATERIAL.** The holotype (♀?) in the CNC is labeled: 2929/Athabaska Falls, Alta., VIII-1919/J.M. Swaine/TYPE ♀ *aplanatus* (sic) Schedl, No. 3132. Four paratypes in the CNC bear the same data and 1 paratype in the SLWC also bears the same data.

**HOST.** *Pinus contorta* and possibly other species of pines, and *Abies lasiocarpa*.

**DISTRIBUTION.** British Columbia and Alberta to Montana. Specimens (27) examined from:

#### CANADA

**Alberta:** Cypress Hills, 24.IX.67, *Pinus contorta*, D.E. Bright (CNC) 1. **British Columbia:** Alaska Highway, Mile 169, 5.VI.58, *Pinus contorta* (CNC) 11; Stanley, I.VIII.31, *Abies lasiocarpa*, K. Graham (CASC) 7.

#### UNITED STATES

**Montana:** Glacier National Park, 30.V.72, *Pinus contorta*, D.E. Bright (CNC) 2.

**REMARKS.** Adults of this species are recognized by the distinct carina on the frons of both sexes (Fig. 154) and by the convex, unimpressed, frequently flattened elytral declivity which is devoid of granules on interstriae 1 and 3 (Fig. 155). It may be further distinguished from *fuscus* by the differently shaped pronotum in which the sides are weakly arcuate and by the much smaller pronotal and elytral punctures.

Wood (1978b) places this species as a synonym of *digestus* LeConte. While there is a considerable amount of superficial resemblance, the two species are distinct. All of the discal interstriae of *digestus* are punctured and bear distinct, short setae while in *aplanatus* only the first, third, and alternate interstriae are punctured and sometimes the second interstriae may have a few setiferous punctures. However, the fourth interstriae is always devoid of punctures except sometimes on the basal one-sixth or less. Wood (1978b) states that a population from Wyoming shows intergrades in the character states indicated above. I have not seen the Wyoming specimens, therefore I cannot test his observation. Wood may be correct but I have retained *aplanatus* as a valid species for the present.

#### 152. *Pityophthorus (P.) festus* Wood

Figs. 156, 157; Map 27

*Pityophthorus festus* Wood, 1967, p. 39; Schedl, 1977b, p. 42.

Length 1.3-1.7 mm, about 2.6 times longer than wide.

**Female.** Frons convex, slightly flattened just above epistoma, divided by a moderately elevated, longitudinal carina which extends from epistomal margin to just above upper

level of eyes; surface shining, finely densely punctured, punctures small, weakly impressed; vestiture inconspicuous. Antennal club nearly circular, very slightly longer than wide; first two sutures nearly straight; first two segments together occupy two-thirds of total club length. Pronotum about as long as wide, widest at about middle; sides weakly arcuate; asperities on anterior slope small, sometimes three to five may be basally joined into broken, irregular, arcuate rows; posterior area of disc deeply punctured, punctures rather large and close; surface between punctures shining, generally smooth but may have a few minute points and/or lines. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures moderately large and deep; discal interstriae about 2.0 times as wide as striae, largely impunctate but occasionally the third and fifth may bear 1 or 2 setose punctures on posterior half of disc, surface shining to moderately dull, marked with numerous minute lines or points. Declivity convex to flattened, steep; interstriae 1 weakly elevated, with a row of very fine setiferous granules; interstriae 2 not wider than discal width, very weakly impressed; interstriae 3 weakly elevated, very slightly higher than 1, with a median row of very fine setiferous granules and/or punctures; punctures in striae 1 and 2 distinct, smaller than those on disc.

**Male.** Virtually identical with female. Distinguishable only by abdominal segmentation.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: 18 mi. W. El Salto, Dr., Mexico, VI-7-1965, 7500 ft., S.L. Wood/Pinus/ HOLOTYPE *Pityophthorus festus* S.L. Wood '66. The allotype and 2 paratypes bear the same data.

Wood (1967) states that 4 paratypes were collected by J.B. Thomas in July 1964. The CNC contains 8 specimens labeled as paratypes of *festus* that were collected by Thomas in 1964. Six of these specimens are actually *P. festus*, 1 is *digestus* LeC. and 1 is unidentified.

**HOSTS.** *Pinus durangensis*, *leiophylla*, *oocarpa*, *tenuifolia*, and probably other species in its range.

**DISTRIBUTION.** Southeastern Arizona to El Salvador (Map 27). Specimens (127) examined from:

#### UNITED STATES

**Arizona:** Bear Canyon, Santa Catalina Mountains, 11.VI.69, *Pinus leiophylla*, S.L. Wood (SLWC) 1; Chiricahua Mountains, Cochise Co., 18.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 18.

#### MEXICO

**Chiapas:** 20 mi N of Bochil, 21.V.69, *Pinus oocarpa*, D.E. Bright (CNC) 2; 8 mi N of Ocosingo, 2.VI.69, *Pinus oocarpa*, D.E. Bright (CNC) 13; 7 mi S of Teopisca, 23.V.69, *Pinus* sp., D.E. Bright (CNC) 20. **Chihuahua:** 23 mi S of Creel, 18.VII.60, *Pinus* sp., S.L. Wood (SLWC) 3. **Durango:** 10 mi W of El Salto, VII.64, flight, J.B. Thomas (CNC) 6; 9 mi E of El Palmito, 15.VI.71, *Pinus durangensis*, D.E. Bright (CNC) 6; 23 mi W of Durango, 4.VI.65, *Pinus leiophylla*, S.L. Wood (SLWC) 2. **Mexico:** Nepantla, 9.V.71, *Pinus leiophylla*, D.E. Bright (CNC) 2; Ocoyoacac, 16.VII.69, *Pinus leiophylla*, D.E. Bright (CNC) 13. **Oaxaca:** 116 km S of Oaxaca (Highway 1½), 11.V.71, *Pinus* sp., D.E. Bright (CNC) 8. **Puebla:** 4 mi E of Zacatlán, 12.VI.67, Pine, S.L. Wood (SLWC) 1. **Veracruz:** Las Vigas, 5.VI.62, *Pinus* sp., R. Corondo P. (SLWC) 22.

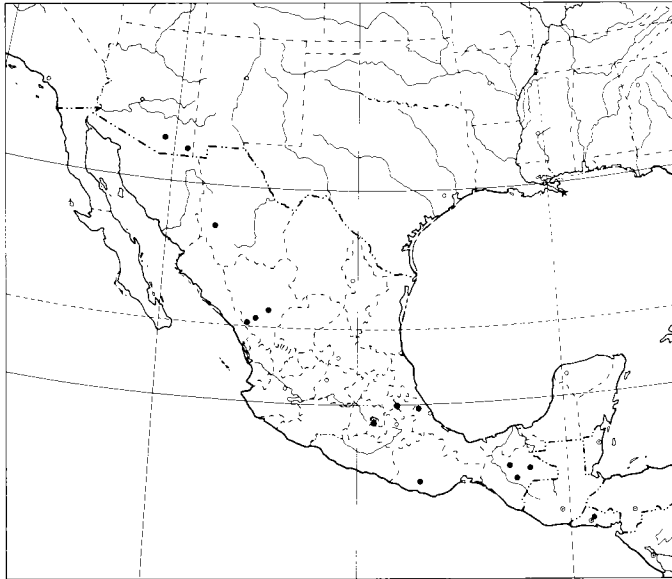
Additional locality in literature.

EL SALVADOR: Perquin, 1.III.75, *Pinus tenuifolia* (Schedl 1977b).

**REMARKS.** Adults of this species may be recognized by the presence of a distinct, longitudinal carina on the frons of both sexes (Fig. 156), by the impunctate elytral interstriae (at least on the anterior half of the disc), and by the evenly convex

to slightly flattened elytral declivity with extremely fine (at 96x) granules on interstriae 1 and 3 (Fig. 157).

Adults of this species are most likely to be confused with those of *digestus*. The adults of *digestus*, however, bear abundant setae in all elytral interstriae.



MAP 27. Collection localities for *P. (Pityophthorus) festus*.

### 153. *Pityophthorus (P.) culminicola* Bright

Figs. 158, 159

*Pityophthorus culminicola* Bright, 1977, p. 524.

Length 1.7-2.0 mm, about 2.6 times longer than wide.

**Female.** Frons convex to very weakly flattened, divided by a fine, longitudinal carina which extends from epistomal margin to about half way to upper level of eyes, this carina more strongly elevated just above epistomal margin; surface opaque, or shining, deeply punctate, punctures not especially close, rather large; vestiture sparse. Antennal club oval, about 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy more than half of total club length. Pronotum as long as wide, widest slightly behind middle; sides arcuate slightly; asperities on anterior slope erect, acute, with several basally contiguous to form short arcuate rows but not joined together to form concentric rows; posterior area of disc deeply, densely punctured, punctures somewhat large and close; surface between punctures moderately shining, frequently with minute lines and points. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures smaller than those on posterior area of pronotum; discal interstriae at least 2.0 times as wide as striae, largely impunctate except interstriae 1, 3, 5, 7, etc. each bear a few, widely scattered, setiferous punctures, surface moderately shining, subrugulose to smooth, with numerous fine lines and points. Declivity convex; interstriae 1 deeply impressed below level of 3, slightly elevated above 2, sometimes with a median row of extremely fine (at 96x) granules; interstriae 2 sulcate, slightly wider than on disc, smooth, moderately shining; interstriae 3 only weakly elevated above 4, much higher than 1, moderately shining, sometimes with a median row of extremely fine granules; punctures in striae 1 and 2 obsolete, those in 2 sometimes barely visible and much smaller than those on disc.

**Male.** Nearly identical with female except longitudinal carina on the frons more sharply elevated.

TYPE MATERIAL. The holotype (♀) in the CNC is labeled: MEX., N.L., Cerro Potosi, V.4.71, 11'500', D.E. Bright/Pinus culminicola/ HOLOTYPE Pityophthorus culminicola D.E. Bright, CNC No. 13732. The allotype and 124 paratypes bear the same data. Seven additional paratypes are labeled: Pinus culminicola/Cerro Potosi, Nuevo Leon, Mex., 111-19-1974/ M.M. Furniss, Hopk. No. 58606B.

Most of the type material is in the CNC, additional paratypes are in the SLWC, the KESC, and the USNM.

DISTRIBUTION. Known only from the type locality in Nuevo León.

HOST. *Pinus culminicola*.

REMARKS. The adults of this species are most easily recognized by the somewhat deeply impressed elytral declivity (Fig. 159), by the large, deep pronotal punctures, and by the weakly elevated longitudinal carina on the frons of both sexes (Fig. 158).

#### 154. *Pityophthorus (P.) pellitus* Schedl

Figs. 160-162; Map 28

*Pityophthorus pellitus* Schedl, 1956, p. 23; Schwerdtfeger, 1957, p. 500; Bright, 1976c, p. 186 (lectotype desig.).

Length 1.4-1.8 mm, about 2.6 times as long as wide.

**Female.** Frons weakly flattened to weakly transversely impressed from epistoma to near upper level of eyes; longitudinal carina low, weakly elevated frequently absent, if present then extending from epistomal margin to near upper level of eyes; surface shining, densely punctate-rugulose. Antennal club 1.4-1.5 times longer than wide, widest through segment 2, first two sutures transverse; first two segments together occupy about two-thirds of total club length. Pronotum about 1.1 times longer than wide, widest behind middle; sides arcuate; asperities on anterior slope very low, small, scattered in no apparent order; posterior area of disc weakly punctured, punctures varying from small, obscure and shallow to moderately large and deep; surface between punctures moderately shining to very opaque, marked with numerous lines and points which obscure the definition of punctures. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in somewhat irregular rows, punctures of moderate size, about equal in size to those on posterior area of pronotum, shallow and close, setae longer than diameter of a puncture; discal interstriae about 2.0 times as wide as striae, surface dull to moderately shining, coarsely minutely reticulate, reticulation obscuring the definition of strial and interstitial punctures; interstriae 1 and 3 always bearing a median row of setiferous punctures, 2 usually bearing a few scattered setiferous punctures and frequently 4 bears a few setiferous punctures, especially on the basal area, setae almost as long as interstitial width. Declivity convex, steep; interstriae 1 weakly elevated above 2, equal in height to 3, frequently with a few, very small granules in a median row; interstriae 2 very weakly sulcate, essentially unmodified; interstriae 3 weakly elevated, equal in height to 1, bearing a few very small, widely separated granules; punctures of striae 1 and 2 obscure, not readily visible.

**Male.** Almost identical with female and most easily distinguished by abdominal segmentation; carina on frons slightly more strongly elevated, and granules on declivital interstriae 1 and 3 slightly larger.

TYPE MATERIAL. The number of specimens in the type series was not recorded by Schedl and no holotype was designated. Two specimens are in the collection of Schedl and 3 specimens are in the Schwerdtfeger collection. The lectotype (♀), designated by Bright (1976b), is in the KESC and bears the labels: Quezaltenango, Pin. rud., 6-9-1951, 2350 m., Guatemala, leg. F. Schwerdtfeger/♀/57/Type Pityophthorus pellitus Schedl/LECTOTYPE Pityophthorus pellitus Schedl, D.E. Bright, 1976. The remaining specimens in the KESC and the Schwerdtfeger collection were designated paralectotypes. All bear the same data.



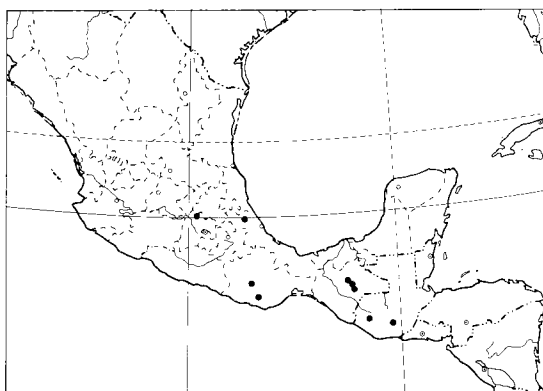
HOSTS. *Pinus lawsoni*, *michoacana*, *montezumae*, *oocarpa*, *pseudostrobus*, *rudis*, *tenuifolia*, and probably other species in its range.

DISTRIBUTION. Central Mexico to Guatemala (Map 28). Specimens (230) examined from:

#### MEXICO

**Chiapas:** 20 mi N of Bochil, 21.V.69, *Pinus oocarpa*, D.E. Bright (CNC) 1; San Cristobal and vicinity, V-VI.69, *Pinus montezumae* and *Pinus* sp., D.E. Bright (CNC) 110; 7 mi SW of Teopisca, 23.V.69, *Pinus* sp., D.E. Bright (CNC) 20. **Oaxaca:** 26 mi SE of Nochixtlán, 17.V.67, *Pinus*, S.L. Wood (SLWC) 3; 75 mi S of Oaxaca (Highway 131), 30.V.71, *Pinus michoacana*, D.E. Bright (CNC) 1; 115 mi S of Oaxaca (Highway 131), 27-30 V.71, *Pinus lawsoni*, D.E. Bright (CNC) 43; 3.5 mi S of Suchixtepec, 2.VI.71, *Pinus oocarpa*, D.E. Bright (CNC) 8. **Puebla:** 6 mi NE of Teziutlán, 2.VII.67, *Pinus*, S.L. Wood (SLWC) 6. **Querétaro:** 2 mi E of Pinal de Amoles, 11.V.71, *Pinus* sp., D.E. Bright (CNC) 3.

GUATEMALA: Ciudad, 29.XII.51, *Pinus tenuifolia*, F. Schwerdtfeger (FSC) 1. Guatemala City, 30.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 16; Quezaltenango, 26.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 9; San Cristobal, 28.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 2; San Juan, 7 and 14.IX.51, *Pinus rudis*, F. Schwerdtfeger (FSC) 1; Tonicapán, 28.V.64, *Pinus pseudostrobus*, S.L. Wood (SLWC) 1.



MAP 28. Collection localities for *P. (Pityophthorus) pellitus*.

BIONOMICS. Schwerdtfeger (1957) gives a brief account of the biology of this species. The gallery pattern is vague and irregular. The nuptial chamber and the egg galleries are not clearly defined. After penetrating the bark, the adults construct an irregular chamber which is deeply cut into the wood. From this chamber, irregular extensions are constructed. Eggs are laid in relatively large egg niches cut along the walls of these extensions. In thin twigs, the adults penetrate into the pith which is bored out in the shape of a central gallery. The larval galleries are close together, in the bark but also extending into the pith. Pupal chambers are in the bark and in the central pith.

REMARKS. Adults of *pellitus* are distinguishable by the very faint longitudinal carina on the frons of both sexes (sometimes absent in female) (Figs. 160, 161), by the very weakly impressed elytral declivity (Fig. 162), and by the abundant and conspicuous elytral pubescence.

The series of 20 specimens from 7 miles southwest of Teopisca, Chiapas vary slightly from the types and the other specimens examined. The specimens of this series have the strial rows on the elytra more regular and the setae of both striae and interstriae shorter. The strial setae is not much longer than the diameter of a puncture and the interstitial setae are only slightly longer. In addition, elytral interstriae 2 and 4 are always completely impunctate, not occasionally sparsely punctured as in the type. These differences are almost enough to warrant the description of the Teopisca specimens as a distinct species but I hesitate to do so in this case. Occasional specimens of *pellitus* approach the conditions described above and no distinctions could be found in a comparison of the male genitalia of the Teopisca series and another series definitely identified as *pellitus*.

Other series from southern Mexico also varied from the type in such features as the elytral punctation, the presence or absence and the degree of elevation of the frontal carina, and in other less obvious characters. It is, therefore, possible that *pellitus* as it is considered here may eventually be broken into one or more additional species.

### 155. *Pityophthorus* (*P.*) *opaculus* LeConte

Figs. 163-165; Map 29

*Pityophthorus opaculus* LeConte, 1878b, p. 623; Hagedorn, 1910, p. 73; Swaine, 1918, p. 99; Blackman, 1928, p. 52; Chamberlin, 1939, p. 366; Craighead, 1950, p. 331; Baker, 1972, p. 255.

*Pityophthorus abietis* Blackman, 1928, p. 49; Chamberlin, 1939, p. 365; Bright, 1977, p. 517 (= *opaculus*).

*Pityophthorus albertensis* Blackman, 1928, p. 50; Chamberlin, 1939, p. 365; Chamberlin, 1958, p. 149; Wood, 1971a, p. 425; Bright, 1977, p. 517 (= *opaculus*).

*Pityophthorus exiguus* Blackman, 1928, p. 51; Chamberlin, 1939, p. 366; Bright, 1977, p. 517 (= *opaculus*).

*Pityophthorus pygmaeus* Schedl, 1931, p. 165; Chamberlin, 1939, p. 366; Wood, 1957, p. 401 (= *opaculus*).

Length 1.3-1.8 mm, about 2.9 times longer than wide.

**Female.** Frons convex, weakly flattened or weakly transversely impressed, frequently divided by a faint longitudinal carina which may extend from epistomal margin to just below upper level of eyes; surface distinctly punctured, punctures deep and rather close; vestiture sparse. Antennal club 1.5 times longer than wide, widest through segment 2; suture 1 and 2 transverse; first two segments together occupy about two-thirds of total club length. Pronotum as long as wide, widest at posterior angles; sides weakly arcuate to subparallel; asperities on anterior slope small, erect, isolated or two or three may be contiguous, scattered in no apparent order; posterior area of disc weakly punctured, punctures shallow, indistinct and close, lateral or posterior margin of each puncture elevated slightly resulting in a granulate appearance on the surface; surface between punctures brightly to moderately shining, smooth to minutely reticulate. Elytra about 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures small, shallow and indistinct; discal interstriae about 1.5-2.0 times wider than striae, surface moderately to brightly shining, smooth to minutely reticulate; vestiture inconspicuous. Declivity convex; interstriae 1 slightly elevated, with a median row of extremely fine granules, these sometimes absent; interstriae 2 as wide as discal width, not sulcate; interstriae 3 not elevated, equal in height to 2, devoid of granules; punctures of striae 1 and 2 obscure, not readily visible.

**Male.** Almost identical with female and most easily distinguished by abdominal segmentation. In addition, the carina on the frons, if present, is slightly more strongly elevated.

**TYPE MATERIAL.** *P. opaculus*. This species was described from one specimen. The holotype, in the LeConte collection at the MCZ, bears the labels: Marquette,

Mich. 3.7/type 1290/123/opaculus LeC./ HOLOTYPE *Pityophthorus opaculus* LeConte.

*P. abietis*. The holotype (♀) in the USNM is labeled: Hopk. U.S. 3168/Silver Lake, Utah/*Abies lasiocarpa*/L. Fetherolf, collector/ ♀/TYPE *Pityophthorus abietis* Blackman/Type No. 41275 U.S.N.M. The allotype and 17 paratypes in the USNM bear the same data; 1 paratype in the CNC also bears the same data. Additional paratypes are labeled: Sta. Catalina Mts., Ariz./J.L. Webb collr/Hopk. U.S. 5621, 5726, 5737, and 5794 (23 in USNM, 1 in DFEC); Hopk. U.S. 5763/Sacramento Mtns., N.M./J.L. Webb, collr/*Pseudotsuga taxifolia* (4 in USNM, 1 in DFEC); Great Basin Expt. Sta., Utah/Aug. 20-25, 1918/C.F. Koration, collr/*Abies lasiocarpa* (4 in USNM, 1 in DFEC) and Hopk. U.S. 6565/Chiricahua For. Res./collected by J.S. Holmes (5 in USNM, 1 in DFEC).

*P. albertensis*. The holotype (♀) in the USNM bears the data: Banff Sp., Alb. 10-6/coll. Hubbard and Schwarz/♀/TYPE *Pityophthorus albertensis* Blackman/Type No. 41276 U.S.N.M. The allotype and 16 paratypes in the USNM and the 1 paratype in the CNC bear the same data.

*P. exiguus*. The holotype (♀) in the USNM bears the labels: Hopk. U.S. 6345/Ft. Garland, Colo./*Picea engelmanni*/A.D. Hopkins, collector/ TYPE *Pityophthorus exiguus* Blackman/Type No. 41277 U.S.N.M. The allotype and 5 paratypes bear the same data. Additional paratypes are labeled: Garland, Colo./coll. Hubbard and Schwarz (1 in USNM); Hopk. U.S. 6252 c (1 in USNM) and Kiabab N.F. Ariz., 6.22.25/M.W. Blackman, collector/N.Y.S. coll. For. Lot No. K-53/*Picea parrayana* (5 in USNM, 1 in DFEC, and 1 in CNC).

*P. pygmaeus*. The holotype (♀) in the CNC bears the labels: TYPE *Pity. Pygmaeus* Schedl, No. 3169/82. The locality where the specimen was taken is St. Anne's, Quebec but this information is not on the holotype labels; it is on one of the paratypes. Two paratypes are in the CNC.

HOSTS. *Abies balsamea*, *concolor*, *lasiocarpa*; *Larix laricina*; *Picea engelmannii*, *glauca*, *mariana*, *rubens*; *Pinus contorta*, *flexilis*; *Pseudotsuga menziesii*. Probably occurs in most conifers in its range.

DISTRIBUTION. Throughout North America north of Mexico except in the southeast (Map 29). Specimens (847) examined from:

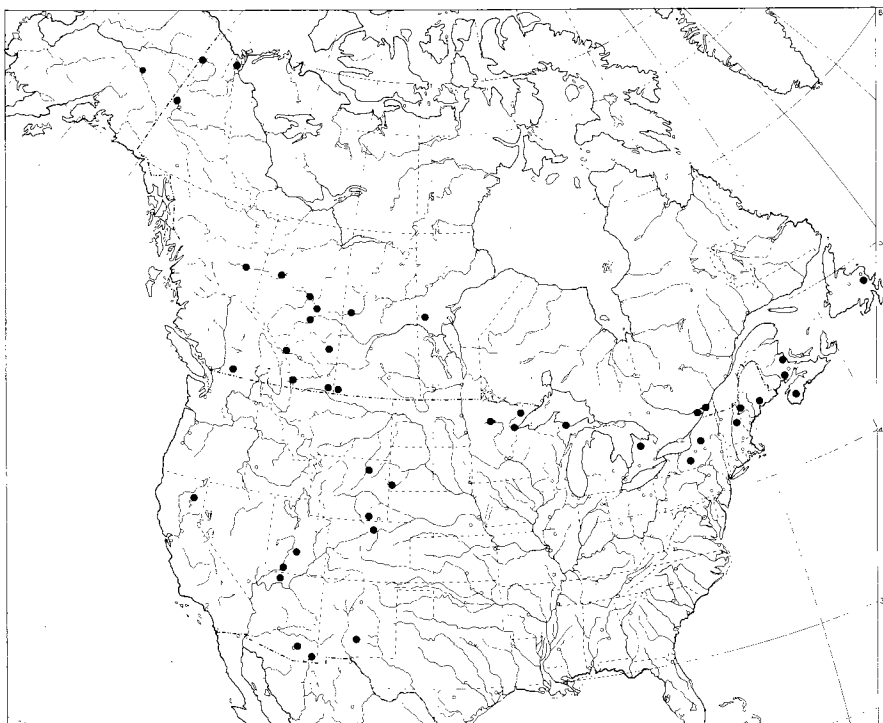
#### CANADA

**Alberta:** Athabasca Landing (CNC) 2; Banff, 7.IX.67, *Pinus flexilis*, D.E. Bright (CNC) 11; Burmiss, 23.VIII.65, *Pinus flexilis* (CNC) 1; Consort, 6.X.65, *Picea glauca* (CNC) 3; Cypress Hills, 24.IX.67, *Picea glauca*, D.E. Bright (CNC) 7; Edmonton, 28.VIII.15, Larch small branches, F.S. Carr (CNC) 1; Johnson Canyon, Banff National Park, 13.IX.67, *Pinus contorta*, D.E. Bright (CNC) 4; 10 miles W of Peace River, 12.VII.72, *Pinus contorta*, D.E. Bright (CNC) 1. **British Columbia:** 5 mi E of Chetwynd, 11.VII.72, *Pinus contorta*, D.E. Bright (CNC) 4; Copper Mountain, 1.XII.29, *Pinus contorta*, G. Stace Smith (UBC) 22. **Manitoba:** Grass River Provincial Park, 27.VII.72, *Picea glauca*, D.E. Bright (CNC) 28. **Newfoundland:** Middle Brook Provincial Park, 27.VII.70, *Picea rubens*, D.E. Bright (CNC) 31. **New Brunswick:** Portage Vale, 14.VII.70, *Abies balsamea* and *Picea glauca*, D.E. Bright (CNC) 2; Kouchibouguac National Park, VIII.77, D.E. Bright (CNC) 12. **Northwest Territories:** Aklavik, 18.VI.31, O. Bryant (SLWC, CASC) 18. **Nova Scotia:** Kejimikujik National Park, 16-17, VII.70, *Picea glauca*, D.E. Bright (CNC) 29. **Ontario:** Chatsworth, 31.VII.65, *Picea glauca*, R. Bowser (CNC) 4; Mer Bleu, 24.VI.54, Black spruce, S.L. Wood (SLWC) 2. **Quebec:** Gaspe Co., 2.VIII.33, *Picea canadensis*, E.B. Watson (CNC) 5; Hudson, 6.VI.10, Larch twig, J.M. Swaine (CNC) 1. **Saskatchewan:** Cypress Hills, 3.IX.67, *Picea glauca*,

D.E. Bright (CNC) 17; Meadow Lake Provincial Park, 20.VII.72, *Picea glauca*, D.E. Bright (CNC) 10. **Yukon Territory:** Fortymile, 17.VI.28 (USNM) 7; Rampart House, 25.V.51, J.E.H. Martin (CNC) 3.

#### UNITED STATES

**Alaska:** Bonanza Creek, Fairbanks, Summer 1979 (INFA) 3. **Arizona:** See type material. **California:** Blacks Mountain, Lassen National Forest, 8.VIII.40, *Abies concolor*, C. Eaton (DEBC) 5; Swarthout Valley, 28.VI.25, *Abies concolor*, J.M. Miller (USNM) 1. **Colorado:** Loveland, *Pinus flexilis* (RMSC) 1. **Maine:** Orono, 5.VIII.19, M.W. Blackman (UMDE) 5; Rangeley, 6.VIII.70, *Picea* sp., D.E. Bright (CNC) 7. **Michigan:** See type material. **Minnesota:** Cass Lake, 7.VII.36, White spruce, H.R. Dodge (SLWC) 1; Cloquet, 8.IX.36, Norway pine, H.R. Dodge (SLWC) 2; Ely, 12.IX.36, White spruce, H.R. Dodge (SLWC) 27; Floodwood, 3.VIII.68, *Larix laricina* (USNM) 1. **Nevada:** Bear Creek Summit, Elko Co., 2.VII.61, *Abies lasiocarpa*, J.D. Maloney (SLWC) 15. **New Hampshire:** Mt. Washington, 6.VIII.70, *Picea* sp., D.E. Bright (CNC) 5. **New Mexico:** Capitan Mountains, *Pseudotsuga taxifolia*, J.L. Webb (DFEC) 1. **New York:** Cranberry Lake, various dates 1921, M.W. Blackman (DFEC) 339; Ithaca (CNC) 4; Sevey, 8.VIII.70, *Picea* sp., D.E. Bright (CNC) 45. **South Dakota:** 2 mi E of Cheyenne Cross, 18.VI.68, *Picea glauca*, S.L. Wood (SLWC) 28. **Utah:** Pin Hollow, Fishlake National Forest, 9.VI.60, *Pinus flexilis*, D.E. Bright (CNC) 1; Widstoe, 22.III.38, *Pseudotsuga taxifolia*, D. DeLeon (RMSC) 12. **Wyoming:** 18 mi SW of Buffalo, 20.VI.68, *Picea engelmannii*, S.L. Wood (SLWC) 3; Medicine Bow National Forest, 27.I.38, *Pseudotsuga taxifolia* (8) and *Pinus flexilis* (1), D. DeLeon (RMSC) 9.



MAP 29. Collection localities for *P. (Pityophthorus) opaculus*.

REMARKS. This is a very common species across Canada and the northern United States. It evidently becomes less common as one proceeds southward

through the western United States. The species is very variable, the adults showing a considerable range of variation in most morphological characters. However, an examination of nearly a thousand specimens from all areas of its range showed that no character was sufficiently consistent to warrant the continued recognition of several species.

Adults are most easily recognized by the evenly convex elytral declivity on which interstriae 1 is only weakly elevated (Fig. 165), by the convex, flattened or transversely impressed frons which bears a weak (sometimes absent) longitudinal carina (Figs. 163, 164), and by the interstitial punctures being present only on the first, third, and alternate interstriae (Fig. 165). This latter character serves to distinguish *opaculus* from *puberulus* LeConte, a species that is also common in eastern North America.

#### DENTIFRONS GROUP

Eight species are included in this group. They may be distinguished by the distinct, sharply elevated, longitudinal carina on the male frons (as in Fig. 170), by the abundant setae on the frons of the female (as in Fig. 169), by the evenly convex to weakly sulcate declivity, and by the other characters mentioned in the key.

This group seems to be a composite of several subgroups. *P. setosus* could reasonably be placed in a group of its own, *aquilus*, *carinulatus* and *dentifrons* also could form their own group, and the remaining species could be included in a third group. This grouping would not help in organizing the species for identification purposes, so is not adopted here.

#### KEY TO SPECIES IN THE Dentifrons group

1. Elytral apex of female densely setose, especially on interstriae 3 and 4 and along posterior lateral margin, setae much longer than other setae on elytra (Fig. 168); setae on elytral apex of male much shorter, but also numerous and densely placed on declivital interstriae 3 and 4; declivity of both sexes sloping; California . . . . . 156. *setosus* Blackman (p. 222)
  - Elytral apex of female not bearing long, densely placed setae; setae on elytral apex of male not numerous; declivity of both sexes usually convex . . . . . 2
2. Declivital interstriae 3 with prominent granules; declivital interstriae 2 slightly to deeply sulcate, wider than discal width . . . . . 3
  - Declivital interstriae 3 devoid of granules, or, if granules present, then they are extremely minute; declivital interstriae 2 equal or nearly equal in width to discal width . . . . . 6
3. Granules on declivital interstriae 3 large, each bearing a very long seta; declivital interstriae 2 moderately to deeply sulcate; punctures on posterior portion of pronotum large, deep, and almost touching; Mexico . . . . . 157. *rudis* Blackman (p. 223)
  - Granules on declivital interstriae 3 small, associated setae very short; declivital interstriae 2 weakly to moderately sulcate; punctures on posterior portion of pronotum smaller, more widely separated . . . . . 4
4. Surface of male frons dull, densely, minutely reticulate between punctures, especially above upper eye level; granules on declivital interstriae 3 very small to moderate in size . . . . . 5
  - Surface of male frons shining between punctures, may be weakly reticulate (Fig. 170); granules on declivital interstriae 3 larger (Fig. 171); Alberta to New Mexico, west to California . . . . . 158. *aquilus* Blackman (p. 224)
5. Occurs in eastern North America, west to Minnesota and Ontario; granules on declivital interstriae 3 prominent . . . . . 159. *dentifrons* Blackman (p. 226)
  - Occurs in southwestern United States; granules on declivital interstriae 3 very small . . . . . 160. *carinulatus* Swaine (p. 228)
6. Distal striae punctures close, deeply impressed, giving appearance that striae are impressed, interstriae appearing convex; declivity slightly flattened; coastal areas of California . . . . . 161. *umidus* Blackman (p. 229)

- Distal striae punctures not deeply impressed, striae not appearing impressed, interstriae flat; declivity convex . . . . . 7
- 7. Western North America; female frons flattened to distinctly concave in center, pubescence abundant, setae on periphery much longer and incurved (Fig. 172); punctures in declivital striae 1 and 2 obsolete (Fig. 174) . . . . . 162. *absonus* Blackman (p. 230)
- Southern Mexico; female frons flattened, pubescence sparse, setae on the periphery only slightly longer than others; punctures in declivital striae 1 and 2 reduced but not obsolete . . . . . 163. *abstrusus* Bright (p. 232)

### 156. *Pityophthorus (P.) setosus* Blackman

Figs. 166-168

*Pityophthorus setosus* Blackman, 1928, p. 77; Bright & Stark, 1973, p. 109.

Length 1.8-2.3 mm, about 2.8 times longer than wide.

**Female.** Frons broadly flattened from well above eyes to epistoma and nearly from eye to eye, sometimes faintly concave in center; surface densely punctured except for a median, smooth space just above epistomal margin, punctures usually close and deep; vestiture abundant, consisting of long, yellowish setae scattered over flattened portion of surface, those setae on periphery much longer than others and incurved. Antennal club elongate-oval, about 1.5 times longer than wide, widest through segment 2; first two sutures transverse, straight; first two segments together occupy two-thirds or more of total club length. Pronotum 1.1 times as long as wide, widest at about middle; sides moderately arcuate; asperities on anterior slope rather low, broad, scattered in no apparent order; posterior area of disc moderately shining, punctures large, deep and close; surface between punctures smooth to minutely rugose or subgranulate. Elytra 1.8-1.9 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures rather large and deeply impressed; discal interstriae about as wide as or slightly wider than striae, surface shining, minutely punctate and/or reticulate. Declivity sloping; interstriae 1 weakly impressed below level of interstriae 3, bearing a median row of fine, setiferous granules; interstriae 2 weakly sulcate, smooth, moderately shining; interstriae 3 not distinctly elevated but higher than 1, bearing numerous, randomly placed, setiferous granules; punctures in striae 1 and 2 obsolete, usually only weakly visible if at all. Vestiture on declivity very long, densely placed, especially on third and fourth interstriae and on posterior lateral margins.

**Male.** Frons deeply, transversely impressed from epistoma to upper level of eyes, impression divided by a distinct, strongly elevated, toothlike, longitudinal carina; vestiture inconspicuous. Pronotum and elytra as in female except punctures more distinct. Declivity sloping; interstriae 2 broader and more distinctly sulcate; long, dense pubescence absent, setae short, very fine in interstriae 1, 3, 4, etc.; interstitial granules sparser and smaller than in female.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the labels: Hopk. U.S. 1078 c/♀/Hopkins, colr., Monterey, Cal./Pinus radiata/TYPE *Pityophthorus setosus* Blackman/Type No. 41292 U.S.N.M. One paratype bears the same labels. The allotype and 4 paratypes in the USNM are labeled: Hopk. U.S. 1089/Hopkins. colr., Delmont, Cal./Pinus sylvestris and the paratype labels. Additional paratypes are labeled: 1, Monterey, Cal., 12-6, E.A. Schwarz, coll; 2, Pacific Grove, Cal., III-26-27/ M.W. Blackman coll/K-266/Pinus muricata; 2 Pacific Grove, Cal., III-23-27/ M.W. Blackman, coll/K-253/Pinus radiata; 5, Pacific Grove, Cal., III-23-27/ M.W. Blackman, coll/K-260/ Pinus radiata. One specimen in the DFEC, bearing a paratype label but not listed by Blackman (1928), bears the additional labels: Hopk. U.S. 13204 / F.P. Keen, colr./ Pinus muricata/Inverness, Cal./Jan. 18, 1915.

Most of the type material is in the USNM, paratypes are in the CNC and the DFEC.

**HOSTS.** *Pinus muricata* and *radiata*.

**DISTRIBUTION.** Endemic to the coastal regions of California from Monterey County to Marin County. Specimens (121) examined from:

## UNITED STATES

**California:** Carmel, 5.XII.13 (OSUC) 2; Monterey, 13.IV.62, *Pinus radiata*, D.E. Bright (DEBC) 8; Point Reyes, 11.XI.61, *Pinus muricata*, D.E. Bright (CNC) 2; San Francisco, 24.XII.65, *Pinus radiata*, H.B. Leech (CASC, CNC) 52; Tunitas Creek at Highway 1, San Mateo Co., 3.XII.66, *Pinus radiata*, H.B. Leech (CASC) 39.

REMARKS. Adults of this distinctive species are easily recognized by the dense, stiff, long setae on the posterior portion of the elytra of the female (Fig. 168), by the broadly sulcate elytral declivity of the male which is devoid of long setae, by the sharply elevated, longitudinal carina on the frons of the male (Fig. 167), and by the restricted distribution.

157. *Pityophthorus (P.) rudis* Blackman

*Pityophthorus rudis* Blackman, 1942, p. 212.

Length 2.4-2.8 mm, about 2.8 times longer than wide.

**Female.** Frons flattened to weakly concave on a large area extending from the epistomal margin to well above upper level of eyes and laterally from eye to eye; surface shining, with numerous, fine punctures, these closer on upper half and along lateral margins; vestiture abundant, consisting of moderately long, erect, yellowish setae scattered over surface, those on periphery longer and incurved, setae along epistoma moderately long. Antennal club oval, 1.4-1.5 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest at middle; sides broadly arcuate; asperities on anterior slope erect, moderately large, isolated, and scattered in no apparent order; posterior area of disc densely punctured, punctures large, deep and almost touching; surface between punctures dull, densely minutely reticulate. Elytra about 1.9 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, about equal in size to those on posterior portion of pronotum and more deeply impressed, each puncture bearing a short, recumbent seta; discal interstriae about as wide or slightly wider than striae, surface dull, minutely reticulate, nearly impunctate. Declivity rather deeply bisulcate; interstriae 1 impressed below level of 3, bearing a median row of about a dozen, very small, fine granules; interstriae 2 moderately to deeply impressed, broader than discal width, surface shining, and minutely reticulate; interstriae 3 strongly elevated, distinctly higher than 1, bearing about 8 large granules, these much larger than those in interstriae 1 and each bearing a very long, fine seta from the posterior margin; punctures in striae 1 and 2 obsolete.

**Male.** Frons flattened from epistoma to upper level of eyes, with a strongly elevated, laterally flattened, toothlike carina on lower half, remainder of surface densely and strongly punctured with scattered, moderately long setae. Pronotum as in female except asperities, serrations, and punctures stronger. Elytra essentially as in female. Declivity shallower than in female and interstriae 3 less strongly elevated.

TYPE MATERIAL. The holotype (♀) of this species is in the USNM and bears the data: 669/Amecameca, Mex., 1/28/36/Pinus/D. De Leon colr/ Type No. 55987 U.S.N.M. Two paratypes bear the same data. The allotype and 4 paratypes also bear the same data except the host is *Abies religiosa* (see remarks).

HOSTS. *Pinus* spp.

DISTRIBUTION. Known only from the type locality in central Mexico.

REMARKS. Blackman's type series of eight specimens actually contained two species. The allotype and four paratypes from *Abies religiosa* were recognized as an undescribed species and have been given the name *blackmani* Bright (1977).

Adults of *rudis* can be distinguished from other members of the group by the deeply, closely punctured posterior portion of the pronotum, by the difference in size of the granules on the first and third declivital interstriae, and by the distribution.

158. *Pityophthorus (P.) aquilus* Blackman

Figs. 169-171; Map 30

*Pityophthorus aquilus* Blackman, 1928, p. 33; Chamberlin, 1939, p. 358; Bright, 1977, p. 514 (= *carinulatus*); Wood, 1977a, p. 209.

*Pityophthorus caelator* Blackman, 1928, p. 78; Chamberlin, 1939, p. 378; Bright, 1977, p. 514 (= *carinulatus*); Wood, 1977a, p. 209.

*Pityophthorus aristatae* Bright, 1964, p. 166; Bright 1971, p. 67 (= *opimus*).

Length 1.9-2.1 mm, about 2.7 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistoma to above upper level of eyes and laterally nearly from eye to eye, frequently bearing a very weakly elevated carina or a weakly elevated epistomal callus; surface shining, finely and densely punctured, sometimes a longitudinal median area extending across flattened area is impunctate, punctures very small and close; vestiture sparse to abundant, moderately long, those setae on periphery longer and incurved, sometimes a glabrous, longitudinal, median space is present extending across flattened area. Antennal club oval, slightly less than 1.2 times longer than wide, widest through segment 2 (sometimes widest through 2); suture 1 weakly but distinctly arcuate, 2 more strongly arcuate; first two segments together occupy slightly less than half of total club length. Pronotum about as long as wide, widest just behind summit; sides moderately arcuate; asperities on anterior slope small, especially near summit, arranged in no apparent order; posterior of disc area densely punctured, punctures deep and usually close; surface between punctures brightly shining, smooth to very faintly minutely reticulate. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep and close; discal interstriae about 2.0 times wider than striae, surface smooth, minutely reticulate; interstriae 1, 3, 5, 7 each bearing a row of widely separated, setiferous punctures. Declivity evenly convex, weakly bisulcate; interstriae 1 narrow, distinctly but slightly elevated, bearing a median row of distinct, fine granules; interstriae 2 widened, weakly to moderately sulcate, moderately opaque, minutely reticulate; interstriae 3 equal in height to interstriae 1, bearing a median row of fine to moderate granules; punctures in striae 1 and 2 obsolete, sometimes weakly visible. Vestiture sparse, inconspicuous.

**Male.** Frons flattened to concave on each side of a strongly elevated, almost toothlike longitudinal carina; surface between punctures shining, may be weakly reticulate; vestiture short, inconspicuous. Segment 1 of antennal club equal in width to 2, club widest through 2. Pronotum and elytra as in female except punctures slightly deeper and coarser. Declivity essentially as in female except interstriae 2 slightly more deeply sulcate and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** *P. aquilus*. The holotype (♀) in the USNM bears the data: Kaibab N.F., Ariz., VI-28-26/M.W. Blackman collector/Pinus ponderosa/K-187/TYPE *Pityophthorus aquilus* Blackman/Type No. 41268 U.S.N.M. The allotype and 12 paratypes bear the same data.

Most of the type material is in the USNM, paratypes are in the CNC and the DFEC.

*P. caelator*. The holotype (♀) in the USNM bears the labels: Hopk US 5430/Blck Hills, S.D./J.L. Webb, collector/Pinus ponderosa/TYPE *Pityophthorus caelator* Blackman/Type No. 41293 USNM. The allotype and 60 paratypes were also in the original type series but some of the paratypes cannot now be located. The allotype and 1 paratype bear the same data as the holotype; 10 paratypes are labeled: Hopk. U.S. 5430, J.L. Webb, coll./Custer, S.D./Pinus ponderosa; 3 paratypes are labeled: Hopk U.S. 5424a/Black Hills, S.D./J.L. Webb, coll./Pinus ponderosa; 2 paratypes are labeled: Hopk U.S. 6273/W.D. Edmonston/Larkspur, Colo/ Pinus ponderosa; 5 paratypes are labeled: Hopk U.S. 6347a; and 49 paratypes are labeled: Kiabab N.F., Ariz., various dates in 1925 and 1926/M.W. Blackman, collector/Pinus ponderosa.



Most of the type material is in the USNM, paratypes are in the CNC and the DFEC.

*P. aristatae*. The holotype (♀) in the CAS bears the labels: CALIF, Crooked Cr., 9500', White Mts., Mono Co., 3 airline mi. N. Inyo Co. line, VII-4-61/emerged XII-24-62, reared from *Pinus aristata* limb, J. Powell, No. 6165/HOLOTYPE *Pityophthorus aristatae* Bright. The allotype and 8 paratypes bear the same data.

Type material is in the CAS, the CIS, and the DEBC.

HOSTS. *Pinus aristata*, *contorta*, *flexilis*, and *ponderosa*.

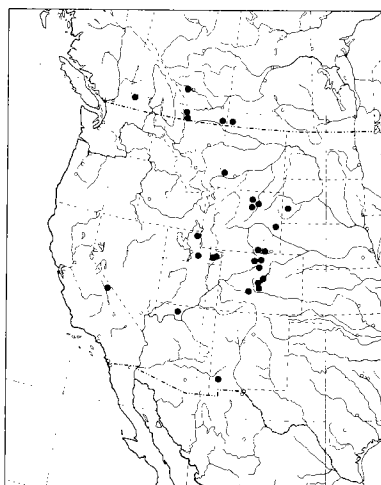
DISTRIBUTION. Western North America (Map 30). Specimens (536) examined from:

#### CANADA

**Alberta:** Burmis, various dates 1968, *Pinus flexilis* (CNC, NFRCE) 5; 27 miles west of Calgary, 11.IX.67, *Pinus flexilis*, D.E. Bright (CNC) 52; Cypress Hills, 24.IX.67, *Pinus contorta*, D.E. Bright (CNC) 54; 25 mi SW of Nanton, 1.VIII.69, *Pinus flexilis*, A.K. Raske (CNC) 5; 25 mi NE of Radium, 5.XI.64, *Pinus contorta* (NFRCE) 1; Waterton Lakes National Park, 19.X.66, *Pinus flexilis* (NFRCE) 7. **British Columbia:** Highland Valley, 29.VII.63, *Pinus contorta* (CNC) 2; Okanagan Center, 29.VIII.59, *Pinus ponderosa* (CNC) 2. **Saskatchewan:** Cypress Hills, 3.IX.67, *Pinus contorta*, D.E. Bright (CNC) 36.

#### UNITED STATES

**Arizona:** See type material. **California:** 10 mi N of Westgard Pass, 6.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 21. **Colorado:** Bailey, 30.V.45, *Pinus ponderosa*, T.T. Terrell (RMSC) 5; Buckhorn Creek, Larimer Co., 25.IV.69, *Pinus contorta*, R.E. Stevens (CNC, RMSC) 6; Colorado National Forest, various dates 1927, *Pinus ponderosa*, M.W. Blackman (DFEC) 37; Estes Park, 16.VII.58, *Pinus contorta*, D.E. Bright (DEBC) 2; Estes Park, 30.VIII.57, *Pinus ponderosa* (RMSC) 4; Evergreen, 1.VIII.37, *Pinus ponderosa* (RMSC) 5; Evergreen, *Pinus aristata*, D. DeLeon (RMSC) 1; 30 km W of Fort Collins, 28.VI.71, *Pinus contorta*, R.E. Stevens (RMSC) 23; 2 mi E of Gould, 12.VI.68, *Pinus contorta*, S.L. Wood (SLWC) 6; 6 mi W of Monarch Pass, 5.VI.64, *Pinus murrayanae*, C.W. O'Brien (DEBC) 6; Mount Manitou, 25.I.14, *Pinus flexilis*, A.B. Champlain (USNM) 4; Pingree Park, Larimer Co., 24.VIII.53, *Pinus flexilis*, S.L. Wood (SLWC) 1; 5 mi W of Woodland Park, Teller



MAP 30. Collection localities for *P. (Pityophthorus) aquilus*.

Co., 6.VI.64, *Pinus ponderosa* C.W. O'Brien (DEBC) 2. **Montana:** near Melville, Sweetgrass Co., 21.VII.72, *Pinus flexilis*, S. Kohler (MDFC, CNC) 16. **New Mexico:** 5 mi N of Mimbres, 6.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 2. **South Dakota:** 2 mi E of Cheyenne Cross, 18.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 3; 7 mi W of Custer, 16.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 9. **Utah:** Logan Canyon, 26.VII.46, *Pinus flexilis*, S.L. Wood (SLWC) 8; North Fork Provo River, Wasatch National Forest, 8.VI.58, *Pinus contorta*, D.E. Bright (DEBC) 1; Vernal, 15.VI.67, Lodgepole pine, W.H. Klein (SLWC) 2; White Rocks, 10.VIII.68, Lodgepole pine, C.K. Lister (SLWC) 2. **Wyoming:** 16 mi SW of Buffalo, 20.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 9; Bighorn Mountains, Sheridan Co., 7.VII.75, D.E. Bright (CNC) 7; Cold Springs, *Pinus contorta*, D. DeLeon (RMSC) 9; 7 mi E of Laramie, 3.VIII.69, *Pinus contorta*, D.E. Bright (CNC) 19; 11 mi W of Lusk, 15.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 9; Saratoga, 17.VI.38, *Pinus flexilis*, D. DeLeon (RMSC) 2; 16 mi NE of Tensleep, 21.VI.68, *Pinus flexilis*, S.L. Wood (SLWC) 8.

**BIOLOGY.** Stevens (1973) has briefly reported on the association of this species (as *P. opimus*) with *Pissodes terminalis* in lodgepole pine tips in Colorado. *Pityophthorus aquilus* apparently has a 1-year life cycle, with emergence and oviposition occurring in mid-summer. In the terminals of lodgepole pine, *aquilus* is frequently associated with *Pissodes terminalis*. The *Pissodes* attacks the terminal first, and by its activities prepares the environment for the development of *aquilus*. In this particular instance, *aquilus* and the *Pissodes* were found only in the lateral branches. This association of *aquilus* with *Pissodes* is further documented by a series of two specimens in the SLWC bearing labels "assoc. with *Pissodes* sp. on lpp". Another series in the SLWC, probably associated with *Pissodes*, is labeled "lodgepole pine reproduction".

Three species of parasitic Hymenoptera were found in the galleries of *aquilus*. These were: *Eurytoma tomici* Ashmead (Eurytomidae) and *Rhopalicus pulchripennis* (Crawford) and *Acercephala atrovioleacea* (Crawford) (Pteromalidae). All these species are known parasitoids of conifer-infesting Coleoptera.

**REMARKS.** This taxa and the two following form a set of closely allied and very similar appearing species. All are recognized by the very distinct, longitudinal, toothlike carina on the male frons (Fig. 170), by the semicircular brush of erect, moderately sparse setae on the female frons (Fig. 169), and by the sloping, weakly sulcate elytral declivity (Fig. 171). *Aquilus* is most easily distinguished from *carinulatus* and *dentifrons* by the shining surface between the punctures on the male frons. It may also be distinguished from the sympatric *carinulatus* by the difference in host; *aquilus* in pines and *carinulatus* most often in spruce.

This is a common and widespread species throughout the western United States and in western Canada. A considerable amount of variation can be noted, none of which can be strictly correlated with geographical distribution. Variations were noted in the height and length of the male carina, the amount and length of pubescence on the female frons, the microsculpturing of the posterior area of the pronotum and elytral interstriae, and in the size of the declivital granules.

#### 159. *Pityophthorus (P.) dentifrons* Blackman

Map 31

*Pityophthorus dentifrons* Blackman, 1922b, p. 125; Blackman, 1928, p. 81; Chamberlin, 1939, p. 279; Beal & Massey, 1945, p. 134; Craighead, 1950, p. 331; Baker, 1972, p. 255.

Length 1.9-2.3 mm, about 2.6 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistoma to above upper margin of eyes and nearly from eye to eye, frequently bearing a very weakly elevated carina on lower half above epistomal margin; surface shining, densely punctured, punctures rather large and deep; vestiture abundant, moderately long, those setae on periphery longer and incurved. Antennal club broadly oval, slightly less than 1.2 times longer than wide, widest through segment 2 or 3; suture 1 weakly arcuate, 2 slightly more strongly arcuate; first two segments together occupy slightly less than half of total club length. Pronotum about as long as wide, widest just behind summit; sides moderately arcuate; asperities on anterior slope low, rather small, scattered in no apparent order; posterior area of disc densely punctured, punctures deep and rather widely separated; surface between punctures dull, surface rather densely microreticulate. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures usually large, deep and close; discal interstriae about 1.5-2.0 times wider than striae, surface smooth, minutely reticulate; interstriae 1, 3, 5, 7, and 9 bear a row of widely separated, setiferous punctures. Declivity evenly convex, distinctly bisulcate; interstriae 1 narrow, distinctly elevated, bearing a median row of fine, acute granules; interstriae 2 widened, distinctly sulcate, surface usually shining, very finely reticulate; interstriae 3 equal in height to interstriae 1, bearing a median row of distinct, rather large granules; punctures in striae 1 and 2 much smaller than those on disc, sometimes obsolete.

**Male.** Frons flattened to weakly concave on each side of a sharply elevated, almost toothlike, longitudinal carina; vestiture short, inconspicuous. Segment 1 of antennal club equal in width to 2, club widest through 2. Pronotum and elytra as in female except punctures slightly deeper and coarser. Declivity essentially as in female except interstriae 2 slightly more deeply sulcate and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) in the USNM is labeled: Me. Agr. Exp. Sta., Orono, Me., 1 Aug 1919/M.W. Blackman, collector/M-122a/Type/Type No. 56914. The allotype and 14 paratypes are labeled as above.

Most of the type material is in the USNM, paratypes are in the CNC and the DFEC.

**HOSTS.** *Abies fraseri*; *Picea glauca*; *Pinus strobus* and *banksiana*. Probably occurs in most species of *Picea* and *Pinus* in its range.

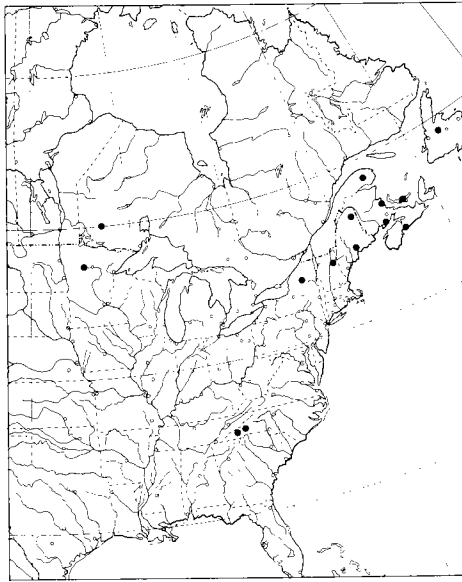
**DISTRIBUTION.** Eastern North America, from North Carolina to Newfoundland, east to western Ontario and western Minnesota (Map 31). Specimens (97) examined from:

#### CANADA

**New Brunswick:** Kouchibouguac National Park, VIII.77, D.E. Bright (CNC) 2. Portage Vale, 14.VII.70, *Picea glauca*, D.E. Bright (CNC) 5. **Newfoundland:** Birchy Lake, 25.VII.70, *Pinus strobus*, D.E. Bright (CNC) 2. **Nova Scotia:** Halifax, 12.VI.22, MacAlony (DFEC) 18. **Ontario:** 30 mi N of Dryden, 6.VIII.72, *Pinus banksiana*, D.E. Bright (CNC) 18. **Prince Edward Island:** Dalvay, 1.IX.67, Austrian pine (CNC) 14. **Quebec:** Gaspé Co., 2.VIII.33, *Picea canadensis*, E.B. Watson (CNC) 10.

#### UNITED STATES

**Maine:** Camp Caribou, *Picea* sp., A.D. Hopkins (DFEC) 3. **Minnesota:** Cass Lake, 29.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 8. **New Hampshire:** Mt. Washington, 6.VIII.70, *Picea* sp., D.E. Bright (CNC) 5. **New York:** Cranberry Lake, various dates 1921-23, M.W. Blackman (DFEC) 5. **North Carolina:** Black Mtn., X.1 (SLWC) 1; V.18 (SLWC) 1; Mt. Mitchell, 22.VIII.41, *Abies fraseri*, J.A. Beal & C.L. Massey (RMSC) 2; Pisgah Ridge, *Picea* sp., W.F. Fiske (DFEC) 3.



MAP 31. Collection localities for *P. (Pityophthorus) dentifrons*.

**BIONOMICS.** Blackman (1922*b*) states that the galleries are started near the base of a smaller branch and are of the radiate type with longitudinal and diagonal branches. The usual host is listed as red spruce but it has also been collected from Fraser fir (*Abies fraseri*) and various species of pines.

**REMARKS.** Adults of this species closely resemble those of *carinulatus* but differ by the more deeply sulcate second declivital interstriae, by the larger granules on the third declivital interstriae, and by the distribution.

160. *Pityophthorus (P.) carinulatus* Swaine

*Pityophthorus carinulatus* Swaine, 1925, p. 193; Blackman, 1928, p. 66; Chamberlin, 1939, p. 375; Bright, 1977, p. 514; Wood, 1977*a*, p. 209.

*Pityophthorus opimus* Blackman, 1928, p. 80; Chamberlin, 1939, p. 379; Bright & Stark, 1973, p. 109; Stevens, 1973, p. 141; Bright, 1977, p. 514 (= *carinulatus*).

Length 2.0-2.6 mm, about 2.6 times longer than wide.

**Female.** Very similar to *dentifrons* in all respects except granules on declivital interstriae 1 and 3 much smaller.

**Male.** Very similar to *dentifrons* except carina usually more strongly elevated, punctures on vertex closer and deeper, and surface between punctures duller and more closely reticulate.

**TYPE MATERIAL.** *P. carinulatus*. The holotype (♂) in the CNC bears the data: Tres Ritos, N.M., VII-7-18, R. Hopping, Lot 411/TYPE *Pityophthorus carinulatus* Sw., No. 1369. Swaine (1925) states that two male paratypes were part of the type material. Only one of these is now present in the CNC; it bears the same data label as given for the holotype but is not conspecific with the holotype.

*P. opimus*. The holotype (♀) in the USNM is labeled: Hopk U.S. 5489/Capitan Mts., N.M./J.L. Webb, collector/*Picea engelmanni*/TYPE *Pityophthorus opimus* Blackman/Type No. 41294 U.S.N.M. Three paratypes bear the same data. The allotype and 2 paratypes bear the data: Hopk. U.S. 6117b/Clyde, Colo./*Picea engelmanni*/A.D. Hopkins, Bred Apr. 13, '06; 4 paratypes are labeled: Hopk.

U.S. 9902E/A.B. Champlain, colr./Mt. Manitou, Colo./Jan. 25, '14/*Pinus flexilis*; 1 paratype is labeled: Hopk US 9401-f/B.T. Harvey, coll./Clyde, Colo./Dec 1, '13/*Picea engelmannii* and 1 paratype is labeled: Hopk US 6116/Clyde, Colo./*Picea engelmannii*/A.D. Hopkins, Bred July 14, '06.

Most of the type material is in the USNM, additional paratypes are in the CNC.

HOSTS. *Picea englemanni* and *pungens*; *Pinus contorta* and *flexilis*.

DISTRIBUTION. Alaska to New Mexico and Arizona. Specimens (28) examined from:

#### UNITED STATES

**Alaska:** Juneau, 26.V.59, *Pinus contorta*, D.E. Bright (DEBC) 2. **Arizona:** San Francisco Mountains, Coconino Co., 18.VIII.68, *Picea engelmannii*, D.E. Bright (CNC) 4. **Colorado:** See type material. **New Mexico:** Cloudcroft, 3.VI.69, *Picea pungens*, S.L. Wood (SLWC) 6. **Utah:** Sanford Canyon, Dixie National Forest, 22.VI.60, *Picea pungens*, S.L. Wood (SLWC) 2.

REMARKS. See remarks under *aquilus*. This species is most readily distinguished from *aquilus* by the reticulate surface of the male frons.

#### 161. *Pityophthorus (P.) tumidus* Blackman

*Pityophthorus tumidus* Blackman, 1928, p. 58; Chamberlin, 1939, p. 369; Bright & Stark, 1973, p. 108.

Length 2.0-2.3 mm, about 2.8 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistoma to upper level of eyes and laterally nearly from eye to eye, sometimes bearing a faint, longitudinal carina just above the epistomal margin; surface faintly punctured, with a few, fine, inconspicuous setae, those on periphery long and incurved. Antennal club elongate-oval, 1.3 times longer than wide, widest through segment 2; first two sutures arcuate, 2 more so than 1; first two segments together occupy about half of total club length. Pronotum about as long as wide, widest just behind middle, sides moderately arcuate; asperities on anterior slope small, sometimes two or three joined together at their bases, all arranged in no apparent order; posterior area of disc densely punctured, punctures large, deep and almost touching; surface between punctures shining, smooth to minutely reticulate. Elytra about 2.0 times longer than wide; apex somewhat narrowly rounded; discal striae punctured in regular rows, punctures large, deeply impressed and very close, almost touching; discal interstriae about as wide as striae, appearing somewhat convex, surface generally shining, minutely reticulate to smooth; interstriae 1, 3, 5, 7, etc. bearing a few, median, setiferous punctures. Declivity convex, appearing slightly flattened; interstriae 1 weakly elevated, with a median row of very fine, minute granules; interstriae 2 not impressed or sulcate, slightly wider than discal width, shining, minutely reticulate-punctate; interstriae 3 not elevated, bearing a median row of very fine, setiferous granules; punctures in striae 1 and 2 much smaller and shallower than on disc, only faintly visible.

**Male.** Frons generally slightly concave on each side of a distinctly elevated, laterally compressed, longitudinal carina, this carina varying from a short, toothlike projection just above epistomal margin to a longer elevation extending from epistomal margin to near upper level of eyes. Pronotum and elytra essentially as in female. Declivity as in female except interstriae 2 usually distinctly, shallowly bisulcate and punctures of striae 1 and 2 larger and deeper.

TYPE MATERIAL. The holotype (♀) in the USNM is labeled: Eureka, Cal., 7-6/H.S. Barber, collector/TYPE *Pityophthorus tumidus* Blackman/Type No. 41282 USNM. The allotype and 1 paratype bear the same data. Two paratypes are labeled: Little Riv. Cal., 31-5-03/H.S. Barber, collector.

All type material is in the USNM.

HOST. Not recorded on material examined.

DISTRIBUTION. Endemic along the California coast. Definitely known only from the type-series localities.

REMARKS. This is evidently a very rare species. It was not found in large collections of *Pityophthorus* made by myself along the California coast nor in the other large collections from the region examined by me. Adults of this species are easily recognized by the sharply elevated, longitudinal carina on the male frons, and by the flattened to weakly bisulcate elytral declivity which bears very fine granules on declivital interstriae 1 and 3.

Bright and Stark (1973) report this species from Penitentiary Flat, Lassen Co., California on *Pinus ponderosa* based on one specimen in the USNM. The record was questionable and since the specimen cannot now be found, the record should be disregarded until additional specimens are found.

#### 162. *Pityophthorus (P.) absonus* Blackman

Figs. 172-174; Map 32

*Pityophthorus absonus* Blackman, 1928, p. 35; Chamberlin, 1939, p. 357; Bright & Stark, 1973, p. 107; Bright, 1977, p. 513.

*Pityophthorus demissus* Blackman, 1928, p. 74; Chamberlin, 1939, p. 377; Chamberlin, 1958, p. 152; Wood, 1971a, p. 425; Bright, 1977, p. 513 (= *absonus*).

*Pityophthorus inyoensis* Bright, 1971, p. 65; Bright, 1977, p. 513 (= *absonus*).

Length 1.7-2.4 mm, about 2.8 times longer than wide.

**Female.** Frons flattened on a semicircular area extending from epistoma to well above eyes and laterally nearly from eye to eye, center of this area frequently broadly to narrowly concave; surface shining, finely punctured and pubescent, setae moderately abundant to sparse, much longer and incurved around periphery. Antennal club large, elongate-oval, about 1.2 times longer than wide, widest through segment 2, segment 1 usually distinctly narrower than 2; suture 1 weakly arcuate, 2 slightly more strongly arcuate; first two segments together occupy slightly less than half of total club length. Pronotum 1.1 times wider than long to as long as wide, widest at middle; sides broadly arcuate; asperities on anterior slope erect, sharp, arranged in no apparent order; posterior area of disc densely punctured, punctures deep and moderately close; surface between punctures shining, generally smooth but may be very finely reticulate. Elytra about 1.7 times longer than wide; apex broadly rounded; discal striae punctured in nearly regular rows, punctures moderate in size and depth; discal interstriae slightly wider than striae, surface minutely reticulate; interstriae 1, 3, 5, 7 each with a few, widely separated, setiferous punctures. Declivity convex; interstriae 1 weakly elevated, with a row of very fine granules, these sometimes absent or very difficult to see; interstriae 2 not wider than discal width, smooth weakly sulcate to flattened; interstriae 3 not elevated, slightly lower than 1, with a median row of fine granules; punctures in striae 1 and 2 very small, usually obsolete and difficult to see, but sometimes distinct to apex.

**Male.** Frons flattened on a semicircular area with a distinct, laterally compressed, toothlike, longitudinal carina on lower half just above epistoma, this carina sometimes longer but rarely or never reaching upper level of eyes. Antennal club with segment 1 as long as 2. Pronotum and elytra essentially as in female except pronotal asperities slightly higher and sharper. Declivity essentially as in female.

TYPE MATERIAL. *P. absonus*. The holotype (♀) in the USNM is labeled: Hopk. US 13838/F.P. Keen, colr/Mineral King, Cal./Sept. 11, 15/*Pinus murrayanae*/TYPE *Pityophthorus absonus* Blackman/Type No. 41269 USNM. The allotype and 2 paratypes bear the same data.

All type material is in the USNM.

*P. demissus*. The holotype (♀) in the USNM is labeled: Hopk US 16934a/*Abies lasiocarpa*/Glacier Nat. Park, Mont./H.J. Rust, colr./ TYPE *Pityophthorus*

demissus Blackman/Type No. 41289 USNM. The allotype and 3 paratypes bear the same data. Two paratypes bear the data: Park City, Ut., 17.6.

All type material is in the USNM.

*P. inyoensis*. The holotype (♀) in the CNC is labeled: 1 mi. S. Onion Val., Inyo Co., Calif. IX-4-1968, D.E. Bright/Pinus balfouriana/HOLOTYPY Pityophthorus inyoensis Bright, CNC No. 10964. The allotype and 19 paratypes bear the same data. Twenty-seven paratypes are labeled: Onion Valley, Inyo Co., Calif., IX-4-1968, D.E. Bright/Pinus balfouriana.

The allotype and most of the paratypes are in the CNC. Additional paratypes are in the CIS and the SLWC.

HOSTS. *Abies lasiocarpa*; *Pinus albicaulis*, *aristatae*, *balfouriana*, *contorta*, *flexilis*, and *monticola*.

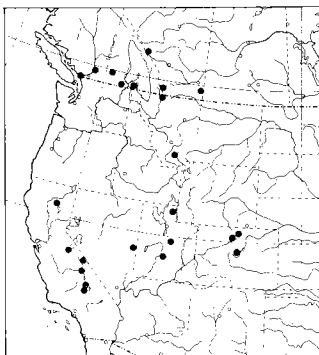
DISTRIBUTION. Known from western North America from California and Colorado north to southern Alberta and British Columbia (Map 32). Specimens (308) examined from:

#### CANADA

**Alberta:** Blairemore, 10.IX.63, *Pinus albicaulis* (CNC) 10; Coleman, 20.VI.52, limber pine (NFRCE) 14; Elkwater, 24.VII.64, *Pinus contorta* (CNC) 1; Mt. Eisenhower, Banff National Park, 12.IX.67, *Pinus albicaulis*, D.E. Bright (CNC) 8; Sulphur Mountain, Banff National Park, 15.IX.66, *Pinus albicaulis*, D.E. Bright (CNC) 35. **British Columbia:** Coal Creek, 5.VIII.57, *Pinus albicaulis* (CNC) 3; Kootenay Pass, 22.IX.67, *Pinus albicaulis*, D.E. Bright (CNC) 10; Rossland, 21.IX.67, *Pinus monticola*, D.E. Bright (CNC) 31; Stanley, 19.VII.27, *Abies lasiocarpa*, W.G. Mathers (CNC) 5; Terrace Mountain, 15 mi W of Nahun, 21.IX.67, *Pinus albicaulis*, D.E. Bright (CNC) 4.

#### UNITED STATES

**California:** Hat Creek, 24.VI.61, *Pinus contorta*, D.E. Bright and D.N. Kinn (DEBC) 3; Mt. Lassen, 12.VIII.40, *Pinus albicaulis*, C.R. Bruck (OSUC) 12; 10 mi N of Westgard Pass, 6.IX.68, *Pinus aristata*, D.E. Bright (CNC) 12. **Colorado:** Cameron Pass, 12.VI.68, *Abies lasiocarpa*, S.L. Wood (SLWC) 4; Evergreen, *Pinus aristata*, D.A. Hestor (USNM) 2; Gould, 12.VI.68, *Abies lasiocarpa*, S.L. Wood (SLWC) 15. **Montana:** Sheridan, 7.X.36, *Pinus albicaulis*, A.L. Gibson (USNM, UMMZ) 8. **Nevada:** Wheeler Peak, White Pine Co., 8.IX.68, *Pinus aristata*, D.E. Bright (CNC) 35. **Utah:** Convulsion, Fishlake National Forest, 9.VI.60, *Pinus flexilis*, D.E. Bright (DEBC) 10; Logan Canyon, 31.XII.45, *Abies lasiocarpa*, S.L. Wood (SLWC) 16; Scofield, H.B. Teillon & F.W. Horning (USNM) 2.



MAP 32. Collection localities for *P. (Pityophthorus) absonus*.

REMARKS. This is a fairly common species at high elevations in western North America. Its occurrences on isolated mountain peaks gives almost an insular distribution pattern resulting in various populations exhibiting a great deal of variation. However, when one compares several characteristics of specimens from various populations, it becomes apparent that only one species is present.

Adults may be recognized by the small, toothlike, longitudinal carina on the lower portion of the male frons (Fig. 173), by the broadly to narrowly concave or sometimes flattened female frons (Fig. 172), by the large, close punctures on the posterior portion of the pronotum and by the convex elytral declivity which bears very fine granules (sometimes absent) on interstriae 1 and 3 (Fig. 174). Variations are found in the length of the male carina, the size and depth of the concavity on the female frons, and in the degree of impression of the second declivital interspace.

### 163. *Pityophthorus (P.) abstrusus* Bright

*Pityophthorus abstrusus* Bright, 1976b, p. 427.

Length 1.7 mm, about 2.9 times longer than wide.

**Female.** Frons slightly flattened on a subcircular area extending from epistoma to upper level of eyes and laterally nearly from eye to eye, flattened portion weakly, transversely impressed in middle; surface shining, finely punctured, punctures very small except at upper margin of flattened area and not especially close; vestiture sparse, setae on periphery only slightly longer than others. Antennal club circular, widest through segment 2; sutures 1 and 2 weakly arcuate; first two segments occupy less than half of total club length. Pronotum very slightly wider than long, widest behind middle; sides moderately arcuate; asperities on anterior slope sharp, erect, small, arranged in no apparent order; posterior area of disc densely punctured, punctures deep, of moderate size and close; surface between punctures dull, densely, minutely reticulate. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures rather large, deep and close; discal interstriae about as wide as striae, flat, surface shining; interstriae 1, 3, 5, 7 each with a few, setiferous punctures. Declivity convex; interstriae 1 narrow, slightly elevated, bearing a median row of fine granules; interstriae 2 not wider than discal width, very weakly impressed, surface shining, with minute lines and points; interstriae 3 weakly elevated, very slightly higher than interstriae 1, bearing a median row of very minute granules; punctures of striae 1 and 2 reduced but readily visible.

**Male.** Frons flattened from epistoma to above upper level of eyes, with a small, sharp, laterally compressed, toothlike, longitudinal carina on lower portion, just above deeply emarginate epistomal margin, remainder of flattened surface shining, finely punctured. Pronotum, elytra, and declivity essentially as in female.

TYPE MATERIAL. The holotype (♀) in the CNC bears the data: MEX. 25 mi. w. Orizaba, V.C., IV-29-1969, D.E. Bright/*Pinus* sp./HOLOTYPE *Pityophthorus abstrusus* D.E. Bright, CNC No. 15071. The allotype bears identical data. Four specimens collected from 9 miles east of El Palmito, Durango, Mexico on June 15, 1971 at an elevation of 7500 ft from *Pinus ayacahuite* by D.E. Bright are also referred to this species but are excluded from the type series.

HOST. *Pinus ayacahuite* and probably other pine species.

DISTRIBUTION. Known only from the type-series localities in Durango and Veracruz.

REMARKS. This species does not appear to fit easily into the present group but I hesitate to erect a separate group for this one species. It appears to be most closely related to *absonus* but may be distinguished by the more distinctly flattened, not concave, frons of the female, by the sparser pubescence on the female frons, by the more distinct punctures in declivital striae 1 and 2, and by the distribution.



Adults are recognized by the small, toothlike carina on the lower part of the male frons, by the sparse pubescence on the weakly transversely impressed female frons, by the small size, and by the distribution.

#### VENUSTUS GROUP

Members of this group are recognized by the evenly arcuate, sharply elevated, longitudinal carina on the male frons (Fig. 176), by the sparsely granulate declivital interstriae (Fig. 177), and by the flattened to concave, densely pubescent female frons (Fig. 175). The species in this group could be placed in the previous group but the difference in structure of the carina on the male frons indicates that the species in the Venustus group are not closely related to those in the Dentifrons group.

Two species are included in this group.

#### KEY TO SPECIES IN THE Venustus group

1. Interstriae 1 on declivity strongly to weakly impressed below level of interstriae 3 (Fig. 177); declivital interstriae 2 weakly impressed; declivity flattened; declivital granules on interstriae 1 and 3 small to prominent; female frons flat (Fig. 175); carina on male frons usually extending to near or above upper eye level (Fig. 176); Nebraska and Montana, south to Arizona and California . . . . . 164. *venustus* Blackman (p. 233)
- Interstriae 1 on declivity not impressed, equal in height to interstriae 3; declivital interstriae 2 not impressed or only very slightly so; declivity more convex; declivital granules on interstriae 1 and 3 small; female frons concave in center; carina on male frons shorter, usually not extending above upper level of eyes; Wyoming to Arizona . . . . . 165. *mormon* Bright (p. 236)

#### 164. *Pityophthorus (P.) venustus* Blackman

Figs. 175-177; Map 33

*Pityophthorus venustus* Blackman, 1928, p. 75; Chamberlin, 1939, p. 377; Chamberlin, 1958, p. 152.

*Pityophthorus artifex* Blackman, 1928, p. 76; Chamberlin, 1939, p. 378; Bright & Stark, 1973, p. 110; Bright, 1977, p. 519 (= *venustus*).

Length 1.7-2.2 mm, about 2.8 times longer than wide.

**Female.** Frons flattened from epistoma to just above upper level of eyes and laterally from a point equal to lateral insertion of mandibles; surface densely, finely, deeply punctured and densely setose, setae of moderate length, those on periphery only slightly longer than others. Antennal club broadly oval, 1.1 or less times longer than wide, widest through segment 2; first two sutures arcuate, 2 more so; first two segments together occupy more than half of total club length. Pronotum about as long as wide, widest just behind middle; sides moderately arcuate; asperities on anterior slope small, erect, acute, scattered over surface; posterior area of disc rather closely and deeply punctured; surface between punctures minutely reticulate, dull. Elytra 1.7-1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep and close; discal interstriae about as wide as or slightly wider than striae, surface smooth to minutely rugose, usually interstriae 1, 3, 5, 7 bearing a median row of fine, setiferous punctures, but frequently all or part of all interstriae may bear a median row of setiferous punctures, setae from these punctures slightly longer than those from striae punctures. Declivity convex, somewhat flattened; interstriae 1 strongly to weakly impressed below level of 3, bearing a median row of very fine granules; interstriae 2 weakly impressed, not widened, sloping downward toward 1 and frequently bearing a few, very fine granules; interstriae 3 convex, slightly elevated above general surface, usually distinctly higher than 1, bearing a median row of fine but distinct granules; punctures in striae 1 and 2 smaller than those on disc, especially those in 2.

**Male.** Frons evenly convex to weakly transversely flattened just above epistomal margin, divided by a distinctly elevated, usually evenly arcuate, longitudinal carina which extends from epistomal margin to upper level of eyes, highest elevation of carina slightly above epistomal margin; surface strongly, deeply punctured, more so near eyes, each puncture bearing a very short, fine seta. Pronotum, elytra, and declivity essentially as in female except some specimens are slightly more strongly sculptured.

**TYPE MATERIAL.** *P. venustus*. The holotype (♀) in the USNM bears the data: Kaibab N.F., Ariz. 6-7-25/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. K-32-b/Pinus ponderosa/TYPE Pityophthorus venustus Blackman/Type No. 41290 U.S.N.M. The allotype and 35 paratypes bear the same data on locality, host, and collector but the dates of collection and the collection number vary. Additional paratypes are labeled: 3, Hopk. U.S. 5754-a/J.L. Webb, Coll./Sacramento Mts., N.M./Pinus ponderosa; 2, Hopk U.S. 5729-a/J.L. Webb, Coll./Sta. Catalina Mts., Ariz./Pinus ponderosa; 2, Hopk U.S. 622-e/J.L. Webb, Coll./Black Hills, S.D./Pinus ponderosa; 2, Hopk. U.S. 5728/J.L. Webb, Coll./Sta. Catalina Mts., Ariz./Abies concolor.

Most of the type material is in the USNM, additional paratypes are in the CNC and the DFEC.

*P. artifex*. The holotype (♀) in the USNM bears the labels: Hopk. U.S. 144594/Meyers, Cal./F.B. Herbert, colr./Pinus jeffreyi/TYPE Pityophthorus artifex Blackman/Type No. 41291 U.S.N.M. The allotype and 7 paratypes bear the same data with the exception of the type labels; all are in the USNM.

**HOSTS.** *Pinus aristata*, *contorta*, *coulteri*, *jeffreyi*, *leiophylla*, *monticola*, *ponderosa*, and *strobiformis*; also recorded from *Abies concolor*.

**DISTRIBUTION.** Western United States and Canada (Map 33). Specimens (304) examined from:

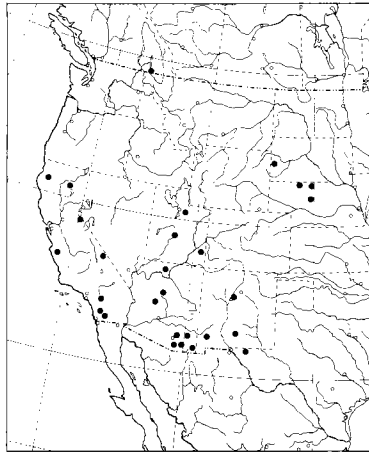
#### CANADA

**British Columbia:** Creston, 31.VII.54, *Pinus monticola*, G. Stace Smith (CNC, UBC) 23.

#### UNITED STATES

**Arizona:** Bear Canyon, Santa Catalina Mtns., 1.VIII.74, *Pinus ponderosa*, D.E. Bright (CNC) 31; Carr Canyon, Cochise Co., 23.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 25; Chiricahua Mtns., 29.VII.55, D.J. & J.N. Knull (DSUC) 1; Mount Bigelow, Santa Catalina Mtns., 6.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 9; Mount Lemmon, Santa Catalina Mtns., 31.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 9; Pinaleno Mtns., Graham Co., 15.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 5; Prescott National Forest, 30.V.30, *Pinus ponderosa*, M.W. Blackman (USNM) 6; Rustlers Park, Cochise Co., 26.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 15; Santa Catalina Mtns., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 11; Santa Rita Mtns., Santa Cruz Co., 29.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1; Sedona, 13.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 12; Spencer Canyon, Santa Cruz Co., 11.VI.69, *Pinus strobiformis*, D.E. Bright (CNC) 2. **California:** Blanco's Corral, White Mtns., *Pinus aristata* (CISC) 1; Carrville, 1.VIII.31, *Pinus ponderosa*, C.R. Bruck (OSUC) 1; Hat Creek, 18.X.47, *Pinus contorta*, S.L. Wood (SLWC) 3; Julian, *Pinus coulteri* (PSFR) 1; Junipero Serra Peak, Monterrey Co., 15.VIII.56, *Pinus coulteri*, H.B. Leech (CASC, SLWC) 4; Lake Arrowhead, 8.VI.32, R.P. Allen (CASC) 1; Mount Laguna, *Pinus coulteri* (PSFR) 1; Palomar Mountain, San Diego Co., 26.VIII.68, *Pinus coulteri*, D.E. Bright (CNC) 3; 11 mi NE of Strawberry, 18.VII.64 (CASC) 1. **Nebraska:** Halsey, 18.VI.29, *Pinus ponderosa*, W.G. Green (USNM, RMSC) 13; Nenzel, 27.VII.29, *Pinus ponderosa*,

L.G. Baumhofer (USNM) 20; Norden, 29.VII.29, *Pinus ponderosa*, L.G. Baumhofer (USNM, RMSC) 14. **New Mexico:** 5 mi E of Lake Roberts, 6.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 1; Sandia Mtns., Bernalillo Co., 9.VII.18, *Pinus ponderosa*, D.E. Bright (CNC) 6. **South Dakota:** See type material. **Texas:** Guadeloupe Mtns. National Park, The Bowl, 17.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 7; McKitteric Canyon, Guadeloupe Mtns. National Park, 16.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 3. **Utah:** 10 mi E of Kamas, 9.IX.60, *Pinus ponderosa*, S.L. Wood (SLWC) 9; La Sal Mtns., 5.VII.58, *Pinus ponderosa*, D.E. Bright (SLWC, DEBC) 5; Pin Hollow, Fishlake National Forest, 9.VI.60, *Pinus ponderosa*, D.E. Bright (DEBC) 5.



MAP 33. Collection localities for *P. (Pityophthorus) venustus*.

REMARKS. Blackman (1928) described some larger specimens of this species from California as *artifex*. They differ from specimens from Arizona and New Mexico only by their slightly larger size, by the slightly coarser sculpture and by the more deeply impressed interstriae 1 on the declivity. However, in any large series from Arizona or elsewhere in its range, specimens as large and as coarse as those from California can be found. In the absence of any consistent morphological difference, only one species can be recognized.

A series of nine females from Creston, B.C. is assigned to this species but differs in several ways. The frons is more strongly flattened, even to the point of being weakly transversely impressed and interstriae 1 on the declivity is not as deeply impressed below the level of interstriae 3. Nevertheless, this series appears to be *venustus* although somewhat deviant from the typical. Male specimens would assist in properly placing this series. In addition, specimens from Nebraska also have a shallower impression on the elytral declivity than those specimens from Arizona and California.

Other variations strictly correlated with geographic distribution are only vaguely indicated. Specimens from the southern parts of the range tend to have interstriae 1 more deeply impressed than those from the northern parts of the range. However, specimens from the north can be found that display characteristics of the southern forms and vice versa. Subspecies are therefore not proposed at this time but it is realized that subspecies may be justified when additional material is available.

165. *Pityophthorus (P.) mormon* Bright

*Pityophthorus mormon* Bright, 1977, p. 528.

Length 1.9-2.2 mm, 2.8 times longer than wide.

**Female.** Frons broadly flattened from epistoma to well above upper level of eyes and laterally from eye to eye, central portion distinctly concave; surface shining, finely, densely punctured and setose, setae rather sparse in central region, much more abundant, longer and incurved on periphery, especially on portion above upper level of eyes. Antennal club 1.2 times longer than wide, widest through segment 2; segment 1 slightly narrower than 2; suture 1 nearly straight, 2 slightly arcuate; first two segments occupy slightly less than half of total club length. Pronotum about as long as wide, widest just behind middle; sides moderately arcuate; asperities on anterior slope erect, small, isolated except near summit, scattered in no apparent order; posterior area of disc closely and deeply punctured; surface between punctures brightly shining, smooth but may bear a few minute points. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures small, shallow, widely separated; discal interstriae 2.0 or more times wider than striae, surface usually minutely rugose, usually interstriae 1, 3, 5, 7 bearing a median row of fine setiferous punctures but occasionally all interstriae may bear a median row of setiferous punctures, setae from these punctures longer than those from striae punctures. Declivity convex; interstriae 1 narrow, not impressed, bearing a median row of very small, setiferous granules; interstriae 2 flat, not impressed or only very weakly so, about as wide as discal width; interstriae 3 not elevated or only extremely weakly so, equal in height to 1, bearing a median row of very fine, setiferous granules; punctures in striae 1 and 2 obvious, slightly smaller than those on disc but usually readily visible.

**Male.** Frons flattened on a broad area from epistoma to well above eyes, longitudinal carina sharply elevated, extending from near epistomal margin to well below upper level of eyes; surface of flattened area weakly rugose-punctate, vestiture inconspicuous. Pronotum as in female except anterior margin broadly rounded, and serrations larger, more erect and asperities on anterior slope sharper, more erect. Elytra as in female except striae punctures slightly larger and deeper, declivital interstriae 2 usually slightly more impressed and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: Parawan Canyon, Iron Co., Utah, VI-20-1960, D.E. Bright/P. *aristata*/ HOLOTYPE *Pityophthorus mormon* D.E. Bright. The allotype and 19 paratypes bear the same data. Nine paratypes bear the same locality and date but bear the labels: *Pinus flexilis*/BYU Bark Beetle Expd. (S.L. Wood, D.E. Bright and J.B. Karren). Four paratypes are labeled: Pin Hollow, Fishlake N.F., Utah, VI-9-60/*Pinus flexilis*. Ten paratypes are labeled: Agassiz Peak, San Francisco Mtns., Ariz., VIII.16.68, D.E. Bright/*Pinus aristata*.

The primary types and 20 paratypes are in the SLWC, additional paratypes are in the CNC and the KESC.

**HOSTS.** *Pinus aristata*, *contorta*, and *flexilis*.

**DISTRIBUTION.** Wyoming to Arizona. Specimens (47) examined from:

## UNITED STATES

**Arizona:** See type material. **Utah:** See type material. **Wyoming:** Yellowstone National Park, 11.VII.75, *Pinus contorta*, D.E. Bright (CNC) 3.

**REMARKS.** Adults of this species are easily distinguished by the convex, weakly sulcate elytral declivity, by the concave median portion of the female frons and by the short, usually less strongly elevated, longitudinal carina on the male frons. The hosts suggest that this species is found at a higher elevation than *venustus*.

Three male specimens from Yellowstone National Park, Wyoming are provisionally placed in this species. They differ only very slightly from the types but the absence of females makes positive identification nearly impossible.

## LATICEPS GROUP

Only one distinctive species is placed in this group at the present time, and only the male is definitely known. The species should be readily identified by the elytral characters given in the key and the description below.

166. *Pityophthorus* (*P.*) *laticeps* Bright

*Pityophthorus laticeps* Bright, 1978, p. 78.

Length 2.5 mm, about 2.9 times longer than wide.

**Male.** Frons flattened from epistoma to well above eyes, very weakly impressed in median portion, divided by a prominent, but weakly elevated, longitudinal carina which extends from epistomal margin to well above upper level of eyes; surface moderately shining, moderately strongly punctured, punctures distinctly impressed, close; vestiture short but conspicuous and abundant. Antennal club oval, 1.3 times longer than wide; first two sutures very weakly arcuate; first two segments occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest at about middle; sides weakly arcuate; asperities on anterior slope erect, rather large, isolated, scattered in no readily apparent order; summit distinct; posterior area of disc distinctly punctured, punctures of moderate size; surface between punctures moderately shining with numerous very fine micropoints; median line broad, impunctate. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, almost touching, deeply impressed; discal interstriae about 2.0 times wider than striae, surface brightly shining, densely micropunctate and subrugulose; interstriae 1, 3, 5, 7, 9 each bearing on disc a median row of about 3-4 larger, setiferous punctures, these punctures as large and deep as those in striae, setae arising from these punctures rather long and stout. Declivity broadly flattened between the fourth interstriae; interstriae 1 rather deeply impressed below level of 3 on upper half, slightly elevated above surface at apex, bearing a median row of very fine granules and short setae; interstriae 2 broadly sulcate, slightly wider than discal width, bearing 2 or 3 very small, acute granules at top; interstriae 3 weakly elevated on upper half, bearing about 5 rounded granules on the upper portion and 1 or 2 more at apex, each granule bearing a moderately long, stout seta; interstriae 4 and 5 smooth, bearing a median row of fine setae; punctures of striae 1 large, not impressed, those in striae 2 much smaller in median area of declivital face than those on disc, those at apex nearly as large as those on disc.

**Female.** Not definitely recognized in present material at hand. A female bearing the identical data and apparently associated with the male has the following characteristics: Frons broadly flattened on a large semicircular area, densely pubescent, with the peripheral setae longer and incurved. Pronotum essentially as in male holotype except surface between punctures on posterior area are more densely micropunctate/reticulate and the large punctures are larger and deeper. Elytra essentially as in male except striae punctures slightly smaller and shallower. Declivity completely different from male, convex, not flattened; interstriae 1 slightly impressed below level of interstriae 3, bearing a median row of fine granules; interstriae 2 weakly, not broadly sulcate, only slightly wider than discal width; interstriae 3 weakly elevated, distinctly higher than 1, bearing a median row of moderately large, rounded, setiferous granules; striae punctures as in male holotype.

**TYPE MATERIAL.** The holotype ( $\delta$ ) in the CNC bears the data: MEX., Oax., 20.5 km. N. Oaxaca, 9000', VI.6.71, Bright/Pinus sp./HOLOTYPE *Pityophthorus laticeps* D.E. Bright, CNC No. 15482. The female specimen described above bears the same data but is not designated as an allotype.

**HOST.** *Pinus* sp.

**DISTRIBUTION.** Known only from the type locality in Oaxaca.

**REMARKS.** Males of this species are readily distinguished by the broadly flattened elytral declivity in which interstriae 3 is near the middle of the declivital

face and is granulate only on the upper half and again at the apex and by the finely punctured posterior half of the pronotum which, in the interpuncture spaces, bears dense, fine micropoints.

The female associated with the male specimen resembles the male in several features but I have doubts that it is the actual female of this species. Until more specimens are available, the female will have to remain doubtful.

#### BLANDUS GROUP

This is a large group that is difficult to characterize because of the variability of the included species. In general, species belonging to this group are distinguished by the shallowly to deeply bisulcate elytral declivity, by the distinctly granulate interstriae 3, by the slightly flattened or concave male frons which is divided by a weakly elevated, longitudinal carina and by the usually densely pubescent female frons. The elytral interstriae are either all punctured and setose or only interstriae 1, 3, 5, 7, etc. are punctured and setose. Species in this group range throughout western North America, through Mexico to Central America.

Sexual dimorphism is so well marked by the species in this group that the sexes had to be separated and each sex keyed individually. Fifteen species are included in the group.

Following the key, species are discussed in alphabetical order.

#### KEY TO SPECIES IN THE Blandus group

1. Frons convex to flattened, bearing a distinct, weakly elevated, longitudinal carina, pubescence sparse, usually inconspicuous (males) . . . . . 2
- Frons flattened, devoid of carina, surface either densely pubescent with the setae on the periphery long and incurved or setae shorter, slightly sparser and usually of equal length (females) . . . . . 22
2. Declivital interstriae 3 equal in height or only very slightly higher than declivital interstriae 1 . . . . . 3
- Declivital interstriae 3 definitely higher than declivital interstriae 1 . . . . . 9
3. Granules on declivital interstriae 3 very small or absent, if present, then equal in size to those on declivital interstriae 1 . . . . . 4
- Granules on declivital interstriae 3 moderate to large, distinctly larger than those on declivital interstriae 1 . . . . . 7
4. Punctures in striae 1 and 2 on declivity distinct; declivital interstriae 2 flat, very weakly impressed; occurs in mistletoe on pine(?); Mexico . . . . . 168. *arceuthobii* Wood (p. 242)
- Punctures in striae 1 and 2 on declivity obsolete, sometimes visible in striae 2 but much reduced; declivital interstriae 2 at least weakly sulcate; occurs in conifers . . . . . 5
5. Occurs in Mexico; carina on frons moderately elevated, short, extending to well below upper margin of eyes; size 1.7-2.0 mm . . . . . 175. *clivus* Bright (p. 250)
- Occurs in western United States and western Canada; carina on frons variable in height but extending to or above the upper margin of eyes . . . . . 6
6. Carina on frons very weakly elevated (Fig. 194); declivital interstriae 2 moderately impressed (Fig. 195); surface between punctures on posterior area of pronotum shining, usually smooth; western United States and western Canada . . . . . 181. *sierraensis* Bright (p. 259)
- Carina on frons sharply elevated; declivital interstriae 2 very weakly impressed; surface between punctures on posterior portion of pronotum dull, minutely reticulate; southern British Columbia . . . . . 179. *orarius* Bright (p. 255)
7. Interstriae 2 wider on declivity than on disc; punctures in striae 1 and 2 on declivity obsolete to weak; southwestern United States to Mexico . . . . . 8
- Interstriae 2 not wider on declivity than on disc (Fig. 192); punctures in striae 1 and 2 on declivity distinct (Fig. 192); southern Mexico to Central America . . . . . 180. *scabridus* Schedl (p. 257)

8. Declivital interstriae 2 deeply, very broadly sulcate, much wider than discal width (Fig. 183); granules on declivital interstriae 3 large, abundant, often located in more than one row (Fig. 183); serrations on anterior margin of pronotum large, erect; in pinyon pines . . . . . 171. *blandus* Blackman (p. 245)
- Declivital interstriae 2 moderately sulcate, only slightly wider than discal width (Fig. 186); granules on declivital interstriae 3 moderate to small, sparse, located in one row (Fig. 186); serrations on anterior margin of pronotum small, low; in Ponderosa pine and its relatives . . . . . 172. *brevis* Blackman (p. 247)
9. Summit of declivital interstriae 3 curved inward at middle toward suture; coastal regions of California . . . . . 173. *californicus* Bright (p. 249)
- Summit of declivital interstriae 3 not curved inward toward suture; generally distributed but does not occur in coastal regions of California . . . . . 10
10. Declivital interstriae 3 more strongly, abruptly elevated on upper half (Fig. 180) . . . . 11
- Declivital interstriae 3 equally elevated throughout, not especially higher on upper half (as in Fig. 189) . . . . . 14
11. Carina on frons low and broad, not sharply elevated (Fig. 179); Mexico . . . . . 170. *blandulus* Schedl (p. 244)
- Carina on frons sharply but weakly elevated . . . . . 12
12. Upper half of declivital interstriae 3 abruptly elevated, inner slope of lateral elevations precipitous, nearly vertical . . . . . 13
- Upper half of declivital interstriae 3 weakly elevated, inner slope of lateral elevations more sloping; southern Mexico . . . . . 176. *declivisetosus* Bright (p. 251)
13. Frons with conspicuous, abundant, long setae on surface; declivital sulcus very deep, narrow; declivital interstriae 3 bearing numerous granules in several rows on summit; pronotum narrowly rounded in front; in *Abies religiosa*; Mexico . . . . . 169. *blackmani* Bright (p. 243)
- Frons with inconspicuous, short setae over surface; declivital sulcus moderately deep, slightly broader; declivital interstriae 3 bearing a single row of granules on summit; pronotum broadly rounded in front; in *Pinus* spp.; Mexico . . . . . 174. *ciliatus* Blackman (p. 250)
14. Interstriae 2 distinctly wider on declivity than on disc . . . . . 15
- Interstriae 2 not distinctly widened on declivity, equal to or nearly equal to discal width . . . . . 17
15. Declivital interstriae 3 more strongly elevated, the inner slope of the lateral elevations precipitous; Mexico . . . . . 174. *ciliatus* Blackman (p. 250)
- Declivital interstriae 3 more weakly elevated, the inner slope of the lateral elevations sloping, not steep . . . . . 16
16. Size 1.6-2.1 mm; southwestern United States and northern Mexico . . . . . 172. *brevis* Blackman (p. 247)
- Size 1.6-1.8 mm; southern Mexico . . . . . 176. *declivisetosus* Bright (p. 251)
17. Punctures in elytral striae 1 and 2 distinct on declivity . . . . . 18
- Punctures in elytral striae 1 and 2 obsolete on declivity . . . . . 20
18. Declivital interstriae 3 abruptly, more strongly elevated, inner slope steep, precipitous; declivital interstriae 2 moderately sulcate; granules on declivital interstriae 3 large, distinct . . . . . 19
- Declivital interstriae 3 weakly elevated, inner slope not steep (Fig. 192); declivital interstriae 2 weakly sulcate (Fig. 192); granules on declivital interstriae 3 small (Fig. 192); southern Mexico to Honduras . . . . . 180. *scabridus* Schedl (p. 257)
19. Size smaller, 1.6-1.8 mm; southern Mexico . . . . . 176. *declivisetosus* Bright (p. 251)
- Size larger, 1.9-2.6 mm; southwestern United States and Mexico . . . . . 177. *durus* Blackman (p. 252)
20. Declivital interstriae 2 much wider than discal width, broadly sulcate (Fig. 183); granules on declivital interstriae 3 very large, acute (Fig. 183); in pinyon pine; southwestern United States . . . . . 171. *blandus* Blackman (p. 245)
- Declivital interstriae 2 only slightly wider than discal width, more narrowly sulcate; granules on declivital interstriae 3 to small to moderately large; in various hosts, not in pinyon pines . . . . . 21

21. Occurs from southern California to Oregon; posterior area of pronotum moderately to weakly punctured, punctures not deep; surface between punctures on posterior area of pronotum micropunctate; in *Pinus ponderosa* and *jeffreyi*. . . . . 178. *electus* Blackman (p. 254)
- Occurs in southern Arizona; posterior area of pronotum deeply punctured, punctures large, close; surface between punctures on posterior area of pronotum microreticulate; occurs in *Abies concolor*. . . . . 167. *apachae* Bright (p. 241)
22. Declivital interstriae 3 equal in height or nearly equal in height to 1 . . . . . 23
- Declivital interstriae 3 distinctly higher than 1, may be only slightly higher . . . . . 28
23. Frons very sparsely setose, setae short, inconspicuous; southern British Columbia . . . . . 179. *orarius* Bright (p. 255)
- Frons densely setose, setae long, conspicuous; generally distributed . . . . . 24
24. Punctures in elytral striae 1 and 2 distinct, not reduced on declivity; declivital interstriae 2 equal in width to discal width; southern Mexico to Honduras . . . . . 180. *scabridus* Schedl (p. 257)
- Punctures in elytral striae 1 and 2 obsolete or reduced but usually visible on declivity; declivital interstriae 2 at least slightly wider than discal width . . . . . 25
25. Declivital interstriae 2 broadly, deeply sulcate; declivital interstriae 3 bearing moderate sized granules, these usually located in two or three ranks; southwestern United States . . . . . 171. *blandus* Blackman (p. 245)
- Declivital interstriae 2 narrowly, shallowly sulcate; granules on declivital interstriae 3 small or absent, if present, located in a single row . . . . . 26
26. Setae on frons long, those on periphery longer and incurved (Fig. 193); surface between punctures on posterior area of pronotum shining, smooth, sometimes with a few fine punctures; in pines . . . . . 27
- Setae on frons shorter, those on periphery only slightly longer if at all and usually incurved; surface between punctures on posterior area of pronotum dull, minutely reticulate; in mistletoe on pines (?); Mexico . . . . . 168. *arceuthobii* Wood (p. 242)
27. Setae on frons sparse, especially in center; median pair of serrations on anterior pronotal margin longer than others; declivital interstriae 2 only slightly wider than on disc; southern Mexico . . . . . 175. *clivus* Bright (p. 250)
- Setae on frons abundant over entire surface (Fig. 193); median pair of serrations on anterior margin of pronotum not especially larger than others; declivital interstriae 2 distinctly wider than on disc; western United States and western Canada . . . . . 181. *sierraensis* Bright (p. 259)
28. Declivital interstriae 2 at least slightly wider than discal width . . . . . 29
- Declivital interstriae 2 not widened, equal to discal width . . . . . 35
29. Setae on frons very short, sparse, usually all of equal or nearly equal length (Fig. 184) . . . . . 30
- Setae on frons long, abundant, those on periphery generally longer and incurved (as in Fig. 187) . . . . . 31
30. Granules on declivital interstriae 3 sparse; setae on declivital interstriae 3 hairlike; serrations on anterior pronotal margin large, erect, isolated from each other; surface between punctures on pronotum shining, with a few minute points; southwestern United States to northern Mexico . . . . . 172. *brevis* Blackman (p. 247)
- Granules on declivital interstriae 3 abundant; setae on declivital interstriae 3 flattened, stout; serrations on anterior pronotal margin low, blunt, basally contiguous; surface between punctures on posterior area of pronotum dull, minutely reticulate; southern Mexico . . . . . 176. *declivisetosus* Bright (p. 251)
31. Punctures in elytral striae 1 and 2 obsolete or much reduced but still visible on declivity . . . . . 32
- Punctures in elytral striae 1 and 2 distinct, not reduced on declivity; southwestern United States and Mexico . . . . . 177. *durus* Blackman (p. 252)
32. Pronotum narrowly rounded in front; size larger, 2.4-2.7 mm; in *Abies religiosa*; Mexico . . . . . 169. *blackmani* Bright (p. 243)
- Pronotum broadly rounded in front; smaller; occurs in *Pinus* spp. . . . . 33



33. Occurs from California to Oregon; surface between punctures on posterior area of pronotum smooth, shining . . . . . 34
- Occurs in Arizona; surface between punctures on posterior area of pronotum minutely reticulate, dull . . . . . 167. *apachae* Bright (p. 241)
34. Lateral or caudal margins of punctures on posterior area of pronotum with upraised edges, giving a subasperate appearance to surface; southern California to Oregon . . . . . 178. *electus* Blackman (p. 254)
- Lateral or caudal margins of punctures on posterior area of pronotum not with upraised edges, surface smooth; coastal central California . . . . . 173. *californicus* Bright (p. 249)
35. Punctures in striae 1 and 2 on declivity deep, not reduced in size . . . . . 36
- Punctures in striae 1 and 2 on declivity obsolete or much reduced in size but still visible . . . . . 37
36. Declivital interstriae 3 strongly elevated, granules on summit large; declivital interstriae 2 not deeply impressed; southwestern United States to Mexico . . . . . 177. *durus* Blackman (p. 252)
- Declivital interstriae 3 weakly elevated, granules on summit small; declivital interstriae 2 very shallowly impressed; southern Mexico to Honduras . . . . . 180. *scabridus* Schedl (p. 257)
37. Granules on declivital interstriae 3 equal in size to those on declivital interstriae 1; mandibles quadrate on distal half (Fig. 178); Mexico . . . . . 170. *blandulus* Schedl (p. 244)
- Granules on declivital interstriae 3 large, abundant; setae on declivital interstriae 1; mandibles not quadrate on distal half . . . . . 38
38. Setae on frons short, all of equal or nearly equal length, those on periphery not longer and incurved (Fig. 184) . . . . . 39
- Setae on frons long, those on periphery longer and incurved; Mexico . . . . . 174. *ciliatus* Blackman (p. 250)
39. Granules on declivital interstriae 3 moderate to small, sparse; setae on declivital interstriae 3 hairlike; serrations on anterior pronotal margin large, erect, isolated from each other; surface between punctures on posterior area of pronotum shining, with a few minute points; southwestern United States and northern Mexico . . . . . 172. *brevis* Blackman (p. 247)
- Granules on declivital interstriae 3 large, abundant; setae on declivital interstriae 3 flattened, stout; serrations on anterior pronotal margin low, blunt, basally contiguous; surface between punctures on posterior area of pronotum dull, minutely reticulate; southern Mexico . . . . . 176. *declivisetosus* Bright (p. 251)

167. *Pityophthorus* (*P.*) *apachae* Bright

*Pityophthorus apachae* Bright, 1977, p. 520.

Length 2.0-2.5 mm, 3.0 times longer than wide.

**Female.** Frons flattened on a broad semicircular area extending from epistoma to well above upper level of eyes and laterally nearly from eye to eye; surface shining, very finely punctured, punctures separated by a distance equal to several times their diameters, vestiture dense, covering entire surface, those setae on periphery denser, longer and incurved. Antennal club oval, 1.1 times longer than wide, widest through segments 2 and 3, segment 1 narrow; first two sutures transverse or very weakly arcuate; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest at about middle; sides weakly arcuate to subparallel; asperities on anterior slope acute, broad, erect, generally isolated but sometimes two or three may be contiguous, arranged at random over surface; posterior area of disc deeply closely punctured; surface between punctures dull, densely and minutely reticulate. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in very regular rows, punctures fine, moderately deep and close; discal interstriae about 1.5-2.0 times wider than striae, surface shining, marked by numerous fine lines and points; interstriae 1, 3, 5, 7 each bearing a few punctures, these about equal in size and depth to striae punctures, and each bearing a very fine, very short seta that is slightly longer than the setae arising from each striae puncture. Declivity convex, bisulcate; interstriae 1 narrowly, weakly elevated, bearing a median row of very

fine granules; interstriae 2 broadly sulcate, moderately deep; interstriae 3 weakly elevated, higher than interstriae 1 and bearing a median row of small granules, these larger than those on interstriae 1; punctures in striae 1 and 2 obsolete, not visible.

**Male.** Frons convex, slightly flattened from epistoma to above upper level of eyes; surface moderately deeply punctured; median carina distinct, weakly elevated for entire length but more strongly elevated at about midpoint, extending from epistoma to well above upper level of eyes; vestiture inconspicuous. Antennae as in female. Pronotum as in female except asperities larger. Elytra as in female. Declivity essentially as in female except interstriae 3 more abruptly elevated, interstriae 2 appearing more deeply sulcate and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the labels: ARIZ. Chiricahua Mts., Rustlers Pk., VI-7-1969, 8200 ft., Stephen L. Wood/*Abies concolor*/HOLOTYPE *Pityophthorus apachae* D.E. Bright. The allotype and 24 paratypes bear the same data. Five additional paratypes are labeled: Miller Canyon, Huachuca Mtns., Ariz., VII.23.68, D.E. Bright/*Abies concolor*.

Most of the type material is in the SLWC, additional paratypes are in the CNC.

**HOST.** *Abies concolor*.

**DISTRIBUTION.** Known only from the type-series localities in Arizona.

**REMARKS.** Adults of this species may be recognized by their large size, by the finely and sparsely punctured female frons, by the structure of the male carina, by the opaque, densely reticulate surface between the punctures on the posterior area of the pronotum, by the lack of acute granules at the top of declivital interstriae 2, and by the host and distribution.

#### 168. *Pityophthorus (P.) arceuthobii* Wood

*Pityophthorus arceuthobii* Wood, 1971b, p. 48.

Length 1.8-2.0 mm, 2.6 times longer than wide.

**Female.** Frons flattened on a semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye, surface weakly, transversely impressed just above epistomal margin; surface shining, densely punctured, punctures close, of moderate size and fairly deep; vestiture rather sparse, covering entire flattened surface, setae of nearly equal length, but those on periphery slightly longer and incurved. Antennal club elongate-oval, 1.4-1.5 times longer than wide, widest through segment 2; suture 1 weakly arcuate, suture 2 strongly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide, widest behind middle; sides weakly arcuate to subparallel on basal third; asperities on anterior slope low, broad, scattered in no apparent order; posterior area of disc closely, deeply punctured; surface between punctures dull, minutely reticulate. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in irregular rows, punctures deep, close; discal interstriae about as wide as striae or slightly wider, each bearing numerous punctures only slightly smaller and slightly less abundant than those in striae, giving entire elytra a randomly punctured appearance, and making discernment of striae or interstriae difficult; surface between punctures shining, with a few, minute points and lines. Declivity convex, weakly bisulcate; interstriae 1 narrowly, weakly elevated, bearing a median row of very fine granules; interstriae 2 weakly sulcate, slightly wider than discal width; interspace 3 weakly elevated, equal in height to 1, bearing a median row of fine granules, these about equal in size to those on interstriae 1; punctures in striae 1 and 2 obsolete, reduced but visible.

**Male.** Frons weakly, transversely impressed from epistoma to near upper level of eyes, convex above; surface dull, minutely reticulate, punctures large, deep on convex portion, obscure below; median carina low, thick, extending to near upper margin of eyes; vestiture inconspicuous. Pronotum and elytra essentially as in female except declivity more shallowly sulcate, granules on interstriae 1 and 3 minute and striae punctures more evident.

**TYPE MATERIAL.** The holotype (♀) in the SLWC is labeled: 60 miles W. Durango, Du., Mexico, VI-5-1965, 7000 ft., S.L. Wood/Phoradendron/HOLO-TYPE *Pityophthorus arceuthobii* Wood. The allotype and 30 paratypes bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

**HOST.** *Arceuthobium globosum* (found growing in a 5-needle pine).

**DISTRIBUTION.** Known only from the type locality in Durango.

**REMARKS.** I have doubts that mistletoe is the actual host of this species and I suspect that it actually occurs and breeds in the branches of the 5-needle pine and was in the mistletoe only accidentally. However, Wood (pers. comm.) disagrees, stating that specimens actually were in the mistletoe. In addition, he indicated that a second collection has been made from the same host (Rio Frio, Mexico from *Arceuthobium*, 7 specimens). I have not seen specimens of this second collection.

Adults of this species are rather typical of pine-infesting species. They may be distinguished by the shallowly bisulcate elytral declivity of both sexes, by the randomly punctured elytral surface of both sexes, by the obscurely punctured declivital striae of both sexes, by the minutely granulate first and third declivital interstriae of both sexes, and by the sparse setae on the frons of the female.

#### 169. *Pityophthorus (P.) blackmani* Bright

*Pityophthorus blackmani* Bright, 1977, p. 521.

Length 2.4-2.7 mm, about 2.7 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistoma to well above eyes and laterally nearly from eye to eye; surface shining, finely punctured, punctures separated by much more than their own diameters; vestiture moderately dense, setae fine, moderately long except around periphery where setae are much denser, much longer and incurved. Antennal club broadly oval, 1.3-1.4 times longer than wide, widest through segment 2; first two sutures transverse, nearly straight; first two segments together occupy slightly more than half of total club length. Pronotum about 1.1 times longer than wide, widest near posterior angles; sides weakly arcuate, rather strongly converging on anterior portion; asperities on anterior slope moderate in size, erect, acute, usually isolated but several may be joined especially near summit, arranged in no definite order; posterior area of disc closely punctured, punctures large, somewhat shallow with upraised lateral or posterior edges; surface between punctures shining, with numerous minute points. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures of moderate size and shallow, each puncture bearing a very short, fine seta; discal interstriae about as wide as or slightly wider than striae, surface shining, with numerous fine points and lines; interstriae 1, 2, 5, 7 each bearing a median row of sparse punctures, these about equal in size to those in striae and each bearing a fine seta much longer than the setae arising from the striae punctures. Declivity convex; interstriae 1 narrow, deeply impressed, with a median row of very fine granules; interstriae 2 steeply sloping laterally forming lower slope of interstriae 3, smooth; interstriae 3 definitely higher than interstriae 1, bearing a median row of moderately large granules, these larger than those on interstriae 1; punctures of striae 1 and 2 obsolete.

**Male.** Frons weakly convex to flattened, shining, with large, close, deep punctures, these somewhat smaller just above epistomal margin; median carina weakly but distinctly elevated, extending from epistoma to upper level of eyes; vestiture rather long, conspicuous. Pronotum as in female except asperities somewhat larger, punctures on posterior portion deeper and surface between punctures densely micropunctate. Elytra as in female except interstitial setae somewhat longer, interstitial punctures more abundant, declivity more deeply, narrowly sulcate with inner slope of lateral elevation much steeper and granules on interstriae 3 more abundant.

**TYPE MATERIAL.** The holotype (♀) in the USNM is labeled: 670/Amecameca, Mex., 1-28-36/*Abies reliogosa*/D. DeLeon, colr/Paratype 55987 USNM/HOLO-TYPE *Pityophthorus blackmani* D.E. Bright. The allotype and 3 paratypes bear the same data. One additional paratype (which may be misidentified) is labeled: 4 mi. W. Rio Frio, Mexico, Mex., VII-14-53, 9800 ft./*Abies*.

The holotype, allotype, and 2 paratypes are in the USNM, 1 paratype is in the CNC and 1 is in the SLWC.

**HOST.** *Abies religiosa*.

**DISTRIBUTION.** Central Mexico. Specimens (12) examined from:

**MEXICO**

**Hidalgo:** El Chico, 10.111.76, *Abies religiosa*, D. Cibrian (SLWC) 6. **Mexico:** See type locality.

**REMARKS.** See remarks under *rudis*.

Adults of this species are readily recognized by the abundant, long setae on the male frons, by the very dense brush of setae on the female frons, by the deep, narrow declivital sulcus, and by the host.

170. *Pityophthorus (P.) blandulus* Schedl

Figs. 178-180

*Pityophthorus blandulus* Schedl, 1956, p. 19; Bright, 1976c, p. 186 (lectotype desig.).

Length 1.8-2.3 mm, 2.9 times longer than wide.

**Female.** Frons very broadly flattened on more than a semicircular area extending from epistoma to well above eyes and laterally very nearly from eye to eye, frequently with a median, longitudinal, weakly concave area on lower half; surface shining, densely, finely punctured; vestiture dense, setae on periphery much longer, denser and incurved; mandibles glabrous, indented strongly near insertion, resulting in a quadrate appearance when viewed from frontal aspect, lower distal margin nearly truncate. Antennal club broadly oval, about 1.1 times longer than wide, widest through segment 2; first two sutures weakly arcuate; first two segments together occupy about half of total club length. Pronotum about 1.1 times longer than wide, widest near posterior angles; sides weakly arcuate, nearly subparallel; asperities on anterior slope erect, acute, usually isolated but occasionally two or three may be basally contiguous, scattered in no apparent order; posterior area of disc moderately punctate, punctures relatively shallow, widely separated; surface between punctures dull, uniformly minutely reticulate. Elytra 1.8-1.9 times longer than wide; apex rather narrowly rounded; discal striae punctured in regular rows, punctures large, moderately deep, close, each with a very fine, short seta; discal interstriae about as wide or slightly wider than striae, surface shining, marked with numerous fine lines and points, interstriae 1, 3, 5, 7 each with a few, median punctures, these smaller than those in striae and each bearing a short, fine seta, slightly longer on disc than those arising from striae punctures and distinctly longer on posterior third. Declivity convex, sloping; interstriae 1 narrowly, moderately elevated, bearing a median row of fine granules; interstriae 2 not widened, impressed but not sulcate; interstriae 3 weakly elevated, slightly higher than interstriae 1, bearing a median row of fine granules, these about equal in size to those on interstriae 1; punctures on striae 1 and 2 much smaller than those on disc but usually visible.

**Male.** Frons convex, somewhat flattened from epistoma to upper level of eyes; surface shining, deeply, closely punctured; median carina broad, only weakly elevated, indistinct and sometimes absent, when present extending from epistoma to a point below the upper level of eye. Pronotum as in female except asperities somewhat larger. Elytra as in female. Declivity deeply bisulcate; interstriae 1 narrowly elevated, impressed deeply below level of 3; interstriae 2 deeply sulcate, slightly broadened; interstriae 3 abruptly elevated on upper half, granules slightly larger than on female; punctures of striae 1 and 2 obsolete.

**TYPE MATERIAL.** The lectotype (♀) is in the KESC and bears the data: Las Trojadas, Pin. rud., 20-9-1951, Guatemala, leg. F. Schwerdtfeger/♀/75/Type *Pityophthorus blandulus* Schedl/LECTOTYPE *Pityophthorus blandulus* Schedl, D.E. Bright, 1976. Two additional specimens bearing the same data were seen but were not designated paralectotypes.

**HOSTS.** *Pinus ochoterenai*, *oocarpa*, and *rudis*.

**DISTRIBUTION.** Southern Mexico to Guatemala. Probably extends into Honduras. Specimens (33) examined from:

**MEXICO**

**Chiapas:** 8 mi E of San Cristobal de las Casas, 6.VI.69, *Pinus ochoterenai*, D.E. Bright (CNC) 24.

**GUATEMALA:** Huehuetenango, 19.IV.72, *Pinus rudis*, E.W. Clark (CNC) 6. Additional locality in literature:

**Mexico:** Temascaltepec, *Pinus oocarpa*, F. Islas (Schedl 1963).

**REMARKS.** Females of this species are easily recognized by the peculiar structure of the mandibles (Fig. 178). The indistinct, longitudinal carina on the frons (Fig. 179) and the deeply impressed elytral declivity with interstriae 3 more strongly, abruptly elevated on the upper half (Fig. 180) will distinguish the male from those of related species.

This species is closely related to *ciliatus* and was at first considered to be that species. Females of *blandulus* differ from those of *ciliatus* by the quadrate, glabrous mandibles while those of *ciliatus* are of the normal shape and bear one or two tufts of setae just anterior to the lateral insertion. The carina on the frons of the male of *blandulus* is obscure, short, weakly elevated and in some specimens is absent, while in *ciliatus* the carina is quite evident, distinctly elevated and long. Other minor differences were noted in the shape of the elytral declivity and the punctuation of the elytra and pronotum.

171. *Pityophthorus (P.) blandus* Blackman

Figs. 181-183; Map 34

*Pityophthorus blandus* Blackman, 1928, p. 107; Chamberlin, 1939, p. 387; Bright & Stark, 1973, p. 114.

*Pityophthorus singularis* Bright, 1966, p. 300; Bright & Stark, 1973, p. 111; Bright, 1977, p. 513 (= *blandus*).

Length 2.0-2.8 mm, 2.8 times longer than wide.

**Female.** Frons broadly flattened over entire surface from epistoma to well above upper level of eyes and laterally from eye to eye; surface shining, densely, finely punctured, densely covered with long, erect, yellowish setae, setae on periphery longer and incurved. Antennal club oval, 1.6 times longer than wide, widest through segment 2; first two sutures weakly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum about 1.1 times longer than wide, widest about middle; sides parallel on posterior half; asperities on anterior slope rather large, erect, scattered in no apparent order; posterior area of disc closely, deeply punctured; surface between punctures shining, very weakly, sparsely micropunctate. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows but may appear irregular because of large interstitial punctures, these punctures deep and close; discal interstriae about 1.5 times wider than striae, surface moderately shining, finely micropunctate-reticulate, interstriae 1, 3, 5, 7 each bearing a few large punctures, these equal in size to strial punctures, and sometimes scattered over interstitial surface, causing discernment of actual strial or interstitial punctures difficult, setae from these punctures slightly longer than those from strial punctures. Declivity bisulcate; interstriae 1 narrow, moderately elevated, equal in height to 3, bearing a

median row of fine granules; interstriae 2 deeply, very broadly sulcate, much wider than discal width, surface moderately shining; interstriae 3 arcuate, elevated slightly, bearing a median row of large, rounded granules, these larger than those on interstriae 1, occasionally supplementary granules are located laterally to median row, these may be numerous; punctures in striae 1 and 2 obsolete.

**Male.** Frons convex, flattened to weakly transversely impressed above epistoma; surface deeply, closely punctured; longitudinal carina weakly elevated, usually extending from epistoma to near upper level of eyes but may be shorter. Pronotum, elytra, and declivity essentially as in female except declivital interstriae 2 is deeper and more broadly sulcate and the granules on declivital interstriae 3 are larger.

**TYPE MATERIAL.** *P. blandus*. The holotype (♀) in the USNM bears the labels: Argus Mtns., May 91, K./on Pinus monophylla/through C.V. Riley/TYPE Pityophthorus blandus Blackman/Type No. 41309 U.S.N.M. Two paratypes bear the same data except for the type labels. The allotype and 5 paratypes are labeled: on Pinus ponderosa/Flagstaff, Ar., 7-111-02/Barber Schwarz, coll.

Most of the type material is in the USNM, additional paratypes are in the DFEC.

*P. singularis*. The holotype (♀) in the CASC is labeled: 12 mi. W. Lone Pine, Inyo Co., Calif., IX-18-65/Pinus monophylla/D.E. Bright and D.N. Kinn, collectors/HOLOTYPE Pityophthorus singularis Bright. The allotype and 51 paratypes bear the same data except for the substitution of paratype (or allotype) labels. Two additional paratypes were collected at Frazier Park, Kern County, California on 9 September 1965 from the same host and by the same collectors as above.

Primary types are in the CASC, additional paratypes are in the CISC, USNM, CNC, SLWC, and DEBC.

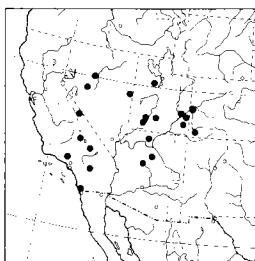
**HOSTS.** *Pinus edulis*, *monophylla*, and occasionally *ponderosa*.

**DISTRIBUTION.** Southwestern United States, west to California and north to Colorado (Map. 34). Specimens (276) examined from:

#### UNITED STATES

**Arizona:** Jacob Lake, 3.VIII.74, *Pinus edulis*, D.E. Bright (CNC) 25; Prescott, 25.VII.50, D. & J.N. Knull (OSUC) 2. **California:** Bear Lake, 25.IV.19, J.O. Martin (CASC) 2; Cajon, 6.VI.48, J.N. Knull (OSUC) 1; Doble, 20.VI.32, Pinon pine, C.R. Bruck (OSUC) 10; Frazier Mountain, 6.IX.40, *Pinus monophylla*, C.R. Bruck (OSUC) 19; 6 mi N of Westgard Pass, Inyo Co., 6.IX.68, *Pinus monophylla*, D.E. Bright (CNC) 71. **Colorado:** Black Ridge, 5 mi N of Glade Park, 14.VII.68, *Pinus edulis*, H.F. Howden (CNC) 6; Mesa Verde National Park, 8.V.30, *Pinus edulis*, M.W. Blackman (USNM) 3. **Nevada:** 7 miles east of Austin, 3.VI.64, *Pinus monophylla*, C.W. O'Brien (DEBC) 3; Baker, 15.V.37, *Pinus monophylla*, T.O. Thatcher (USNM) 11; East Gate, 20.X.35, *Pinus monophylla* (USNM) 6. **Utah:** Beaver, 23.IV.49, *Pinus edulis*, S.L. Wood (SLWC) 20; Deadhorse Point, 15.V.58, *Pinus edulis*, H.P. Shertleff (SLWC) 3; Gooseberry, Fishlake National Forest, 9.VI.60, *Pinus edulis*, D.E. Bright (DEBC) 6; Iron Mountain, 13.V.50, *Pinus monophylla*, S.L. Wood (SLWC) 9; LaSal Mountains, 5.VII.58, *Pinus edulis*, D.E. Bright (DEBC) 1; Mercur, Tooele Co., 27.IV.60, *Pinus monophylla*, D.E. Bright (CNC, DEBC) 8; 8 miles E of Monticello, 29.V.69, *Pinus edulis*, S.L. Wood (SLWC) 4; Panguitch Lake, Dixie National Forest, 22.VI.60, *Pinus edulis*, S.L. Wood (SLWC) 2.

**REMARKS.** Adults of *blandus* are easily distinguished by the very broad, deeply sulcate second declivital interstriae (Fig. 183), by the strongly granulate third declivital interstriae (Fig. 183), by the somewhat irregularly punctured elytral striae, and by the short, weakly elevated carina on the male frons (Fig. 182).

MAP 34. Collection localities for *P. (Pityophthorus) blandus*.172. *Pityophthorus (P.) brevis* Blackman

Figs. 184-186; Map 35

*Pityophthorus brevis* Blackman, 1928, p. 81; Chamberlin, 1939, p. 379.

Length 1.6-2.1 mm, about 2.8 times longer than wide.

**Female.** Frons flattened on a rather small area extending from epistomal margin to slightly above upper margin of eyes and laterally nearly to eyes; surface shining, very densely punctured, punctures moderately deep, nearly touching; pubescence sparse, short, of nearly equal length except a few setae on periphery may be slightly longer and slightly incurved. Antennal club oval, about 1.2 times longer than wide, widest through segment 2; first two sutures transverse, straight, or may be very weakly arcuate; first two segments together occupy more than half of total club length. Pronotum about 1.2 times longer than wide, widest at middle; sides subparallel on basal half; asperities on anterior slope prominent, erect and acute, isolated, scattered in no apparent order; posterior area of disc densely, deeply punctured, punctures almost touching or narrowly separated; surface between punctures brightly shining, smooth with a few, minute points or lines. Elytra 1.6 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures large and deep; discal interstriae shining, about as wide or slightly wider than striae, each with a median row of sparser, slightly smaller punctures, each puncture bearing a hairlike seta that is slightly longer than those arising from striae punctures. Declivity convex, bisulcate; interstriae 1 narrowly elevated, bearing a median row of very fine granules or largely devoid of granules; interstriae 2 moderately broadly sulcate, wider than discal width; interstriae 3 moderately elevated, slightly higher than interstriae 1, with a row of rather large granules, these distinctly larger than those on interstriae 1, setae hairlike; punctures in striae 1 and 2 usually visible but much reduced, especially in striae 2.

**Male.** Frons transversely flattened or slightly impressed above epistomal margin, bearing a weakly elevated, distinct, longitudinal carina that extends from epistomal margin to upper level of eyes; surface convex above impression, deeply, densely punctured, setae inconspicuous. Pronotum and elytra essentially as described for female except granules on declivital interstriae 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Kaibab N.F., Ariz., 6-7-25/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. K-32b)/*Pinus ponderosa*/TYPE *Pityophthorus brevis* Blackman/Type No. 41295 U.S.N.M. The allotype and 108 paratypes bear the same data; 5 paratypes same as above except Lot No. K-33 and date is 6-8-25; 64 paratypes same as above except date is 7-1-25 and Lot No. is K-72; 7 paratypes same as above except date is 6-26-25 and Lot No. is 69; 19 paratypes: Hopk. US. 5525/J.L. Webb, coll./Capitan Mtns. N.M./ *Pinus strobiformis* and 42 paratypes: various Hopkins numbers/Sta. Catalina Mts., Ariz./J.L. Webb, coll./*Pinus strobiformis*.

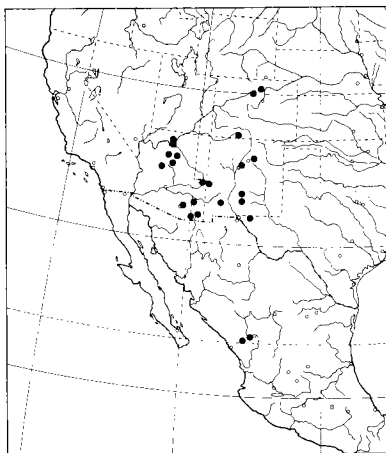
Most of the type material is in the USNM, additional paratypes in CNC, DFEC, and RMSC.

**HOSTS.** *Pinus aristata*, *ayachuite*, *contorta*, *edulis*, *flexilis*, *leiophylla*, *ponderosa*, and *strobiformis*. One record is from *Abies concolor*.

DISTRIBUTION. Southwestern United States south to at least Durango, Durango, Mexico and north to northeastern Colorado (Map 35). Specimens (1062) examined from:

#### UNITED STATES

**Arizona:** Agassiz Peak, San Francisco Mtns., 16.VIII.68, *Pinus strobiformis* (1) and *Pinus aristata* (1), D.E. Bright (CNC) 2; Alpine, 11.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 21; Bear Canyon, Santa Catalina Mtns., 1.VIII.74, *Pinus ponderosa*, D.E. Bright (CNC) 14; Carr Canyon, Santa Cruz Co., 8.VIII.62, *Pinus flexilis*, S.L. Wood (SLWC) 17; Grand Canyon, North Rim, 30.V.69, *Pinus ponderosa*, W. Harwood (SLWC) 8; 9 mi W of Jacob Lake, 30.V.69, *Pinus ponderosa*, W. Harwood (SLWC) 5; Mount Bigelow, Santa Catalina Mtns., 6.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 11; Mount Lemmon, Pima Co., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 18; Oak Creek Canyon, 6 mi N of Sedona, 2.VIII.74, *Pinus ponderosa*, D.E. Bright (CNC) 12; Pinaleno Mtns., Graham Co., 15.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 34; Prescott National Forest, 31.V.30, *Pinus ponderosa*, M.W. Blackman (USNM) 59; Rustler Park, Cochise Co., 19.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 35; San Francisco Mtns., 18.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 40; Santa Catalina Mtns., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1; Spencer Canyon, Santa Catalina Mtns., 11.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 27; Walker, 23.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 20; Williams (DFEC) 1. **Colorado:** Colorado National Forest, *Pinus contorta* (DFEC) 19; Estes Park, 16.VIII.58, *Pinus ponderosa*, D.E. Bright (DEBC, SLWC) 4; Fort Collins, *Pinus ponderosa* (RMSC) 4; 30 mi W of Fort Collins, 14.VIII.58, *Pinus ponderosa*, D.E. Bright (DEBC) 4; 15 mi N 11 mi W of Pagosa Springs, 27.VI.68, *Abies concolor*, W.G. Harwood (SLWC) 1. **New Mexico:** Cloudcroft, 4.V.69, *Pinus ponderosa*, S.L. Wood (SLWC) 22; 5 mi E of Cloudcroft, 13.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 14; Emory Pass, Sierra Co., 24.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 23; Luna, Catron Co., 11.VII.68, *Pinus edulis*, D.E. Bright (CNC) 16; Mayhill, 12.VII.74, *Pinus edulis*, D.E. Bright (CNC) 24; Ruidoso, *Pinus ponderosa* (RMSC) 4; Sandia Mountains, 29.V.69, *Pinus ponderosa*, S.L. Wood (SLWC) 16 and same locality 9.VII.68, same host, D.E. Bright (CNC) 28; same host, D.E. Bright (CNC) 28; Sopello, 19.VI.52, *Pinus*, Beamer and LeBerge (SLWC) 4. **Texas:** Guadeloupe Mountains National Park, The Bowl, 17.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 2.



MAP 35. Collection localities for *P. (Pityophthorus) brevis*.



## MEXICO

**Durango:** 60 mi W of Durango, 5.VI.65, *Pinus* sp., S.L. Wood (SLWC) 1; El Salto vicinity, various dates, *Pinus ayacahuite* and *Pinus* sp., D.E. Bright, J.B. Thomas or S.L. Wood (CNC, SLWC) 304.

REMARKS. Adults of this species are most easily recognized by the moderately deeply, broadly sulcate second declivital interstriae (Fig. 186), by the sparsely pubescent female frons on which all setae are short and all about equal in length (Fig. 184), and by the distribution. It is a common species in Arizona and New Mexico.

I have seen one specimen, a male, from southwestern Colorado collected from *Abies concolor* (SLWC). This specimen is very slightly larger than typical specimens from Arizona and New Mexico. In addition, the frons is dull and densely minutely reticulate, not smooth and shining as in typical specimens. However, this difference is not consistent since occasional specimens of otherwise typical *brevis* from pines also display the reticulate microsculpture on the frons. The size difference is only very minor and is not considered significant.

173. *Pityophthorus* (*P.*) *californicus* Bright

<sup>o</sup> *Pityophthorus deleoni* Bright, 1966, p. 302 (preoccupied); Bright & Stark, 1973, p. 109.

*Pityophthorus californicus* Bright, 1976b, p. 427.

Length 1.7-2.1 mm, 2.7 times longer than wide.

**Female.** Frons and antennal essentially as in *electus*. Pronotum as long as wide, widest behind summit; sides moderately arcuate, anterior constriction very weak; posterior area of disc essentially as in *electus* except punctures not as deeply impressed and are more vague; surface between punctures shining, more densely marked with minute lines and points. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae and interstriae as in *electus*. Declivity essentially as in *electus* except interstriae 2 not as deeply impressed.

**Male.** Essentially as in *electus*, except interstriae 3 on declivity with summits slightly pushed inward toward suture.

TYPE MATERIAL. The holotype (♀) in the USNM bears the labels: Hopk U.S. 33689/Bonnie Doone, Santa Cruz Co., Calif., V-21-41/*Pinus attenuata*/D. De Leon, Colr./HOLOTYPE *Pityophthorus deleoni* Bright. The allotype and 13 paratypes bear the same data.

HOSTS. *Pinus attenuata* and *radiata*.

DISTRIBUTION. Coast Range of California. Specimens (16) examined from:

## UNITED STATES

**California:** 18 mi N of Santa Cruz, 9.III.62, *Pinus radiata* D.E. Bright (DEBC) 1.

REMARKS. This species seems to be closely related to *electus* but the adults of *californicus* may be distinguished by the narrower anterior pronotal margin, by the smaller size, by the differently formed male declivity as brought out in the description and by the host and distribution.

I suspect that *californicus* is a derivative of *electus* that was isolated when the Coast Range of California was separated from the interior by an inland sea during the Miocene and Pliocene periods. Its hosts, *Pinus attenuata* and *radiata*, are characteristic of this coastal region although, in the case of *attenuata*, not restricted to it.

174. *Pityophthorus (P.) ciliatus* Blackman

*Pityophthorus ciliatus* Blackman, 1942, p. 211.

Length 1.7-2.1 mm, about 2.7 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface shining, very finely, densely and closely punctured; vestiture dense, covering entire surface, those setae on periphery longer and incurved. Mandibles bearing several tufts of short setae near lateral insertion, masking basal half. Antennal club narrowly oval, 1.3 times longer than wide, widest through segment 2; first two sutures transverse, straight; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest near base; sides moderately arcuate; asperities on anterior slope low, broad, usually isolated but frequently two to four may be basally contiguous, arranged in no apparent order; posterior area of disc deeply, finely punctured; surface between punctures moderately shining, with numerous fine lines and points or minutely reticulate. Elytra 1.6-1.7 times longer than wide; apex rather narrowly rounded; discal striae punctured in regular rows, punctures large, shallow, close; discal interstriae about 1.5 times wider than striae, surface shining, marked by fine lines and points; interstriae 1, 3, 5, 7 each bearing a few punctures, these about equal in size to those in striae and each bearing a fine seta, setae on disc about as long as interstitial width, becoming much longer and stouter toward elytral apex. Declivity convex; interstriae 1 slightly elevated, bearing a row of very fine granules; interstriae 2 weakly sulcate, not noticeably wider than discal width; interstriae 3 weakly elevated, only slightly higher than interstriae 1, bearing a median row of fine granules, these larger than those on interstriae 1; punctures in striae 1 and 2 obsolete, but usually visible, smaller than those on disc.

**Male.** Frons convex, closely, deeply punctured, punctures almost touching each other; median carina prominent, distinctly but weakly elevated from epistomal margin to well above upper level of eyes, vestiture inconspicuous. Pronotum as in female except asperities stronger. Elytra as in female. Declivity essentially as in female, except interstriae 3 more abruptly elevated, especially on upper half, distinctly higher than interstriae 1, granules larger; interstriae 2 more deeply sulcate.

**TYPE MATERIAL.** The holotype (♀) in the USNM is labeled: 688-10/Jalapa, V.C. 2-9-36/Pinus patula/D. DeLeon colr./Type No. 55986, U.S.N.M. The allotype and 8 paratypes bear the same data.

All of the type material is in the USNM except one paratype which is in the CNC.

**HOSTS.** *Pinus patula* and probably other species of *Pinus*.

**DISTRIBUTION.** Known only from Veracruz, Mexico, but probably occurs throughout southern Mexico. Specimens (14) examined from:

## MEXICO

**Veracruz:** 1 mi W of Las Vigas, 5.VII.67, *Pinus* sp., S.L. Wood (SLWC) 4.

**REMARKS.** Adults of this species closely resemble those of *blandulus* but differ by the stronger carina on the male frons and by the shape of the female mandible (see remarks under *blandulus*).

175. *Pityophthorus (P.) clivus* Bright

*Pityophthorus clivus* Bright, 1977, p. 522.

Length 1.7-2.0 mm, 2.6 times longer than wide.

**Female.** Frons broadly flattened from epistoma to above upper level of eyes and laterally from eye to eye; surface smooth, brightly shining, weakly punctured around periphery, central portion impunctate except sometimes a few scattered punctures may be present; vestiture sparse to absent in central area, setae present only on periphery and on lateral areas near periphery, those setae on periphery much longer and incurved. Antennal

club oval, 1.1 times longer than wide; widest through segment 2; suture 1 transverse; suture 2 rather strongly arcuate; first two segments together occupy slightly less than half of total club length. Pronotum less than 1.1 times longer than wide, widest behind summit; sides weakly arcuate; asperities on anterior slope small, acute, usually isolated but often two or three may be basally contiguous, individuals or groups scattered in no apparent order; posterior area of disc densely, deeply punctured; surface between punctures brightly shining, smooth and may bear a few minute points. Elytra 1.7-1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures rather small and deep; discal interstriae about as wide as striae, brightly shining, lightly sculptured with weak grooves and points, interstriae 1, 3, 5, 7 each with a median row of sparse punctures, these equal in size to those in striae and each bearing a slightly longer seta. Declivity convex; interstriae 1 weakly elevated, bearing a row of numerous, small, rounded granules; interstriae 2 very weakly impressed, slightly wider than discal width; interstriae 3 weakly elevated, equal in height to 1, bearing only a few rounded granules; punctures of striae 1 and 2 much smaller than those on disc, sometimes obsolete and not visible.

**Male.** Frons flattened, densely punctate-reticulate, opaque to only moderately shining; longitudinal carina moderately elevated, short, extending from epistomal margin to well below upper level of eyes. Pronotum and elytra essentially as in female except asperities and punctures somewhat stronger. Declivity as in female except interstriae 1 very slightly lower than level of interstriae 3.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the labels: MEX., N.L., Cerro Potosi, V.4.71, 11,500', D.E. Bright/Pinus strobiformis/HOLOTYPE Pityophthorus clivus D.E. Bright, CNC No. 13970. The allotype and 28 paratypes bear the same data.

Most of the type material is in the CNC, additional paratypes are in the KESC and the SLWC.

**HOST.** *Pinus strobiformis*.

**DISTRIBUTION.** Known only from the type locality in Nuevo León.

**REMARKS.** Adults of this species resemble those in the *Deletus* group but the presence of about six to eight serrations on the anterior margin of the pronotum of adults of *clivus* prevents it being included in that group. Adults of *clivus* may be distinguished by the glabrous, impunctate median portion on the female frons, by the short carina on the male frons, by its smaller size, and by its distribution.

This species was found at a very high elevation on Cerro Potosi in Nuevo León and may be endemic to that mountain.

#### 176. *Pityophthorus (P.) declivisetosus* Bright

*Pityophthorus declivisetosus* Bright, 1977, p. 525.

Length 1.6-1.8 mm, 2.7 times longer than wide.

**Female.** Frons flattened to weakly convex; surface obscurely shallowly punctured and sparsely setose, setae all equal or nearly equal in length, some on periphery may be slightly longer and incurved. Antennal club oval, 1.3 times longer than wide; suture 1 very weakly arcuate to straight, 2 more strongly but still slightly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum 1.1 times longer than wide, widest near middle; sides subparallel on posterior half; asperities on anterior slope small, erect, acute, isolated, scattered in no apparent order; posterior area densely punctured, punctures large and moderately deep; surface between punctures dull, minutely reticulate. Elytra 1.7 times longer than wide; apex broadly rounded; discal striae punctured in fairly regular rows, punctures moderately large, deep and close; discal interstriae narrower or equal in width to striae, surface dull, minutely reticulate, interstriae 1, 3, 5, 7 each bearing a few scattered punctures on disc, these extending to near base, interstriae 2, 4, 6, etc. with a few punctures on posterior portion near declivity, each puncture bearing a longer, hairlike

seta, each seta longer than interstriae width. Declivity convex, bisulcate; interstriae 1 narrowly elevated, without a median row of granules or, if granules present, then they are very small and inconspicuous; interstriae 2 moderately deeply sulcate, slightly wider than discal width to nearly equal to discal width; interstriae 3 moderately elevated, higher than 1, the granules on summit rather large, abundant, setae flattened, stout; punctures in striae 1 and 2 reduced in size but readily visible.

**Male.** Frons very similar to female except a faintly elevated, weak, median carina is present extending from epistomal margin to near upper level of eyes. Pronotum as in female except punctures on posterior portion slightly larger and deeper. Elytra as in female except strial and interstitial punctures deeper, interspace 1 more deeply impressed on declivity and granules on declivital interstriae 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) in the CNC is labeled: MEX., 32 mi. S.E. Nochixtlan, Oax., VII-14-1969, D.E. Bright/Pinus pringlei/HOLOTYPE *Pityophthorus declivisetosus* D.E. Bright, CNC No. 13738. The allotype and 23 paratypes bear the same data.

Most of the type material is in the CNC, additional paratypes are in the KESC and the SLWC.

**HOST.** *Pinus pringlei*.

**DISTRIBUTION.** Known only from the type locality in Oaxaca.

**REMARKS.** Adults of this species resemble the adults of *durus* but those of *declivisetosus* may be distinguished by the short, sparse setae on the female frons, by the smaller size and by the coarser declivital setae. Although the adults may key out close to *brevis* the two species are not closely related.

### 177. *Pityophthorus (P.) durus* Blackman

Figs. 187-189; Map 36

*Pityophthorus durus* Blackman, 1928, p. 70; Chamberlin, 1939, p. 377.

Length 1.9-2.6 mm, about 2.5 times longer than wide.

**Female.** Frons weakly planoconvex on a wide area extending from epistomal margin to above upper level of eyes and laterally nearly from eye to eye; surface shining, finely, densely punctured, moderately densely covered with long, yellowish setae, those on periphery longer and incurved, surface readily visible through pile. Antennal club oval, 1.3 times wider than long, widest through segment 2; suture 1 transverse, straight to very weakly arcuate, 2 more strongly arcuate; first two segments together occupy about half of total club length. Pronotum 1.1 times longer than wide, widest behind middle; sides weakly arcuate; asperities on anterior slope large, erect, acute, isolated except that occasionally two or three may be joined, especially near summit; posterior area of disc moderately punctured, punctures of moderate size, deep and close; surface between punctures shining to dull, marked with numerous points or minutely reticulate. Elytra about 1.5 times longer than wide; apex broadly rounded; discal striae punctured in nearly regular rows, punctures large, deep and close; discal interstriae about as wide as striae, surface shining, interspaces 1, 3, 5, 7 each with a median row of sparse punctures, these about equal or slightly smaller than those in striae and each bearing a long hairlike seta, often all interstriae may be sparsely punctured. Declivity convex, steep, bisulcate; interstriae 1 narrowly, weakly elevated, not bearing a median row of granules or, if granules present, then they are very small; interstriae 2 moderately sulcate, equal or nearly equal to discal width; interstriae 3 abruptly elevated, definitely higher than 1, inner slope of elevations steep, precipitous, granules on summit rather large, abundant, arranged in a single row; punctures in striae 1 and 2 somewhat obsolete to distinct, usually somewhat reduced in size.

**Male.** Frons flattened on a semicircular area similar to female, with a distinct but weakly elevated, longitudinal carina extending from epistomal margin to near or just above upper level of eyes; surface of flattened area dull to shining, minutely reticulate between the moderately deep, large punctures; vestiture inconspicuous. Pronotum similar to female

except asperities larger. Elytra similar to female except strial and interstitial punctures larger, granules on declivital interstriae 3 larger, punctures of declivital striae 1 and 2 more distinct and declivital interstriae 2 slightly more deeply sulcate.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Hopk. US 6586 d/J.S. Holmes, coll./Paradise, Ariz./*Juniperus pachyphloea*/TYPE *Pityophthorus durus* Blackman/Type No. 41287 U.S.N.M. The allotype and 2 paratypes bear the same data.

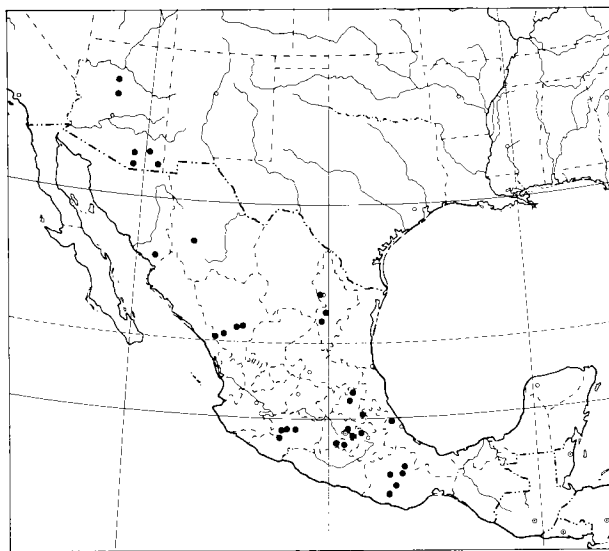
All type material is in the USNM.

**HOSTS.** *Pinus ayachuite*, *cembroides*, *engelmannii*, *lawsoni*, *leiophylla*, *michoacana*, *ponderosa*, *pringlei*, *strobiformis*, and *teocote*. One record from *Pseudotsuga menziesii*. The host recorded on the type series is an error.

**DISTRIBUTION.** Southwestern United States south to Oaxaca and Veracruz, Mexico (Map 36). Specimens (437) examined from:

#### UNITED STATES

**Arizona:** Agassiz Peak, San Francisco Mtns., 16.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 18; Bear Canyon, Santa Catalina Mtns., 15.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1; Cave Creek, Chiricahua Mtns., 7.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 3; Madera Canyon, Santa Rita Mtns., 29.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 15; Pinaleno Mtns., Graham Co., 15.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 2; Pinery Canyon, Chiricahua Mtns., 20.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 2; Santa Rita Mtns., 20.VII.68, *Pinus engelmannii*, D.E. Bright (CNC) 3; 8 mi E of Sedona, 13.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1.



MAP 36. Collection localities for *P. (Pityophthorus) durus*.

#### MEXICO

**Chihuahua:** La Laja, 16.VII.60, *Pinus*, S.L. Wood & J.B. Karren (SLWC) 4. **Durango:** Area between Durango and El Salto, various dates 1953-71, *Pinus tecote*, *P. cembroides*, *P. ayachuite* or *P. leiophylla*, D.E. Bright or S.L. Wood (CNC, SLWC) 140; 9 mi E of El Palmito, 15.VI.71, *Pinus Tecote*, D.E. Bright (CNC) 2. **Hidalgo:** 8 mi S of Durango, 29.IV.69, *Pinus* sp., D.E. Bright (CNC) 43; 11 mi SE of Jacala,

22.VI.53, *Pinus*, S.L. Wood (SLWC) 6; 19 mi E of Tulancingo, 24.VI.53, *Pinus*, S.L. Wood (SLWC) 14. **Mexico:** Chalco, 29.I.31, *Pinus leiophylla*, D. DeLeon (SLWC) 2; Nepantla, 9.V.71, *Pinus leiophylla*, D.E. Bright (CNC) 6. **Michoacán:** 6 mi S of Carapán, 18.VI.65, *Pinus*, S.L. Wood (SLWC) 14; 16 mi E of Morelia, 14.VI.65, *Pinus*, S.L. Wood (SLWC) 7; 4 mi W of Quiroga, 17.VI.65, *Pinus*, S.L. Wood (SLWC) 10; 6 mi E of Volcan Paricutin, 19.VI.65, *Pinus leiophylla*, S.L. Wood (SLWC) 20. **Morelos:** Cuernavaca, 5.V.36, *Pinus leiophylla*, D. DeLeon (USNM) 3; 5 mi N of Cuernavaca, 15.VII.69, *Pinus michoacana*, D.E. Bright (CNC) 5. **Nuevo León:** Cerro Potosi, 2.V.71, *Pseudotsuga menziesii*, D.E. Bright (CNC) 2; Chipinque Msa, near Monterrey, 23.VI.71, *Pinus* sp., D.E. Bright (CNC) 5; 15 mi E of San Roberto, 5.V.71, *Pinus cembroides*, D.E. Bright (CNC) 3. **Oaxaca:** Vicinity of Oaxaca, various dates 1971, *Pinus lawsoni* and *P. sp.*, D.E. Bright (CNC) 58; 32 mi SE of Nochixtlán, 14.VII.69, *Pinus leiophylla* and *P. pringlei*, D.E. Bright (CNC) 12; 53 mi S of Valle Nacional, 25.V.71, H. Howden (CNC) 2. **Puebla:** 16 mi W of Texmelucán, 13.VI.67, *Pinus*, S.L. Wood (SLWC) 13; Km. 70, road from Mexico City to Tlaxcala, 3.VII.61, Bravo (CNC) 9. **Sonora:** Navajoa, 25.XI.41, Pine bark (USNM) 6. **Veracruz:** 1 mi W of Las Vigas, 5.VII.67, *Pinus*, S.L. Wood (SLWC) 2.

REMARKS. The adults of this species are rather easily distinguished by the abruptly, somewhat strongly elevated third declivital interstriae which bears large granules on the summit (Fig. 189), by the moderately densely pubescent female frons (Fig. 187), and by the large stria punctures. The adults resemble those of *declivisetosus* but those of *durus* are larger and differ in other ways as mentioned under *declivisetosus*.

#### 178. *Pityophthorus (P.) electus* Blackman

*Pityophthorus electus* Blackman, 1928, p. 140; Chamberlin, 1939, p. 401; Chamberlin, 1958, p. 161; Wood, 1971a, p. 427.

Length 2.0-2.2 mm, 2.8 times longer than wide.

**Female.** Frons broadly flattened to weakly concave from epistoma to well above upper level of eyes and laterally nearly from eye to eye; surface shining, very densely, finely punctured except occasionally on a small, median area on the epistomal margin, densely covered with long, erect, yellowish setae, those on periphery longer and incurved. Antennal club oval, about 1.2 times longer than wide, widest through segment 2; first two sutures transverse; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest behind summit; sides weakly arcuate; asperities on anterior slope large, acute, isolated but occasionally two or three may be contiguous, scattered in no apparent order; posterior area of disc moderately to weakly punctured, punctures not especially deep or well defined, lateral or posterior borders slightly raised, giving the appearance of fine, low asperities or granules over surface; surface between punctures shining, marked with numerous fine lines and points. Elytra 1.7-1.8 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures large, deep and close; discal interstriae about as wide or slightly wider than striae, surface shining, marked with fine points and lines, interstriae 1, 3, 5, 7 each bearing a median row of sparse punctures, these smaller than those in striae and each bearing a very short, erect seta that is slightly longer than those arising from stria punctures. Declivity convex; interstriae 1 narrow, weakly elevated and bearing a median row of fine granules; interstriae 2 moderately sulcate, broader than discal width, smooth and shining; interstriae 3 moderately elevated, higher than 1, bearing a median row of moderate size granules, these slightly larger than those on interstriae 1; punctures in striae 1 and 2 obsolete and usually not visible, if visible then much smaller than those on disc.

**Male.** Frons convex, weakly transversely impressed above epistoma; surface strongly punctured, more finely so just above epistoma; median carina weakly elevated. Pronotum as in female except asperities larger, more erect. Elytra as in female. Declivity with interstriae 1 slightly lower and interstriae 3 slightly more elevated than in female.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Ashland, Oregon, Oct. 16, 1914/Pinus ponderosa/F.P. Keen collector/37a/TYPE Pityophthorus electus Blackman/Type No. 41324 U.S.N.M. The allotype and 2 paratypes bear the same data.

All type material is in the USNM.

**HOSTS.** *Pinus coulteri*, *jeffreyi*, and *ponderosa*. The record from Norway spruce is considered accidental.

**DISTRIBUTION.** Southern California to Oregon. Specimens (35) examined from: UNITED STATES

**California:** Julian, 2.IX.15, *Pinus coulteri*, F.P. Keen (USNM) 2; Mt. Hawkins, 27.VI.40, *Pinus ponderosa*, C.R. Bruck (OSUC) 2; Mt. Laguna, San Diego Co., 25.VIII.68, *Pinus jeffreyi*, D.E. Bright (CNC) 23. **Oregon:** Corvallis, 11.V.57, Norway spruce, S. Tunnock (MDSPF) 4.

**REMARKS.** Adults of this species can be distinguished by the faintly elevated, longitudinal carina on the male frons, by the large, erect serrations on the anterior margin of the pronotum, by the large asperities on the anterior slope of the pronotum, by the large stria punctures, and by the characteristics of the declivity.

This species is probably much more common than the records indicate. Blackman included this species in his group VII, the members of which should have the elytral apex acuminate. All the specimens (including types) examined in this study have a broadly rounded elytral apex, not acuminate in the slightest manner. Further, in the key to species and in the description, Blackman refers to a transverse carina on the male frons. No specimen was seen that showed even the slightest indication of a transverse carina. These two discrepancies have undoubtedly led all previous investigators to either misidentify or overlook this species in their studies.

*Pityophthorus electus* is closely related to *californicus* but members of the latter differ by the smaller size, by the more narrowly rounded anterior pronotal margin, by the less deeply impressed elytral declivity and by the host and distribution.

#### 179. *Pityophthorus (P.) orarius* Bright

*Pityophthorus orarius* Bright, 1968, p. 607; Hedlin & Ruth, 1970, p. 105; Furniss & Carolin, 1977, p. 402.

Length 2.0-2.3 mm, about 2.7 times longer than wide.

**Female.** Frons flattened on a broad semicircular area from epistoma to above eyes and laterally nearly from eye to eye, median portion slightly concave or transversely impressed; surface densely punctured except on a smooth, shining, weakly elevated, median space just above epistoma, punctures shallow, sparse around impunctate median space; vestiture very sparse, fine, rather short, a few setae slightly longer and incurved on periphery. Antennal club oval, 1.5 times longer than wide, widest through segment 2; sutures 1 and 2 rather strongly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum as long as wide, widest just before base; sides moderately curved; asperities on anterior slope low, blunt, arranged in no apparent order; posterior area of disc densely punctured, punctures deep, coarse and close; surface between punctures subopaque, densely minutely-reticulate. Elytra about 1.4 times longer than wide; apex broadly rounded; discal striae punctured in nearly regular rows, punctures deep and close; discal interstriae wider than striae, surface subopaque, each with a median row of punctures, these as large as those in striae but less numerous and bearing longer setae. Declivity convex, shallowly bisulcate; interstriae 1 wide, moderately elevated, with a median row of numerous, small granules; interstriae 2 distinctly wider than discal width, smooth, weakly impressed; interstriae 3 very slightly elevated, equal in height to or even lower than inter-

striae 1, with a median row of small granules; punctures of striae 1 and 2 obsolete, sometimes faintly visible in striae 2.

**Male.** Frons flattened, strongly punctured, punctures large, shallow; vestiture as on female; carina extending from epistomal margin to well above eyes, well developed, more strongly elevated in epistomal region. Pronotum is in female except asperities on anterior slope more numerous and posterior area more strongly, roughly punctured. Elytra as in female except striae more irregular, interstriae more strongly punctured making the entire elytral disc appear irregularly punctured and granules on declivital interstriae 1 and 3 somewhat larger than in female.

**TYPE MATERIAL.** The holotype (♀) in the CNC bears the data: Colwood, British Columbia, VII-28-64, A.F. Hedlin/*Pseudotsuga menziesii*/HOLOTYPE *Pityophthorus orarius* Bright, No. 9735. The allotype and 14 paratypes bear the same data as holotypes and 37 bear same data except collected on 9 January 1968, D. Ruth.

The holotype, allotype, and most of the paratypes are in the CNC. Additional paratypes are in the PFRC, the SLWC, and the USNM.

**HOST.** Recorded only from *Pseudotsuga menziesii*.

**DISTRIBUTION.** Interior British Columbia but probably has a wider distribution in the range of Douglas-fir. Specimens (55) examined from:

#### CANADA

**British Columbia:** Langley, 22.IV.59, Douglas fir twigs, K. Graham (UBC) 6; Surrey, 14.VII.75, D. fir tip, W. Lock (CNC, PFRC) 2.

**BIOLOGY.** Hedlin and Ruth (1970) provide data on the life history and habits of this species.

Overwintering adults emerge from twigs in the spring when the new growth on Douglas-fir twigs is about 5 cm long. This is mid-May on southern Vancouver Island.

The female selects a twig and tunnels into the previous years growth directly below the node. After tunnelling 10-11 mm, the beetle excavates a small chamber at the base of a lateral twig and deposits one or two eggs. Oviposition in 1968 occurred from 23 May to 3 July. Mating was not observed but presumably occurs in the galleries, since pairs were found in several galleries examined. The pearl-colored egg is elliptical (.60x.81 mm, av. of 13 eggs) and has a reticulate surface. Hatching occurred from 6 June to 3 July in 1968, after an incubation period of about 14 days.

Larvae are present from early June to early August. Development is completed in about 30 days. Head capsule measurements indicate they pass through 3 instars. The larvae feed mainly in the previous years growth, but will also mine the new shoots. Larval galleries range from 5 to 29 mm long, with an average of about 14 mm.

Pupae are present from early July to mid-August and the pupal period is about 15 days.

Adults are found from mid-July to mid-August and sometimes as late as mid-September. They emerge from the parental host tissue and seek overwintering sites in twigs of the previous year's growth.

The gallery construction and feeding of adults and larvae kills the new shoots and may kill young cones on the previous year's growth. Since the new shoots are potential cone bearers, a beetle infestation may also affect the cone crop of future years.



REMARKS. Adults of this species may be recognized by the very shallowly scalate elytral declivity, with interstriae 1 and 3 equal in height, by the sparsely pubescent female frons, by the somewhat sharply elevated carina on the male frons, and by the host and distribution.

180. *Pityophthorus (P.) scabridus* Schedl

Figs. 190-192; Map 37

*Pityophthorus scabridus* Schedl, 1956, p. 24; Schwerdtfeger, 1957, p. 502; Schedl, 1963, p. 158; Bright, 1976c, p. 186 (lectotype desig.); Schedl, 1977b, p. 42.

Length 1.9-2.4 mm, 2.2 times longer than wide.

**Female.** Frons flattened on a semicircular area extending from the epistomal margin to well above the eyes and laterally to near the eyes; surface finely, densely punctured, punctures deeper and larger around periphery of flattened portion, usually a small impunctate space is located just above midpoint of epistomal margin; vestiture moderately long, moderately dense, all setae of equal or nearly equal length, those on periphery only very slightly longer and incurved. Antennal club broadly oval, about 1.1 times longer than wide, widest through segment 2; first two sutures weakly but distinctly arcuate; first two segments together occupy slightly less than two-thirds of total club length. Pronotum less than 1.1 times longer than wide, widest at about middle; sides weakly arcuate to weakly converging; asperities on anterior slope low, blunt, isolated except near summit where two to four may be joined at the base, all scattered in no apparent order; posterior area of disc deeply punctured, punctures large and moderately close; surface between punctures dull, densely microreticulate. Elytra about 1.4 times longer than wide; apex broadly rounded; discal striae punctured in nearly regular rows, punctures large, deep and close; discal interstriae about as wide as striae, either all bearing a median row of punctures or only 1, 3, 5, 7 with punctures on disc, when all interstriae are punctured, the discernment of individual striae or interstitial rows is difficult, surface shining, smooth, microreticulate. Declivity convex, steep; interstriae 1 rather broad, distinctly but weakly elevated, bearing a median row of small granules; interstriae 2 not widened, equal to discal width, slightly impressed; interstriae 3 weakly elevated, equal in height to interstriae 1, bearing a median row of small granules, these larger than those on interstriae 1; punctures in striae 1 and 2 distinct, as large and deep as those on disc.

**Male.** Frons slightly flattened as in female, carina weakly elevated but distinct, extending from epistomal margin to upper level of eyes, surface strongly to moderately punctured, reticulate between punctures. Pronotum and elytral disc as in female. Declivity as in female except interstriae 2 slightly more deeply impressed.

TYPE MATERIAL. The lectotype, designated by Bright (1976c), bears the data: Quezaltenango, Pin. rud.; 6-9-195 , 2350 m, Guatemala, leg. F. Schwerdtfeger/ ♀ / Type *Pityophthorus scabridus* Schedl/LECTOTYPE *Pityophthorus scabridus* Schedl, D.E. Bright, 1976. Three additional specimens in the KESC and 3 in the Schwerdtfeger collection are part of the type series and bear identical labels. All are labeled as paralectotypes.

HOSTS. *Pinus ayacahuite*, *montezumae*, *oocarpa*, *patula*, *pseudostrobus*, and *rudis*.

DISTRIBUTION. Mexico City region south to Honduras (Map 37). Specimens (229) examined from:

MEXICO

**Chiapas:** 4 miles N of Bochil, 10.V.69, *Pinus* sp., D.E. Bright (CNC) 23; Lagos de Colores, 17.V.69, *Pinus oocarpa*, D.E. Bright (CNC) 34; Vicinity of San Cristobal de las Casas, various dates 1969, *Pinus ayacahuite* and *Pinus* sp., D.E. Bright (CNC) 40; vicinity of Teopisca, various dates 1969, *Pinus montezumae* and *Pinus* sp., D.E. Bright (CNC) 32. **Jalisco:** 14 mi NW of Guadalajara, 19.VII.53, *Pinus*, S.L.

Wood (SLWC) 4. **Mexico:** 20 mi N of Cuernavaca, 15.VII.69, *Pinus* sp., D.E. Bright (CNC) 4; Sn. Colletano, 16.III.73, *Pinus patula* (CNC) 2. **Michoacán:** Uruapan, 29.V.69, *Pinus patula* (CNC) 10. **Morelos:** 30 mi S of Mexico City, 9.VI.71, *Pinus* sp., D.E. Bright (CNC) 6. **Nayarit:** Laguna Sta. Marie, 6.VII.65, *Pinus*, S.L. Wood (SLWC) 5. **Oaxaca:** 26 mi SE of Nochixtlán, 17.VI.67, *Pinus*, S.L. Wood (SLWC) 1. **Veracruz:** Las Vigas, 5.VI.62, *Pinus* sp., R. Coronado (SLWC) 2.

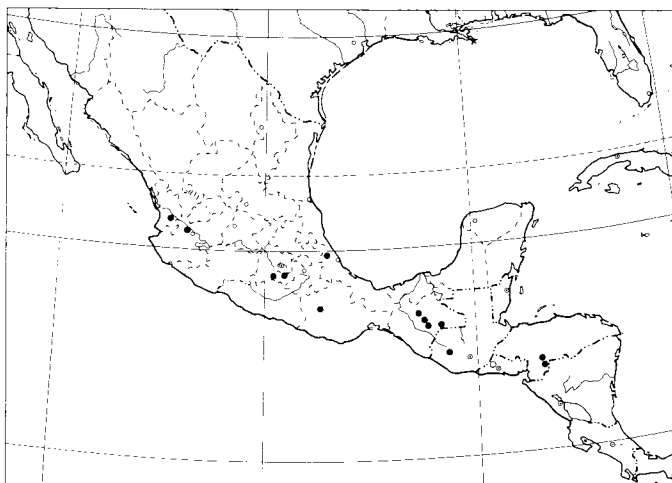
GUATEMALA: Volcan de Agua, 19.V.64, *Pinus pseudostrabus*, S.L. Wood (SLWC) 14.

HONDURAS: Tegucigalpa, 9.III.66, *Pinus oocarpa*, S.L. Wood (SLWC) 11; Yuscarán, 23.IV.64, *Pinus oocarpa*, S.L. Wood (SLWC) 22; Zamorano, 18.IV.64, *Pinus pseudostrabus*, S.L. Wood (SLWC) 12.

Additional localities in literature:

EL SALVADOR: El Congo, 25.II.75, *Bambusa*; Metapán, 15.I.75, *Pinus oocarpa* (Schedl 1977b).

MEXICO: Carr, Mexico-Tlaxcala, k.70, 3.VII.61, *Pinus* sp., Hiram Bravo M. (Schedl 1963).



MAP 37. Collection localities for *P. (Pityophthorus) scabridus*.

**BIOLOGY.** Schwerdtfeger (1957) gives the only data available on the biology of this species.

This species is found in smaller parts of the stem and in branches and twigs of dead or dying pines. Attack is often made through the needle scars of needles that have fallen off the twig.

After penetrating to the cambium layer, an irregular shaped nuptial chamber is constructed by the male. Females enter shortly after mating and construct the egg galleries. From one to five, but mostly two or three, females are associated with one male and each female constructs individual egg galleries. These galleries are deeply cut into the wood and may reach 70 mm in length although 3-40 mm is more common. Eggs are laid in niches cut into the gallery walls and there is about one egg niche per 1-1.5 mm of gallery length.

Larval mines are deeply cut into the wood, and may reach a length of 25 mm. These galleries are filled with the brown boring dust and frass.

At the ends of the larval mines and often also at the ends of the parental egg galleries, the individuals turn into the wood and may penetrate as far as pith of the

twig. In the case of adults, they continue to feed, presumably until death or possibly this feeding is a maturation feeding and the adults re-emerge and attack new host material. In the case of larvae, feeding continues in the pith or wood until pupation. Depending on how deeply the larvae penetrated into the wood, the pupae may lie completely in the wood but are exposed when the bark is removed, or the pupae may be only shallowly beneath the surface or may be close to or directly on the pith. In thin twigs, pupation takes place in the pith, which may be completely destroyed by the boring activities of the larvae.

REMARKS. Adults of this species can be distinguished by the stout body shape, by the steep elytral declivity on which interstriae 1 and 3 are equal in height, and interstriae 2 is weakly impressed (Fig. 192), by the distinct strial punctures on the declivity, by the equal or nearly equal length of the setae on the female frons (Fig. 190), and by the distribution.

181. *Pityophthorus* (*P.*) *sierraensis* Bright

Figs. 193-195

*Pityophthorus sierraensis* Bright, 1971, p. 64; Bright & Stark, 1973, p. 110.

Length 2.4-2.7 mm, 2.9 times longer than wide.

**Female.** Frons flattened to subconcave on a relatively small to large subcircular area, this area usually extending from epistoma to above upper level of eyes and laterally not quite to eye margin; surface finely, densely punctured, densely covered with long, yellowish setae, those on the periphery longer and incurved. Antennal club 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse to weakly arcuate, 2 sometimes more strongly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum 1.1 times longer than wide, widest behind summit; sides moderately arcuate; asperities on anterior slope low, broad, usually isolated but two or three may be contiguous, arranged in no definite order; posterior area of disc finely punctured, punctures of moderate size, not especially deeply impressed, widely separated; surface between punctures shining, finely marked with minute lines and points. Elytra 1.8 times longer than wide; apex broadly rounded; discal striae punctured in very regular rows, punctures small; discal interstriae about 1.5 times wider than striae, moderately shining, marked with minute points and lines; interstriae 1, 3, 5, 7 each bearing a median row of about 4 or 5 punctures, equal in size to those in striae and each bearing a short, fine seta, very slightly longer than those arising from strial punctures. Declivity convex; interstriae 1 narrowly elevated, bearing a median row of fine granules; interstriae 2 weakly sulcate, moderately impressed, distinctly wider than discal width; interstriae 3 weakly elevated, equal in height to 1, bearing a median row of about 5 widely separated, small granules; punctures in striae 1 and 2 obsolete, not visible, or only barely so, then much smaller than those on disc.

**Male.** Frons convex to weakly flattened, strongly, densely punctured; median carina weakly elevated, extending from epistomal margin to near or above upper level of eyes. Pronotum as in female except asperities larger. Elytra and declivity essentially as in female.

TYPE MATERIAL. The holotype (♀) in the CNC bears the data: 1 mi. S. Onion Val., Inyo Co., Calif., IX-4-1968, D.E. Bright/*Pinus balfouriana*/HOLOTYPE *Pityophthorus sierraensis*, D.E. Bright, CNC No. 10777. The allotype and 13 paratypes bear the same data; 48 additional paratypes bear the same data on locality, date, and collector but were collected from *Pinus flexilis*.

Most of the type material is in the CNC, additional paratypes are in the CIS and the SLWC.

HOSTS. *Pinus albicaulis*, *aristata*, *balfouriana*, and *flexilis*. One record is from *Abies lasiocarpa*.

DISTRIBUTION. Occurs throughout the subalpine forests of western United States and Canada. Specimens (164) examined from:

## CANADA

**British Columbia:** Kootenay Pass, 20 mi W of Creston, 22.IX.67, *Pinus albicaulis*, D.E. Bright (CNC) 37.

## UNITED STATES

**California:** See type material. **Colorado:** Ouray, 11.VII.35, *Abies lasiocarpa* (USNM) 2. **Nevada:** Wheeler Peak, White Pine Co., 8.IX.68, *Pinus aristata*, D.E. Bright (CNC) 50. **Wyoming:** Bighorn Mtns., Sheridan Co., 7.VII.75, *Pinus flexilis*, D.E. Bright (CNC) 12.

REMARKS. For the most part, this species was represented in this study by a large number of specimens from four widely separated localities, e.g. eastern California, eastern Nevada, northern Wyoming, and southern British Columbia. Although the samples show a slight amount of variation, nothing was found that would warrant naming the populations as distinct species. The genitalia of several males from each population were examined, and although there are slight individual differences, the segregation of species was not supported. More samples of populations from intermediate areas are necessary before any conclusions on the status of these populations can be inferred.

Adults may be recognized by the convex, weakly bisulcate elytral declivity on which interstriae 1 and 3 are equal in height and bear a median row of small granules (Fig. 195), by the weakly elevated, usually long, longitudinal carina on the male frons (Fig. 194), by the densely pubescent female frons (Fig. 193), and by the hosts.

## PUBERULUS GROUP

Members of this group are distinguished by the presence of a distinct (sometimes faint), longitudinal carina on the frons of both sexes, by the distinct punctures in all elytral interstriae on the disc, and by the convex elytral declivity.

Three species are included in the group.

## KEY TO SPECIES IN THE Puberulus group

1. Suture 1 on antennal club transverse or nearly so; carina on frons faintly elevated (sometimes obsolete); declivital interstriae 2 at most only slightly wider than discal width . . . 2
- Suture 1 on antennal club weakly arcuate, 2 more strongly so; carina on frons strongly elevated (Fig. 196); declivital interstriae 2 much wider than discal width (Fig. 197); southwestern United States . . . . . 182. *lecontei* Bright (p. 260)
2. Setae on declivital interstriae 1, 3, 4, etc. slightly but distinctly longer than those on discal interstriae (Fig. 199); declivital interstriae 3 with fine granules (Fig. 199); western North America, south to Durango . . . . . 183. *digestus* (LeConte) (p. 261)
- Setae on declivital interstriae 1, 3, 4, etc. not longer than those on discal interstriae (Fig. 201); declivital interstriae 3 devoid of granules (Fig. 201); eastern North America, south to Kansas and North Carolina . . . . . 184. *puberulus* (LeConte) (p. 264)

182. *Pityophthorus (P.) lecontei* Bright

Figs. 196, 197

*Pityophthorus lecontei* Bright, 1977, p. 525.

Length 1.8-2.4 mm, 2.6-2.7 times longer than wide.

**Female.** Frons convex, frequently slightly flattened above epistoma; surface roughly punctured, punctures deep and close, larger and deeper on upper portion, gradually becoming smaller toward epistoma; carina distinct, moderately to strongly elevated, extending from epistomal margin to near or just below the upper level of eyes; vestiture short, inconspicuous. Antennal club circular to subcircular, 1.1 times longer than wide, widest through segment 2; suture 1 weakly arcuate, 2 more strongly so; first two segments together occupy more than

half of total club length. Pronotum 1.1 times longer than wide, widest at about middle; sides moderately arcuate; asperities on anterior slope moderate in size, erect, acute, usually isolated but frequently several may be basally joined especially near summit and showing tendency to form broken concentric rows; posterior area of disc densely, finely punctured, punctures moderate in size, fairly deep and very close; surface between punctures smooth, shining, frequently with a few very small points. Elytra 1.5 times longer than wide; apex broadly rounded; disc appearing randomly, densely punctured caused by striae and interstriae punctures being nearly equal in size and number, striae rows distinguished by very slightly larger punctures and very slightly shorter setae arising from the punctures; discal interstriae difficult to discern but wider than striae, usually brightly shining, smooth to minutely rugose, with an irregular row of punctures. Declivity almost flat, steep; interstriae 1 narrowly elevated, with a median row of fine granules; interstriae 2 very broad, much wider than discal width, flat to weakly impressed, smooth, shining; interstriae 3 arcuate, very weakly elevated if at all, bearing numerous, scattered, fine granules; punctures of striae 1 and 2 obsolete.

**Male.** Virtually identical with female. Frons more deeply, coarsely punctured; carina slightly more strongly developed; pronotum and elytra slightly more coarsely sculptured.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the labels: Kitt Peak, Pima Co., Ariz., VIII.2.1968, D.E. Bright/Pinus cembroides/HOLOTYPIC Pityophthorus lecontei D.E. Bright, CNC No. 13971. The allotype and 28 paratypes bear the same data. Numerous additional paratypes are from: 6, Magdalena, New Mexico, *P. cembroides*; 6, Aragon, New Mexico, *P. edulis*; 21, 7 mi W of Kingston, New Mexico, *P. edulis*; 7, Nogal Lake Forest Camp, New Mexico, *P. edulis*; 2, 5 mi W of Roberts Lake, New Mexico, *P. edulis*; 2, 3 mi N of Mimbres, New Mexico, *P. edulis*; 2, 5 mi N of San Lorenzo, New Mexico, *P. ponderosa*; 45, Las Vegas Hot Springs, New Mexico, *P. edulis*; 1, Canon City, Colorado and 1, Fort Garland, Colorado, *P. edulis*.

The holotype, allotype and 40 paratypes are in the CNC. Additional paratypes are in the SLWC, the KESC, and the USNM.

**HOSTS.** *Pinus cembroides*, *edulis*, and *ponderosa*.

**DISTRIBUTION.** Known only from the type localities in the southwestern United States.

**BIONOMICS.** Occurs in the needle-bearing portion of small twigs.

**REMARKS.** This species is usually represented in collections under the name *digestus* LeConte as determined by M.W. Blackman. Actually, the lectotype of *digestus* (see below) is an entirely different species.

Adults of *lecontei* are easily distinguished by the convex to flat, steep elytral declivity on which the second interstriae is very wide, usually falt, weakly impressed if at all and the third interstriae is arcuate and armed with few to many small granules (Fig. 197). The frons bears a distinct longitudinal carina in both sexes.

### 183. *Pityophthorus* (*P.*) *digestus* (LeConte)

Figs. 198, 199; Map 38

*Cryphalus digestus* LeConte, 1874, p. 71; Bright, 1976c, p. 185 (lectotype desig.).

*Pityophthorus digestus*: LeConte & Horn, 1876, p. 355; Swaine, 1908, p. 135; Hagedorn, 1910, p. 71; Blackman, 1928, p. 54; Chamberlin, 1939, p. 368.

*Pityophthorus idoneus* Blackman, 1928, p. 55; Chamberlin, 1939, p. 368; Chamberlin, 1958, p. 149; Bright, 1966, p. 304; Wood, 1971a, p. 425; Bright & Stark, 1973, p. 108; Bright, 1977, p. 514 (= *digestus*).

*Pityophthorus hopkinsi* Blackman, 1928, p. 56; Chamberlin, 1939, p. 368; Chamberlin, 1958, p. 149; Bright, 1966, p. 304 (= *idoneus*); Wood, 1971a, p. 425; Bright, 1977, p. 514 (= *digestus*).

*Pityophthorus ponderosae* Blackman, 1928, p. 57; Chamberlin, 1939, p. 369; Chamberlin, 1958, p. 150; Bright, 1966, p. 304 (= *idoneus*); Wood 1971a, p. 475; Bright, 1977, p. 514 (= *digestus*).

Length 1.5-2.0 mm, about 2.5-2.6 times longer than wide.

**Female.** Frons convex, somewhat flattened below upper level of eyes, divided by a weakly elevated, longitudinal carina which extends from epistomal margin to upper level of eyes; surface shining, densely, shallowly punctured; vestiture sparse, consisting of scattered, short, hairlike setae on flattened portion. Antennal club about 1.3 times longer than wide, widest through segments 2 and 3; suture 1 transverse, 2 weakly arcuate; first two segments together occupy about half of total club length. Pronotum as long as wide, widest behind summit; sides arcuate; asperities on anterior slope scattered, often two to six are basally contiguous and arranged in a short, broken arcuate row, especially near summit; posterior area of disc deeply, closely punctured; surface between punctures smooth, shining, occasionally very finely micropunctate. Elytral 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular or nearly regular rows, punctures moderately large and deep; discal interstriae 1.0-1.5 times wider than striae, all sparsely punctured, surface shining, smooth to minutely reticulate, each puncture bearing a seta slightly longer than those in striae and slightly shorter than those on declivity. Declivity convex, flattened to very weakly sulcate; interstriae 1 weakly elevated, bearing a median row of fine granules; interstriae 2 equal to discal width or very slightly wider; interstriae 3 not elevated, equal in height to 1, bearing a median row of fine granules; punctures in striae 1 and 2 much smaller than those on disc.

**Male.** Virtually identical with female. Frons convex, carina more strongly developed. Pronotum and elytra slightly more strongly sculptured and declivital granules slightly larger.

**TYPE MATERIAL.** *C. digestus*. The lectotype, designated by Bright (1976c), is in the MCZ bears the labels: Type 997/*C. digestus* Lec/LECTOTYPE-Top left specimen - *Cryphalus digestus* LeConte (Bright 1976). Seven other specimens, mounted on four cards on the same pin, are labeled paralectotypes. Two other specimens mounted on separate pins are also labeled paralectotypes.

All specimens are in the MCZ.

*P. idoneus*. The holotype (♀) in the USNM is labeled: Hopk US 5194b/J.L. Webb, collector/Centrville, Id./*Pinus ponderosa*/TYPE *Pityophthorus idoneus* Blackman/Type No. 41279 U.S.N.M. The allotype and 1 paratype bear the same data. Additional paratypes are labeled: 4, Hopk US 5194/Centrville, Id./J.L. Webb/bred June 30, '06/*Pinus ponderosa*; 4, Hopk US 234a/Hopkins Colr, Moscow Mts., Ida/*Pinus ponderosa* and 2, Hopk U.S. 8794-i/Reared Mar 4-11.

Most of the type material is in the USNM but 1 paratype has been found in the DFEC.

*P. hopkinsi*. The holotype (♀) in the USNM is labeled: Hopk. U.S. 2775 b-1/Hopkins colr., Ventura Co., Cal./♀/*Pinus jeffreyi*/TYPE *Pityophthorus hopkinsi* Blackman/Type No. 41280 U.S.N.M. The allotype and 4 paratypes bear the same data. One paratype is labeled: Crocker R.S., Sept. 27, 1910/*P. jeffreyi*/J.M. Miller, colr. and 2 paratypes bear the data: L. Tahoe, Cal., 10-7/coll. Hubbard & Schwarz.

Most of the type material is in the USNM but 2 paratypes are in the DFEC.

*P. ponderosae*. The holotype (♀) in the USNM bears the data: on *Pinus ponderosa*/Las Vegas H.S., N.M./Barber and Schwarz, coll./9386/TYPE *Pityophthorus ponderosae* Blackman/Type No. 41281 U.S.N.M. The allotype and numerous paratypes bear the same data. Additional paratypes are labeled: 2, Alta, Ut., 6-30/coll. Hubbard and Schwarz; 12, Williams Ariz., 2-VI/Barber and Schwarz; 2, Chiric. Mtns., Ariz., 10-5/Hubbard and Schwarz; 5, Meek, N.M./W.F. Fiske, collr.; 4, Chiricahua Mtns., Ariz./J.L. Webb, collr./8-6, 9-07; 1, Santa Catalina Mtns., Ariz./J.L. Webb, collr./Apr 29, 09; and Flagstaff, Ariz./June 1, 1915/A.J.

Jaewicke, collr/P. pond. The paratypes from Alta, Utah are not conspecific with the type.

Most of the type material is in the USNM, a few paratypes have been found in the CNC and the DFEC.

HOSTS. *Pinus contorta*, *jeffreyi*, *ponderosa*, and *washoensis*. Probably occurs in other related pine species.

DISTRIBUTION. Western North America (Map 38). Specimens (314) examined from:

#### CANADA

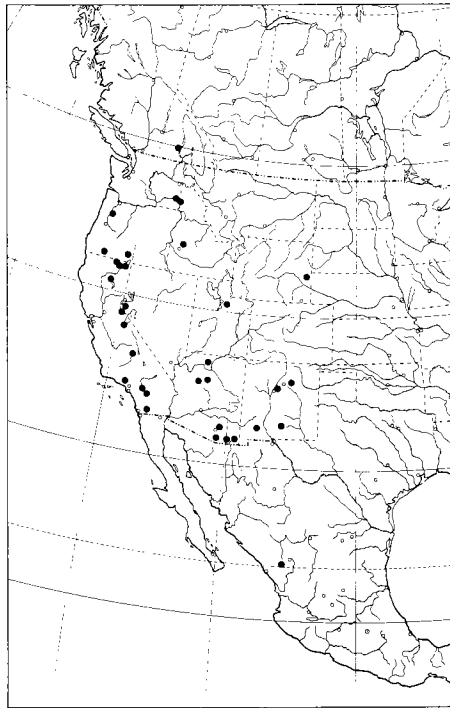
**British Columbia:** Peachland, 10.VI.55 (CNC) 4.

#### UNITED STATES

**Arizona:** Carr Canyon, Cochise Co., 23.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 9; Mount Bigelow, Santa Catalina Mtns., 11.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 9; Kaibab National Forest, 29.VI.26, *Pinus ponderosa*, M.W. Blackman (DFEC) 1; Rustlers Park, Chiricahua Mtns., 7.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 12; Santa Catalina Mtns., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 21; Santa Rita Mtns., 29.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 9; Spencer Canyon, Santa Catalina Mtns., 11.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 4. **California:** Antelope District, Siskiyou Co., 26.VIII.39, *Pinus ponderosa*, P.C. Johnson (CISC) 1; Barton Flat, San Bernardino National Forest, 24.V.56, *Pinus jeffreyi*, H. Ruckes & B.J. Adelson (SLWC) 2; Bumble Bee, Tuolumne Co., 26.VI.51, A.T. McClay (UCDC) 1; Elk Creek, Glenn Co., 19.IV.13 (CNC) 1; Fallen Leaf Lake, 6-9.VI.61, *Pinus ponderosa* and *P. jeffreyi*, S.L. Wood (SLWC) 14; Fallen Leaf Lake, VII.14, Lodgepole pine, E.C. Van Dyke (CASC) 18; Glass Mountain, Modoc Co., 25.VI.31, *Pinus ponderosa*, K.A. Salmon (DEBC, SLWC) 7; Hackamore, 6.VI.31, *Pinus ponderosa* (DEBC) 4; Harvey Valley, *Pinus ponderosa* (DEBC) 57; Hat Creek, 18.X.47, *Pinus contorta*, S.L. Wood (SLWC) 5; Idlewild, 8.VII.28, E.C. Van Dyke (CASC) 1; Indian Mountain, San Bernardino Co., 12.V.60, *Pinus jeffreyi* J. Pierce (CISC) 1; Lake Tenaya, 11.VIII.18, *Pinus murrayana*, J.E. Patterson (USNM) 1; Lava Beds National Monument, 22.VII.53, *Pinus jeffreyi* (DEBC) 5; Manzanita Chute Plantation, 1.VIII.53, *Pinus ponderosa*, M.M. Furniss (CISC) 1; Mohawk, 26.V.14, Yellow pine, C.L. Smith (OSUC) 1; Mount Laguna P.O., 20.V.53, *Pinus jeffreyi* (CISC, DEBC) 4; Old Station, 29.X.47, *Pinus jeffreyi*, S.L. Wood (SLWC) 6; Sequoia National Park, 2.II.34, *Pinus jeffreyi* (USNM) 1; Viola, 27.VII.53, *Pinus jeffreyi*, M.M. Furniss (CISC) 1; Whitehorse, Modoc Co., 6.VII.35, *Pinus ponderosa*, K.A. Salmon (SLWC) 1. **Nevada:** Little Valley, Washoe Co., 25.V.70, N. Stark (CNC) 9; Mount Rose, Washoe Co., 15.VII.63, *Pinus washoensis*, C.L. Wray (DEBC) 2. **New Mexico:** Cloudcroft, 3.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 5; Sandia Mountains, Dry Camp, 31.V.69, *Pinus ponderosa*, S.L. Wood (SLWC) 10; 5 mi E of San Lorenzo, 6.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 8. **Oregon:** Ashland, Flying (DFEC) 1; Paisley, 8.VI.70, *Pinus ponderosa*, P.W. Orr (SLWC) 1; Salem, Douglas fir, E.D. Pearson (SLWC) 3. **Washington:** Elberton, Whiteman Co., 1.X.74, *Pinus ponderosa*, P. Klein (SLWC) 3. **Wyoming:** 11 mi S of Lusk, Niobrara Co., 15.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 10.

#### MEXICO

**Durango:** 10 mi W of El Salto, VII.64, J.B. Thomas (CNC) 1.



MAP 38. Collection localities for *P. (Pityophthorus) digestus*.

**REMARKS.** This is a relatively common species throughout western North America. Adults are recognized by the convex frons that bears a distinct, low, longitudinal carina in both sexes (Fig. 198), by the punctured elytral interstriae, by the convex elytral declivity on which interstriae 2 may be weakly impressed, and by the small to minute granules on declivital interstriae 3 (Fig. 199). See also the remarks under *aplanatus* (p. 212).

184. *Pityophthorus (P.) puberulus* (LeConte)

Figs. 200, 201; Map 39

*Cryphalus puberulus* LeConte, 1868, p. 157.

*Pityophthorus puberulus*: LeConte & Horn, 1876, p. 354; Swaine, 1909, p. 137; Hagedorn, 1910, p. 73 (additional references); Blatchley & Leng, 1916, p. 629; Swaine, 1918, p. 99; Blackman, 1928, p. 48; Chamberlin, 1939, p. 365; Dodge, 1938, p. 43; Beal & Massey, 1945, p. 136; Craighead, 1950, p. 331; Baker, 1972, p. 255.

*Pityophthorus infans* Eichhoff, 1872a, p. 135; Eichhoff & Schwarz, 1895, p. 609; Bright, 1978, p. 72 (neotype desig.).

Length 1.3-1.6 mm, 2.8-2.9 times longer than wide.

**Female.** Frons convex, frequently very weakly flattened above epistoma; surface finely, shallowly punctured, punctures obscure; longitudinal carina very faint, extending from epistoma to above upper level of eyes; vestiture sparse, consisting of fine hairlike setae scattered over surface. Antennal club 1.5-1.6 times longer than wide, widest through segments 2 and 3; suture 1 transverse or occasionally very weakly arcuate, 2 more strongly arcuate; first two sutures together occupy slightly less than half of total club length. Pronotum about as wide as long, widest at about level of summit; sides strongly arcuate; asperities on anterior slope small, low, isolated, scattered in no apparent order; posterior area of disc finely, deeply punctured, punctures rather large, deep and close; surface between



punctures usually dull, densely microreticulate, occasionally shining and smooth. Elytra about 1.6 times longer than wide; apex broadly rounded; discal striae punctured in nearly regular rows, punctures small and shallow; discal interstriae about 2.0 times wider than striae, shining, each with a regular, median row of fine punctures, these punctures slightly less numerous than those in striae and each bearing a more erect, slightly longer seta, these equal in length to those on declivity. Declivity convex; interstriae 1 weakly elevated, narrow, usually with a median row of very fine granules; interstriae 2 not wider than on disc, very weakly impressed if at all; interstriae 3 not elevated or granulate; punctures in striae 1 and 2 obscure but usually faintly visible in 2.

**Male.** Almost identical with female except carina on frons slightly more strongly elevated, pronotum and elytra slightly more coarsely sculptured and interstriae 2 on declivity slightly more impressed.

**TYPE MATERIAL.** *C. puberulus*. The holotype is in the MCZ and bears the labels: D.C./Type 998/*C. puberulus* Lec./HOLOTYPE *Cryphalus puberulus* LeConte. Four other specimens are in LeConte's collection but obviously were added later and should not be considered as part of the type series. All 4 are labeled: Port Huron, Mich. June/*puberulus* 2, 3, 4, or 5 respectively. The second specimen also bears a handwritten label "white pine".

*P. infans*. The type was destroyed during World War II. A neotype for this name was designated by Bright (1978). It bears the labels: Syracuse, N.Y., 5-14-18/M.W. Blackman, collector/N.Y.S.C.F. Lot 1138/compared with type of *P. infans* Eichh. by H. Eggers. 5 specimens, all typical (large red label)/NEOTYPE *Pityophthorus infans* Eichhoff, D.E. Bright 1977.

The neotype is in the USNM.

**HOSTS.** Most species of eastern *Pinus*, plus *Abies fraseri*, *A. balsamea*, and *Picea* spp. Probably occurs in all species of conifers in its range.

**DISTRIBUTION.** Eastern North America south to Kansas and North Carolina (Map 39). Specimens (479) examined from:

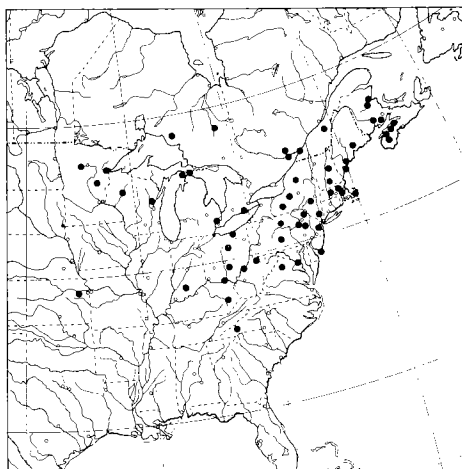
#### CANADA

**New Brunswick:** 13 mi N of Fredericton, 13.VII.70, *Pinus strobus*, D.E. Bright (CNC) 2; 4 mi E of McGraw Brook, 7.VII.70, *Pinus banksiana*, D.E. Bright (CNC) 4; Portage Vale, 14.VII.70, *Pinus banksiana*, D.E. Bright (CNC) 11; Silikers, 2.III.65, Red pine (CNC) 42. **Nova Scotia:** Kejimikujik National Park, 16-17, VII.70, *Pinus resinosa* and *P. strobus*, D.E. Bright (CNC) 15; Kentville, 5.VI.25, Red pine twigs (CNC) 4; 3 mi W of Kingston, 15.VII.70, *Pinus rigida*, D.E. Bright (CNC) 12; Round Hill, Annapolis Co., 13.IX.60, Scotch pine (CNC) 5. **Ontario:** 3 mi S of Bourget, 29.VI.67, *Pinus sylvestris*, D.E. Bright (CNC) 4; Cedar Bay, 10.VI.38, *Pinus sylvestris*, H.S. Fleming (CNC) 7; Cochrane, 14.X.60, *Pinus resinosa*, F. Brequelt (CNC) 7; Constance Bay, 6.VI.68, *Pinus banksiana*, D.E. Bright (CNC) 12; Fisher Glen, 11.VI.31, W.J. Brown (CNC) 9; Ottawa, 7.VI.12, *Pinus*, J.M. Swaine (CNC) 4; Port Credit, 6.IX.54, *Alnus nigra* (NFRCE) 18 (host?); Prince Edward Co., 21.III.19, J.W. Green (CASC) 4; Simcoe, 27.VIII.65, *Pinus strobus*, J. Trinnell (CNC) 10; White River, 2.IX.65, D. Constable (CNC) 1. **Quebec:** Kazabazua, 24.VIII.66, *Pinus banksiana*, D.E. Bright (CNC) 3; Ste. Annes, J.M. Swaine (CNC) 15; Ste. Marie, VIII.75, *Pinus banksiana* (LFRC) 6.

#### UNITED STATES

**District of Columbia:** Washington (CNC) 2. **Indiana:** Shoals, 24.VII.51, *Pinus*, Price, Beamers and Wood (SLWC) 6. **Kansas:** Lawrence, 14.VI.20, M.W. Blackman (DFEC) 20. **Kentucky:** 11.5 mi E of Irvine, 19.IV.67, D.E. Bright (CNC) 9. **Maine:** Brunswick, 28.VI.19, M.W. Blackman (UMDE) 1; Orono, 24-28.VI.19, M.W. Blackman (UMDE) 1; Peak Island, *Picea*, A.D. Hopkins (USNM) 1. **Mas-**

**sachusetts:** Cape Cod, 5.X, J.N. Knull (USNM) 4; Farmington, 26.V.07, C.A. Frost (CNC, DFEC) 5; Marian, A. Fenyés (CASC) 1; Petersham, 9.XI.24, H.J. MacAloney (USNM) 1; Springfield, 12.V.00 (USNM) 1; Sudbury, 2.VII.56, (UDCC) 1. **Michigan:** Beaver Island, 9.IX.22, M.H. Hatch (UMMZ) 1; Grand Island, *Pinus resinosa*, W.F. Fiske (USNM) 10; Seney, *Pinus resinosa*, W.F. Fiske (USNM) 1. **Minnesota:** Atkinson, 14.IX.36, White pine limbs, H.R. Dodge (SLWC) 1; Cass Lake, 29.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 27; Cloquet, 4.VII.36, Norway pine, H.R. Dodge (SLWC) 31; Crow Wing Co., 2.VII.36, Jack pine, H.R. Dodge (SLWC) 1. **New Hampshire:** Antrim, VI.24, C.A. Frost (USNM) 1; Atco, Pine, H.A. Kaeber (USNM) 5; Littleton (DFEC) 3. **New Jersey:** Cape May, Hubbard & Schwarz (USNM) 1; Jamesburg, E.L. Dickerson (CNC) 2. **New York:** Cranberry Lake, 22.VI.23, M.W. Blackman (DFEC) 50; Ithaca, *Abies* (CNC) 2; Rensselaerville, VI-VII.67, R. & J. Matthews (CNC) 5; West Point, 15.VI.13, W. Robinson (USNM) 1. **North Carolina:** Mount Mitchell, 21.VIII.41, *Abies fraseri*, J.A. Beal & C.L. Massey (RMSC) 2. **Ohio:** Cleveland, 5.III.45, Scotch pine, J.S. Houser (USNM) 9; Haynesville, 24.IV.32, Pitch pine, R.C. Hall (USNM) 1; Hocking Co., 8.VII.50, N.L. & E.L. Sleeper (OSUC) 1; Portsmouth, 1.VIII.53, Pitch pine, W.E. Miller (USNM) 1. **Pennsylvania:** Caledonia, 20.VIII.59, *Pinus pungens* (USNM) 2; Carbondale, 9.VI.28, Red pine, MacAloney (USNM) 5; Charter Oak, 14.VIII, *Pinus rigida*, J.N. Knull (USNM, DFEC) 3; Clarks Valley, 2.III.26, *Pinus strobus* (CNC) 2; Petersburg, 22.VI.27, J.N. Knull (DFEC) 4; Pocono Lake, 8.II.06, H.A. Kaeber (USNM) 16; Reading, 4.IV.04 (UMMZ) 2; Wilkes Barre, 30.V.66, Scotch pine (USNM) 3. **Virginia:** Falls Church, 20-21.VI, *Pinus divaricata*, R. St. George (USNM) 1; Shenandoah National Park, 1949, *Pinus pungens*, J. Shanklin (USNM) 12. **West Virginia:** Cranesville, *Picea*, A.D. Hopkins (USNM) 2; Dellslow, A.D. Hopkins (USNM) 19; Morgantown, *Picea excelsa*, A.D. Hopkins (USNM) 3; Wood Co., *Pinus echinata*, A.D. Hopkins (USNM) 3. **Wisconsin:** Chippewa Falls, 26-30.VII.36, White pine, H.R. Dodge (SLWC) 13; Clintonville, 26.III.36, dead White pine tree, H.R. Dodge (SLWC) 29.



MAP 39. Collection localities for *P. (Pityophthorus) puberulus*.

**BIOLOGY.** During June, 1977, the bionomics of this species was briefly studied. Adults were found under the bark of extremely small twig tips on a broken spruce top, and some were even found starting galleries in the dry buds on the end of the twigs. At this time, only one adult was found per gallery, either a male, or more

frequently, a female. The gallery consisted of an enlarged chamber, about 2 mm across with one short, longitudinal egg gallery. Small larvae were found in the cambial region adjacent to the egg galleries.

Chamberlin (1939) states that this species is very abundant in dead and suppressed twigs and may also be found killing living twigs. Adults are found under the bark but in very small twigs of white pine they may be found in the pith (Dodge 1938).

REMARKS. Adults of this species may be recognized by their small size, by the convex frons of both sexes which bears a weak longitudinal carina (sometimes absent in females) (Fig. 200), by the evenly, regularly punctured and setiferous elytral interstriae and by the evenly convex elytral declivity (Fig. 201). Adults occur in the same habitat as those of *opaculus* and it may be difficult to distinguish the two species. Adults of *opaculus* have elytral interstriae 1, 3, 5, 7, etc. punctured, not all interstriae punctured as in *puberulus* and, in addition, adults of *opaculus* are more commonly found in twigs of spruce, whereas those of *puberulus* are commonly found in twigs of pines, although both species may occur together in spruce or pines.

#### CONFINIS GROUP

Species belonging to this group are characterized by the numerous interstitial punctures, by the convex elytral declivity which is similar in both sexes, by the small granules on the first and third declivital interstriae, and by the stout body. At present, only one common species is included in this group.

#### 185. *Pityophthorus (P.) confinis* LeConte

Figs. 5, 202-204; Map 40

*Pityophthorus confinis* LeConte & Horn, 1876, p. 354; Swaine, 1909, p. 135; Hagedorn, 1910, p. 70 (additional references); Chamberlin, 1917, p. 355; Swaine, 1918, p. 101; Blackman, 1928, p. 67; Salman, 1938, p. 613; Chamberlin, 1939, p. 375; Patterson & Hatch, 1945, p. 153; Keen, 1952, p. 37; Chamberlin, 1958, p. 151; Bright & Stark, 1973, p. 111; Wood, 1971a, p. 426; Bright, 1976c, p. 185 (lectotype desig.); Furniss & Carolin, 1977, p. 402.

Length 2.5-3.1 mm, about 2.5 times longer than wide.

**Female.** Frons convex to weakly flattened on a semicircular area extending from epistoma to above upper level of eyes; surface densely punctured, punctures larger and deeper above, becoming finer toward epistoma; vestiture abundant over flattened area, setae on periphery slightly longer than the remainder; epistomal margin nearly straight. Antennal club oval, about 1.6 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, nearly straight to weakly arcuate; first two segments together occupy less than half of total club length. Pronotum about as long as wide, widest at about middle; sides distinctly arcuate; asperities on anterior slope numerous, usually weakly elevated and blunt to acute; scattered in no apparent order; summit strongly elevated, located at midpoint of disc; posterior area of disc strongly punctured, punctures large and deep; surface between punctures shining, smooth, frequently bearing numerous minute points. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal surface densely, randomly punctured, striae and interstriae difficult or impossible to detect, punctures large, deep, very closely placed; vestiture inconspicuous, consisting of a very short seta arising from each puncture on surface. Declivity convex, bisulcate; interstriae 1 weakly elevated, bearing a median row of very fine granules; interstriae 2 moderately sulcate, smooth, slightly wider than discal width; interstriae 3 moderately elevated, slightly higher than interstriae 1, usually with a median row of fine granules but frequently granules are absent; punctures in striae 1 and 2 obsolete, not impressed, not readily visible.

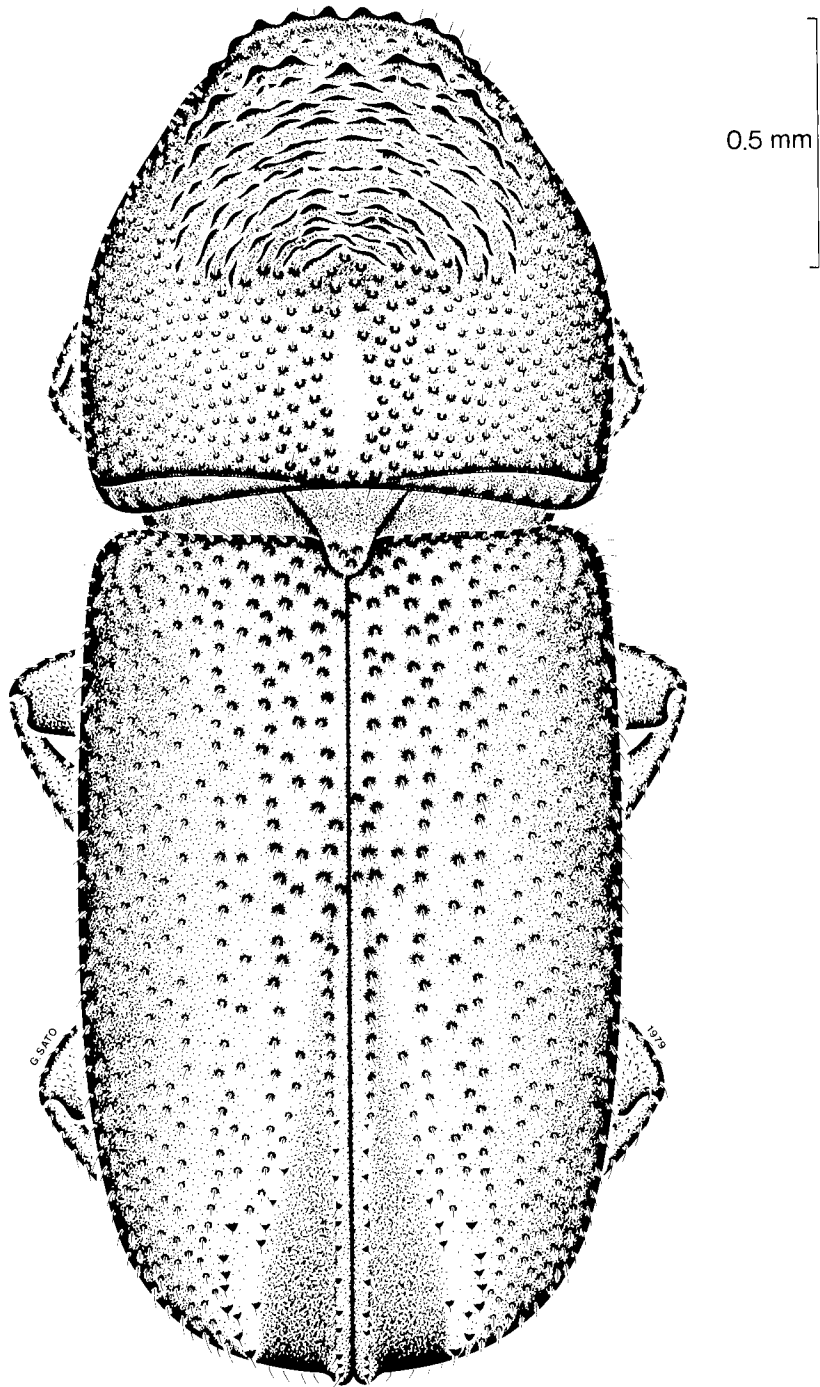


FIG. 5. *Pityophthorus confinis* LeConte.

**Male.** Frons convex, weakly flattened just above epistoma, divided by a distinct, longitudinal carina which is more strongly elevated at about midpoint or near upper level of eyes, carina below this elevation may be only weakly indicated or obsolete; surface densely, deeply punctured, less so above epistoma; epistomal margin deeply emarginate. Pronotum, elytra, and declivity essentially as in female except sculpturing stronger.

**TYPE MATERIAL.** This species was described from two specimens, both of which are in the LeConte collection at the MCZ. The first specimen is a female and is labeled: Cala./Type 1030/P. confinis LeC. The second specimen is labeled: genitalia ♀!!/Type 1320/confinis 2. The first specimen has been designated the lectotype by me (1976) and bears my lectotype label. The second specimen is labeled paralectotype.

**HOSTS.** *Pinus albicaulis*, *contorta*, *coulteri*, *jeffreyi*, *lambertiana*, *monophylla*, *ponderosa*, *sabiniana*, and *strobiformis*.

**DISTRIBUTION.** British Columbia, south through the western United States to southern Arizona and western Texas, but apparently does not occur in Mexico (Map 40). Specimens (740) examined from:

#### CANADA

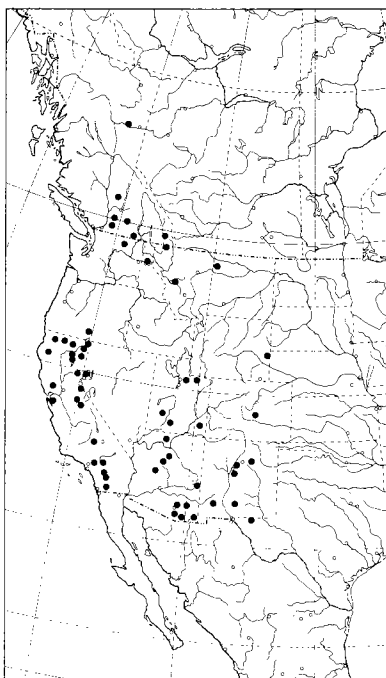
**British Columbia:** Aspen Grove, various dates 1931, *Pinus ponderosa*, H. Richmond (UBC, CASC) 12; 5 mi E of Chetwynd, 11.VII.72, *Pinus ponderosa*, D.E. Bright (CNC) 2; 6 mi N of Clinton, 7.VII.72, *Pinus ponderosa*, D.E. Bright (CNC) 14; Copper Mountain, 22.II.30, *Pinus contorta*, G. Stace Smith (UBC) 2; Cranbrook, 29.VI.20, C. Garrett (CNC) 1; 3 mi W of Grand Forks, 2.VII.72, *Pinus ponderosa*, D.E. Bright (CNC) 9; Kona Valley, 7.V.33, *Pinus ponderosa*, H. Richmond (CASC) 6; Middy Valley, Merritt, various dates 1924-25, *Pinus ponderosa* (CNC) 91; Nicola, 28.IV.32, P.N. Vroom (CNC) 1; Pavilion Lake, 8.VII.72, *Pinus ponderosa*, D.E. Bright (CNC) 10; Peachland, 10.IV.18, W.R.S. Metcalfe (CNC) 1.

#### UNITED STATES

**Arizona:** Alpine, 11.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 8; Carr Canyon, Cochise Co., 23.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 9; Chiricahua Mtns., 18.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 5; Flagstaff, VII, Wickham (USNM) 2; 10 mi SW of Flagstaff, 14.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 8; Huachuca Mtns., 16.VII.07 (USNM) 5; Jacob Lake, 3.VIII.74, *Pinus ponderosa*, D.E. Bright (CNC) 2; Kaibab National Forest, *Pinus ponderosa* (DFEC) 5; Mount Bigelow, Santa Catalina Mtns., 6.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 7; Mount Lemmon, Pima Co., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 2; Pinaleno Mtns., 15.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 17; Rustler Park, Chiricahua Mtns., 7.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 23; Santa Rita Mtns., 29.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 56; Santa Catalina Mtns., 5.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 23; Walker, 23.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 9. **California:** Alamo, 7.V.59, J.D. Wagner (CISC) 1; Anderson Valley, Mariposa Co., 11.III.14, *Pinus ponderosa* (CNC) 3; Antelope District, 26.VIII.39, *Pinus ponderosa*, D.C. Johnson (CISC) 1; Cannel Meadows, 11.VI.13, *Pinus jeffreyi* (CNC) 1; Carrville, 3-19.VII.13, E.C. Van Dyke (CASC) 1; Cedar Ridge, Glenn Co., 4.X.13, *Pinus ponderosa*, R. Hopping (CASC) 4; Chestor, 1.VII.51, D.J. and J.N. Knull (OSUC) 8; Chiquito Basin, 26.III.14, *Pinus ponderosa* (CASC) 1; Cleveland National Forest, 8.III.31, *Pinus jeffreyi*, K.A. Salmon (RMSC) 2; Elk Creek, Glenn Co., 19.IV.23, R. Hopping (CASC, CNC) 3; Fallen Leaf Lake, 9.VI.61, *Pinus jeffreyi*, D.E. Bright (CNC) 5; Fresno Co., 1914, *Pinus ponderosa*, R. Hopping (CASC) 21; Glass Mountain, Modoc Co., 25.VI.31, *Pinus ponderosa*, K.A. Salmon (SLWC) 2; Gorman, 23.VII.29, *Pinus monophylla*, J.R. Hodgson (SLWC) 8; Hackamore, 6.VI.31, *Pinus ponderosa* (CISC) 1; 36 mi S of Happy

Camp, 13.VI.62, *Pinus lambertiana*, D.E. Bright (CISC) 1; Harvey Valley, *Pinus ponderosa* (DFEC) 58; Hat Creek, 24.VI.61, *Pinus ponderosa*, S.L. Wood (SLWC) 4; Idyllwild, 1.VI.40 (CISC) 1; Igerna, Siskiyou Co., *Pinus ponderosa* (CASC, CNC) 2; Indian Mountain, San Bernardino Mtns., 12.V.60, *Pinus ponderosa*, J. Pierce (USNM) 2; Julian, 26.X.41, *Pinus coulteri*, D. DeLeon (PSFR) 1; Lake Arrowhead, 8.VI.32, *Pinus ponderosa*, C.R. Bruck (OSUC) 5; Lassen National Forest, 20.IV.15, *Pinus jeffreyi*, R. Hopping (CNC) 1; Manzanita Chute, Shasta Co., 1.VIII.53, *Pinus ponderosa*, M.M. Furniss (PSFR) 1; Markleeville, 28.V.57, R.P. Allen (CASC) 1; McCloud, 22.VI.14, E.C. Van Dyke (CASC) 2; Milford, 8.VII.14, *Pinus ponderosa* and *P. jeffreyi* (CASC, RMSC) 5; Mohawk, Plumas Co., 26.V.14, Yellow pine, G.L. Smith (CASC) 2; Mount Hawkins, Los Angeles Co., 23.VI.40, *Pinus sabiniana*, C.R. Bruck (OSUC) 1; Mount Laguna, 8.III.31, *Pinus jeffreyi* (CISC) 1; Mount Shasta Ski Area, 24.VI.67, *Pinus albicaulis* (DEBC) 1; Old Station, 29.X.47, *Pinus jeffreyi*, S.L. Wood (SLWC) 5; Pinecrest, VIII.35, *Pinus ponderosa*, W. Wagner (USNM) 1; Pine Valley, 19.VIII.41, *Pinus ponderosa*, T.O. Thatcher (SLWC) 3; Portola, 10.VIII.17 (USNM) 1; Santa Rosa Mountain, 25.VI.46, D.J. & J.N. Knoll (OSUC) 1; Self Ranger Station, Glenn Co., 19.IV.13 (CNC) 1; Sequoia National Park, 8.III.31, *Pinus ponderosa* (CISC) 1; Sgerna, Siskiyou Co., *Pinus ponderosa*, R. Hopping (CASC) 4; Signal Peak Lookout, 6.VII.46, *Pinus ponderosa*, T.O. Thatcher (SLWC) 9; Stoddard Springs, 6.VIII.35, *Pinus ponderosa*, W. Wagner (CISC) 1; Tahoe, 7.X.15, *Pinus jeffreyi*, R. Hopping (CASC) 1; Tallac, July, A. Fenyés (CASC) 2; Warner Mtns., 8.VII.22 (CASC) 1; Whitehorse, 6.VII.35, *Pinus ponderosa*, K.A. Salman (SLWC) 6; Willow Ranch, 24.VI.29, *Pinus ponderosa*, J.A. Beal (RMSC) 4. **Colorado:** 10 mi S of Colorado Springs, 14.V.??, J.B. Wallis (CNC) 1. **Idaho:** Coeur d'Alene, 15.X.31, *Pinus ponderosa*, H.J. Rust (UMMZ) 4. **Montana:** Clinton, 24.IX.36, *Pinus ponderosa*, T.O. Thatcher (SLWC) 7; Rocky Boy Indian Reservation, Hill Co., 25.IX.67, *Pinus ponderosa*, D.E. Bright (CNC) 14. **Nevada:** Little Valley, Washoe Co., 25.V.70, N. Stark (CNC) 3. **New Mexico:** Cloudcroft Ski Area, 4.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 11; Emory Pass, 24.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 31; Haynes Forest Camp, 3.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 14; Las Vegas Hot Springs, *Pinus ponderosa* (DFEC) 4; Sandia Mtns., 8.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 15; 5 mi NE San Lorenzo, 6.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 10; 4 mi N of Tajique, Apache Canyon, 12.VIII.62, *Pinus ponderosa*, S.L. Wood (SLWC) 12. **Oregon:** Paisley, 8.VI.70, *Pinus ponderosa*, P.W. Orr (SLWC) 2. **Texas:** Guadalupe Mtns. National Park, The Bowl, 7.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 25; McKitteric Canyon, Guadalupe Mtns. National Park, 16.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 2. **Utah:** Bear Ears, Elk Ridge, *Pinus scopulorum* (USNM) 2; Beaver, 19.V.50, *Pinus ponderosa*, S.L. Wood (SLWC) 4; Bryce Canyon, *Pinus scopulorum* (USNM) 11; Elks Park, Ashley National Forest, 16.VI.60, *Pinus ponderosa*, S.L. Wood (SLWC) 5; 10 mi E of Kamas, 9.IX.60, *Pinus ponderosa*, S.L. Wood (SLWC) 5; La Sal Mtns., San Juan Co., 5.VII.58, *Pinus ponderosa*, D.E. Bright (CNC) 7; Pin Hollow, Fishlake National Forest, 9.VI.60, *Pinus ponderosa*, S.L. Wood (SLWC) 7; Yellowstone Ranger Station, Ashley National Forest, 16.VI.60, *Pinus ponderosa*, S.L. Wood (SLWC) 4. **Washington:** Omak, 10.VI.42, *Pinus ponderosa*, C.L. Massey (RMSC) 1. **Wyoming:** 11 mi S of Lusk, 15.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 18.

**BIOLOGY.** This species, working in concert with *confertus*, has been implicated in the topkilling of mature, vigorous ponderosa pines in California (Salman 1938). The trees attacked were largely on cutover lands, but some were in uncut forest stands. The attacks killed the top several feet of the tree and resulted in the forma-



MAP 40. Collection localities for *P. (Pityophthorus) confinis*.

tion of snagtops or, more seriously, in weakening the tree so that other species (*Ips* and *Dendroctonus*) could successfully attack and overcome the tree. The *Pityophthorus* attacks appeared to be primary since no other cause for the trees decline in vigor was detected, although root fungus, soil moisture, sunscald or other such factors could have predisposed the tree to the *Pityophthorus* attack. *Pityophthorus confinis* is also reported to attack twigs, limbs, and main stems of reproduction or pole-size trees.

Although this species is common and widespread, there is very little information on the gallery pattern, seasonal history, or other details of its life history. The gallery is the typical stellate type, with four to six egg galleries radiating from a central nuptial chamber. Some evidence indicates that the adults and larvae bore in the pith as well as in the inner bark. The gallery pattern was illustrated by Hopkins (1899).

REMARKS. Adults of this species are easily recognized by the characters mentioned in the group characteristics and in the diagnosis.

#### CRASSUS GROUP

Adults in this group may be recognized by the usually small and narrow first antennal segment, by the strongly arcuate second antennal suture, by the strongly flattened, distinct, longitudinal tooth on the male frons, by the convex elytral declivity in which, in the male, the third interstriae are strongly elevated only on the upper half or less, while in the female, the third interstriae are evenly elevated to the apex, by the randomly punctured elytra, and by the stout body shape.

#### KEY TO SPECIES IN THE Crassus group

1. Declivital interstriae 1 distinctly impressed below level of 3; antennal club large, but less than .20 mm in length; male frons distinctly strongly, transversely impressed, carina toothlike; generally distributed in North America . . . . . 2

- Declivital interstriae 1 either not or very weakly impressed, equal in height to 3 or slightly lower (Fig. 207); antennal club very large and broad, .21-.24 mm in length; male frons convex or very weakly transversely impressed or flattened, carina sharply elevated but not toothlike (Fig. 206); Chiapas . . . . . 186. *montezumae* Bright (p. 272)
- 2. Average body size smaller, 1.7-2.4 mm (occasional specimens may reach 2.5 mm); male carina short, not reaching level of upper margin of eyes (Fig. 209); declivity more shallowly impressed, interstriae 3 of male less strongly elevated (Fig. 210); female frons finely, more sparsely punctured (Fig. 208); in pinyon pines; southwestern United States and northern Mexico . . . . . 187. *schwarzi* Blackman (p. 273)
- Average body size larger, 2.8-3.2 mm; male carina long, reaching level of upper margin of eyes (Fig. 212); declivity more deeply impressed, interstriae 3 of male abruptly elevated, strongly granulate (Fig. 213); female frons more densely, strongly punctured (Fig. 211); in pines other than pinyons; western United States to southern Mexico . . . . . 188. *crassus* Blackman (p. 275)

186. *Pityophthorus (P.) montezumae* Bright

Figs. 205-207

*Pityophthorus montezumae* Bright, 1978, p. 81.

Length 2.5-2.9 mm, about 2.5-2.6 times longer than wide.

**Female.** Frons flattened on a broad area extending from epistoma to well above upper eye level and laterally nearly from eye to eye, central portion of flattened area frequently concave; surface moderately shining, densely, finely punctured and marked with numerous fine lines and points; vestiture abundant, those setae in central area short and erect, those on periphery much longer and incurved. Antennal club very large and broad .21-.24 mm long, about 1.1 times longer than wide, widest through segment 3; sutures 1 and 2 distinctly arcuate; segment 1 small, much narrower than 2 or 3; segments 1 and 2 together occupy less than half of total club length. Pronotum as long as wide, widest on posterior one-quarter; sides weakly arcuate to weakly converging; asperities on anterior slope numerous, low, broad, densely scattered in no apparent order; summit distinct; posterior area of disc densely punctured, punctures moderately deeply impressed, lateral margins of some punctures weakly elevated, giving a weakly, subasperate appearance to surface, especially on lateral area; surface between punctures dull, finely, minutely reticulate. Elytra 1.6-1.7 times longer than wide; apex broadly rounded; discal striae punctured in regular rows, punctures very large and moderately deep; discal interstriae narrower than or equal in width to striae, surface moderately dull, densely, minutely reticulate, each interstriae with a median row of large punctures equal in size to those in striae, each of these bearing a moderately long, erect seta, the setae longer on posterior portions of each interstriae. Declivity convex, moderately bisulcate; interstriae 1 moderately elevated, equal in height to 3 or very slightly lower, bearing a median row of about 6 widely separated, fine granules, each granule with a long, erect seta arising from lower edge; interstriae 2 moderately sulcate, equal in width or slightly wider than discal width, impunctate; interstriae 3 weakly elevated, bearing a median row of about 6 or fewer small granules, these slightly larger than those in interstriae 1 and each bearing a long erect seta on lower edge; punctures of striae 1 and 2 obsolete.

**Male.** Frons flattened to very weakly impressed or convex on each side of a sharply elevated, longitudinal carina which extends from epistomal margin to upper level of eyes, this carina more strongly elevated on lower half and may be nearly toothlike; surface on each side of carina dull, densely punctured with numerous, moderately long setae. Pronotum and elytra essentially as in female. Declivity as in female except granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: MEX. 7 mi. SE San Cristobal, Chis., V-13-69, D.E. Bright/Pinus montezumae/♀/HOLOTYPE *Pityophthorus montezumae* D.E. Bright, CNC No. 15485. The allotype and 22 paratypes bear the same data. One additional paratype bears the labels: MEX. 4 mi E. San Cristobal, Chis., V-26-1969, D.E. Bright/Pinus sp.

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.



HOSTS. Known only from *Pinus montezumae*.

DISTRIBUTION. Known only from the type locality in Chiapas.

REMARKS. Adults of this species show many of the characteristics of the *Blandus* group except for the remarkable antennal club and the more distinctly elevated carina on the male frons. Adults are easily recognized by the very large, broad antennal club with the narrow first segment and the strongly arcuate sutures, by the sharply elevated but not toothlike carina on the male frons (Fig. 206), by the first and third declivital interstriae being nearly equal in height (Fig. 207), and by the distribution. It is apparently the only species in this group that occurs south of the Isthmus of Tehuantepec.

187. *Pityophthorus (P.) schwarzi* Blackman

Figs. 208-210; Map 41

*Pityophthorus schwarzi* Blackman, 1928, p. 71; Chamberlin, 1939, p. 377.

Length 1.7-2.4 mm, about 2.5 times longer than wide.

**Female.** Frons flattened to weakly convex on a broad, semicircular area extending from epistomal margin to near level of upper margin of eyes and laterally nearly from eye to eye; surface finely, moderately sparsely punctured; vestiture on surface of flattened area abundant, long, those setae on periphery slightly longer and incurved. Antennal club broad, about 1.1 times longer than wide, widest through segment 3; suture 1 weakly to moderately arcuate, 2 more strongly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum about as long as wide, widest about middle; sides broadly arcuate; asperities on anterior slope erect, generally acute, numerous, scattered in no apparent order; summit strongly elevated; posterior area of disc deeply, densely punctured, punctures large and close; surface between punctures dull, opaque, smooth, frequently bearing minute points and lines or densely, minutely reticulate. Elytra 1.5-1.6 times longer than wide; apex broadly rounded; discal surface appearing densely, randomly punctured, striae usually only vaguely indicated, punctures in striae and interstriae usually equal in size and depth but those in striae tend to form more definite rows, may be slightly larger and bear a very short seta, those in interstriae more randomly placed, may be slightly smaller and bear a long, erect seta; surface between punctures shining, frequently bearing numerous, fine points and lines. Declivity convex, moderately bisulcate; interstriae 1 narrow, weakly elevated, usually devoid of granules but may have a few, fine granules; interstriae 2 moderately sulcate, wider than discal width, smooth, impunctate; interstriae 3 moderately elevated, higher than 1, bearing a median row of 6-8 large granules; punctures of striae 1 and 2 obsolete.

**Male.** Frons moderately, transversely impressed from epistoma to below level of upper margin of eyes, impression divided by a short, laterally flattened tooth which is more highly elevated near epistomal region; surface of impression deeply punctured. Pronotum and elytra essentially as in female except surface sculpturing rougher. Declivity moderately sulcate; interstriae 3 more abruptly and more strongly elevated on upper half, bearing 3 or 4 granules, inner slope sloping, not abrupt.

TYPE MATERIAL. The holotype (♀) is in the USNM and is labeled: 9483a/Las Vegas H.S., N.M./Barber and Schwarz, coll./on *Pinus edulis*/♀/TYPE *Pityophthorus schwarzi* Blackman/Type No. 41288 U.S.N.M. The allotype and 10 paratypes bear the same data and 12 paratypes bear the same data but with the number omitted.

HOSTS. Primarily pinyon pines such as *Pinus cembroides* and *edulis* but also recorded from *Pinus greggii*, *leiophylla*, and *ponderosa*.

DISTRIBUTION. Southwestern United States to northern Mexico (Map 41). Specimens (351) examined from:

## UNITED STATES

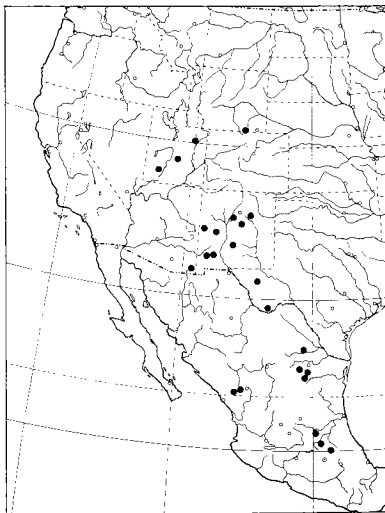
**Arizona:** Cave Creek Canyon, Chiricahua Mtns., 20.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 4. **New Mexico:** Clines Corners, 9.VII.68, *Pinus edulis*, D.E. Bright (CNC) 43; 6 mi W of Emory Pass, 25.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 5; 7 mi W of Kingston, 5.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 3; 3 mi W of Kingston, 22.VII.74, *Pinus edulis* (CNC) 6; 5 mi W of Lake Roberts, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 5; La Placita, 29.V.69, *Pinus edulis*, S.L. Wood (SLWC) 2; 5 mi W of Magdalena, 10.VII.68, *Pinus edulis*, D.E. Bright (CNC) 9; 3 mi N of Mimbres, 6.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 5; 6 mi W of Quemado, 12.VIII.62, *Pinus edulis*, S.L. Wood (SLWC) 8; Sandia Mountains, Dry Camp, 31.V.69, *Pinus edulis*, S.L. Wood (SLWC) 5; 10 mi NE of San Lorenzo, 25.VII.74, *Pinus edulis*, D.E. Bright (CNC) 21. **Texas:** Big Bend National Park, 21.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 6; Davis Mtns., 14.VII.55, D. & J.N. Knull (OSUC) 3; Madera Canyon, 23 mi N of Fort Davis, 19.VII.74, *Pinus ponderosa* and *P. cembroides*, D.E. Bright (CNC) 62; McDonald Observatory, Jeff Davis Co., 5.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 2. **Utah:** Beaver, 29.V.50, *Pinus edulis*, S.L. Wood (SLWC) 3; 2 mi N 17 mi W of Duchesne, 21.VII.68, *Pinus edulis*, W. Harwood (SLWC) 6; Gooseberry, Fishlake National Forest, 9.VII.60, *Pinus edulis*, S.L. Wood (SLWC) 1. **Wyoming:** 6 mi SW of Woods Landing, 5.VI.69, W.E. Clark (SLWC) 1.

## MEXICO

**Coahuila:** Puesto de Fores, 23.IX.69, *Pinus* (CNC) 82; Saltillo, IX.68, *Pinus* (CNC) 5. **Durango:** 23 to 40 mi W of Durango, various dates 1965-1971, *Pinus cembroides*, D.E. Bright or S.L. Wood (CNC or SLWC) 57. **Hidalgo:** 11 mi NE of Jacala, 22.VI.52, *Pinus*, S.L. Wood (SLWC) 2; 19 mi NE of Tulancingo, 24.VI.52, *Pinus*, S.L. Wood (SLWC) 2. **Nuevo León:** Cerro Potosi, 2.V.71, *Pinus* sp., D.E. Bright (CNC) 12; 15 mi E of San Roberto, 5.V.71, *Pinus cembroides*, D.E. Bright (CNC) 25. **Querétaro:** 10 mi E of Landa de Matamores, 11.VI.71, *Pinus greggii*, D.E. Bright (CNC) 30.

Additional locality in literature:

MEXICO: Carr. Mexico-Puebla, k.59, 28.VI.61, *Pinus* sp., Hiram Bravo M (Schedl 1963).



MAP 41. Collection localities for *P. (Pityophthorus) schwarzi*.

REMARKS. This species is very closely allied to *crassus* and adults are separated mainly on their smaller size and on their different host preference. Adults of *crassus* are from 2.8 to 3.2 mm in length and are not known to occur in pinyon pines. In contrast, adults of *schwarzi* are 1.7 to 2.4 mm in length and are most commonly collected from pinyon pines, although they occasionally are found in other species of pines.

188. *Pityophthorus* (*P.*) *crassus* Blackman

Figs. 211-213, Map 42

*Pityophthorus crassus* Blackman, 1928, p. 67; Chamberlin, 1939, p. 376; Schedl, 1963, p. 158.

*Pityophthorus endemos* Bright (manuscript name); Furniss, 1978, p. 106.

Length 2.8-3.2 mm, 2.6-2.7 times longer than wide.

**Female.** Frons flattened to weakly convex on a broad, semicircular area extending from the epistoma to well above the eyes and laterally nearly from eye to eye; surface moderately to brightly shining, strongly, densely punctured except on a small, median space just above epistoma, this space may be weakly elevated into a blunt callus or a very short, longitudinal carina; vestiture on surface of flattened area abundant, long, those setae on periphery of flattened area longer and incurved. Antennal club large, oval, about 1.3-1.5 times longer than wide, widest through segment 3; suture 1 weakly to moderately arcuate, 2 more strongly arcuate; first two segments together occupy slightly more than half of total club length. Pronotum about as long as wide, widest at about middle; sides broadly arcuate; asperities on anterior slope erect, generally acute, numerous, scattered in no apparent order; summit strongly elevated; posterior area of disc deeply, densely punctured, punctures large and close; surface between punctures dull, opaque, smooth, frequently bearing minute points and lines or densely minutely reticulate. Elytra 1.5-1.6 times longer than wide; apex broadly rounded; discal surface densely, randomly punctured, striae only vaguely indicated, punctures of interstriae and striae equal in size and depth, those in striae tending to form more definite rows and each bearing a very short seta, those in interstriae more randomly placed and each bearing a long, erect seta; surface between punctures shining, frequently bearing numerous fine lines and points. Declivity convex, deeply bisulcate; interstriae 1 narrowly, weakly elevated, usually devoid of granules but may bear a few very fine granules; interstriae 2 deeply sulcate, wider than discal width, smooth; interstriae 3 strongly elevated, definitely higher than interstriae 1, bearing a median row of 6-8 large granules; punctures of striae 1 and 2 obsolete, not readily visible.

**Male.** Frons deeply, transversely impressed, impression extending from epistoma to just above level of upper margin of eyes, impression divided by a large, strongly elevated, laterally flattened tooth which is most highly elevated near epistomal region; surface of impression strongly, deeply punctured, punctures stronger and deeper at upper level of impression and on slope above impression. Pronotum and elytra essentially as in female except sculpture of surface rougher. Declivity deeply bisulcate; interstriae 3 more abruptly and more strongly elevated on upper half, granules clustered on upper half, inner slope of interstriae 3 much more abrupt.

TYPE MATERIAL. The holotype (♀) is in the USNM and is labeled: Hopk U.S. 3953/W.F. Fiske, collector/Capitan, N.M./Pinus strobus/TYPE *Pityophthorus crassus* Blackman/Type No. 41285 U.S.N.M. Numerous paratypes are from: Larkspur, Colorado (3); Sierra Blanca Mtns., Boreal, N.M. (4); Halfway, Colorado (18); Manitou, Colorado (2); Woodland Park, Colorado (5); Longmont, Colorado (3); Breckenridge, Colorado (2); Flagstaff, Arizona (67) and Colorado National Forest, Colorado (24) (for details see Blackman, 1928).

Paratypes have been located in the CNC, the DFEC, and the USNM.

HOSTS. *Pinus aristata*, *arizonica*, *ayachuite*, *cembroides*, *contorta*, *cooperi*, *culminicola*, *durangensis*, *edulis*, *engelmannii*, *flexilis*, *greggii*, *hartweggii*, *leio-phylla*, *lumholtzii*, *montezuma*, *patula*, *ponderosa*, *strobiformis*, and *teocote*.

DISTRIBUTION. Western United States south to southern Mexico (Map 42). Specimens (1029) examined from:

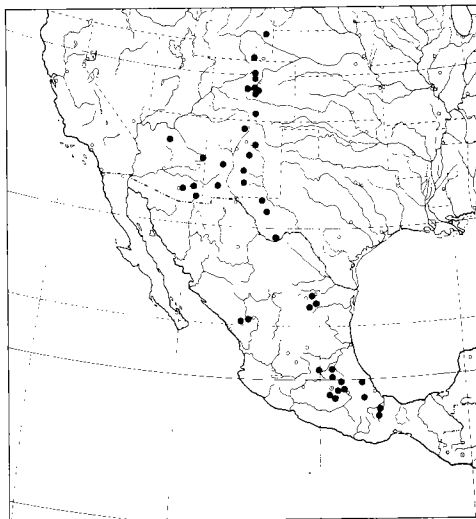
#### UNITED STATES

**Arizona:** Agassiz Peak, San Francisco Mtns., 16.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 37; Alpine, 11.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 14; 15 mi S of Alpine, 12.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 20; Bear Canyon, Santa Catalina Mtns., 11.VI.69, S.L. Wood (SLWC) 1; Cave Creek Canyon, Chiricahua Mtns., 20.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 5; Chiricahua Mtns., Cochise Co., 18.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 16; Mount Lemmon, Santa Catalina Mtns., 3-4.VIII.67, *Pinus ponderosa*, L.A. Kelton (CNC) 1; Pinaleno Mtns., Graham Co., 15.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 3; Rustler Park, Cochise Co., 19.VII.68 and 26.VII.74, *Pinus ponderosa* and *P. leiophylla*, D.E. Bright (CNC) 34; San Francisco Mtns., Coconino Co., 18.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 21; Upper Sabino Canyon, Pima Co., 6.VIII.68, *Pinus strobiformis*, D.E. Bright (CNC) 4. **Colorado:** Bailey, 30.V.45, *Pinus ponderosa*, T.T. Terrell (RMSC) 7; Estes Park, V.45, *Pinus ponderosa*, C.L. Massey (RMSC) 1; Evergreen, *Pinus aristata*, D. DeLeon (RMSC) 7; Nederland-Ward, 3-12.VIII.73, H. & A. Howden (CNC) 4; Stonewall, 1938, *Pinus ponderosa*, C.L. Massey (RMSC) 1; 5 mi SW of Woodlawn Park, Teller Co., 6.VI.64, *Pinus ponderosa*, C.W. O'Brien (DEBC) 8. **New Mexico:** Clines Corners, 9.VII.68, *Pinus edulis*, D.E. Bright (CNC) 42; Cloudcroft, 3-4.V.69, *Pinus ponderosa*, S.L. Wood (SLWC) 11; Emory Pass, 5.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 17; 6 miles W of Emory Pass, 25.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 5; Las Vegas Hot Springs, *Pinus edulis*, Barber & Schwarz (CNC, DFEC, USNM) 24; 5 mi W of Magdalena, 10.VII.68, *Pinus edulis*, D.E. Bright (CNC) 8; 10 miles NE of San Lorenzo, 25.VII.74, *Pinus edulis*, D.E. Bright (CNC) 21; Sopollo, 19.VII.52, *Pinus* sp., Beamer & LaBerge (SLWC) 5; Vallecitos, 28.VII.64, *Pinus ponderosa* (USNM) 1. **Texas:** Big Bend National Park, The Basin, 21.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 6; Davis Mtns., 15.VII.55, D.J. & J.N. Knull (OSUC) 3; Guadalupe Mtns. National Park, 17.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 12. **Wyoming:** Cold Springs, *Pinus contorta*, D. DeLeon (RMSC) 1; 7 mi E of Laramie, 3.VIII.69, *Pinus flexilis*, D.E. Bright (CNC) 4; 11 mi S of Lusk, 15.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 10.

#### MEXICO

**Durango:** Buenos Aires, 10 mi W of La Ciudad, 18.VII.64, *Pinus cooperi*, J.B. Thomas (CNC) 24; Durango to El Salto environs, various dates 1964-71, *Pinus cembroides*, *P. durangensis*, *P. leiophylla*, *P. cooperi*, *P. ayachuíte* or *P. teocote*, D.E. Bright, J.B. Thomas or S.L. Wood (CNC, SLWC) 105; 7 mi E of El Palmito, 15.VI.71, *Pinus lumholtzii*, *P. teocote* or *P. leiophylla*, D.E. Bright (CNC) 28. **Hidalgo:** 8 mi S of Durango, 29.IV.69, *Pinus* sp., D.E. Bright (CNC) 3; Jacala, 28.IV.69, *Pinus montezumae*, D.E. Bright (CNC) 22; 19 mi E of Tulancingo, 12.VI.67, *Pinus*, S.L. Wood (SLWC) 2; 8 mi NE of Zimipan, 28.IV.69, *Pinus edulis*, D.E. Bright (CNC) 15; 17 mi N of Zimipan, 11.VII.67, *Pinus montezumae*, S.L. Wood (SLWC) 6. **Mexico:** 20 mi N of Cuernavaca, 15.VII.69, *Pinus* sp., D.E. Bright (CNC) 4; Mexico - Puebla road, km. 59, 29.VI.61, H. Bravo (CNC) 8; Rio Frio, 7.V.36, *Pinus*, D. DeLeon (USNM) 1; Tequesquinahua, III.62, *Pinus*, R. Coronado P. (SLWC) 12; Texcoco, 5.II.62, *Pinus*, R. Coronado P. (SLWC) 17. **Morelos:** 30 mi S of Mexico City, 9.VI.71, *Pinus* sp., D.E. Bright (CNC) 5. **Nuevo León:** Cerro Potosi, 2-3.V.71, *Pinus arizonica*, *P. strobiformis* or *P. culminicola*, D.E. Bright (CNC) 120; Chipinque Mesa, near Monterrey, 26.IV.69, *Pinus ponderosa*, D.E. Bright (CNC) 9; 15 mi E of San Roberto, 5.V.71, *Pinus cembroides*, D.E. Bright

(CNC) 25. **Oaxaca**: 20.5 km N of Oaxaca, 31.V.71, *Pinus*, D.E. Bright (CNC) 12; 53 and 66 mi N of Oaxaca, various dates 1969-71, *Pinus patula*, J.E. H. Martin or D.E. Bright (CNC) 13; 37-40 mi S of Valle Nacional, 24-25.V.71, *Pinus hartwegii* and *P. sp.*, D.E. Bright (CNC) 52. **Puebla**: Texmelucán, 14.VII.53, *Pinus*, S.L. Wood (SLWC) 1. **Querétaro**: 10 mi E of Landa de Matamores, 11.VI.71, *Pinus greggii*, D.E. Bright (CNC) 30; 2 mi E of Pinal de Amoles, 9.VI.71, *Pinus greggii*, D.E. Bright (CNC) 6. **Tlaxcala**: 1 mi N of Tlaxco, 9.VII.67, *Pinus*, S.L. Wood (SLWC) 12. **Veracruz**: 25 mi W of Orizaba, 29.IV.69, *Pinus sp.*, D.E. Bright (CNC) 4; 1 mi W of Las Vigas, 5.VII.67, *Pinus*, S.L. Wood (SLWC) 10.



MAP 42. Collection localities for *P. (Pityophthorus) crassus*.

**BIOLOGY.** This species constructs its galleries in the pith and in the sapwood of either living or recently dead twigs and branches.

**REMARKS.** This is the largest species in this group. The adults can be most easily recognized by the large size, by the characteristics of the antennal club as given in the key, and by the declivital characters given in the group statement.

Furniss (1978) records a species called *endemos* Bright from Nuevo León, Mexico. This is a manuscript name for the population found in the endemic pine, *Pinus culminicola* on Cerro Potosi in Nuevo León. This population is now referred to *crassus*; however, it is slightly different but perhaps not enough to warrant specific status. Specimens from Cerro Potosi are slightly larger than the average *crassus* and the setae on the elytral interstriae are much longer, especially on the declivity.

#### COMOSUS GROUP

Members of this group are distinguished by the densely, confusedly punctured elytral disc, by the very fine, indistinct, longitudinal carina on the male frons, by the broad, steep, flat second declivital interstriae of the female, and by the stout body shape. Only one species is included in the group.

#### 189. *Pityophthorus (P.) comosus* Blackman

*Pityophthorus comosus* Blackman, 1928, p. 65; Chamberlin, 1939, p. 375.

*Pityophthorus foratus* Wood, 1967, p. 40; Bright, 1977, p. 514 (= *comosus*).

Length 2.4-2.8 mm, 2.5 times longer than wide.

**Female.** Frons flattened on a broad, semicircular area extending from epistomal margin to well above eyes and laterally from eye to eye, frequently central portion may be weakly concave or more definitely flattened; surface shining, densely, deeply punctured, punctures fine, close except on a small, impunctate space just above midpoint of epistomal margin; pubescence moderately abundant, setae nearly equal length, except those on periphery may be slightly longer and incurved. Antennal club oval, 1.2-1.3 times longer than wide, widest through segment 2; suture 1 weakly arcuate, 2 more strongly so; first two segments together occupy slightly more than half of total club length. Pronotum about as long as wide, widest at posterior angles; sides moderately arcuate, converging; asperities on anterior slope numerous, low, scattered at random over surface; summit evident but low; posterior area of disc deeply, densely punctured, punctures large and close, usually almost touching; surface between punctures moderately shining, bearing numerous fine lines and points. Elytra 1.5-1.6 times longer than wide; apex broadly rounded; discal striae and interstriae deeply, densely punctured, making discernment of strial rows difficult if not impossible, sometimes striae 1 and 2 can be vaguely seen, all punctures equal or nearly equal in size and depth; vestiture conspicuous, consisting of very long, erect, hairlike seta arising from what is interpreted to be the interstrial punctures and shorter setae arising from the strial punctures; surface between punctures generally shining and frequently bearing fine lines and points. Declivity steep; interstriae 1 wide, weakly elevated, with a median row of very weak punctures or granules; interstriae 2 very broad, flat, smooth, shining with fine points or minute lines; interstriae 3 arcuate, weakly elevated, with a row of fine punctures; punctures of striae 1 and 2 weakly impressed but distinctly visible, smaller than those on disc.

**Male.** Frons weakly flattened, much smoother and less densely punctured than in female, bearing a fine, weakly elevated, longitudinal carina extending from epistoma to level of upper margin of eyes and meeting a narrow, transverse swelling marking upper level of transverse flattened area. Pronotum similar to female except summit lower. Elytra as in female. Declivity more sloping, more convex; interstriae 2 narrower; interstriae 3 more distinctly granulate; punctures of striae 1 and 2 more obscure.

**TYPE MATERIAL.** *P. comosus*. The holotype (♀) in the USNM is labeled: Hopk U.S. 5754/J.L. Webb, collector/Sacramento Mtns., N.M./*Pinus ponderosa*/TYPE *Pityophthorus comosus* Blackman/Type No. 41284 U.S.N.M. The allotype and 6 paratypes bear the same locality, host and collector data, the Hopkins numbers differ.

*P. foratus*. The holotype (♀) in the CNC bears the data: 10 mi W. El Salto, Durango, Mexico, July 1964, J.B. Thomas/in flight/TYPE *Pityophthorus foratus* S.L. Wood '66. Paratypes (all ♀♀) bear the same data. Wood (1967) states that the type series contains 6 paratypes, however 13 specimens are labeled as paratypes, 8 of these are in the CNC and 5 are in the SLWC.

The type material of both names has been directly compared with each other. Only one species is evident.

**HOSTS.** *Pinus ponderosa*.

**DISTRIBUTION.** Southwestern United States and western Mexico. Specimens (46) examined from:

**UNITED STATES**

**Arizona:** Palmerlee, VII (USNM) 2; Walker, 23.VIII.68, *Pinus ponderosa*, D.E. Bright (CNC) 1. **New Mexico:** Cloudcroft, 4.V.69, *Pinus ponderosa*, S.L. Wood (SLWC) 9; Haynes Forest Camp, Cloudcroft, 3.VI.69, *Pinus ponderosa*, S.L. Wood (SLWC) 12.

**MEXICO**

**Durango:** See type material.

**REMARKS.** This stout, chunky beetle can be most easily recognized by the characters given under the group characteristics and in the diagnosis.

## CHALEOENSIS GROUP

The species belonging to this group are characterized by their relatively large size, by the lack of a pronotal summit, by the broadly flattened, densely punctured and pubescent frons in both sexes, and by the more weakly sulcate elytral declivity (especially in the female).

Three species are included in the group. All occur in *Pinus* spp.

## KEY TO SPECIES IN THE Chaleoensis group

1. Punctures on frons large, deep, distinctly separated; male frons with a slightly elevated, impunctate callus on upper margin; declivity very steep, moderately deeply bisulcate, granules on interstriae 1 and 3 moderately large; Mexico ..... 190 *chaleoensis* Hopkins (p. 279)
- Punctures on frons very fine and very densely placed; male frons without an elevated callus on upper margin; declivity moderately steep, weakly bisulcate, granules on interstriae 1 and 3 small ..... 2
2. Smaller, average length about 2.6 mm; frons of both sexes evenly flattened or evenly planoconvex, punctures and setae very dense; Oaxaca to Nicaragua ..... 191. *miniatus* n. sp. (p. 280)
- Larger, average length about 3.0 mm; frons of male subconvexly to transversely impressed, female flat to weakly impressed, punctures and setae slightly less dense; Arizona to Durango ..... 192. *ingens* Blackman (p. 281)

190. *Pityophthorus* (*P.*) *chaleoensis* Hopkins

*Pityophthorus chaleoensis* Hopkins, 1905, p. 73; Hagedorn, 1910, p. 70; Schedl, 1939, p. 348; Bright, 1978, p. 71.

*Pityophthorus herrerae* Hopkins, 1905, p. 74; Hagedorn, 1910, p. 71; Bright, 1978, p. 71 (= *chaleoensis*).

Length 2.2-2.7 mm, 2.8 times longer than wide.

**Female.** Frons very broadly flattened on a large semicircular area extending from epistomal margin to well above eyes and laterally from eye to eye; surface densely punctured, punctures rather large, deep, and close but distinctly separated, surface between punctures shining; a smooth, broadly arcuate, weak elevation located just above midpoint of epistoma; vestiture on surface abundant, consisting of moderately long, hairlike setae scattered over surface, these all of equal or nearly equal length. Antennal club slightly longer than wide, widest through segment 2; sutures not readily visible except at lateral margins where they are heavily chitinized and bear long setae; segments not readily discernible. Pronotum 1.1-1.2 times longer than wide, widest at about middle; sides rather broadly arcuate; asperities on anterior slope low, broad, scattered in no apparent order; summit not evident; posterior portion of disc deeply punctured, punctures large and close, lateral edges weakly elevated, resulting in a subasperate appearance most noticeable on lateral areas of posterior portion; surface between punctures densely, minutely punctured to minutely subreticulate. Elytra 1.6-1.7 times longer than wide; apex broadly, moderately acuminate; discal striae punctured in irregular rows, punctures large, deep and very close, almost touching; discal interstriae about as wide or slightly wider than striae, surface densely, minutely punctured, shining, with large, deep punctures in interstriae 1, 3, 5, 7, 9, these equal in size to those in striae and somewhat randomly placed on basal third, resulting in a randomly punctured appearance on some specimens. Declivity very steep, moderately deeply bisulcate; interstriae 1 distinctly elevated, equal in height to 3, bearing a median row of large to moderately large granules; interstriae 2 moderately impressed, broader than discal width, densely microreticulate; interstriae 3 distinctly elevated, inner slope abrupt, summit bearing a row of large to moderately large granules, these equal in size to those in interstriae 1; punctures in striae 1 and 2 very small to obsolete.

**Male.** Frons identical with female except upper margin of flattened area bearing a small, round, impunctate, weakly elevated callus and punctures on the surface of the flattened area deeper. Pronotum, elytra, and declivity essentially as in female except punctures and granules stronger.

TYPE MATERIAL. *P. chaleoensis*. Described from one specimen in the USNM and bearing the labels: . . . (illegible word), 19 Oct 03, Chaleo, Mex./872, Herrera/♀ type/Pityophthorus chaleoensis Hopk./♀ type No. 7511, U.S.N.M.

*P. herrerae*. Described from 3 specimens in the USNM. The holotype is labeled: Det. No. 696, Herrera/1138 Hopk. U.S./♀ type/Pityophthorus herrerae Hopk./♀ type No. 7512, U.S.N.M. A male paratype bears the same data except the lot number is 694 and 1 female paratype bears the same labels as the holotype with the omission of a type label.

HOSTS. *Pinus* sp.

DISTRIBUTION. Known only from Mexico. Specimens (7) examined from:

MEXICO

**Michoacán:** Co. Hidalgo, *Pinus* sp. (NIFR, CNC) 3.

REMARKS. This species is closely related to *ingens* and *miniatus*. The adults may be most easily recognized by the characters given in the key.

In addition to the types, only three specimens of this species have been seen. Examination of the specimens in this latter series showed that the distinctions pointed out by Hopkins in his original descriptions of *chaleoensis* and *herrerae* were only variations in the species. The species is evidently rare since it has not been subsequently collected (other than as noted above) in spite of rather intensive collecting in central Mexico.

#### 191. *Pityophthorus (P.) miniatus* n. sp.

Length 2.2-2.9 mm, about 3.0 times longer than wide.

**Female.** Frons flattened on a very broad, semicircular area extending from epistomal margin to well above eyes and laterally from eye to eye; surface very densely punctured, almost subgranulate, punctures very fine and very close, evenly distributed over surface except on a small, oval, weakly elevated callus just above midpoint of epistoma; vestiture dense, consisting of numerous, erect, yellowish setae over surface, those on periphery longer and incurved. Antennal club oval, 1.3-1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, distinctly chitinized at lateral margins; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.2 times longer than wide, widest near level of summit; sides evenly, weakly arcuate; asperities on anterior slope numerous, low, broad, scattered in no apparent order; summit weakly elevated; posterior portion of disc densely punctured, larger punctures deep, distinct and moderately close; surface between large punctures shining and densely punctured, punctures very small and close. Elytra about 1.8 times longer than wide; apex moderately acuminate; discal striae punctured in fairly even, regular rows, punctures larger than those on pronotum, deeply impressed and close; discal interstriae about 1.5-2.0 times wider than striae, surface shining, with dense, minute points and usually with a few, scattered, large, interstitial punctures. Declivity sloping, weakly bisulcate; interstriae 1 weakly elevated, bearing about five very small granules, these often obsolete; interstriae 2 broad, distinctly wider than discal width, weakly impressed, surface opaque, with extremely fine microsculpturing; interstriae 3 weakly elevated, slightly lower than interstriae 1, with a median row of about five very small granules, these sometimes obsolete; punctures in striae 1 and 2 visible, distinctly impressed.

**Male.** Virtually identical with female except declivity more deeply sulcate, interspaces 1 and 3 more strongly elevated and each bearing a median row of small, distinct granules.

TYPE MATERIAL. The female holotype, allotype, and 3 paratypes were collected at Cerro Pena, Blanca, Honduras, 6000 ft, on April 23, 1964 from *Pinus pseudo-strobus* by S.L. Wood. Additional paratypes were collected as follows: 1, Godinez, Guatemala, April 29, 1956, *Pinus pseudo-strobus*, R.L. Furniss; 1, 115 mi



S of Oaxaca, Oaxaca, Mexico, May 27-30, 1971, *Pinus lawsonii*, D.E. Bright; 1, Daraici, Esteli, Nicaragua, January 11, 1960, Encorteza de Pino, J. Morales and 1, Tegucigalpa, Honduras, March 9, 1966, *Pinus oocarpa*.

The holotype, allotype, and several paratypes are in the SLWC. Additional paratypes are in the CNC and in the USNM.

REMARKS. This species is evidently widely distributed throughout the pine growing regions of southern Mexico and Central America. It is associated with *Dendroctonus* spp. and may be economically important by virtue of its attack habits. Attacks by adults of this species may predispose trees to attacks by the more vigorous and destructive *Dendroctonus* species.

Adults are very similar to those of *ingens* but the differences noted in the key will readily separate the species.

#### 192. *Pityophthorus (P.) ingens* Blackman

*Pityophthorus ingens* Blackman, 1928, p. 124; Chamberlin, 1939, p. 395.

Length 2.6-3.4 mm, 2.9 times longer than wide.

**Female.** Frons as in *miniatus* except surface may be weakly impressed, punctures and setae slightly less dense. Antennal club, pronotum, and general features of elytra as in *miniatus*, except stria punctures slightly shallower and declivity slightly shallower. Sculpturing on entire body slightly coarser.

**Male.** Very similar to female except frons distinctly subconcavely or transversely impressed. Declivity more deeply sulcate, interstriae 1 and 3 more strongly elevated and more strongly granulate.

TYPE MATERIAL. The holotype (♀) in the USNM is labeled: Hopk. U.S. 4919d/G. Holfer, colr./Santa Catalina Mts., Ariz./Apr 7-17/Pinus ponderosa/TYPE *Pityophthorus ingens* Blackman/Type No. 41315 U.S.N.M. Paratypes are labeled: 4, Hopk. J.S. 5527g/J.L. Webb, collector/Chiricahua Mts., Ariz./Pinus ponderosa; 6, Hopk. U.S. 5641g/J.L. Webb, collector/Sta Catalina Mts., Ariz./Pinus ponderosa; 6, same as above except Hopk. J.S. 5642-d and 2, same as above except Hopk U.S. 5645-a. Most of the type material is in the USNM, 2 paratypes are in the CNC.

HOST. *Pinus ponderosa*.

DISTRIBUTION. Southern Arizona to northern Mexico. Specimens (25) examined from:

#### UNITED STATES

**Arizona:** Mount Graham, 14.VIII.30, M.W. Blackman (USNM) 1.

#### MEXICO

**Chihuahua:** San Juanito, 15.III.74, M.M. Furniss (SLWC) 2. **Durango:** Durango, 24.III.74, M.M. Furniss (SLWC) 3.

REMARKS. This species is apparently widespread throughout southern Arizona and northern Mexico, but is not commonly encountered. Its biology is unknown, but it probably occurs in the bole of dying pines.

Adults closely resemble those of *miniatus* but may be distinguished by the differences given in the key and diagnosis.

#### CONSIMILIS GROUP

Species that belong to this group are characterized by the strongly acuminate elytral apex, by the glabrous, discal elytral interstriae, by the presence of long setae

on declivital interstriae 1, 3, 5, 7 and by the flattened to weakly convex or weakly transversely impressed and moderately pubescent frons of both sexes.

Four species are included in the group.

#### KEY TO SPECIES OF *Consimilis* group

1. Male frons convex, densely punctured; female frons flat to planoconvex, vestiture long and abundant; posterior portion of pronotum reticulate or granulate . . . . . 2
- Male and female frons flattened or weakly, transversely impressed; female frons sparsely pubescent; posterior portion of pronotum never reticulate or granulate . . . . . 3
2. Posterior portion of pronotum with small, rounded tubercles, punctures obscure; female frons finely punctured, longest setae on female equal in length to half the distance between eyes, shorter in male; declivity more weakly impressed; veracruz . . . . . 193. *perotei* Blackman (p. 282)
- Posterior portion of pronotum strongly reticulate, punctures coarse, their margins not elevated; female frons more strongly punctured, setae shorter; declivity more deeply impressed; Durango to Jalisco and Puebla . . . . . 194. *discretus* Wood (p. 283)
3. Declivital interstriae 1 and 3 with very small granules or granules absent (Fig. 216); male frons weakly, transversely impressed (Fig. 214); female frons flattened (Fig. 214), both frequently with a faint, longitudinal carina; Alberta to Nova Scotia, south to eastern Texas and Florida . . . . . 195. *consimilis* LeConte (p. 283)
- Declivital interstriae 1 and 3 with prominent granules (Fig. 219); frons of both sexes transversely impressed (Fig. 217, 218); Arizona and northwestern Mexico . . . . . 196. *intentus* Bright (p. 286)

#### 193. *Pityophthorus* (*P.*) *perotei* Blackman

*Pityophthorus perotei* Blackman, 1942, p. 218.

Length 1.5-2.0 mm, 2.7-2.8 times longer than wide.

**Female.** Frons broadly flattened from epistoma to well above upper level of eyes and nearly from eye to eye; surface shining, finely, densely punctured; pubescence dense, consisting of long yellowish setae scattered over surface, those on periphery longer and incurved. Antennal club small, about 1.1 times longer than wide, widest through segment 2; first two sutures transverse; first two segments together occupy about two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest at base; sides subparallel, weakly converging; asperities on anterior slope low, blunt, groups of three or four may be basally contiguous, scattered in no apparent order; posterior area of disc weakly punctured, punctures shallow, poorly defined, margins elevated resulting in a tuberculate appearance to surface; surface between punctures moderately shining, bearing numerous, minute points. Elytra about 1.7-1.8 times longer than wide; apex distinctly, sharply acuminate, tips of extreme apex bent downwards when viewed laterally; discal striae punctured in regular rows, punctures moderately large and somewhat shallow; discal interstriae about as wide as striae, surface shining, marked by fine lines and points, impunctate and glabrous except on posterior third of 1, 3, 5, 7, and 9, setae on these interstriae at least as long as interstitial width and hairlike. Declivity sloping; interstriae 1 broad, weakly elevated, extending into an acute, ventrally projecting apex, surface bearing a median row of fine granules and setae; interstriae 2 weakly impressed, about as wide as discal width, shining and glabrous; interstriae 3 weakly elevated, equal in height to 1, bearing a median row of fine granules and setae; punctures of striae 1 and 2 distinctly visible but slightly reduced in size.

**Male.** Very similar to female except frons convex, vestiture on frons sparser; interstriae 2 more strongly impressed on declivity and ventrally directed elytral apices much shorter.

**TYPE MATERIAL.** The holotype (♀) is in the USNM and is labeled: 690-1/Perote, V.C., II-9-36/Pinus teocote/D.DeLeon, colr/type No. 55992 U.S.N.M. Fourteen paratypes bearing the same data are also in the USNM.

**HOSTS.** *Pinus leiophylla* and *teocote* and probably other species of *Pinus*.

DISTRIBUTION. Southern Mexico. Specimens (25) examined from:

MEXICO

**Mexico:** Rio Frio 10.II.36, *Pinus leiophylla*, D. DeLeon (USNM) 2. **Morelos:** Cuernavaca, 5.II.36, *Pinus leiophylla*, D. DeLeon (USNM) 5. **Puebla:** El Seco, 7.II.36, *Pinus*, D. DeLeon (USNM) 2. **Veracruz:** 1 mi W of Las Vigas, 5.VII.67, *Pinus*, S.L. Wood (SLWC) 1.

REMARKS. Adults of this little species are easily distinguished by the sub-tuberculate appearance of the posterior portion of the pronotum. In addition, the tips of the elytral apex are bent downward. In the females this characteristic is easily visible when specimens are viewed laterally; the male tips are much shorter and frequently do not show this feature. The frons of both sexes is weakly convex to flattened and moderately pubescent.

194. *Pityophthorus (P.) discretus* Wood

*Pityophthorus discretus* Wood, 1977b, p. 394.

Length 1.6-2.2 mm, about 2.9 times longer than wide.

**Female.** Frons flattened from epistoma to above upper level of eyes and nearly from eye to eye; surface shining, finely, densely punctured but more coarsely punctured than in *perotei*; pubescence as in *perotei* except only about two-thirds as long. Antennal club as in *perotei*. Pronotum essentially as described for *perotei* except punctures on posterior portion of disc moderately coarse and deep, margins not elevated and surface between punctures strongly reticulate. Elytra essentially as described for *perotei* except surface of discal interstriae subreticulate and declivity slightly steeper and interstriae 2 slightly more strongly impressed and wider.

**Male.** Very similar to female except vestiture on frons sparser and shorter; interspace 2 on declivity slightly more strongly impressed.

TYPE MATERIAL. The holotype (♀) is in the SLWC and is labeled: 3 mi. W. El Salto, Dgo., Mexico, VI-7-1965, 7000 ft., in S.L. Wood/ *Pinus ayacahuite*/ HOLOTYPE *Pityophthorus discretus* S.L. Wood. The allotype and 1 paratype bear the same data. Additional paratypes all collected by S.L. Wood are as follows: 2, 18 miles west Quiroga, Michoacan, Mexico, VI-11-1965), *Pinus*; 1, 6 miles east Volcan Paricutin, Jalisco, Mexico, VI-19-1965/*Pinus* and 1, 14 miles west Texmelucan, Puebla, Mexico, VII-14-1953/*Pinus*.

All of the type material is in the SLWC.

HOSTS. *Pinus ayacahuite* and other species of pines.

DISTRIBUTION. Known only from the type-series localities given above.

REMARKS. This species is closely related to *perotei* but the adults of *discretus* may be recognized by their slightly larger average size, by the reticulate posterior surface of the pronotum, by the absence of tubercles on the edges of the punctures on the pronotum, by the more strongly punctured female frons, and by the steeper, more deeply impressed elytral declivity.

195. *Pityophthorus (P.) consimilis* LeConte

Figs. 214-216; Map 43

*Pityophthorus consimilis* LeConte, 1878, p. 622; Swaine, 1909, p. 135 (additional references); Hagedorn, 1910, p. 71 (additional references); Blatchley & Leng, 1916, p. 630; Chapin, 1917, p. 29; Swaine, 1918, p. 104; Blackman, 1928, p. 131; Dodge, 1938, p. 45; Chamberlin, 1939, p. 397; Beal & Massey, 1945, p. 137; Craighead, 1950, p. 333; Bright, 1976c, p. 185 (lectotype desig.).

*Pityophthorus granulatus* Swaine, 1917, p. 28; Swaine, 1918, p. 103; Blackman, 1922a, p. 107; Blackman, 1928, p. 132, 148 (= *consimilis*); Bright, 1967, p. 678 (lectotype desig.).

*Pityophthorus nudus* Swaine, 1917, p. 30; Swaine, 1918, p. 104; Blackman, 1922a, p. 108; Blackman, 1928, p. 133; Dodge, 1938, p. 46; Chamberlin, 1939, p. 397; Beal & Massey, 1945, p. 137; Craighead, 1950, p. 333; Bright, 1967, p. 678 (lectotype desig.); Wood, 1977c, p. 515 (= *consimilis*).

Length 1.5-2.0 mm, about 3.0 times longer than wide.

**Female.** Frons convex to weakly flattened; surface finely, densely punctured on an area extending not quite to upper level of eyes and laterally to a point equal with lateral insertion of mandibles, punctures sparser and deeper above this area; a weak, short, longitudinal carina is frequently evident just above epistoma; vestiture sparse, consisting of short to moderately long, erect setae on the densely punctured semicircular flattened area. Antennal club small, about 1.3-1.4 times longer than wide, widest through segment 2; first two sutures transverse; first two segments together occupy more than two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest at base; sides weakly arcuate to subparallel, weakly converging; asperities on anterior slope low, blunt, usually isolated but may be joined at base into groups of three or four, arranged in no apparent order; posterior area of disc moderately punctured, punctures shallow and close; surface between punctures shining, bearing minute lines and points. Elytra about 1.8 times longer than wide; apex distinctly, sharply acuminate; discal striae punctured in regular rows, punctures moderately large, shallow and close; discal interstriae about as wide as striae, shining to opaque, smooth to densely microrugose, devoid of setae on disc, interstriae 1, 3, 5, 7 sparsely pubescent on posterior half or less. Declivity sloping; interstriae 1 moderately elevated, bearing a median row of fine granules; interstriae 2 moderately sulcate, broader than discal width; interstriae 3 moderately elevated, as high as 1, usually bearing a median row of very fine granules, granules may be absent on some specimens; punctures of striae 1 and 2 very small and fine.

**Male.** Very similar to female except vestiture on frons sparser and interstriae 2 more strongly sulcate on declivity.

**TYPE MATERIAL.** *P. consimilis*. The lectotype (♂) is in the MCZ and bears the labels: Marquette, Mich., 1-7/ ♀ (error)/type 1284/ *P. consimilis* LeC./ LECTOTYPE *Pityophthorus consimilis* LeConte, D.E. Bright 1976. Two additional specimens are labeled as paralectotypes. The first of these is labeled: Marquette, Mich., 29.6/126/ *consimilis* 2 and is probably a specimen of *intextus*. The other paralectotype is labeled: Detroit, Mich./125/oak twigs/ *consimilis* 3 and is probably a specimen of *lautus*.

*P. granulatus*. The lectotype (♂) of this species is in the CNC and bears the labels: 115/*Pityophthorus granulatus*, n.sp./type of description/TYPE *P. granulatus* Sw. 3149/ LECTOTYPE *Pityophthorus granulatus* Sw. CNC No. 9324. Swaine did not give the number of specimens in the type series nor did he even give a description of the species, merely indicating a few characteristics that distinguish it from *nudus*. No additional specimens have been located in the CNC but since Swaine commonly did not label the type series, additional specimens could be in the CNC but unrecognized.

*P. nudus*. The lectotype (♂) is in the CNC and is labeled: Ste. Anne de Bellevue, 9-4-06/48/*Pityophthorus nudus* n.sp./type of description/TYPE *P. nudus* Sw.3148/ LECTOTYPE *Pityophthorus nudus* Sw., CNC No. 9325. No indication is given of the number of specimens in the type series, but 3 additional specimens, labeled by Swaine as paratypes, are in the CNC.

**HOSTS.** *Picea glauca*; *Pinus banksiana*, *clausa*, *contorta*, *echinata*, *resinosa*, *rigida*, *serotina*, *sylvestris*, and *taeda*. Probably occurs in most species of *Picea* and *Pinus* in its range.

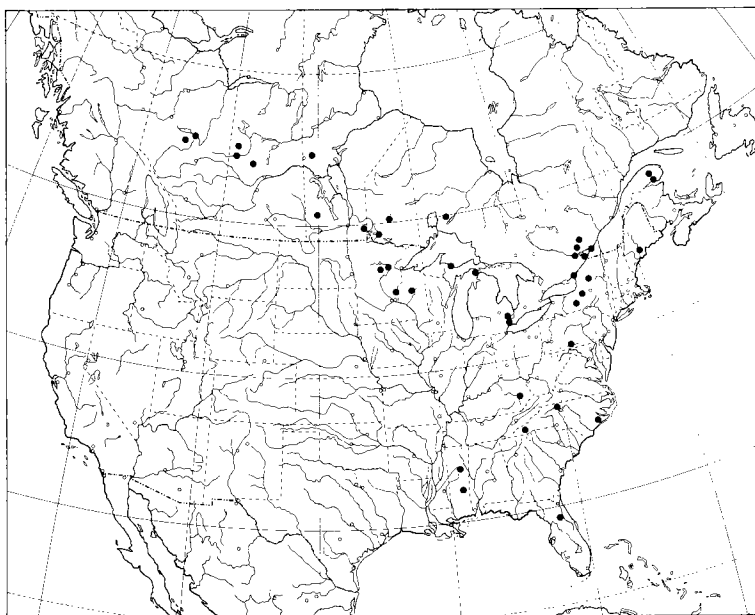
DISTRIBUTION. Eastern United States and eastern Canada, west in Canada to northern Alberta, west in the United States to the Mississippi River and south to Mississippi (Map 43). Specimens (358) examined from:

## CANADA

**Alberta:** 10 mi NE of Smith, 15.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 3; Swan Hills, 15.VII.72, *Pinus contorta*, D.E. Bright (CNC) 2. **Manitoba:** Grass River Provincial Park, 27.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 34; Riding Mountains National Park, Jack pine, J.M. Swaine (CNC) 3; Whiteshell Provincial Park, 30.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 8. **Ontario:** 3 mi S of Bourget, 24.VI.67, *Pinus resinosa*, D.E. Bright (CNC) 3; Constance Bay, 1.IX.66, *Pinus strobus*, D.E. Bright (CNC) 6; 30 mi N of Dryden, 6.VIII.72, *Pinus banksiana*, D.E. Bright (CNC) 18; Geraldton, 25.VII.65, *Pinus resinosa*, V. Jansons (CNC) 3; Lake of the Woods, 1.VIII.72, *Pinus banksiana*, D.E. Bright (CNC) 4; Prince Edward Co., 21.III.19, J.W. Green (CASC) 1. **Quebec:** Gaspé Co., 15.VIII.34, *Picea canadensis*, E.B. Watson (CNC) 1; Kazabazua, 13.VII.67, *Pinus banksiana*, D.E. Bright (CNC) 52; Kelly's Camp, 17.VII.39, *Picea canadensis*, P.M. Morley (CNC) 2; 4 mi W of Marsham, near Mud Lake, 24.X.67, J.M. Campbell & A. Smetana (CNC) 1. **Saskatchewan:** Big River, 23.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 2; Canoe Lake, 21.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 1; Meadow Lake Provincial Park, 20.VII.72, *Pinus banksiana*, D.E. Bright (CNC) 14.

## UNITED STATES

**Florida:** Juniper Springs, Marion Co., 22.IV.67, *Pinus clausa*, D.E. Bright (CNC) 16. **Kentucky:** Slade, 25.VIII.67, J.M. Campbell (CNC) 40. **Maine:** Orono, 1.VIII.19, M.W. Blackman (DFEC) 15. **Michigan:** Beaver Island, 26.VIII.22, M.H. Hatch (UMMZ) 3; Romeo, 1.II.38, *Pinus strobus* (USNM) 1. **Minnesota:** Cass Lake, Cass Co., 29.IX.67, *Pinus banksiana*, D.E. Bright (CNC) 11; Chisago Co., 7.IX.36, White pine, H.R. Dodge (DEBC) 2; Hubbard Co., 8.VII.36, Jack pine, H.R. Dodge (DEBC) 1. **Mississippi:** A & M, various dates, M.W. Blackman (DFEC) 35; Meri-



MAP 43. Collection localities for *P. (Pityophthorus) consimilis*.

dian, 11.IV.19, M.W. Blackman (DFEC) 7. **New York:** Cranberry Lake, 12.VII.21, M.W. Blackman (DFEC) 1; Green Lakes State Park, 14.X.70, *Pinus strobus*, R.C. Miller (DFEC) 21; Syracuse, VIII.25, *Pinus strobus*, A.H. MacAndrews (RMSC) 1. **North Carolina:** Asheville, 9.VIII.24, *Pinus strobus*, A.H. MacAndrews (RMSC) 1 and *Pinus echinata* (RMSC) 3; Asheville, 10.VIII.24, *Pinus strobus* and *P. rigida* (DFEC) 10; Camp Lejeune, 19.IX.63, *Pinus serotina*, H.P. Shurtleff (CNC) 11; Durham, 22.III.42, *Pinus strobus* and *P. taeda*, C.L. Massey (RMSC) 2. **Pennsylvania:** Mt. Alto, 1.III.31, *Pinus silvestris* (CASC) 10. **Wisconsin:** Chippewa Falls, 26.VII.36, White pine, H.R. Dodge (DEBC) 1.

**BIOLOGY.** The galleries of this species are the typical radiate type. The number of egg galleries varies from two to seven. They are usually constructed in a longitudinal direction, sometimes becoming slightly transverse. The eggs are laid in small niches in the sides of galleries at regular intervals. Larval mines are perpendicular to these galleries.

**REMARKS.** Early (prior to 1928) references to this species give the host as various species of *Rhus*. This was caused by a misidentification of the species in *Rhus* as a result of LeConte's type series of *consimilis* actually containing three different species. *P. consimilis* therefore become known as a species in *Rhus* and Swaine described *granulatus* and *nudus* (the true *consimilis*) from conifers. The confusion was cleared up by Blackman (1928) when he recognized *consimilis* in the LeConte collection and compared it with Swaine's *granulatus*.

Adults of this species are recognized by the convex frons of both sexes which usually bears a fine, short carina just above the epistoma (Figs. 214, 215), by the sparse pubescence on the frons, by the impunctate, discal, elytral interstriae, by the sparse, erect setae on the posterior half of interstriae 1, 3, 5, 7, and by the very fine granules (sometimes absent) on the third declivital interstriae (Fig. 216).

This is a common species in conifers in northeastern and eastern North America.

#### 196. *Pityophthorus (P.) intentus* Bright

Figs. 217-219

*Pityophthorus intentus* Bright, 1978, p. 77.

Length 1.5-1.8 mm, about 2.8 times longer than wide.

**Female.** Frons weakly convex, flattened or weakly, transversely impressed from epistoma to near upper level of eyes, with a weak, longitudinal carina extending from the epistoma to upper level of eyes, ending at a weakly elevated, impunctate, median elevation; surface deeply, densely punctured, punctures rather large and close, almost touching; vestiture sparse, scattered, and inconspicuous. Antennal club small, oval, about 1.4 times longer than wide; first two sutures straight; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide; sides nearly straight, parallel on basal half; asperities on anterior slope erect, low, generally isolated and arranged in no apparent order; posterior portion of disc finely punctured, punctures shallow, small and widely separated; surface between punctures brightly shining, generally smooth but usually bearing a few very minute points or lines, Elytral about 1.9 times longer than wide; apex strongly acuminate; discal striae punctured in regular rows, punctures much larger than those on posterior portion of pronotum, deeply impressed; discal interstriae about as wide as striae or slightly narrower, surface moderately shining, with scattered fine points and lines. Declivity bisulcate; interstriae 1 narrowly, strongly elevated, equal in height to 3, bearing a median row of about 4 widely separated, acute granules and erect, stout setae; interstriae 2 deeply sulcate, distinctly wider than discal width, smooth and shining; interstriae 3 distinctly elevated and bearing a median row of about 4 widely separated, acute granules, these equal in size to those on interstriae 1; punctures in striae 1 and 2 obsolete.

**Male.** Frons almost identical with female except median transverse elevation stronger, longitudinal carina slightly more evident and punctures on surface slightly stronger. Pro-

notum and elytra as in female except elytral apex less strongly acuminate. Declivity essentially as in female except interstriae 2 slightly less deeply impressed and interstitial setae stouter.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the labels: Bear Canyon, Santa Catalina Mtns., Ariz., VIII-15-1968, D.E. Bright/ *Pinus ponderosa*/ Holotype *Pityophthorus intentus* D.E. Bright, CNC No. 15481. The allotype and 11 paratypes bear the same data. Five additional paratypes are labeled: Santa Rita Mtns., Santa Cruz Co., Ariz., VII-29-68, D.E. Bright/ *Pinus strobiformis* (1) or *Pseudotsuga menziesii* (4).

Most of the type material is in the CNC, paratypes are also in the SLWC and the KESC.

**HOSTS.** *Pinus leiophylla*, *ponderosa*, and *strobiformis*; *Pseudotsuga menziesii*.

**DISTRIBUTION.** Arizona and northwestern Mexico. Specimens (38) examined from:

#### UNITED STATES

**Arizona:** Madera Canyon, Santa Rita Mtns., 29.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 12.

#### MEXICO

**Durango:** San Dimas, VII.71, *Pinus* sp. (CNC) 8.

**REMARKS.** Adults of *intentus* resemble those of *consimilis* but differ in a number of points. On adults of *intentus*, the second declivital interstriae is more deeply sulcate, the granules on declivital interstriae 1 and 3 are much larger (Fig. 219), the punctures on the frons of both sexes are larger and deeper and the longitudinal carina and the transverse elevation are much more prominent (Figs. 217, 218). In addition, *consimilis* occurs in conifers in eastern North America, while *intentus* occurs in conifers in the southwestern United States and northwestern Mexico.

#### PULLUS GROUP

Species belonging to this group are recognized by the large size of the adults, by the weakly to strongly, transversely impressed frons of both sexes, by the presence of setae on some of the discal elytral interstriae, and by the presence of a median row of long setae on each interstriae on the posterior third of the elytra. Two species are included in this group.

#### KEY TO SPECIES IN THE Pullus group

1. Occurs in eastern North America; frons of both sexes weakly, transversely impressed; size smaller, 2.2-2.6 mm, avg. 2.3 mm . . . . . 197. *pullus* (Zimmermann) (p. 287)
- Occurs in western North America; frons of both sexes deeply, transversely impressed (Figs. 220,221); size larger, 2.4-2.9 mm, avg. 2.5 mm . . . . . 195. *grandis* Blackman (p. 289)

#### 197. *Pityophthorus* (*P.*) *pullus* (Zimmermann)

Map 44

*Cryturgus pullus* Zimmermann 1868, p. 143.

*Cryphalus pullus*: LeConte, 1868, p. 155.

*Pityophthorus pullus*: LeConte & Horn, 1876, p. 352; Swaine, 1909, p. 138 (additional references); Hagedorn, 1910, p. 74 (additional references); Swaine, 1918, p. 103; Blackman, 1922a, p. 105; Blackman, 1928, p. 118; Chamberlin, 1939, p. 394; Beal & Massey, 1945, p. 131; Craighead, 1950, p. 332; Bright, 1976c, p. 187 (lectotype desig.).

*Pityophthorus bisulcatus* Eichhoff, 1869, p. 274; LeConte & Horn, 1876, p. 352 (= *pullus*?); Swaine, 1909, p. 139 (= *pullus*); Blackman, 1928, p. 119 (not syn. of *pullus*); Wood, 1977c, p. 516 (= *pullus*).

*Pityophthorus cribripennis* Eichhoff, 1869, p. 274; LeConte & Horn, 1876, p. 354 (= *nitidulus*); Eichhoff & Schwarz, 1895, p. 609 (= *pullus*); Swaine, 1909, p. 139 (additional references); Bright, 1978, p. 72 (neotype desig.).

Length 2.2-2.6 mm, about 3.0 times longer than wide.

**Female.** Frons weakly, broadly, transversely impressed from epistoma to upper level of eyes, median space of upper border of impression bearing a slightly elevated, glabrous callus; surface deeply, densely punctured, punctures finer toward epistoma, larger and deeper above transverse impression; vestiture not abundant but usually conspicuous, confined to transverse impression and epistomal margin, consisting of moderately long, yellowish setae. Antennal club 1.4-1.5 times longer than wide, widest through segment 2; first two sutures transverse, straight; first two segments together occupy about two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest on basal half; sides nearly straight, parallel; asperities on anterior slope moderately large, erect, three or four may be basally contiguous and sometimes forming short, broken, indefinite, concentric rows, rows and individual asperities scattered in no apparent order; posterior portion of disc densely, deeply punctured, punctures very large and close; median line broad, impunctate, sharply elevated just behind summit; surface between punctures shining, smooth, with numerous fine points. Elytra 1.9-2.0 times longer than wide; apex distinctly acuminate; discal striae punctured in irregular rows, especially confused near base, punctures large, deep and close; discal interstriae narrower than striae, usually bearing an irregular row of deep punctures, these slightly smaller than those in striae, but numerous enough to make discernment of striae and interstitial rows difficult, interstitial punctures each bearing a moderately long seta, setae arising from striae punctures much shorter. Declivity sloping, bisulcate; interstriae 1 moderately elevated with a row of very fine granules; interstriae 2 moderately sulcate, usually densely microreticulate; interstriae 3 moderately elevated, equal in height to 1, bearing a row of fine granules, these more abundant on upper half; punctures in striae 1 and 2 distinct, smaller than those on disc.

**Male.** Almost identical with female but transverse impression on frons deeper and more strongly punctured, setae on frons sparser and elytral punctures may be larger and deeper.

**TYPE MATERIAL.** *P. pullus*. Zimmermann described this species from an undesignated number of specimens. Bright (1976c) designated a lectotype (MCZ) which bears the data: S.C./Cryphalus pullus Zimm/yellow square of paper/LECTOTYPE Crypturgus pullus Zimmermann, D.E. Bright 1976. For details about this specimen, see Bright (1976c).

*P. bisulcatus*. No original type material of this species has been seen since all specimens were probably destroyed during World War II in the bombing at Hamburg, Germany. In addition, no specimens compared to the types by Eggers have been located. LeConte and Horn (1876), Swaine (1909), and Wood (1977c) have all stated that this name is a synonym of *pullus* and I accept their opinions.

*P. cribripennis*. A neotype of this species was designated by Bright (1978). It is in the USNM and bears the data: Ripley, Mississippi, 4-21-20) M.W. Blackman, collector/N.Y.S.C.F. Lot Mi 261/Pityophthorus cribripennis Eichh. mit type in coll. Eichhoff verglichen (in Eggers handwriting)/NEOTYPE Pityophthorus cribripennis Eichhoff, D.E. Bright, 1977. Two other specimens from Corinth, Mississippi were apparently also compared by Eggers and declared conspecific. One additional specimen, bearing identical labels to the two mentioned above, also has the label "nicht Pityophthorus cribripennis Eichh., Eggers" (in Eggers handwriting) but I cannot detect any differences between it and the other specimens mentioned above except that it is slightly smaller.

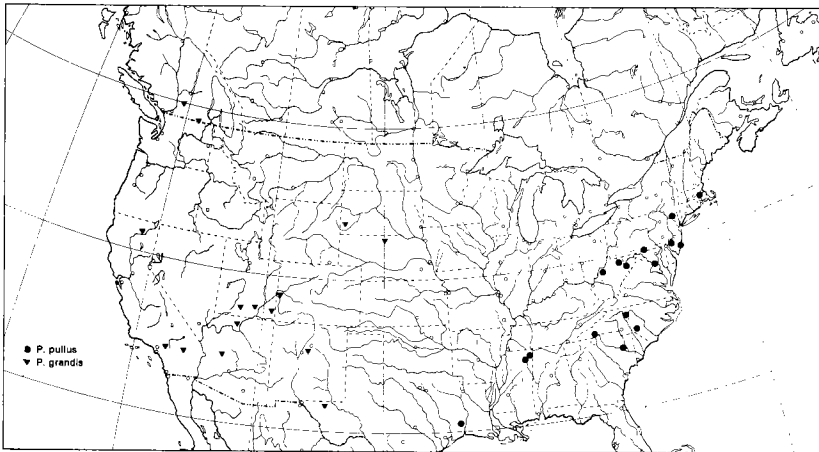
**HOSTS.** *Pinus echinata*, *palustris*, *strobus*, *taeda*, and probably other species of *Pinus* in its range.



DISTRIBUTION. Massachusetts to Michigan south to eastern Texas and Mississippi (Map 44). Specimens (174) examined from:

UNITED STATES

**District of Columbia:** Washington (USNM) 1. **Massachusetts:** Farmington, II.09, *Pinus strobus* (USNM) 2. **Mississippi:** Iuka, various dates, M.W. Blackman (DFEC) 11. **New Jersey:** Clementon, 20.V. , H.A. Kaeber (USNM) 7; Five Mile Beach, 22.VI. , H.A. Kaeber (USNM) 6; Waretwon, 3.III.06, H.A. Kaeber (USNM) 11. **New York:** Greenwood Lake, 13.VI.26, Pine, A. Nicolas (USNM) 1. **North Carolina:** Asheville, 7.IV.26 (DFEC) 2; Durham, 8.VIII.42, *Pinus taeda*, J.A. Beal (RMSC) 1; Raleigh, 22.XII.02 (USNM) 2, (EDNC) 50; Southern Pines, 3.III.10 (EDNC) 1; Tryon, *Pinus*, Fiske (DFEC) 1. **Pennsylvania:** Hunters Run, 6.VI. , J.N. Knull (DFEC) 1; Mt. Alto, 7.IV.33, J.N. Knull (CASC) 24. **South Carolina:** Columbia, 8.III.97, Pine (USNM) 2. **Texas:** Kirbyville, *Pinus palustris* (USNM) 6. **West Virginia:** Bayard, *Pinus*, Hopkins (USNM) 10+; Dellslow, *Pinus*, Hopkins (USNM) 10+; Kanawha Co., *Pinus*, Hopkins (USNM) 10+; Wood Co., *Pinus strobus*, Hopkins (USNM) 10+.



MAP 44. Collection localities for *P. (Pityophthorus) pullus* and *P. grandis*.

**BIOLOGY.** The galleries of this species are found in the smaller trunks and branches of dead and dying pines. The egg galleries are long and winding and originate from a central nuptial chamber. Ordinarily 2-5 egg galleries are constructed. Eggs are laid in small niches in the sides of the galleries, and the larvae feed across the grain of the wood (Beal and Massey 1945).

**REMARKS.** This is one of the larger species of *Pityophthorus* in the eastern and southeastern United States. Adults may be recognized by the acuminate elytral apex, by the large size, by the transversely impressed frons of both sexes and by the strongly punctured elytral striae and interstriae. *P. pullus* appears to be related to *grandis* and the adults may be distinguished by the characteristics given in the key to the species.

198. *Pityophthorus (P.) grandis* Blackman

Figs. 220-222; Map 44

*Pityophthorus grandis* Blackman, 1928, p. 119; Chamberlin, 1939, p. 395; Chamberlin, 1958, p. 157; Wood, 1971a, p. 426; Bright & Stark, 1973, p. 115.

Length 2.4-2.9 mm, about 3.0 times longer than wide.

**Female.** Frons as in *pullus* except transverse impression deeper, median callus larger and more prominent and punctures deeper. Pronotum as in *pullus* except surface between punctures on posterior portion more densely micropunctate. Elytra as in *pullus* except granules on interstriae 1 and 3 slightly larger and interstriae 2 is slightly more deeply sulcate.

**Male.** Virtually identical with female except transverse impression on frons deeper and setae on frons sparser.

**TYPE MATERIAL.** The holotype (♂?) in the USNM bears the data: Kaibab N.F., Ariz., 6-8-25/M.W. Blackman, collector/N.Y.S. Coll. For. Lot No. K-33/*Pinus ponderosa*/TYPE *Pityophthorus grandis* Blackman/Type No. 41312 U.S.N.M. No allotype was chosen. Paratypes: 126, same locality, host and collector data as type, differing slightly in dates and collection number; 2, Hopk. U.S. 619-a/J.L. Webb, coll./Black Hills, S.D./*Pinus ponderosa* and 3, Hopk. U.S. 3948/W.F. Fiske, coll./ Meek, N.M./*Pinus ponderosa*.

Type material is now scattered but is known to be in the CNC, the DFEC, and the USNM.

**HOSTS.** *Pinus flexilis*, *leiophylla*, *monophylla*, and *ponderosa*, and probably other species of *Pinus* in western North America.

**DISTRIBUTION.** Western North America from southern British Columbia to southern California, east to New Mexico and South Dakota (Map 44). Specimens (279) examined from:

#### CANADA

**British Columbia:** 3 mi W of Grand Forks, 2.VII.72, *Pinus ponderosa*, D.E. Bright (CNC) 2; Merritt, 18.V.26, *Pinus ponderosa*, W. Mathers (CASC) 63.

#### UNITED STATES

**Arizona:** Prescott, 7.VIII.59, *Pinus ponderosa* (USNM) 3. **California:** McCloud, June, A. Fenyes (CASC) 1. **Colorado:** 5 mi N of Glade Park, 14.VII.68, H. Howden (CNC) 1. **Nebraska:** Norden, 29.VII.29, *Pinus ponderosa*, L.G. Baumhofer (USNM) 11. **New Mexico:** Mescalero Reserve, 19.VI.54, *Pinus ponderosa*, J. Bongberg (USNM) 6; Sandia Mtns., 31.V.69, *Pinus ponderosa*, S.L. Wood (SLWC) 21. **South Dakota:** Black Hills, 14.II.66, J.M. Schmid (RMSC) 7; 7 mi W of Custer, 16.VI.68, *Pinus ponderosa*, S.L. Wood (SLWC) 4. **Texas:** Guadalupe Mtns. National Park, 17.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 1. **Utah:** LaSal Mtns., 5.VII.58, *Pinus ponderosa*, S.L. Wood & D.E. Bright (SLWC, DEBC) 22; Long Hollow, 23.VI.60, *Pinus flexilis*, S.L. Wood (SLWC) 4; Lonesome Beaver, Henry Mtns., 6.VIII.68, A.T. Howden (CNC) 1.

Additional localities in literature:

**California:** Joshua Tree National Monument, *Pinus monophylla* (PSFR); Wrightwood, *Pinus monophylla* (CISC) (Bright and Stark 1973).

**REMARKS.** Adults of *grandis* may be recognized by the deep, transverse impression on the frons of both sexes (Figs. 220, 221), by the strongly punctured elytral striae and interstriae, and by the acuminate elytral apex (Fig. 222). This species is closely related to *pullus* and may be distinguished by the characteristics given in the key to species.

#### CONFUSUS GROUP

This group of species is easily distinguished by the peculiar groove on the posterolateral margin of the prothorax. This groove is evident in both sexes but may be obscure (or even absent) in some males. Other useful characters are given in the key on page 291.

Two species are included in the group.

KEY TO SPECIES IN THE *Confusus* group

1. Size larger, 2.0-2.9 mm; female frons deeply concave on a very broad semicircular area, setae on periphery very long and dense (Fig. 222); male frons circularly concave or rarely transversely concave, deeply punctured, setae sparse (Fig. 224); southeastern United States to Honduras . . . . . 199. *confusus* Blandford (p. 291)
2. Size smaller, 1.4-1.7 mm; female frons weakly concave to flat, setae on periphery long and slightly less dense (Fig. 226); male frons shallowly, transversely impressed; southeastern United States and Arizona to Belize . . . . . 200. *annectens* LeConte (p. 293)

199. *Pityophthorus* (*P.*) *confusus* Blandford

Figs. 223-225; Map 45

*Pityophthorus confusus* Blandford, 1904, p. 237; Hagedorn, 1910, p. 70; Schedl, 1963, p. 158; Bright, 1976c, p. 184 (lectotype desig.); Schedl, 1977b, p. 42.

*Pityophthorus confusus bellus*. **New status.**

*Pityophthorus bellus* Blackman, 1928, p. 123; Chamberlin, 1939, p. 396; Beal & Massey, 1945, p. 129; Craighead, 1950, p. 333; Wood, 1977c, p. 515 (= *confusus*).

Length 2.1-2.9 mm, very slightly more than 3.0 times longer than wide.

**Female.** Frons moderately to strongly concave on a broad circular area extending from epistoma to well above eyes and laterally from eye to eye; surface of concavity shining, densely and finely punctured and bearing setae of moderate length, setae on periphery very long and incurved and extending around entire periphery except on a small area at midpoint of epistoma. Antennal club oval, about 1.4 times longer than wide, segments 1, 2 and 3 almost equal in width; sutures 1 and 2 transverse; segments 1 and 2 together occupy about two-thirds of total club length. Pronotum 1.1-1.2 times longer than wide, widest at posterior angles; sides nearly straight on posterior half and weakly converging; asperities on anterior slope very low, broad, very numerous and arranged in no apparent order; summit very low to absent; posterior portion of disc moderately punctured, punctures deep, moderate in size; surface between punctures brightly shining, bearing scattered, minute points; lateral margin bearing a fairly wide, deep, distinct groove on posterior half. Elytra 1.7-1.8 times longer than wide; apex moderately acuminate; discal striae punctured in irregular rows, punctures large, deep and very close; discal interstriae slightly convex, equal to or narrower than striae, all bearing a few irregular punctures which are equal in size and depth to those in striae. Declivity sloping, bisulcate; interstriae 1 moderately elevated, bearing a median row of 6-8 fine granules; interstriae 2 slightly wider than discal width, moderately to weakly impressed, surface dull, minutely reticulate; interstriae 3 moderately elevated, equal in height to 1, bearing a median row of fine granules, these about equal in size to those on 1; punctures in striae 1 and 2 obsolete.

**Male.** Frons concave in middle portion, setae sparse and fine, all of equal length. Pronotum and elytra as in female except declivital interstriae 2 more deeply impressed and granules on declivital interstriae 1 and 3 larger.

This species appears to exist in at least two subspecies which can be recognized as follows:

1. Size generally larger, majority of specimens larger than 2.4 mm; occurs in southern Mexico and Central America . . . . . *confusus confusus* Blandford, **new status**
- Size generally smaller, majority of specimens smaller than 2.4 mm; occurs in southeastern United States and northern Mexico . . . . . *confusus bellus* Blackman, **new status**

**TYPE MATERIAL.** *P. confusus confusus*. This species was described from three specimens, all of which are in the BMNH. The lectotype (♀) is labeled: Type (on an orange bordered circle)/S. Geronimo, Guatemala, Champion/B.C.A. Col. IV.6, *Pityophthorus confusus* Blandf./LECTOTYPE *Pityophthorus confusus* Blandford, D.E. Bright, 1976. A second specimen with identical data is labeled as a paralectotype.

*P. confusus bellus*. The holotype (♀) in the USNM bears the data: Hopk. W.Va. 5967/♀/Monogalia Co., W. Va./Pinus/*Pityophthorus bellus* n.sp. 5-21-02

(label folded)/Type/TYPE *Pityophthorus bellus* Blackman/Type no. 41314 U.S.N.M. The allotype and 2 paratypes bear the same data. An additional 113 paratypes are in the USNM, CNC, and DFEC from North Carolina, Texas, Florida, Georgia, and South Carolina (for details see Blackman, 1928).

HOSTS. *Pinus echinata*, *elliotti*, *michoacana*, *ochoterenai*, *oocarpa*, *palustris*, and *taeda*. Probably occurs in other species of *Pinus* in its range as well.

DISTRIBUTION. Southeastern United States; Central America and southern Mexico (Map 45). Specimens (332) examined from:

**P. confusus confusus**

MEXICO

**Chiapas:** Altamirano, XI.66 (NIFR) 2; Junction highways 190 and 195, 12.V.69, *Pinus michoacana*, D.E. Bright (CNC) 15; 21 mi W of Lazardo Cardenas, 26.VI.69, *Pinus oocarpa*, D.E. Bright (CNC) 6.

HONDURAS

San Lucas, Paraiso, 22.IV.64, *Pinus oocarpa*, S.L. Wood (SLWC) 4; Tegucigalpa, 9.III.66, *Pinus oocarpa*, S.L. Wood (SLWC) 6; Yuscarán, Paraiso, 23.IV.64, *Pinus oocarpa*, S.L. Wood (SLWC) 2.

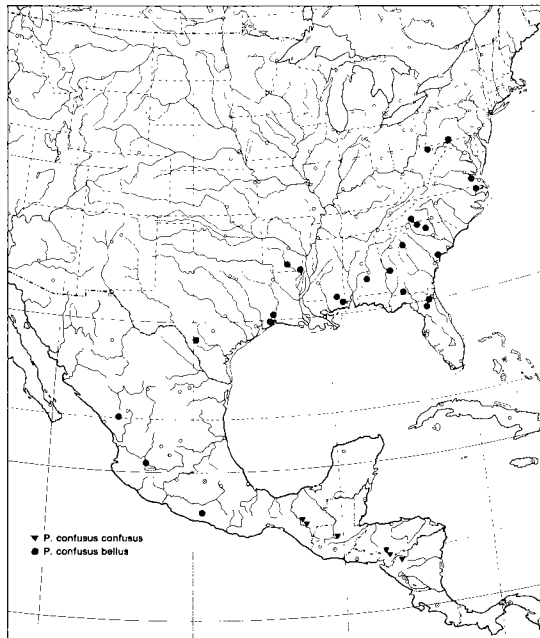
NICARAGUA

Dipilto n. Segovia, 10.VIII.59, Pine (USNM) 1; Las Cruces, n. Segovia, 14.I.60, Pine (USNM) 1.

Additional records in literature:

EL SALVADOR

Dulce nombre de Marie, 1.III.74, *Pinus tenuifolia*; Metapán, various dates 1974-75, *Pinus oocarpa* or *P. ochoterenai* (Schedl 1977b).



MAP 45. Collection localities for *P. (Pityophthorus) confusus confusus* and *P. confusus bellus*.

***P. confusus bellus***

## UNITED STATES

**Alabama:** Calhoun, *Pinus* (CNC) 1. **Arkansas:** Ashley Co., 10.III.65, L.O. Warren (UADE) 7; Dallas Co., 14.VII.54, L.O. Warren (UADE) 2. **Florida:** Baldwin, *Pinus*, A.D. Hopkins (USNM) 8; Gainesville, 2.XII.74, slash pine (SLWC) 11. **Georgia:** Athens, 3.X.73, *Pinus echinata*, R.C. Wilkensen (SLWC) 21; Columbus, 23.III.62, M.S. McWhirter (SLWC) 1; Thomasville, *Pinus*, A.D. Hopkins (USNM) 2; Whitehall Forest, Clarke Co., 18.IV.73, R. Turnbow (SLWC) 1. **Mississippi:** Leaf, 13.I.30, H. Dietrich (CNC) 5; Lucedale, 7.VI.32, H. Dietrich (CNC) 3. **North Carolina:** Asheville, 1.VII.24, *Pinus echinata* (DFEC) 21; Murfreesboro, 12.VI.42, *Pinus taeda*, J.A. Beal (RMSC) 1; Tryon, *Pinus*, W.F. Fiske (USNM) 29. **Pennsylvania:** Mount Alto, 26.II.33 (SLWC) 5. **South Carolina:** Georgetown, *Pinus palustris*, R. St George (USNM) 4; Spartanburg, *Pinus*, T.E. Snyder (USNM) 8. **Texas:** Call, *Pinus palustris*, W.F. Fiske (USNM) 11; Hardin Co., XII.69, loblolly pine, R.C. Thatcher (USNM, SLWC) 2; Montell, *Pinus edulis*, W.F. Fiske (USNM) 14 (questionable). **Virginia:** Blackstone, 10.VI.75, loblolly pine, D.J. Egan (CNC, VPIC) 6; Gloucester Co., 23.VI.39, L.A. Hetrick (VPIC) 3. **West Virginia:** See type material.

## MEXICO

**Durango:** 20 mi NE of El Salto, 23.VII.53, *Pinus*, S.L. Wood (SLWC) 1. **Guerrero:** Tixtlancingo, 10.VII.77, J. Coster (CNC) 10. **Jalisco:** 18 mi NW of Guadalajara, 30.IV.61, Howden & Martin (CNC) 2.

**BIOLOGY.** Beal and Massey (1945) provide the only information on the biology of *confusus bellus*. The galleries are entirely in the inner bark. As with most other species in this genus, from two to five galleries radiate from a central nuptial chamber. These galleries may extend in any direction and are often long and meandering. The beetles breed in the bole and larger limbs of trees previously attacked and killed by other bark beetles such as *Dendroctonus* and *Ips*. One collection records this species from the top of trees.

**REMARKS.** Wood (1977c) places *bellus* as a synonym of *confusus* and suggests that the southern population represents an introduction. This may well be true; however, I prefer to consider subspecific status for the two populations since they do exist as distinct, isolated entities and to regard them under a single specific name would obscure the populational characteristics.

Adults of this species are distinguished from those of *annectens* by their larger size and by the features of the male and female frons as mentioned in the key. In addition, the surface of the second declivital interstriae of *confusus* is dull and minutely reticulate while in *annectens* it is brightly shining and smooth.

200. *Pityophthorus* (*P.*) *annectens* LeConte

Figs. 226, 227; Map 46

*Pityophthorus annectens* LeConte, 1878, p. 622; Swaine, 1909, p. 134; Hagedorn, 1910, p. 70 (additional references); Blatchley & Leng, 1916, p. 631; Swaine, 1918, p. 104; Blackman, 1922a, p. 109; Chamberlin, 1939, p. 400; Beal & Massey, 1945, p. 136; Craighead, 1950, p. 333; Baker, 1972, p. 255; Bright, 1976c, p. 185 (lectotype desig.).

*Pityophthorus citus* Blackman, 1928, p. 137; Chamberlin, 1939, p. 399; Wood, 1977c, p. 514 (= *annectens*).

Length 1.4-1.7 mm, about 3.0 times longer than wide.

**Female.** Frons weakly concave to flattened on a broad, semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface finely, densely punctured, clothed with moderately long setae, setae on the periphery much denser,

longer and incurved. Antennal club very slightly longer than wide, widest through segment 2; sutures 1 and 2 transverse, weakly indicated except for lateral portions which are heavily chitinized; segments 1 and 2 together occupy over half of total club length. Pronotum about 1.1 times longer than wide, widest about middle; sides straight and parallel to weakly arcuate on posterior two-thirds; asperities on anterior slope small, rather sharply elevated, scattered in no apparent order; summit low to absent; posterior portion of disc deeply punctured, punctures of moderate size; surface between punctures moderately shining, with minute points or weak reticulation; lateral margin bearing a narrow, shallow to moderately deep groove on posterior half. Elytra about 1.9-2.0 times longer than wide; apex distinctly acuminate; distal striae punctured in regular rows, punctures larger and deeper than those on posterior portion of pronotum; discal interstriae usually narrower than striae, moderately shining, surface weakly reticulate; interstriae 1, 3, 5, 7, 9 each bearing about 3-5 short, erect setae. Declivity steep, weakly bisulcate, shining; interstriae 1 moderately elevated, bearing a median row of very fine granules; interstriae 2 weakly impressed, slightly wider than discal width, surface shining, smooth; interstriae 3 weakly elevated, as high or very slightly higher than 1, bearing a row of very fine granules; punctures in striae 1 and 2 obsolete.

**Male.** Frons shallowly, transversely impressed from epistoma to upper level of eyes; surface with fairly large, deep punctures and sparse, fine, short setae. Otherwise as in female except declivity more deeply sulcate, and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** *P. annectens*. The lectotype (♀) in the MCZ bears the data: Tampa, Fla. 1-4/1492/Type 1283/P. annectens Lec./LECTOTYPE Pityophthorus annectens LeConte, D.E. Bright, 1976. Two paralectotypes are also in the MCZ.

*P. citus*. The holotype (♀) of this species is in the USNM and is labeled: Hopk. U.S. 5703c/J.L. Webb, collector/Chiricahua Mtns., Ariz./pinon pine/TYPE Pityophthorus citus Blackman/Type No. 41322 U.S.N.M. One paratype bears the same labels. The allotype and 2 paratypes are labeled: Hopk. U.S. 5710 b/J.L. Webb, colr./ Sta. Catalina Mts., Ariz/Pinus ponderosa; 3 paratypes bear the data: Hopk. U.S. 5678a/J.L. Webb, Colr./Capitan Mts., N.M., pinyon pine; 1 paratype is labeled: 9486c/Pinus ponderosa/Las Vegas H.S., N.M./Barber and Schwarz, coll. and 1 paratype bears the labels: Chiric, Mts., Ar. 10-5/ Coll. Hubbard and Schwarz.

Most of the type material has been located in the USNM.

**HOSTS.** *Pinus ayachuhte*, *caribaea*, *elliottii*, *engelmannii*, *lawsoni*, *leiophylla*, *palustris*, *ponderosa*, *resinosae*, and *taeda*.

**DISTRIBUTION.** Southeastern United States west to Arizona, south through Mexico to Belize (Map 46). Specimens (137) examined from:

#### UNITED STATES

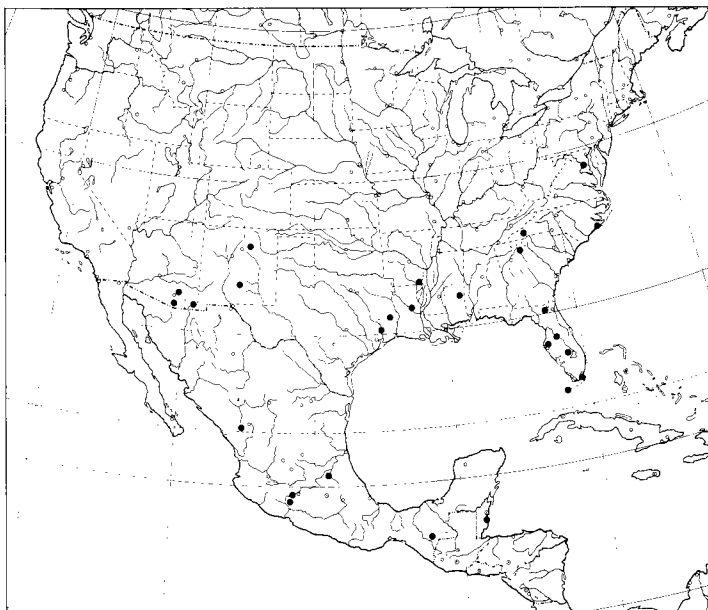
**Arizona:** Madera Canyon, Santa Rita Mtns., 29.VII.74, *Pinus leiophylla*. D.E. Bright (CNC) 4. **Arkansas:** Ashley Co., 10.III.69 (UADE) 1. **Florida:** Big Pine Key, 9.V.67, *Pinus elliotti*, D.E. Bright (CNC) 29; Homestead, 26.VII.40, J.C. Bradley (CNC) 3; Juniper Springs, Marion Co., 22.IV.67, *Pinus elliotti*, D.E. Bright (CNC) 1; Lake Placid, 29.IV.67, *Pinus elliotti*, D.E. Bright (CNC) 2; near Olustee, v.46, *Pinus caribaea* (USNM) 2. **Georgia:** Whitehall Forest, Clarke Co., 26.III.67, window trap, R. Turnbow (CNC) 3. **Louisiana:** Pineville, 20.III.66, J. Moser (USNM) 7. **Mississippi:** Meridan, 19.V.20, M.W. Blackman (USNM) 15. **New Mexico:** See type material. **North Carolina:** Asheville, 1.VIII.24, red pine (USNM) 8; Broadman (USNM) 1; Morehead City, 15.I.42, *Pinus palustris*, Beal & Massey (RMSC) 4. **Texas:** 5 mi S of Huntington, 18.II.72, *Pinus taeda* limbs, J.E. Coster (CNC) 24; Liberty Co., 16.XI.60, loblolly pine, R.C. Thatcher (USNM) 2. **Virginia:** Falls Church, 15.V.24, *Pinus resinosa*, A.H. McAndrews (RMSC, USNM) 6.

#### MEXICO

**Chiapas:** 20 mi NW of Comitán, 17.VI.74, *Pinus*, S.L. Wood (SLWC) 4. **Durango:**

68-70 mi W of Durango, 18.VI.71, *Pinus engelmannii*, D.E. Bright (CNC) 17; 3 mi W of El Salto, 7.VI.65, *Pinus ayacahuite*, S.L. Wood (SLWC) 1. **Hidalgo:** Jacala, 18.I.36, *Pinus lawsoni*, D. DeLeon (USNM) 1. **Michoacan:** 18 mi W of Quiroga, 17.VII.65, *Pinus*, S.L. Wood (SLWC) 2; 6 mi E of Volcan Paricutin, 19.VI.65, *Pinus*, S.L. Wood (SLWC) 2.

**BELIZE:** Stann Creek, *Pinus carabaea* (USNM) 3.



MAP 46. Collection localities for *P. (Pityophthorus) annectens*.

**BIOLOGY.** This is a common species found in limbs, branches, and small twigs of slash and living trees. It is polygamous. The egg galleries extend from the central nuptial chamber longitudinally up to 10 cm under the bark. Eggs are, as usual, laid in niches along the gallery wall and the larval mines are perpendicular to the egg galleries and tend to wind slightly. Common associates in North Carolina were: *Pityophthorus pulicarius*, *Orthotomicus caelatus* (Eichh.), *Ips grandicollis* (Eichh.) (Scolytidae) and *Lasconotus pusillus* Lec. and *L. referendarius* Zimm. (Colydiidae). (Beal and Massey 1945.)

**REMARKS.** Adults of this species are easily recognized by their small size, by the narrow to broad groove on the posterolateral portion of the pronotum, by the flattened, densely pubescent female frons, and by the distribution.

#### CONFERTUS GROUP

This is a large group of species and includes the majority of species with an acuminate elytral apex. Conceivably the group could be broken into several smaller groups but this does not seem to be a viable consideration at this time. Since all the species in the group are closely related, I believe only more confusion would result if the group was fractured further.

Species belonging to this group are characterized by the sexually dimorphic frons, by the scattered pronotal asperities (forming irregular concentric rows in several species), and by the acuminate elytral apex. All species occur in coniferous hosts.

KEY TO SPECIES IN THE *Confertus* group

1. Body size larger, 2.5 mm or more in length . . . . . 2
- Body size smaller, less than 2.5 mm in length . . . . . 5
2. Body size larger, 3.1-3.9 mm; elytra densely and randomly punctured, setae long and conspicuous; male frons very deeply, transversely impressed; Nuevo León . . . . . 201. *megas* Bright (p. 298)
- Body size smaller, 2.5-3.4 mm; elytra punctured in even stria rows or randomly punctured; discal interstriae impunctate to sparsely punctured; male frons weakly to moderately impressed . . . . . 3
3. Elytral apex moderately to very strongly acuminate; declivital interstriae 2 very deeply sulcate, 3 strongly elevated on upper half, much higher than 1; setae on female frons sparse, not concealing surface; southern Arizona to southern Mexico . . . . . 4
- Elytral apex less strongly acuminate; declivital interstriae 2 weakly sulcate, 3 not more strongly elevated on upper half, slightly higher than 1 except at apex; female frons very densely pubescent, concealing surface; Arizona . . . . . 202. *zonalis* Bright (p. 299)
4. Second declivital interstriae very dull, reticulate; body more slender, 2.9-3.0 times longer than wide; Hidalgo to Veracruz . . . . . 203. *spadix* Blackman (p. 300)
- Second declivital interstriae moderately to brightly shining, surface smooth to very weakly reticulate; body stouter, about 2.6 times longer than wide; Arizona to Durango . . . . . 204. *rubidus* Wood (p. 301)
5. Interstriae 2 equal in width on disc and declivity, deeply impressed and flat on declivity (Figs. 229, 231); pronotal asperities sometimes in irregular concentric rows . . . . . 6
- Interstriae 2 broader on declivity than on disc, weakly to strongly sulcate on declivity; pronotal asperities always randomly placed . . . . . 7
6. Elytral apex distinctly, strongly acuminate (Fig. 229), the apices projecting ventrally on female; southern Mexico and Guatemala . . . . . 205. *subsimilis* Schedl (p. 301)
- Elytral apex weakly acuminate (Fig. 231), the apices not projecting ventrally on female; southern Mexico . . . . . 206. *subimpressus* Bright (p. 303)
7. Female frons more extensively flattened and pubescent, flattened area extending nearly from eye to eye; body about 2.8-2.9 times longer than wide; declivital interstriae 2 minutely reticulate; Jalisco to Honduras . . . . . 207. *cacuminatus* Blandford (p. 304)
- Female frons flattened and pubescent on a smaller area, flattened area occupying about 80% of distance between eyes; body more slender, about 3.1 times longer than wide; declivital interstriae 2 not reticulate; southern Mexico to Guatemala . . . . . 8
8. Strial and interstitial punctures on elytral disc numerous, randomly placed or in vague rows; declivity weakly to deeply sulcate . . . . . 9
- Strial punctures on elytral disc arranged in distinct or vague rows, interstriae impunctate or more sparsely punctured; declivity weakly to moderately sulcate . . . . . 10
9. Elytral declivity deeply sulcate, interstriae 3 abruptly elevated, bearing about 7-10 large, acute denticles; declivital interstriae 1 feebly elevated, with a row of very fine tubercles; California to Idaho and British Columbia . . . . . 208. *serratus* Swaine (p. 304)
- Elytral declivity weakly to moderately sulcate, interstriae 3 only moderately to weakly elevated, usually equal in height to interstriae 1 but may be slightly lower; declivital interstriae 1 and 3 bearing about 6 small, acute to rounded granules (Fig. 234); generally distributed in western North America . . . . . 209. *confertus* Swaine (p. 305)
10. Discal interstriae largely impunctate (except 1), except sometimes near declivity . . . 11
- At least some discal interstriae bearing at least a few punctures and setae; western North America . . . . . 210. *murrayanae* Blackman (p. 311)
11. Female frons weakly impressed or flattened on lower half, surface densely punctured, vestiture short, of equal length; male frons also very weakly flattened, with a fine, longitudinal carina; elytral declivity moderately sulcate; British Columbia to Wyoming . . . . . 211. *acceptus* n. sp. (p. 315)
- Female frons flattened on a more extensive area, setae longer, incurved on periphery; male frons moderately to strongly impressed on lower half, never with a longitudinal carina . . . . . 12
12. Female frons flattened on a small semicircular, median area, setae relatively sparse; elytral declivity not impressed, interstriae 2 flat, 1 weakly elevated; punctures on pos-



- terior portion of pronotum weakly impressed, surface between punctures densely and minutely reticulate; color black; Nuevo León to Tlaxcala . . . . . 212. *anthracinus* Bright (p. 317)
- Female frons broadly flattened, setae abundant; elytral declivity variable; punctures on posterior portion of pronotum deeply impressed, surface between punctures smooth, not densely reticulate; color usually reddish brown or light brown, not usually black . . . . . 13
13. Male frons flattened or weakly convex on a large semicircular area, densely punctured; setae on female frons very long on periphery; pronotal punctures moderate in size, deeply impressed, surface between punctures with numerous, fine points; Guatemala; in *Abies guatemalensis* . . . . . 213. *mesembria* Bright (p. 318)
- Male frons moderately strongly transversely impressed, median portion of upper margin of impression distinctly elevated (as in Fig. 239); setae on female frons moderately long on periphery (as in Fig. 238); pronotal punctures large, deep and close, surface between punctures smooth, with a few, scattered points and/or lines . . . . . 14
14. Declivital interstriae 3 equal in height to 1 or lower than 1 in both sexes; declivital interstriae 1 of male bearing a median row of granules; discal interstriae always impunctate except near declivity . . . . . 15
- Declivital interstriae 3 on male strongly elevated above level of 1 (Fig. 240), less strongly elevated but still higher than 1 on female; declivital interstriae 1 of male largely devoid of granules (Fig. 240); discal interstriae 1, 3, 5, 7 sometimes sparsely punctured and setose; Northwest Territories to Colorado and Utah . . . . . 214. *bassetti* Blackman (p. 318)
15. Declivital interstriae 2 moderately sulcate and broadly widened; declivital interstriae 3 strongly elevated with large granules in male, smaller granules in female; elytral apex strongly acuminate (Fig. 243); southwestern United States . . . . . 215. *acutus* Blackman (p. 321)
- Declivital interstriae 2 moderately to shallowly sulcate, narrower, declivital interstriae 3 weakly elevated, granules small in both sexes; elytral apex moderately to weakly acuminate . . . . . 16
16. Declivital interstriae 2 weakly impressed; granules on declivital interstriae 1 and 3 small; male frons weakly to moderately impressed on lower half, carina on upper margin weakly elevated; female frons more extensively flattened and pubescent to well above eyes, punctures finer, longer; body size generally smaller, average about 2.0 mm . . . . . 17
- Declivital interstriae 2 moderately to strongly impressed; granules on declivital interstriae 1 and 3 large and distinct; male frons strongly impressed on lower half, carina on upper margin strongly elevated; female frons less extensively flattened, pubescence extending only slightly above upper level of eyes, punctures larger, vestiture shorter, finer; body size generally larger, averaging about 2.4 mm . . . . . 18
17. Punctures on posterior portion of pronotum usually bearing a minute granule on lateral or posterior margin; declivity more deeply impressed; Durango to Honduras . . . . . 216. *delicatus* Wood (p. 323)
- Punctures on posterior portion of pronotum not bearing granules, margins smooth; declivity more shallowly impressed; Arizona to southern Mexico . . . . . 217. *cuspidatus* Blackman (p. 324)
18. Punctures in declivital striae 1 and 2 distinct; declivital interstriae 2 slightly wider than 1; female frons bearing a slight median callus at upper level of eyes; vestiture on female frons slightly longer and more abundant on lateral areas; Arizona . . . . . 218. *clarus* Blackman (p. 324)
- Punctures in declivital striae 1 and 2 minute, obscure; declivital interstriae 2 about 2.0 times wider than 1; female frons not bearing a median callus; vestiture on female frons less abundant, shorter . . . . . 19
19. Declivital interstriae 2 moderately impressed, narrower and weakly reticulate; granules on declivital interstriae 1 and 3 smaller, vestiture shorter (Fig. 246); vestiture on female frons not extending above eyes, less abundant and shorter (Fig. 244); western North America in *Abies* and *Pseudotsuga* . . . . . 219. *solers* Blackman (p. 325)
- Declivital interstriae 2 strongly impressed, broader and more strongly reticulate; granules on declivital interstriae 1 and 3 larger, more distinct, vestiture longer; vestiture on female frons extending slightly above upper level of eyes, setae more abundant and longer; Oaxaca in *Pinus* . . . . . 220. *solatus* Wood (p. 327)

201. *Pityophthorus (P.) megas* Bright

*Pityophthorus megas* Bright, 1976b, p. 436.

Length 3.1-3.9 mm, 3.1-3.2 times longer than wide.

**Female.** Frons weakly flattened on a relatively small area extending from epistomal margin to just above upper level of eyes and laterally occupying about 77% of the distance between eyes; surface of flattened area very densely, finely punctured, except on a small, impunctate, median, circular area just above epistomal margin, entire flattened area clothed with moderately long setae which are all generally equal in length, periphery of the flattened area generally strongly indented with punctures larger and deeper; surface lateral to and above pubescent area with scattered deep punctures. Antennal club large, oval, 1.3 times longer than wide, widest through segment 3; sutures 1 and 2 broadly arcuate, 2 more strongly so; segments 1 and 2 together occupy about half of total club length. Pronotum 1.1-1.2 times longer than wide, widest slightly behind level of summit; sides weakly arcuate to subparallel on posterior half; asperities on anterior slope large, erect, acute, scattered in no apparent order; summit distinct, moderately elevated; posterior area of disc densely punctured, punctures large and deeply impressed; surface between punctures moderately shining, with numerous very fine points scattered between the punctures. Elytra about 1.8 times longer than wide; apex weakly acuminate; discal striae punctured in fairly regular rows, punctures very large, deeply impressed and close, each bearing a moderately long, fine seta; discal interstriae about as wide as striae, each with a median row of large, deeply impressed punctures, each puncture bearing a long, fine seta that is longer than those arising in striae punctures, punctures in striae and interstriae of equal size and depth and somewhat randomly placed giving the appearance of a totally randomly punctured elytra, interstriae discernible because of the longer setae arising from interstitial punctures. Declivity moderately sulcate, steep; interstriae 1 rather strongly elevated, slightly lower than 3, bearing a median row of about 5 large, acute granules, each bearing a long fine seta; interstriae 2 broadly widened, flat, distinctly impressed, surface moderately shining, densely microreticulate; interstriae 3 moderately elevated on upper half, slightly higher than 1, and bearing a median row of about 5 large, acute granules, each bearing a long fine seta; remaining interstriae bearing a row of long, fine setae; punctures in striae 1 and 2 much reduced and almost obsolete.

**Male.** Frons very deeply, narrowly transversely impressed, upper margin of impression strongly elevated, lateral and lower margins distinctly elevated but less so than upper; surface of impression densely punctured, punctures of moderate size, setae abundant, of moderate length, but shorter than setae on epistomal margin. Pronotum, elytra and declivity essentially as in female except declivital interstriae 1 devoid of granules except at base of declivity and at extreme apex, 2 more deeply sulcate and 3 more strongly elevated and granules larger.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: MEX., N.L., Cerro Potosi, V.4.71, 11500; D.E. Bright/*Pinus culminicola*/HOLOTYPE *Pityophthorus megas* D.E. Bright, CNC No. 15066. The allotype and 10 paratypes bear the same data.

Most of the type material is in the CNC, additional paratypes are in the SLWC and the KESC.

**HOST.** *Pinus culminicola*.

**DISTRIBUTION.** Known only from the type locality in Nuevo León.

**REMARKS.** This is one of the largest species in the genus, measuring nearly 4.0 mm in length. Adults can be easily recognized by the densely punctured elytra on which striae and interstriae are difficult to discern, by the deeply transversely impressed frons of the male, by the relatively small, flattened, pubescent, median portion of the female frons, by its size, and by the host.

This species has only been found in the endemic *Pinus culminicola* at the summit of Cerro Potosi in northeastern Mexico. It is probably endemic to that area.

202. *Pityophthorus* (*P.*) *zonalis* Bright

*Pityophthorus zonalis* Bright, 1976b, p. 443.

Length 2.5 mm, 3.1 times longer than wide.

**Female.** Frons mostly concealed in the one specimen available but pubescence visible, consisting of a dense fringe of very long yellowish setae on periphery, those on lower portion above epistoma and on lateral area near eye erect and very long. Antennal club oval, 1.45 times longer than wide; sutures 1 and 2 transverse, straight except at lateral margins; segments 1 and 2 transverse, straight except at lateral margins; segments 1 and 2 together occupy about half of total club length. Pronotum 1.2 times longer than wide, widest at summit; sides subparallel on posterior half; asperities on anterior slope larger and more erect than serrations on anterior margin, scattered in no apparent order; summit not strongly elevated; posterior portion strongly punctured, punctures large, deep, and close; surface between punctures smooth and shining, with numerous fine points scattered between the punctures. Elytra slightly more than 2.0 times longer than wide; apex strongly acuminate; discal striae punctured in even, regular rows, punctures large, deeply impressed and almost touching; discal interstriae equal in width or narrower than striae, weakly convex, impunctate, surface shining, with numerous scattered fine points. Declivity generally convex, steep; interstriae 1 strongly elevated, bearing a median row of 6-8 small, acute granules, each of these bearing a long, fine seta; interstriae 2 weakly sulcate, slightly wider than discal width; interstriae 3 moderately elevated, slightly higher than 1 and bearing a median row of 4-6 acute, small granules, each of these bearing a long, fine seta; remaining interstriae each with a median row of several, long, fine setae; punctures in striae 1 and 2 distinct, smaller, and less deeply impressed than those on disc.

**Male.** Frons shallowly impressed on lower half, upper level of impression not elevated; surface densely punctured, punctures large and deep. Pronotum as in female except punctures on posterior portion much larger and deeper. Elytra essentially as in female. Declivity essentially as in female.

**TYPE MATERIAL.** The holotype (♀) is in the USNM and bears the data: 638-7/Jerome, Ariz., 11-22-35/Pinus ponderosa/HOLOTYPE *Pityophthorus zonalis* D.E. Bright.

**HOSTS.** *Pinus cembroides* and *ponderosa*.

**DISTRIBUTION.** Known from Arizona to Nuevo León. Specimens (2) examined from:

**UNITED STATES**

**Arizona:** See type material.

**MEXICO**

**Nuevo León:** 15 mi E of San Roberto, 5.V.71, *Pinus cembroides*, D.E. Bright (CNC) 1.

**REMARKS.** This species is closely related to *spadix*. Females of *zonalis* may be distinguished by the very long, erect and incurved setae on the periphery of the frons, by the much less strongly elevated declivital interstriae 3 and the much less deeply sulcate declivital interstriae 2. In *spadix*, the third declivital interstriae is much higher than the first, and is most strongly elevated on the upper half. In *zonalis*, the third declivital interstriae is only very slightly higher than the first and is more evenly elevated along its entire length, except at the extreme apex.

The diagnosis of the male given above is based on the one specimen from Nuevo León. Although this specimen very closely resembles the female holotype there is a slight possibility that it is not the male of this species. Until a series which contains both sexes is available the specimen from Nuevo León will remain questionable.

203. *Pityophthorus (P.) spadix* Blackman

*Pityophthorus spadix* Blackman, 1942, p. 219.

Length 2.4-2.8 mm, about 2.9-3.1 times longer than wide; color dark reddish brown.

**Female.** Frons flattened on a semicircular area extending from epistomal margin to well above eyes and laterally occupying about 80% of the distance between eyes; surface shining, densely, finely punctured, except for a small, impunctate callus just above mid point of epistoma, periphery of flattened area narrowly impressed or indented; vestiture abundant, setae erect and moderately long, those on periphery longer and incurved. Antennal club oval, about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate, 2 more strongly arcuate than 1; segments 1 and 2 together occupy more than half the total club length. Pronotum 1.1 times longer than wide, widest at level of summit; sides nearly straight on posterior half; asperities on anterior slope low, broad, usually isolated, arranged in no apparent order; summit distinct, with a broad impression posterior to it; posterior surface of disc deeply punctured, punctures rather large, and widely separated; surface between punctures smooth, shining, with numerous very fine lines and/or points. Elytra about 1.6-1.8 times longer than wide; apex strongly acuminate; discal striae usually punctured in regular rows but may occasionally be randomly punctured, punctures large, deep and close; discal interstriae about equal in width to striae, with a few scattered large punctures, these much more abundant toward declivity. Declivity deeply bisulcate; innerstriae 1 moderately elevated, bearing a median row of about 6 small, acute granules; interstriae 2 broad, distinctly wider than discal width, rather deeply impressed, surface opaque, densely microsculptured; interstriae 3 strongly elevated on upper half slightly higher than 1, inner slope nearly vertical, summit bearing a row of about 6, large, close granules, each with a long, stout seta arising from the posterior margin; remaining interstriae bearing a median row of long, erect setae; punctures in striae 1 and 2 usually obsolete but visible.

**Male.** Frons moderately impressed from epistoma to upper level of eyes, upper level of impression distinctly elevated, especially in middle area; surface of impression with large, deep punctures. Pronotum as in female except asperities higher and sharper and punctures on posterior portion deeper. Elytra as in female except punctures deeper and larger. Declivity essentially as in female except interstriae 2 more deeply sulcate, interstriae 3 more strongly, abruptly elevated with larger and more abundant granules and interstitial setae longer and finer.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: 692-1/Rio Frio, Pa., III-10-36/*Pinus leiophylla*/D. DeLeon colr/runs to acutus (handwritten) /Type No. 55993 U.S.N.M. The allotype and 5 paratypes bear the same data. All type material is in the USNM.

**HOSTS.** *Pinus leiophylla* and probably other species of pines in its range.

**DISTRIBUTION.** Hidalgo to Veracruz. Specimens (9) examined from:

**MEXICO**

**Hidalgo:** 11 mi NE of Jacala, 22.VI.53, *Pinus* sp., S.L. Wood (SLWC) 1. **Puebla:** See type material. **Veracruz:** Texcoco, 5.II.62, *Pinus*, R. Coronado P. (SLWC) 1.

**REMARKS.** This species is extremely closely related to *rubidus* and distinguishing the two may be exceedingly difficult. The only obvious distinctions I can see is the more reddish color and stouter body of adult *rubidus*. Otherwise the two are morphologically identical. *Spadix* is less closely related to *megas* and *zonalis*. From *megas*, adults of *spadix* may be distinguished by their much smaller size, by the much less deeply impressed male frons, by the more even striae rows, by the slightly more deeply sulcate elytral declivity of both sexes, and by the host and distribution. The females of *P. spadix* are easily distinguished from those of *zonalis* by the much less densely setose frons and by the much more deeply sulcate elytral declivity of *spadix*. Adults also closely resemble those of *acutus* but are much

larger with larger granules on the declivity and a more coarsely sculptured body surface.

204. *Pityophthorus (P.) rubidus* Wood

*Pityophthorus rubidus* Wood, 1978b (1979), p. 400.

Length 2.4-2.8 mm, about 2.6-2.8 times longer than wide; color distinctly reddish or light reddish brown.

**Female.** Frons and antennal club as described for *spadix*. Pronotum about 1.1 times longer than wide, essentially as described for *spadix*. Declivity steeper than *spadix*, deeply bisulcate, otherwise essentially as described for *spadix* except surface of interstriae 2 shining, smooth to very weakly reticulate.

**Male.** As described for *spadix*.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the labels: Madera Canyon, Santa Rita Mountains, Arizona, V-1-1978, S.L. Wood/Pinus engelmanni/HOLOTYPE Pityophthorus rubidus S.L. Wood. The allotype and 68 paratypes bear the same data. Additional paratypes are from: 6, 23 miles west of Durango, Durango, Mexico, VI-4-1965 and 3, 30 miles northeast of El Salto, Durango, Mexico, VII-23-1953.

All of the type material is in the SLWC.

**HOSTS.** Recorded from *Pinus cooperi*, *engelmannii*, *leiophylla*, *lumholtzi*, and *ponderosa*.

**DISTRIBUTION.** Southern Arizona to Durango. Specimens (12) examined from:

UNITED STATES

**Arizona:** Santa Rita Mtns., Santa Cruz Co., 29.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 2.

MEXICO

**Durango:** 24 mi W of Durango, 4.VI.65, *Pinus leiophylla*, S.L. Wood (SLWC) 1; 68 km W of Durango, 18.VI.71, *Pinus engelmannii*, D.E. Bright (CNC) 5; 9 mi E of El Palmito, 15.VI.71, *Pinus lumholtzi*, D.E. Bright (CNC) 1; 10 mi SE of El Salto, 11.VII.64, *Pinus cooperi*, J.B. Thomas (CNC) 2.

**REMARKS.** See remarks under *spadix*. The validity of this species should be questioned. Although when examining the specimens available one can detect a slight difference in color and body proportions, these characteristics are known to vary in different populations. The distinctions are not as clearcut as one would hope for. All of my specimens from Durango match exactly the elytral proportions of two paratypes of *spadix*. Therefore my Durango specimens should be referred to *spadix*, however they are from the same population from which Wood designated paratypes of *rubidus*. My two specimens (topotypes) from Arizona are considerably stouter and match more closely Woods' description of *rubidus*. The description given above is based on my Arizona specimens. I am recognizing both species as valid taxa based on geographical differences and the differences seen between my Arizona specimens of *rubidus* and the two paratypes of *spadix*.

205. *Pityophthorus (P.) subsimilis* Schedl

Figs. 228, 229

*Pityophthorus subsimilis* Schedl, 1956, p. 25; Schwerdtfeger, 1957, p. 504.

Length 1.0-1.5 mm, 2.8 (♂) - 3.1 (♀) times longer than wide.

**Female.** Frons broadly flattened on a large semicircular area extending from epistomal margin to well above upper level of eyes and laterally occupying a space about 80% of dis-

tance between eyes; surface very finely, very densely punctured; vestiture moderately abundant, setae on the periphery slightly longer than others. Antennal club about 1.1 times longer than wide, widest at about middle; suture 1 transverse, chitinized at lateral margins, suture 2 indistinct, not chitinized, not readily visible; segment 1 occupies about one-fourth of total club length. Pronotum about 1.2 times longer than wide, widest just behind summit; asperities on anterior slope small, low, usually basally contiguous, arranged in at least two fairly regular rows, with a third and sometimes fourth row more irregular and broken; posterior area of disc finely punctured, punctures shallow, rather small and widely separated; surface between punctures moderately shining, with numerous fine lines and points; median line flattened, wide, impunctate. Elytra 1.9-2.0 times longer than wide; apex strongly acuminate, apices projecting ventrally; discal striae punctured in regular rows, punctures rather large and close; discal interstriae about as wide or slightly wider than striae, shining and impunctate on disc, surface with fine lines and points. Declivity convex; interstriae 1 moderately elevated, terminating in acute, downward pointing tips, surface moderately shining, sometimes with a few, very fine, minute granules; interstriae 2 not broadened, flat, weakly impressed, shining; interstriae 3 very weakly elevated, about equal in height to 1, with a very few, very fine, minute granules; punctures of striae 1 and 2 distinct, slightly smaller than those in discal striae.

**Male.** Frons flattened on a broad semicircular area equal to that on female; surface finely punctured; pubescence sparse, inconspicuous. Pronotum and elytra essentially as on female except elytral apices not directed downward, and setae on apical third of elytra much shorter, stouter and slightly flattened.

**TYPE MATERIAL.** This species was described from an undesignated number of specimens from the Schedl and Schwerdtfeger collections. Two specimens are in the Schedl collection and 4 are in the Schwerdtfeger collection. The lectotype, designated by Bright (1976c), is a female in the Schedl collection and bears the labels: Guatem. ciudad, Pin. tenuif. 25.8.1951, Guatemala, by F. Schwerdtfeger/♀/43/Type Pityophthorus subsimilis Schedl/LECTOTYPE Pityophthorus subsimilis Schedl, D.E. Bright '76. The second specimen in the Schedl collection is labeled: G. ciudad, Pin. tenuif., 14.8.1951, Guatemala, by F. Schwerdtfeger/♂/36/Dauerparapret No. 2033, Fuhler, coll. Schedl/Type Pityophthorus subsimilis Schedl/PARALECTOTYPE Pityophthorus subsimilis Schedl, D.E. Bright '76.

The 4 specimens in the Schwerdtfeger collection bear the same data as above, 2 bear the data "25.8.1951", and 2 are labeled "14.8.1951". These specimens are all labeled as paralectotypes.

**HOST.** *Pinus strobus* var. *chiapensis* and *tenuifolia*. Probably occurs in other species of pines in its range.

**DISTRIBUTION.** Southern Mexico and Guatemala, probably extends into Honduras to the southern limit of pine growth. Specimens (56) examined from:

**MEXICO**

**Chiapas:** 5 mi SW of Bochil, 3.VII.69, *Pinus strobus* var. *chiapensis*, D.E. Bright (CNC) 50.

**GUATEMALA:** See type material.

**BIOLOGY.** Schwerdtfeger (1957) gives a brief account of the biology of this species.

Adults attack the thin barked portion of small branches and twigs. The gallery pattern is evidently the typical stellate type with up to seven female galleries radiating from an irregular-shaped nuptial chamber. The female galleries may be up to 70 mm long, are almost entirely in the inner bark and are packed with boring dust and frass. Egg niches are widely spaced, usually about one per 2 mm of gallery. Larvae mine across the grain of the wood and apparently do not turn to follow the grain, as is done in many other species.

REMARKS. Because of the downward pointing elytral apex, the small size and the regular striaal rows, adults of *subsimilis* closely resemble those of *perotei*. The sparse pubescence on the female frons and the fairly regular, concentric rows of asperities on the pronotum of adult *subsimilis* will aid in distinguishing the species.

This species is included in the *Confertus* group because of its relationship to other species in the group. It and *subimpressus* differ from all others by the fairly regular concentric rows of asperities on the pronotum. Because of this character, these two species are also placed in the key to the *Scriptor* group to facilitate identification.

### 206. *Pityophthorus* (*P.*) *subimpressus* Bright

Figs. 230, 231

*Pityophthorus subimpressus* Bright, 1976b, p. 441.

Length 1.4-1.7 mm, about 3.1 times longer than wide.

**Female.** Frons flattened from epistomal margin to slightly above eyes, usually with a faint, longitudinal elevation on lower half; surface finely punctured, with abundant, fine, erect setae, those on periphery longer and incurved. Antennal club elongate-oval, about 1.1 times longer than wide; only one transverse suture chitinized and visible, sometimes a second suture is visible at extreme lateral margins. Pronotum 1.1-1.2 times longer than wide; asperities on anterior slope arranged in two or three irregular concentric rows; posterior area of disc moderately shining, punctures of moderate size, deeply impressed; surface between punctures moderately shining, with numerous fine lines and points or minutely reticulate. Elytra 2.0 times longer than wide; apex weakly acuminate, the apices not projecting ventrally; discal striae punctured in regular rows, punctures of moderate size and depth, very close; discal interstriae impunctate, glabrous. Declivity convex; interstriae 1 weakly elevated, with a median row of sparse, fine granules; interstriae 2 flat, weakly to moderately impressed, equal in width to discal width; interstriae 3 weakly elevated, equal to or slightly higher than 1, with a few, fine granules; punctures in striae 2 distinct but usually reduced.

**Male.** Frons weakly, transversely impressed to upper eye level, upper margin of impression narrowly elevated, surface finely punctured, setae sparse. Otherwise resembles female except interstitial granules on declivity slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and bears the data: MEX. Oax., 32 mi. S. Valle Nacional, 7000', V21.71, Bright/*Pinus* sp./HOLOTYPE *Pityophthorus subimpressus* D.E. Bright, CNC No. 15091. The allotype and 14 paratypes bear the same data. Additional paratypes are labeled: 9, MEX. Hwy. 24, 9 mi. S.E. Teopisca, Chis., V-14-1969, D.E. Bright; 11, MEX., Lagos des Colores, Chis., VI-14-1969, D.E. Bright; 32, Teziutlan, 6 mi. N.E., Pue., Mex., VII-2-1967, 4800 ft., S.L. Wood/*Pinus*.

The holotype, allotype, and most of the paratypes collected by me are in the CNC, additional paratypes are in the KESC and the SLWC.

**HOSTS.** *Pinus* spp.

**DISTRIBUTION.** Southern Mexico. Known only from the type-series localities.

**REMARKS.** The adults of *subimpressus* are very similar to those of *attenuatus*. The most obvious distinction is the distinct striaal punctures on the declivity of *subimpressus* in contrast to the obsolete punctures in the declivital striae of *attenuatus*. *P. subimpressus* occurs in the limbs of various species of pines and *attenuatus* occurs in shrubs or broadleaf trees.

Wood (1977a) has placed *subimpressus* in synonymy under *subsimilis*. It is retained here as a valid species based on the differences referred to in the key. These differences are consistent and I feel specific status for *subimpressus* is appropriate.

207. *Pityophthorus (P.) cacuminatus* Blandford

*Pityophthorus cacuminatus* Blandford, 1904, p. 238; Hagedorn, 1910, p. 70; Bright, 1976c, p. 184 (lectotype desig.).

Length 1.5-1.7 mm, about 2.8-2.9 times longer than wide.

**Female.** Frons flattened on a large semicircular area extending from epistoma to well above eyes and laterally nearly from eye to eye; surface finely, densely punctured and bearing densely placed, erect setae, those on periphery much longer and incurved. Antennal club as in *subsimilis*. Pronotum and elytra as in *subsimilis*. Declivity steep, bisulate; interstriae 1 weakly elevated, with a median row of sparse, fine granules; interstriae 2 flat, weakly to moderately impressed, equal in width to discal width, surface minutely reticulate; interstriae 3 moderately elevated, equal to or slightly higher than 1, with a few, fine granules; punctures in striae 1 and 2 distinct but reduced in size and depth.

**Male.** Frons weakly, transversely impressed to upper eye level, upper margin of impression narrowly elevated, surface finely punctured, setae sparse. Otherwise similar to female.

**TYPE MATERIAL.** This species was described from three specimens now in the BMNH. The lectotype (♀), designated by Bright (1976c), is labeled: Type (orange bordered circle)/S. Geronimo, Guatemala, Champion/B.C.A. Cal. IV.6, *Pityophthorus cacuminatus* Blandf./LECTOTYPE *Pityophthorus cacuminatus* Bldf., D.E. Bright, 1976. The other 2 specimens are similarly labeled.

**HOSTS.** *Pinus* spp.

**DISTRIBUTION.** Jalisco to Honduras.

**REMARKS.** The only authentic specimens of this species that I have records of seeing are the type series. Wood (pers. comm.) records the species from Jalisco to Honduras and I have no reason to question this statement.

This species is evidently related to *subsimilis* and *subimpressus*. Adults of *cacuminatus* may be distinguished by the more extensively flattened and pubescent female frons, by the steeper declivity, by the slightly larger size, and by the stouter body.

208. *Pityophthorus (P.) serratus* Swaine

*Pityophthorus serratus* Swaine, 1918, p. 103; Blackman, 1928, p. 122; Chamberlin, 1939, p. 395; Chamberlin, 1958, p. 157; Bright & Stark, 1973, p. 115; Wood, 1971a, p. 427.

Length 2.1-2.3 mm, about 3.0 times longer than wide.

**Female.** Frons very broadly flattened to weakly concave on a large semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface very densely, minutely punctured and densely pubescent, setae erect, moderately long, those on periphery of flattened area longer and incurved. Antennal club oval, about 1.5 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, heavily chitinized at lateral margins; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1-1.2 times longer than wide, widest at middle; sides weakly arcuate; asperities on anterior slope erect, acute, of moderate size, usually isolated, scattered in no apparent order; summit distinctly elevated; posterior portion of disc strongly punctured, punctures large, deep and almost touching; surface between punctures shining, with dense, minute points. Elytra 1.9 times longer than wide; apex distinctly acuminate; surface appearing randomly punctured, discal striae rows not readily distinguished except on lateral portions, punctures large, deeply impressed and very close; vestiture abundant, setae rather long, erect, those arising from striae punctures longer and more erect. Declivity sloping, deeply bisulcate; interstriae 1 weakly elevated, bearing a median row of very fine, small granules; interstriae 2 deeply sulcate, broadly widened, surface very finely microsculptured with fine



lines; interstriae 3 strongly elevated, much higher than 1, inner slope precipitous on upper half, summit bearing a row of about 7-10 large granules, each with a long fine seta arising from posterior margin; setae in remaining interstriae long and fine; punctures in striae 1 and 2 much reduced but generally vaguely visible.

**Male.** Frons deeply, transversely impressed from epistoma to near upper eye level, the upper margin of impression elevated into a moderately elevated, weakly arcuate, transverse carina with a caudal extension toward vertex; surface in and above impression roughly punctured, setae short, erect. Pronotum as in female except asperities on anterior slope larger and more erect and punctures on posterior portion larger and more erect. Elytra as in female except punctures larger and deeper. Declivity essentially as in female except interstriae 2 broader and more deeply sulcate and interstriae 3 more strongly elevated and bears about 10 large, acute, and close granules.

**TYPE MATERIAL.** The holotype ( $\delta$ ) in the CNC is labeled: Barkhouse Cr. 11-15-13/yellow pine limb/Siskiyou Co., Cal/TYPE *Pityophthorus serratus*/ $\delta$ /2933/*Pityophthorus serratus* SW. mss/TYPE *Pityophthorus serratus*  $\delta$ , No. 1374. One paratype ( $\varphi$ ) bears the same data except for the type labels.

**HOST.** *Pinus ponderosa*.

**DISTRIBUTION.** British Columbia to Idaho and California. Specimens (8) examined from:

#### CANADA

**British Columbia:** Aspen Grove, 26.VII.31, *Pinus ponderosa*, H. Richmond (CASC) 2; Midday Valley, 27.VII.22, *Pinus ponderosa* (SLWC) 1.

#### UNITED STATES

**California:** McCloud, 27.X.72, *Pinus ponderosa*, H.A. Moeck (CNC) 2. **Idaho:** Moscow, 23.IV.52, W.F. Barr (SLWC) 1.

**REMARKS.** This species is related to *confertus*. Adults of *serratus* are easily distinguished by the much more deeply sulcate elytral declivity, by the much higher declivital interstriae 3 and by the much larger and more numerous granules on the third declivital interstriae which form almost a serrate summit on that interstriae.

*P. serratus* is evidently a very rare species. Only four small series have been seen despite the extensive amount of collecting that has taken place in California by myself, Wood, Thatcher, and numerous other forest entomologists.

### 209. *Pityophthorus (P.) confertus* Swaine

Figs. 6, 232-234; Map 47

*Pityophthorus confertus* Swaine, 1917, p. 27; Chamberlin, 1917, p. 355; Swaine, 1918, p. 103; Blackman, 1928, p. 122; Chamberlin, 1939, p. 395; Chamberlin, 1958, p. 159; Bright, 1967, p. 678; Bright & Stark, 1973, p. 115; Wood, 1971a, p. 427; Bright, 1976a, p. 181; Furniss & Carolin, 1977, p. 402.

*Pityophthorus burkei* Blackman, 1928, p. 129; Chamberlin, 1939, p. 396; Chamberlin, 1958, p. 158; Bright, 1966, p. 304 (= *confertus*).

*Pityophthorus confertus agnatus*. **New status.**

*Pityophthorus agnatus* Blackman, 1928, p. 125; Chamberlin, 1939, p. 396; Wood, 1977c, p. 514 (= *confertus*).

*Pityophthorus comptus* Blackman, 1928, p. 127; Chamberlin, 1939, p. 396; Wood, 1977c, p. 514 (= *confertus*).

**BIOLOGY.** Amman *et al.* 1974; Dahlsten & Stephen, 1974; Salman, 1938.

Length 1.8-2.6 mm, about 2.9 times longer than wide.

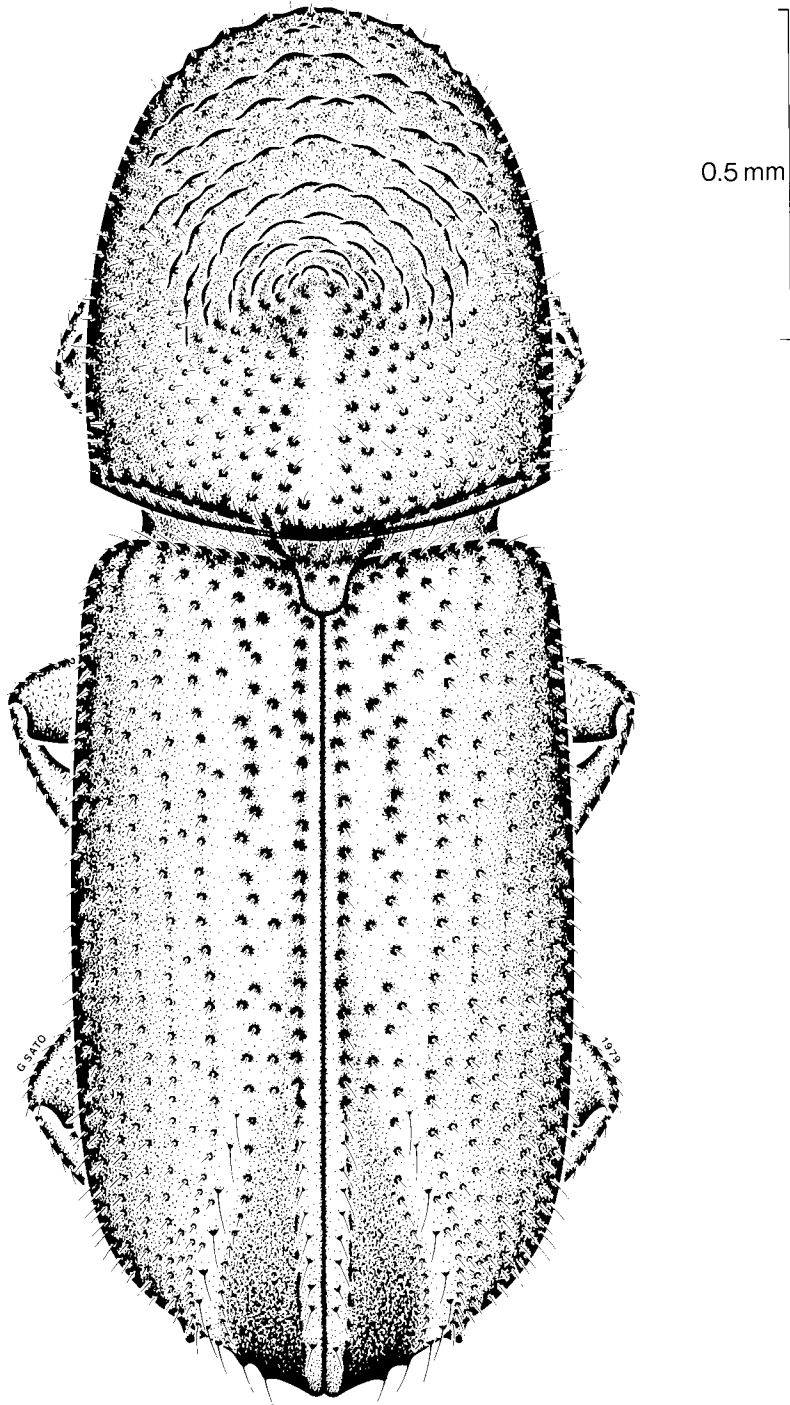


FIG. 6. *Pityophthorus confertus* Swaine.

**Female.** Frons broadly flattened to weakly concave on a semicircular area extending from epistomal margin to well above eyes and laterally nearly from eye to eye; surface very finely, densely punctured, punctures very small and close; vestiture abundant, consisting of moderately long, erect setae over surface, each seta arising from a puncture, those setae on periphery of flattened area much longer and incurved. Antennal club very slightly longer than wide, widest through segment 2; sutures 1 and 2 transverse to weakly arcuate, distinctly chitinized at lateral margin; segments 1 and 2 together occupy about half of total club length. Pronotum 1.1-1.2 times longer than wide, widest at middle; sides straight on posterior half; asperities on anterior slope moderately large, erect, acute, isolated from one another and scattered in no apparent order; summit moderately elevated; posterior area of disc strongly punctured, punctures large, deeply impressed and close; surface between punctures shining, smooth and usually with extremely fine points or lines. Elytra about 1.5-1.6 times longer than wide; apex broadly, moderately acuminate; discal surface randomly, densely punctured, strial rows difficult or impossible to discern except for presence of longer, erect setae which arise from interstitial punctures, setae arising from strial punctures slightly shorter, or, discal striae punctured in vague rows, interstriae usually with numerous punctures. Declivity steep, weakly to moderately bisulcate; interstriae 1 moderately elevated, about as high as 3 or slightly higher, bearing a median row of about 6 small, acute to rounded granules; interstriae 2 broader than discal width, moderately impressed, surface dull to shining, marked with fine, close lines; interstriae 3 weakly to moderately elevated, equal in height to 1 or slightly lower, bearing a median row of about 6 or more fine, acute to rounded granules, these equal in size to those in 1; punctures in striae 1 and 2 obsolete.

**Male.** Frons distinctly, moderately deeply, transversely impressed from epistoma to upper level of eyes, median area of upper margin of impression elevated and impunctate, with a caudal extension extending toward vertex; surface densely, moderately deeply punctured. Pronotum and elytra essentially as in female except asperities stronger. Declivity essentially as in female except interstriae 2 may be slightly more deeply impressed and granules in interstriae 1 and 3 slightly larger.

This species forms two subspecies which can be recognized as follows:

1. Elytral declivity moderately deeply sulcate, interstriae 1 and 3 equal in height, 2 moderately impressed; elytra randomly punctured, striae not discernible or only very vaguely so; British Columbia to California, east into Montana, Idaho, northern Utah, and northern Colorado . . . . . *confertus confertus* Swaine, **new status**
- Elytral declivity more shallowly sulcate, interstriae 1 slightly higher than 3, 2 shallowly impressed; discal strial punctures arranged in more easily distinguished rows, interstriae abundantly to sparsely punctured; Arizona, New Mexico, Texas, southern Utah and Colorado, into southeastern California and northern Mexico . . . . . *confertus agnatus* Blackman, **new status**

**TYPE MATERIAL.** *P. confertus confertus*. This species was described from a long series of specimens collected by Mr. Tom Wilson from *Pinus contorta* at Admas Lake, British Columbia. The lectotype (designated by Bright, 1967) in the CNC is labeled: 2453/J.M. Swaine coll./♀/TYPE/Pityophthorus confertus mss/TYPE Pityophthorus confertus, No. 1375/LECTOTYPE Pityophthorus confertus Sw., CNC No. 9323. One additional specimen bears the same labels but is designated as the "allotype" and 20 specimens bear only the labels: 2453 and J.M. Swaine, coll. All type material is in the CNC.

*P. burkei*. The holotype (♀) in the USNM bears the data: Hopk. U.S. 7-31-16/ Meyers, cal./F.B. Herbert colr/Pinus murrayana/TYPE Pityophthorus burkei Blackman/Type No. 41319 U.S.N.M. The allotype and 7 paratypes bear the same data. Four additional paratypes are labeled: Hopk U.S. 4122-a/Burke, colr., Smith's Ferry, Ida/Pinus murrayana/Paratype Pityophthorus burkei Blackman/Paratype No. 41319 U.S.N.M.

*P. confertus agnatus*. The holotype (♀) is in the USNM and bears the labels: Hopk U.S. 39826/ W.F. Fisk, collector/Cloudcroft, N.M./Pinus strobiformis/TYPE Pityophthorus agnatus Blackman/Type No. 41316 U.S.N.M. The allotype

and 8 paratypes bear the same data. Numerous additional paratypes from New Mexico, Texas, and Arizona are in the USNM.

Most of type material is in the USNM, some paratypes are also in the CNC.

*P. comptus*. The holotype (♀) is in the USNM and bears the data: Hopk. US5801/Bred Nov. 12-7/J.L. Webb, collector/Sta. Catalina Mts., Ariz./ *Pinus strobiformis*/TYPE *Pityophthorus comptus* Blackman/TYPE No. 41317 U.S.N.M. The allotype and 2 paratypes bear the same data. Numerous additional paratypes from Arizona are in the USNM.

Most of the type material is in the USNM, additional paratypes are in the CNC.

HOSTS. All *Pinus* species in its range. Several records are from *Pseudotsuga menziesii*.

DISTRIBUTION. Western North America, from British Columbia to central Mexico (Map 47). Specimens (1239) examined from:

***P. confertus confertus*:**

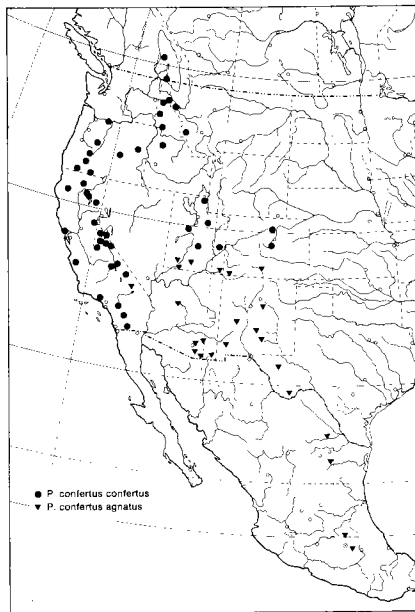
CANADA

**British Columbia:** Creston, 10.I.32, *Pinus contorta*, G. Stace Smith (UBC) 24.

UNITED STATES

**California:** Alpine Co., VII.34, J.R. Blum (SLWC) 4; Bass Lake, I.V.34, R.P. Allen (CASC) 12; Big Pine Peak, 24.VI.40, *Pinus jeffreyi*, C.R. Bruck (OSUC) 3; 3 mi SSE of Bridgeport, emerged 2.II.64, *Pinus monophylla*, H.B. Leech (CASC) 70; Burney, 11.VI.61, *Pinus ponderosa*, S.L. Wood and D.E. Bright (CNC, SLWC) 26; Carrville, Trinity Co., 17.VI.13, *Pinus ponderosa* (CASC) 20; Cedar Flat, Westgard Pass, Inyo Co., em. 6.II.64, *Pinus monophylla*, H.B. Leech (CASC) 26; Chestor, 25.VI.51, D. & J.N. Knull (OSUC) 10; Cisco, 2.XI.63, Lodgepole pine, C.W. O'Brien (DEBC) 6; Dalton Creek, Fresno Co., 14.IV.20, *Pinus lambertiana*, H. Dietrich (DFEC, CNC) 10; Devils Post Pile, 8.VIII.40, *Pinus contorta*, C.R. Bruck (OSUC) 26; Hackamore 6.V.31, *Pinus ponderosa*, K.E. Salmon (RMSC) 1; Huckleberry Meadow, 6.VIII.12, Sugar pine (CNC) 2; Junipero Serra Peak, Monterrey Co., 22.IV.57, *Pinus coulteri*, H.B. Leech (CASC) 18; Lake Arrowhead, 8.VI.32, *Pinus ponderosa*, C.R. Bruck (OSUC) 6; Lassen National Park, 10.VII.38, *Pinus ponderosa* (RMSC) 1; McCloud, 1.VII.14, *Pinus attenuata*, E.C. Van Dyke (CASC) 2; 7 mi E of McCloud, 18.VI.62, *Pinus attenuata*, D.E. Bright (CNC) 6; Mount Hawkins, 22.VII.40, *Pinus ponderosa*, C.R. Bruck (OSUC) 10; Mount Laguna, San Diego Co., 20.V.53, *Pinus jeffreyi* (CNC) 6; 3 mi S of Mount Laguna, 27.III.61, *Pinus jeffreyi*, E.E. Lindquist (DEBC) 3; Muir Woods, Marin Co., 15.II.21, J.O. Martin (CASC) 1; Norval Flats, Lassen Co., 23.V.20, *Pinus murrayana* (CASC) 34; Old Station, Lassen National Forest, 29.IX.47, *Pinus jeffreyi*, S.L. Wood (SLWC) 4; 1 mi S of Onion Valley, Inyo Co., 4.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 10; Pinyon Flat, Riverside Co., 17.IV.62 (CASC) 7; Stanislaus National Forest, 18.V.27, *Pinus lambertiana*, J.M. Miller (DFEC) 3; Ventura Co., A.D. Hopkins (DFEC) 4; Willow Ranch, 27.VI.29, *Pseudotsuga taxifolia*, J.A. Beal (RMSC) 2; Yosemite, various dates, sugar pine or *Pinus murrayana* (CASC) 53. **Colorado:** Estes Park, 28.VIII.39, *Pinus ponderosa* (RMSC) 1; Evergreen, *Pinus aristata*, D. DeLeon (RMSC) 5; Manitou, 4.V.16, *Pinus edulis*, G. Hofer (USNM) 2. **Idaho:** Coeur D'Alene, 15.I.17, *Pinus ponderosa*, J.C. Evenden (DFEC) 2; Magee, R.L. Furniss (DFEC) 4; McCall, VII.78, *Pinus contorta*, M.P. Chatelain (Univ. Idaho, CNC) 20; Moscow Mountains, *Pinus ponderosa* (DFEC) 1; Pine Creek, Swan Valley, 16.III.71, *Pinus contorta*, A.C. Valcarce (CNC) 4. **Montana:** St. Regis, 1.VI.70, *Pinus contorta*, M.D. McGregor (MDSPPF) 23; Sula, *Pinus contorta*, D. DeLeon (DFEC) 12. **Oregon:** Ashland, 20.V.16, *Pinus ponderosa* (DFEC) 4; Blue Mountains, *Pinus contorta*

(CNC) 1; Bly, 28.VII.28, *Pinus contorta*, F.P. Keen (DFEC) 16; Chemult, 16.VI.61, *Pinus contorta*, S.L. Wood & D.E. Bright (CNC, SLWC) 25; Crater Lake, 14.VI.31, *Pinus contorta* (RMSC, USNM) 12; Dixie Pass, Malheur National Forest, 23.VII.61, *Pinus contorta*, S.L. Wood & D.E. Bright (CNC, SLWC) 16; 5 mi E of East Lake, 2.IX.39, *Pinus albicaulis*, Schuh & Gray (SLWC) 29; Grant Co., 22.VI.14, *Pinus contorta* (CNC) 2; Hood River, 20.5, Hubbard & Schwarz (DFEC) 5; Keno, 14.VII.29, *Pseudotsuga taxifolia*, J.A. Beal (RMSC) 7; Klamath Falls, VIII.30, *Pinus ponderosa*, J.A. Beal (RMSC, USNM) 8; Ochoco National Forest, 1914, R. Hopping (CNC) 19; Santiam Pass, Linn Co., 19.VII.61, *Pinus monticola*, S.L. Wood (SLWC) 4. **Utah:** Arches National Monument, Devils Garden, 29.VII.68, *Pinus edulis*, W.G. Harwood (SLWC) 31; Gooseberry, Fishlake National Forest, 9.VI.60, *Pinus edulis*, D.E. Bright (DEBC) 4; Logan Canyon, various dates 1946, *Pinus contorta*, S.L. Wood (SLWC) 34; Lost Lake, Wasatch National Forest, 8.VI.58, *Pinus contorta*, D.E. Bright (DEBC) 5; Mercur, 27.IV.60, *Pinus monophylla*, D.E. Bright (DEBC) 2; Wolf Creek Pass, 2.VII.60, *Pinus contorta*, D.E. Bright (SLWC) 4.



MAP 47. Collection localities for *P. (Pityophthorus) confertus confertus* and *P. confertus agnatus*.

### ***P. confertus agnatus***

#### UNITED STATES

**Arizona:** Ash Canyon, Huachuca Mtns., 7.VI.69, *Pinus cembroides*, S.L. Wood (SLWC) 15; Carr Canyon, Cochise Co., 23.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 29; Chiricahua Mtns., Cochise Co., 18.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 70; 6 mi S and 4 mi W of Jerome, 8.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 4; Madera Canyon, Santa Rita Mtns., 49.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 21; Parker Canyon Lake, Cochise Co., 25.VII.68, *Pinus cembroides*, D.E. Bright (CNC) 12; Pinaleno Mtns., Graham Co., 15.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 30; Rucker Canyon, Chiricahua Mtns., 21.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 10; Rustler Park, Cochise Co., 19.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 5. **California:** Mahogany Flat, Death Valley, V.67,

*Pinus monophylla*, W.H. Tyson (CNC) 9. **Colorado**: 16 mi N of Cotopaxi, 20.VII.71, *Pinus edulis*, D. Yound (RMSC) 2; Mancos, 7.VI.35, *Pinus edulis*, L.G. Baumhofer (RMSC) 2; Mesa Verde, 7.VI.35, *Pinus edulis*, L.G. Baumhofer (RMSC) 4. **New Mexico**: Bingham Summit, 1.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 8; Clines Corners, 9.VII.68, *Pinus edulis*, D.E. Bright (CNC) 14; Cloudcroft Ski Area, 4.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 5; Emory Pass, Sierra Co., 24.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 9; 4 mi W of High Rolls, 13.VII.74, at light, D.E. Bright (CNC) 9; 7 mi W of Kingston, 4.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 1; 5 mi W of Lake Roberts, 9.VI.69, *Pinus edulis*, S.L. Wood (SLWC) 27; 5 mi W of Magdalena, 10.VII.68, *Pinus edulis*, D.E. Bright (CNC) 11. **Texas**: Big Bend National Park, 4.VII.74, *Pinus cembroides*, D.E. Bright (CNC) 34; 17 mi NE of Fort Davis, 19.VII.74, *Pinus strobiformis*, D.E. Bright (CNC) 43; Jeff Davis Co., 4.VII.53, D. & J.N. Knull (OSUC) 1. **Utah**: Beaver, 15.IX.49, *Pinus edulis*, S.L. Wood (SLWC) 10; Escalante, 23.IX.52, Pinyon pine, L.W. Orr (USNM) 8; La Sal Mountains, 5.VII.58, *Pinus edulis*, S.L. Wood (SLWC) 7; 8 mi E of Monticello, 29.V.69, *Pinus edulis*, S.L. Wood (SLWC) 6; Mount Carmel, 31.III.38, *Pinus edulis*, D. DeLeon (RMSC) 21.

#### MEXICO

**Coahuila**: Puerto de Flores, 23.IX.69, *Pinus* sp. (CNC) 26. **Hidalgo**: 8 mi NE of Zimapán, 28.IV.69, *Pinus cembroides*, D.E. Bright (CNC) 9. **Nuevo León**: Cerro Potosí, 3.V.71, *Pinus arizonica*, D.E. Bright (CNC) 28. **Puebla**: Limon, 9.II.36, *Pinus cembroides*, D. DeLeon (USNM) 8.

**BIOLOGY.** This species occurs in the branches and twigs of various species of pines. It is frequently encountered in association with various species of *Dendroctonus*. It also occurs in the bole of small, recently dead pinyon pines, where it may be the causal factor in the death of the trees. In two instances where it was found in this situation in Texas, *confertus agnatus* was the only species present in the bole. The expected species of *Ips* were not present. Galleries of this species extended into the roots and were also in the top portion of the bole and in the main branches.

Amman *et al.* (1974) have studied the development of *confertus* in Idaho. They reported that the average length of the egg galleries was 4.0 cm 17 days after attack. These were apparently completed galleries since the females had abandoned them. Eggs were spaced along the gallery wall an average of 2.7 mm apart. Eggs were most abundant in the fourth cm of gallery. Only two larval instars were apparent from head capsule measurement. Total development time taken from when the parent females attacked until the population consisted almost entirely of brood adults was 52-58 days.

Damage done by *confertus* is generally negligible but Salman (1938) reports that the species (along with *confinis*) was responsible for killing the tops of large, mature ponderosa pine which had been left as seed trees in a cut-over area. The beetles killed the top 2 ft or more of trees that were apparently completely healthy. Dahlsten and Stephen (1974) reported a similar occurrence in sugar pine. However, in their report, the tree was infested with the mountain pine beetle, *Dendroctonus ponderosae* Hopkins. *Pityophthorus confertus* occurred in the upper portion of the infested bole and 58% of the specimens were in the top meter in 1968 and over 68% of the specimens were in the top meter in 1970. Extremely high populations of *confertus confertus* developed in large diameter boles of lodgepole pine (*P. contorta*) in association with a widespread epidemic of the mountain pine beetle (*Dendroctonus ponderosae* Hopkins) in 1971 in Idaho. The next generation of attacking adults literally "peeled" and killed some ornamental Scotch pine and Alpine fir saplings. Parts attacked included 2-5 in. diam. main stems and all limbs and twigs

down to pencil size and smaller. Saplings of both these tree species were apparently suffering from moisture deficit (Valcarce pers. comm.).

Two species of parasites are recorded from *P. confertus* (as *P. burkei*) by Bushing (1965): *Eusandulum hubbardi* (Ashmead) (Eupelmidae) and *Heydenia unica* Cook and Davis (Pteromalidae). Dahlsten and Stephen (1974) add *Macromesus americanus* Hedqvist (Pteromalidae).

REMARKS. *Pityophthorus confertus* is a very common and widespread species. Because of its wide distribution and host range, it is also an extremely variable species.

Two subspecies have been recognized in this work but there are indications that *confertus confertus* could be broken into a third distinguishable population. This population occurs in the northern Rocky Mountain area of Montana, Idaho, and adjacent states. It is distinguishable by its slightly smaller size (2.0 mm or less) and by the very densely, deeply punctured elytra. For the present, I prefer to leave this population unnamed since I cannot be sure that the variation observed is individual or populational.

*Pityophthorus confertus agnathus* is an easily distinguishable subspecies. It mainly occurs in the various pines of the southwest. Some specimens show a slight degree of overlap in characters with *confertus confertus* but generally the population as a whole is distinctive.

#### 210. *Pityophthorus (P.) murrayanae* Blackman

Figs. 235-237; Map 48

*Pityophthorus murrayanae* Blackman, 1922c, p. 138; Blackman, 1928, p. 133; Chamberlin, 1939, p. 398; Chamberlin, 1958, p. 106; Wood, 1971a, p. 427; Bright & Stark, 1973, p. 115; Bright, 1976a, p. 182; Wood 1977c, p. 515.

*Pityophthorus elongatus* Swaine, 1925, p. 194; Blackman, 1928, p. 133 (= *murrayanae*); Bright, 1967, p. 678; Wood, 1971a, p. 427.

*Pityophthorus gracilis* Swaine, 1925, p. 195; Blackman, 1928, p. 134; Chamberlin, 1939, p. 398; Chamberlin, 1958, p. 160; Bright, 1967, p. 678; Wood, 1971a, p. 427; Bright, 1976a, p. 182; Wood, 1977c, p. 525 (= *murrayanae*).

*Pityophthorus cutleri* Swaine, 1925, p. 195; Blackman, 1928, p. 136; Chamberlin, 1939, p. 399; Chamberlin, 1958, p. 161; Bright, 1967, p. 678; Wood, 1971a, p. 427; Wood, 1977c, p. 515 (= *murrayanae*).

*Pityophthorus exilis* Swaine, 1925, p. 196; Blackman, 1928, p. 134; Chamberlin, 1939, p. 348; Chamberlin, 1958, p. 160 (= *gracilis*); Bright, 1967, p. 678; Wood, 1971a, p. 427; Wood, 1977c, p. 515 (= *murrayanae*).

*Pityophthorus tenuis* Swaine, 1925, p. 196; Blackman, 1928, p. 134; Chamberlin, 1939, p. 398; Wood, 1957, p. 401 (= *murrayanae*); Chamberlin, 1958, p. 160; Bright, 1967, p. 679; Wood 1971a, p. 427.

*Pityophthorus depygis* Blackman, 1928, p. 128; Chamberlin, 1939, p. 396; Wood, 1977c, p. 515 (= *murrayanae*).

*Pityophthorus watsoni* Schedl, 1930, p. 197; Bright, 1976a, p. 188; Wood, 1977c, p. 515 (= *murrayanae*).

*Pityophthorus murrayanae aurulentus*, **new status.**

*Pityophthorus aurulentus* Bright, 1966, p. 301; Bright & Stark, 1973, p. 116; Wood, 1976c, p. 516 (= *murrayanae*).

Length 1.9-2.5 mm, about 3.0-3.1 times longer than wide.

**Female.** Frons either flattened on a broad semicircular area extending from epistomal margin from slightly to well above upper level of eyes, laterally occupying about 75-80% of distance between eyes, or, frons weakly convex or weakly concave; surface between eyes very densely, minutely punctured in median area, punctures very close and deep; vestiture

between eyes variable, either completely absent (except along epistomal margin), or very short to moderately long and all of equal length, or setae abundant, erect, those on periphery longer and incurved; surface above and lateral to pubescent or finely punctured area smooth, with widely separated, deep punctures. Antennal club oval, about 1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse to very weakly arcuate; segments 1 and 2 together occupy about half of total club length. Pronotum about 1.2 times longer than wide, widest at level of summit; sides straight on posterior half; asperities on anterior slope rather large, erect, isolated, scattered in no apparent order; summit moderately high; posterior portion of disc densely punctured, punctures varying from deeply to obscurely impressed; surface between punctures shining to dull, usually minutely reticulate, sometimes strongly enough to obscure punctation. Elytra about 1.8 times longer than wide; apex moderately acuminate; discal striae punctured in regular rows, punctures rather large, equal to or slightly larger than those on posterior portion of pronotum, rather deeply impressed and close; discal interstriae about as wide as striae or slightly wider, surface brightly shining to dull, usually smooth but may be finely reticulate, each interstriae with a median row of 2 or 3 punctures, these equal in size to those in striae and bearing a more erect and slightly longer seta, or some interstriae may be devoid of punctures. Declivity moderately bisulcate; interstriae 1 moderately elevated, about equal in height to 3, bearing a median row of 5 or 6 (or more), fine granules; interstriae 2 broad, usually much wider than discal width but may be only slightly so, moderately impressed, surface smooth, brightly shining to dull and minutely reticulate; interstriae 3 moderately to weakly elevated, bearing about 4 or 5 very small granules, each of these with a long, stout seta arising from posterior margin; punctures in striae 1 and 2 usually obsolete or barely visible, if so then much smaller than those on disc.

**Male.** Frons moderately, deeply, transversely impressed from epistoma to upper level of eyes, median portion of upper margin of impression weakly elevated into a subtriangular or round, impunctate callus; surface of impression deeply, closely punctured, sometimes a very weakly elevated, impunctate, longitudinal carina is evident on lower half of transverse impression, this carina may be absent or not elevated. Pronotum and elytra essentially as in female. Declivity as in female except interstriae 2 is usually more deeply impressed and the granules on interstriae 1 and 3 are larger.

This is an extremely common, widespread and variable species. I recognize two subspecies that are distinguished as follows:

1. Occurs in coastal regions of central California; frons of female with a very dense brush of setae, with very long setae on the periphery, those on vertex reaching almost to epistomal margin . . . . . *P. murrayanae aurulentus* Bright, **new status**
- Occurs elsewhere in North America; frons of female very variable, varying from densely, finely punctured and glabrous, or with short to moderately long, equal length setae, or setae abundant, those on periphery longer and incurved but those setae on vertex reaching half way or less toward epistoma . . . . . *P. murrayanae murrayanae* Blackman, **new status**

**TYPE MATERIAL.** *P. murrayanae*. The holotype (♀) is in the USNM and bears the data: Grand Lake, Colorado, 12-30-20/E.R. Guild, collector/N.Y.S. coll. For. Lat Lat Colo. 1214/TYPE Pityophthorus murrayanae Blackman/Type No. 53850 U.S.N.M. Blackman (1922) stated that this species was described from a series of 25 specimens from the above locality, dated December 30, 1920, January 22 and February 18, 1921. Only 15 paratypes can now be accounted for in the USNM, the DFEC, and the CNC.

*P. elongatus*. The holotype (♀) of this species is in the CNC. It bears the labels: 17053, Lot 1006/Pinus contorta/Midday Val., Merritt, B.C., V-19-1923, R. Hopping/♀/TYPE Pityophthorus elongatus Sw. No. 1365. Two paratypes with the same data have been located, one in the USNM and one in the CNC.

*P. gracilis*. The holotype (♀) is in the CNC with the data: Grant Co., Ore., 6-23-14/Pinus contorta/W.J. Chamberlin, collector/1965/TYPE Pityophthorus



*gracilis* Sw., No. 1364. One paratype with the data: Dying lodgepole pine, T95R36E . . . (illegible)/Or. Ex. Sta. No. 1422J and the paratype label is in the CNC.

*P. cutleri*. The holotype (♀) in the CNC bears the labels: *Pinus ponderosa*/17051, Lot 555/Midday Val. Merritt, B.C./VI-12-1922, N. Cutler/TYPE *Pityophthorus cutleri* Sw., No. 1363. Three paratypes (♀ ♀) with the same data are in the CNC.

*P. exilis*. The holotype (♀) in the CNC bears the labels: Ochoco N.F., Ore. 1914, R. Hopping/TYPE *Pityophthorus exilis* Sw., No. 1362. The allotype and 4 paratypes, all with the same data, are in the CNC, and 1 paratype, also with the same data is in the USNM.

*P. tenuis*. The holotype (♀) of this species is in the CNC and is labeled: 17053, Lot 1014/*Pinus contorta*/Midday Val., Merritt, B.C., VI-8-1923, R. Hopping/TYPE *Pityophthorus tenuis* Sw., No. 1366. One female paratype with the same data, dissected and mounted in balsam, is in the CNC.

*P. depygis*. The USNM holds the holotype of this species. The holotype (♀) is labeled: Hopk. U.S. 12657/Reared, June 16-14, H.B. Kirk/A.B. Champlin, colr./Clyde, Colo./*Pinus flexilis*/TYPE *Pityophthorus depygis* Blackman/Type No. 41318 U.S.N.M. Three paratypes with the same data are in the USNM.

*P. watsoni*. The holotype (♀) in the CNC bears the data: Nector Lake, N.B., 9.VII.1921, M.B. Dunn, R. spruce/*P. watsoni* Schedl, T. No. 3167, ♀. The allotype and 4 paratypes in the CNC bear the same data. Two paratypes, labeled Frater, Ont., 8-VII-7925, E.B. Watson/*Picea canadensis* and the paratype labels, are supposed to be in the CNC but only one was located.

*P. aurulentus*. The holotype (♀) in the CAS is labeled: CALIF: Walnut Cr., (foot of Shell Ridge), Contra Costa Co., J. Powell, X-13-63/J. Powell No. 63K2, Emerged by X-64, Reared from *Pinus radiata*/HOLOTYPE *Pityophthorus aurulentus* D.E. Bright. The allotype and 12 paratypes bear the same data but some lack the second label cited above and simply bear the label "Pinus radiata".

Nine additional paratypes are from California and are cited in Bright (1966).

HOSTS. Probably occurs in most species of *Pinus* in its range, also in *Picea* spp. and one record from *Abies lasiocarpa*.

DISTRIBUTION. Western United States and Canada, except the southwestern states and possibly occurs across Canada in the northern coniferous forests to at least New Brunswick (Map 48). Specimens (400) examined from:

**P. murrayanae murrayanae:**

CANADA

**Alberta:** Banff, 7.IX.67 and 13.IX.67, *Pinus flexilis* and *P. contorta*, D.E. Bright (CNC) 6; Peace River, 30.VI.66, *Picea glauca* (NFRCE) 5; Seebe, V.66, *Picea glauca*, D.F.J. Hilton (CNC) 6. **British Columbia:** Fernie, 12.VII.55, *Abies lasiocarpa*, H.B. Leech (UBC) 1; Lorna, 2.VI.28, *Pinus contorta*, E.A. Randell (CASC) 1; Trinity Valley, 17.VI.27, *Pinus contorta*, E.A. Randell (CASC) 2. **Manitoba:** Clear Lake, 17.V.53, *Picea glauca* (NFRCE, CNC) 2. **New Brunswick:** See type material. **Northwest Territories:** Aklavik, 29.VII.30, O. Bryant (SLWC) 55. **Ontario:** Westree, VII.28, A.H. MacAndrews (CNC) 1.

UNITED STATES

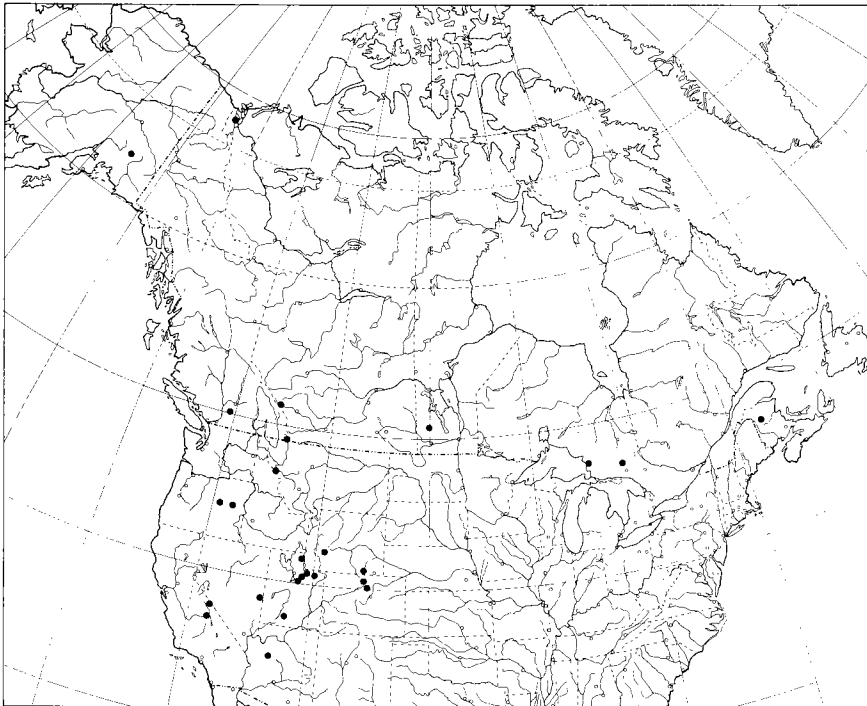
**Alaska:** Mile 295, Richardson Highway, 19.VI.59, *Picea glauca*, G.L. Downing (DEBC) 3. **Arizona:** Prescott National Forest, 7.VI.30, *Pinus ponderosa*, M.W. Blackman (USNM) 8. **California:** Ontion Valley, Inyo Co., 4.IX.68, *Pinus balfouriana*, D.E. Bright (CNC) 19; 10 mi N of Westgard Pass, Inyo Co., 6.IX.68,

*Pinus flexilis* and *P. aristata*, D.E. Bright (CNC) 40. **Colorado**: Gould, 10.VIII.58, *Pinus contorta*, D.E. Bright (DEBC) 2. **Montana**: Saint Regis, 25.V.70, *Pinus contorta*, M.D. McGregor (MDSPP) 2; Sula, 25.VIII.28, *Pinus contorta*, C.R. Bruck (OSUC) 4. **Nevada**: Wheeler Peak, White Pine Co., 8.IX.68, *Pinus flexilis*, D.E. Bright (CNC) 1. **Oregon**: Corvallis, 11.V.57, Norway spruce, S. Tunnock (MDSPP) 1; 5 mi E of East Lake, 2.IX.59, *Pinus albicaulis*, Schuh & Gray (SLWC) 18. **Utah**: Elks Park, Ashley National Forest, 16.VI.60, *Pinus contorta*, S.L. Wood (SLWC) 1; Hoop lake, Wasatch National Forest, 5.VII.58, D.B. Cahill (USNM) 1; Logan Canyon, various dates, *Pinus contorta*, S.L. Wood (SLWC) 22; Lost Lake, Wasatch National Forest, 8.VI.58, *Pinus contorta*, D.E. Bright (DEBC) 1; Provo Canyon, Utah Co., 12.IV.57, H.P. Shurtleff (DEBC) 95; Sanford Canyon, Dixie National Forest, 22.VI.60, *Picea pungens*, D.E. Bright (CNC) 1; Wolf Creek Pass, 12.VII.60, *Pinus contorta*, D.E. Bright (SLWC) 2. **Wyoming**: Frontier Creek, Shoshone National Forest, 19.VII.59, *Pinus contorta*, M.E. McKnight (RMSC) 1; Saratoga, various dates 1937-38, *Pinus contorta*, *P. flexilis* or *Picea pungens* (RMSC) 19; 16 mi NE of Tensleep, 21.VI.68, *Pinus flexilis*, S.L. Wood (SLWC) 2.

***P. murrayanae aurulentus***

UNITED STATES

**California**: 2 mi NNE of Angwin, Napa Co., 28.VII.77, *Pinus ponderosa*, H.B. Leech (SLWC) 9.



MAP 48. Collection localities for *P. (Pityophthorus) murrayanae murrayanae*.

**REMARKS** The classification and synonymy of this species is presented with some apprehensiveness. For many years, *murrayanae* and *gracilis* have been somewhat of an enigma. Forest entomologists and taxonomists have long recognized that two related but very different appearing "species" occurred in the west. No suggestion was made that the two species could possibly be the same until Wood

(1971a) raised the question and suggested that *murrayanae* could possibly be a subspecies or a local variant of *gracilis*. After a study of hundreds of specimens, I suggest that this species contains polymorphic females and that this accounts for the variation that is encountered. Wood (1977c) placed several species in synonymy.

Three types of females can be described or recognized but all three types intergrade to some degree. In one form, the surface of the female frons is densely, finely punctate, glabrous or pubescent but if pubescent, then the setae are all very short and very inconspicuous (*murrayanae*) (Fig. 236); in a second form, the female frons is more densely pubescent and the setae are short to moderately long and all are equal or nearly equal in length (*depygis*); and in the third form, the frons of the female is densely pubescent with the setae on the periphery being longer and incurved (*gracilis* and the subspecies *aurulentus*) (as in Fig. 232). Numerous intergrades are also found which accounts for the synonyms being described.

When the frons of the holotypes (all females) of all the species involved are examined, the following results are seen: *elongatus* is the "murrayanae" type described above; *gracilis* is as described above; *cutleri* is essentially as in "gracilis" but the pubescence of the frons is sparser and the surface of the frons is as in the "murrayanae" type; *exilis* is the "gracilis" type but tending also to resemble the "depygis" type; *tenuis* is in the "murrayanae" type but with the setae longer; *depygis* is as described above and *watsoni* is as in the "murrayanae" type as in *tenuis* but one paratype resembles the "gracilis" type. In addition, in one series of 95 specimens taken together at one time in Provo Canyon, Utah on April 12, 1957 by H.P. Schurtleff, specimens fitting or closely resembling the holotypes of *murrayanae*, *gracilis*, and *depygis* were found.

I was unable to find any consistent differences on the frons of the males from each of the above mentioned "species", nor was I able to detect any differences in the pronotal or elytral characters that could be used to distinguish species.

One distinctive population occurs along the central California coast. The females of this population resemble the "gracilis" type but the setae over the surface of the frons are much longer and denser and those on the periphery are very long and dense. Since this population is allopatric, and morphologically distinct, I have decided to consider it a subspecies.

A comment about *P. watsoni* should also be made. This is the only species under the present consideration that originates from the east (New Brunswick and Ontario). An examination of the type material shows that it definitely is in the "murrayanae" type and should be considered a synonym of *murrayanae*. The easiest way to account for its eastern locality is to consider it mislabeled. As further support for this argument, no additional specimens have yet been collected despite the extensive collecting done in the east. However, this may not be the proper answer. Quite a few "eastern" species of bark beetles have been found to occur as far west as northern Alberta and there are several species that have been found to occur transcontinentally. This may be the case with *m. murrayanae* with it being quite rare in the eastern extension of its range. Only further collecting, concentrating on this species, can provide the answer.

#### 211. *Pityophthorus (P.) acceptus* n. sp.

Length 2.1-2.5 mm, 2.1-2.2 times longer than wide.

**Female.** Frons flattened to very weakly impressed on an area equal to less than a half-circle, extending from epistomal margin to upper level of eyes and laterally occupying about 75-80% of distance between eyes; surface of flattened area very finely, densely punctured; a weakly elevated, impunctate, circular callus is located just above epistomal margin and frequently a short, very narrow, weakly elevated, longitudinal carina extends upward from the callus; upper median margin of flattened area may be weakly elevated; vestiture

consisting of moderately abundant, erect setae scattered over flattened area; surface above and lateral to flattened portion smooth, more sparsely punctured, punctures much deeper and much larger, each of these bearing a very short seta. Antennal club oval, 1.2-1.3 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, lightly chitinized along entire length or only at lateral margins; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest on posterior half; sides subparallel on posterior half, weakly converging to anterior constriction; asperities on anterior slope fairly large, erect, and isolated below summit but becoming basally contiguous around summit; summit prominent; posterior area of disc abundantly punctured, punctures of moderate size and depth; surface between punctures brightly shining, smooth, with scattered, extremely fine, minute lines and points. Elytra 1.8-1.9 times longer than wide; apex distinctly, rather strongly acuminate; discal striae punctured in regular rows, punctures slightly larger than those on posterior portion of pronotum and more deeply impressed and close; discal interstriae about 2.0 times wider than striae, impunctate (except 1) or with 1 or 2 scattered punctures in interstriae 3, 5, 7, 9, surface of interstriae subopaque to moderately shining, subrugulose, and with numerous very fine lines. Declivity moderately, deeply bisulcate; interstriae 1 narrowly, moderately elevated, bearing a median row of about 6 small, acute granules; interstriae 2 wider than discal width, moderately deeply impressed, surface opaque, with numerous fine lines; interstriae 3 moderately elevated, equal in height to 1, bearing a median row of 5 or 6 very fine granules, these usually slightly smaller than those in 1; punctures in striae and 2 obsolete.

**Male.** Frons almost convex, usually very weakly flattened on area between epistoma and upper margin of eyes, with a weakly elevated, longitudinal median carina extending from epistoma to upper eye level or less, usually ending at a small, impunctate, median callus; surface strongly, roughly punctured. Pronotum as in female except asperities and punctures larger, more prominent. Elytra and declivity essentially as in female.

**TYPE MATERIAL.** The holotype (♀), allotype, and 5 paratypes were collected at the summit of Granite Pass, 8950 ft elevation, Big Horn Mountains, Sheridan Co., Wyoming on June 7, 1975 from twigs of *Pinus flexilis* by D.E. Bright (CNC No. 15795). Three additional paratypes are from Hixon, British Columbia, collected from *Pinus contorta* on 9 July 1972 by D.E. Bright.

The holotype, allotype, and 6 paratypes are in the CNC. One pair of paratypes is in the SLWC.

**REMARKS.** This species is described with some hesitation. Wood (pers. comm.) regards it as a variety of *murrayanae*. However, there are several characters that indicate that *acceptus* is not another of the many varieties of *murrayanae*. *P. murrayanae* is an extremely variable species but several characters such as the features of the male frons and the punctate discal interstriae do not vary and usually enable one to recognize the numerous varieties (see discussion under *murrayanae*). The male frons of *acceptus* is quite different from any of the *murrayanae* varieties by being very weakly impressed and by bearing a fine, longitudinal carina which extends from the epistoma to the midpoint on the frons. In addition, the discal interstriae of *acceptus* are completely impunctate, while in all the synonyms and varieties of *murrayanae* the interstriae are consistently punctured. The female frons of *acceptus* is also completely different from any of the varieties of *murrayanae*; however, the female frons is the feature that displays the most variation in *murrayanae*. Once again, however, the frons of all the varieties of *murrayanae* display a similar basic structure, that is, a large, semicircular, flattened area that extends to well above the upper eye level, the surface of which is very finely, densely punctured and varies from glabrous to densely pubescent. In *acceptus*, the frons is weakly impressed on a much less extensive area, only barely reaching the upper eye level, and also frequently bears a fine, longitudinal carina which is never present on *murrayanae*. These distinctions are sufficient I believe to regard *acceptus* as a valid species. The three paratypes from Hixon, British Columbia are all females and

very closely resemble the females in the type series. They differ slightly, however, in having the frons more evenly flattened, not impressed, and the median callus on the epistoma and the median longitudinal carinae are slightly more prominent. These differences are all very slight and are believed to represent only minor populational variations.

212. *Pityophthorus (P.) anthracinus* Bright

*Pityophthorus anthracinus* Bright, 1976b, p. 428.

Length 1.6-1.9 mm, 3.2 times longer than wide; color black.

**Female.** Frons flattened on a small, semicircular area extending from epistoma to above upper level of eyes and laterally occupying 75% of distance between eyes; surface of flattened area very densely, very finely punctured and rather sparsely covered with moderately long setae, those on periphery longer and incurved; surface lateral to flattened area dull, punctures larger, more widely separated. Antennal club small, oval, about 1.3 times longer than wide; first two sutures transverse, straight; segments 1 and 2 together occupy more than half of total club length. Pronotum 1.2 times longer than wide in front of summit; sides parallel on posterior two-thirds; asperities on anterior slope small, low but more erect than serrations on anterior margin, scattered in no apparent order; summit distinctly elevated; posterior portion of disc weakly punctured, punctures of moderate size but indistinctly impressed; surface between punctures densely, minutely reticulate, obscuring the weakly impressed punctures. Elytra 1.9 times longer than wide; apex weakly acuminate; distal striae punctured in regular rows, the punctures of moderate size, very weakly impressed and appearing obsolete in some specimens; discal interstriae wider than striae, impunctate, very densely microrugose and reticulate, this sculpturing obscuring the striae punctures. Declivity convex, not impressed; interstriae 1 distinctly but weakly elevated, bearing a median row of about six very small granules and fine setae; interstriae 2 flat to weakly, broadly sulcate; interstriae 3 not or only very weakly elevated, equal or very nearly equal in height to 2 and lower than 1, bearing a median row of 2-4 very fine granules and setae; remaining alternate interspaces with a few, very fine setae; punctures in striae 1 and 2 not visible.

**Male.** Frons flattened as in female, surface much more sparsely, deeply punctured and densely minutely reticulate, setae absent except for a few along epistomal margin. Pronotum, elytra, and declivity essentially as in female except punctures on posterior portion of pronotum and in elytral striae slightly larger and deeper and granules on declivital interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and is labeled: Cerro Potosi, N.L., Mexico, 111-21-1974/*Abies* sp./M.M. Furniss, Hopk-58614/Holotype *Pityophthorus anthracinus* D.E. Bright. The holotype, allotype, and 7 paratypes bear the same data.

The holotype, allotype, and 5 paratypes are in the SLWC, 2 paratypes are in the CNC.

**HOST.** *Abies religiosa*.

**DISTRIBUTION.** Nuevo León to Tlaxcala. Specimens (10) examined from:  
MEXICO

**Nuevo León:** See type material. **Tlaxcala:** 11 mi N of Tlaxco, 9.VII.67, *Abies religiosa*, S.L. Wood (SLWC) 1.

**BIONOMICS.** The type series was collected from a shaded-out branch of fir. The galleries were radiate but not typically stellate and were found in the small diameter portion of the branch (Furniss pers. comm.).

**REMARKS.** Adults of *anthracinus* are most easily recognized by the uniformly black color, by their small size, by the dense microsculpturing of the body surface, by the obscure punctures on the posterior portion of the pronotum and in the striae, and by the host and distribution.

213. *Pityophthorus (P.) mesembria* Bright

*Pityophthorus mesembria* Bright, 1978, p. 80.

Length 2.0-2.2 mm, about 2.8 times longer than wide.

**Female.** Frons flattened on a large semicircular area extending from epistomal margin to well above eyes and laterally occupying over 80% of distance between eyes; surface shining, moderately densely punctured, largely concealed by long, incurved setae which extend from periphery of flattened area almost to epistomal margin, setae on remainder of flattened area very short, erect. Antennal club oval, about 1.3 times longer than wide, widest through segment 2; first two sutures transverse, rather heavily chitinized at lateral margins; first two segments together occupy more than half of total club length. Pronotum 1.1 times longer than wide, widest on posterior half; sides moderately to rather strongly arcuate; asperities on anterior slope erect, usually isolated but some may be basally contiguous, scattered in no apparent order; summit prominent; posterior area of disc strongly punctured, punctures of moderate size, deeply impressed and close; surface between punctures brightly shining, with numerous fine points. Elytra 1.6-1.7 times longer than wide; apex moderately acuminate; discal striae punctured in regular rows, punctures slightly larger than those on posterior portion of pronotum and more deeply impressed, each puncture bearing a very short, recumbent setae; discal interstriae 1.5-2.0 times wider than striae, surface shining, impunctate, smooth with numerous very fine lines and/or points. Declivity shallowly bisulcate; interstriae 1 weakly elevated, bearing a median row of 10 or more small, rounded granules, each of these with a long, erect, moderately stout seta arising from posterior margin; interstriae 2 wider than discal width, shallowly impressed, surface shining, with numerous, scattered, fine points and lines; interstriae 3 slightly elevated, higher than 1, bearing a median row of 8-10 fine, rounded granules, each of these with a stout, erect seta as on interstriae 1; punctures in striae 1 and 2 visible but smaller and less deeply impressed than those on disc.

**Male.** Frons flattened or weakly convex on a semicircular area as in female, punctures very large, deep, and close; a weakly elevated median, longitudinal carina extends from epistoma to upper level of eyes; vestiture moderately long, sparse, and relatively inconspicuous. Pronotum as in female except asperities larger and points in spaces between punctures on posterior portion of pronotum deeper and more conspicuous, resulting in large punctures becoming more obscure. Elytra as in female except striae punctures deeper. Declivity as in female except granules on interstriae 1 and 3 larger.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the data: Cerro Calel, Quez., Guatemala, 10000 ft., v-26-1964. S.L.W./*Abies guatemalensis*/HOLOTYPE *Pityophthorus mesembria* D.E. Bright. The allotype and 5 paratypes bear the same data.

Most of the type material is in the SLWC, 2 paratypes are in the CNC.

**HOST.** *Abies guatemalensis*.

**DISTRIBUTION.** Known only from the type locality in Guatemala.

**REMARKS.** Adults of this species are distinguished from other species in the *Confertus* group by the arcuate pronotal sides, by the densely punctured inter-puncture sparse on the posterior portion of the pronotum, by the presence of numerous granules on declivital interstriae 1 and 3, and by other characters given in the key to species.

214. *Pityophthorus (P.) bassetti* Blackman

Figs. 7, 238-240; Map 49

*Pityophthorus bassetti* Blackman, 1920, p. 1; Blackman, 1928, p. 136; Chamberlin, 1939, p. 399; Chamberlin, 1958, p. 160; Wood, 1971a, p. 427; Bright, 1976c, p. 183 (lectotype desig.).

Length 1.8-2.3 mm, about 3.0 times longer than wide.

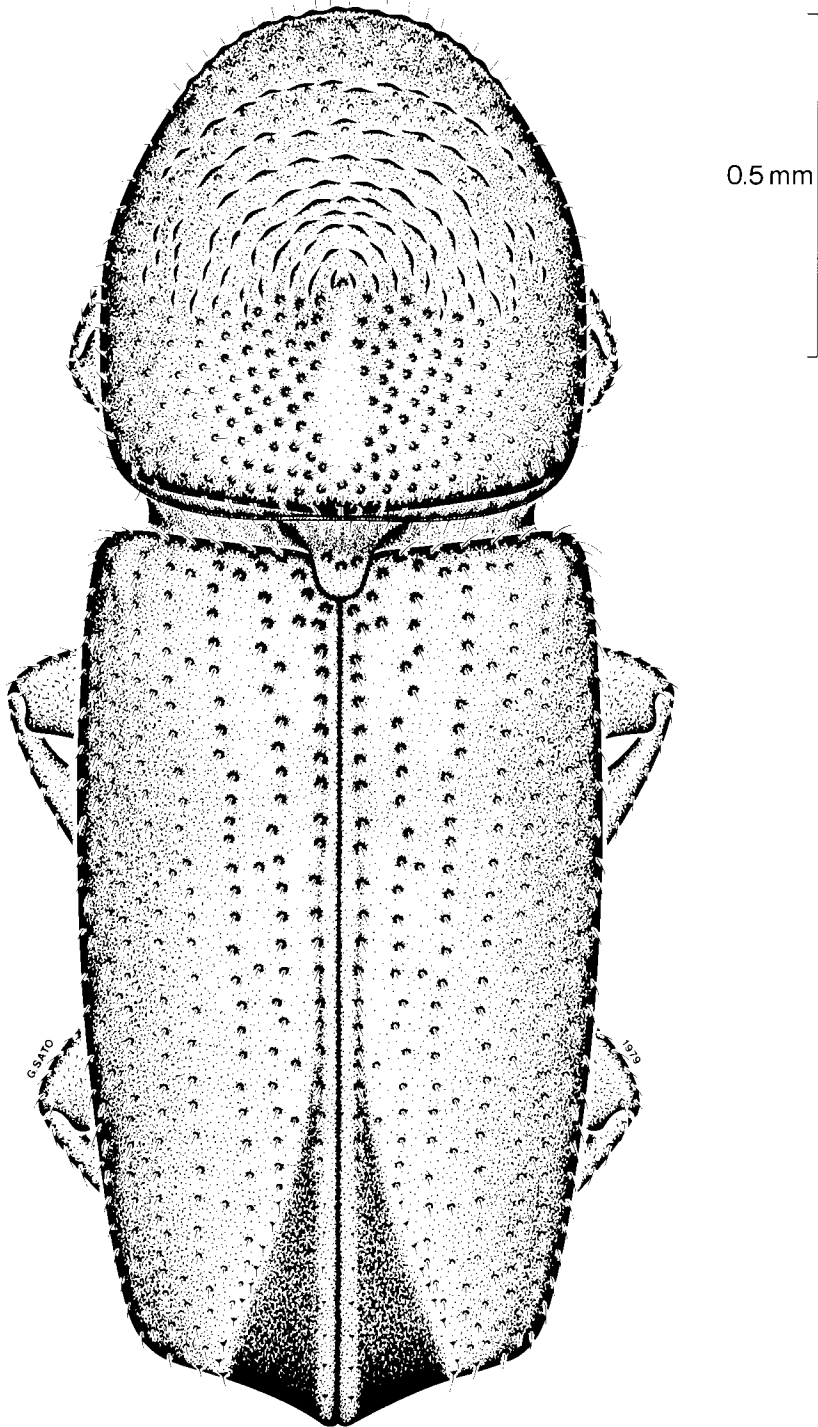


FIG. 7. *Pityophthorus bassetti* Blackman.

**Female.** Frons flattened on a semicircular area extending from the epistomal margin to well above upper level of eyes and laterally nearly from eye to eye; surface of flattened area very finely, densely punctured, clothed with long, yellowish setae, those on periphery longer and incurved; remainder of surface bearing a few, widely scattered punctures. Antennal club oval, about 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse, usually chitinized for entire length; segments 1 and 2 together occupy about half of total club length. Pronotum about as long as wide to 1.1 times longer than wide, widest at about middle; subparallel to weakly arcuate on posterior half; asperities on anterior slope rather large, erect, acute, arranged in no apparent order; summit distinctly elevated; posterior area of disc densely punctured, punctures large, deep, and close; surface between punctures shining, with numerous fine points. Elytra about 1.7 times longer than wide; apex weakly acuminate, very narrowly rounded; discal striae punctured in regular rows, punctures smaller and more shallowly impressed than those on posterior portion of pronotum; discal interstriae 1.5-2.0 times wider than striae, generally impunctate but sometimes a few punctures are placed near declivity, or infrequently, discal innerstriae 1, 3, 5, 7 may bear 1 or 2 setiferous punctures. Declivity moderately bisulcate; interstriae 1 weakly elevated, devoid of granules; interstriae 2 much broader than discal width, moderately impressed, surface opaque, densely marked with fine lines; interstriae 3 rather strongly elevated, distinctly higher than 1 on upper half, bearing about 7 very small, fine granules; punctures in striae 1 and 2 obsolete, not visible.

**Male.** Frons distinctly, moderately deeply, transversely impressed from epistoma to upper level of eyes, upper margin of impression strongly elevated forming a distinct, transverse, impunctate ridge; surface deeply, closely punctured (except on ridge) and bearing a few, scattered, inconspicuous setae. Pronotum and elytra essentially as in female except pronotal asperities and elytral striae punctures slightly larger. Declivity deeply impressed; interstriae 1 weakly elevated, devoid of granules except sometimes at apex; interstriae 2 essentially as in female; interstriae 3 strongly elevated, much higher than 1, bearing a median row of about 10 large, distinct granules.

**TYPE MATERIAL.** This species was described from an unrecorded number of specimens. The lectotype, designated by Bright (1976c), is a female in the USNM and bears the data: Pitkin, Colo./M.W. Blackman, collector/706/TYPE/ Type No. 56924 U.S.N.M./LECTOTYPE *Pityophthorus bassetti* Blackman, D.E. Bright 1976. Numerous specimens from Colorado were labeled paratypes by Blackman but are in fact paralectotypes.

**HOSTS.** *Picea engelmannii*, *glauca*, and *pungens*.

**DISTRIBUTION.** Western North America throughout range of host trees (Map 49). Specimens (99) examined from:

#### CANADA

**Northwest Territories:** Aklavik, 20.IX.30, O. Bryant (DEBC, SLWC) 68. **Yukon Territory:** Mile 37, Boundary Road, 12.VII.61, *Picea glauca* (PFRC) 2.

#### UNITED STATES

**Alaska:** Bonanza Creek, Fairbanks, Summer 1979 (INFA) 1. **Colorado:** Poudre Canyon, Pingree Park Road, Larimer Co., 14.VI.68, *Picea pungens*, S.L. Wood (SLWC) 2. **Utah:** Granddaddy Lakes, Uintah Mtns., V.M. Tanner (CASC) 4; Logan Canyon, 24.VII.46, *Picea engelmannii*, S.L. Wood (SLWC) 3; McKee Draw, Ashley National Forest, 16.VI.60, *Picea pungens*, S.L. Wood (SLWC) 14; Sanford Canyon, Dixie National Forest, 22.VI.60, *Picea pungens*, S.L. Wood (SLWC) 2.

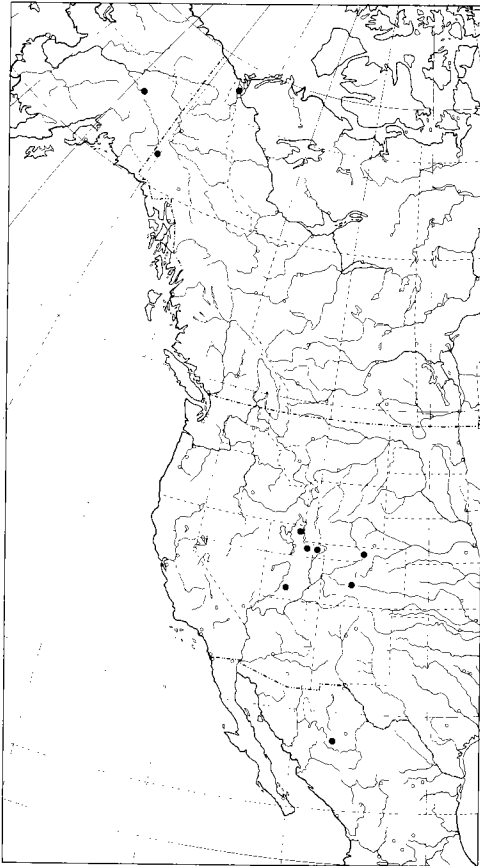
#### MEXICO

**Chihuahua:** La Laja, 16.VII.60, *Picea*, S.L. Wood (SLWC) 2.

**REMARKS.** Adults of *bassetti* are most easily recognized by the impunctate elytral interstriae, by the large punctures on the posterior portion of the pronotum, by the absence (or near absence) of granules on declivital interstriae 1 (Fig. 240),



and by the strongly elevated and strongly granulate declivital interstriae 3 of the male (Fig. 240).



MAP 49. Collection localities for *P. (Pityophthorus) bassetti*.

### 215. *Pityophthorus (P.) acutus* Blackman

Figs. 241-243; Map 50

*Pityophthorus acutus* Blackman, 1928, p. 134; Chamberlin, 1939, p. 398.

Length 1.9-2.4 mm, about 3.0 times longer than wide.

**Female.** Frons broadly flattened on a nearly circular area extending from epistoma to well above upper level of eyes and laterally occupying over 80% of the distance between eyes, surface very finely, densely punctured and setiferous, punctures very small, setae erect, of moderate length, those on periphery longer and incurved; surface above and lateral to flattened area smooth, with a few, widely scattered, large, deep punctures. Antennal club narrowly oval, 1.3-1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy more than half of total club length. Pronotum about 1.1-1.2 times longer than wide, widest at level of summit; sides subparallel to weakly arcuate on posterior half; asperities on anterior slope rather large, erect and acute, usually isolated but up to 3 or 4 may be basally contiguous, scattered in no apparent order; summit prominent; posterior area of disc distinctly punctured, punctures deep, rather large and widely separated; surface between punctures shining, sometimes bearing numerous, very fine points. Elytra about 1.8 times longer than wide; apex strongly acuminate; discal striae punctured in regular rows, punctures slightly larger and deeper than those on pronotum

and close; discal interstriae slightly wider than striae, impunctate except near declivity. Declivity steep, moderately bisulcate; interstriae 1 moderately elevated, bearing a median row of about 5 or 6 moderately large granules; interstriae 2 moderately deeply sulcate, very wide, surface shining with fine reticulations; interstriae 3 strongly elevated, equal in height to 1 on upper half, bearing a median row of moderately large granules and long setae; punctures in striae 1 and 2 indistinct but usually visible.

**Male.** Frons moderately, transversely impressed from epistoma to upper level of eyes, upper margin of impression distinctly elevated into an arcuate, transverse carina; surface of impression deeply, densely punctured and bearing moderately long, erect setae. Pronotum and elytra essentially as in female except punctures and asperities stronger. Declivity as in female except interstriae 3 more abruptly elevated, granules on 1 and 3 slightly larger and interstriae 2 slightly deeper.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Kaibab N.F., Ariz., 6-8-25/M.W. Blackman collector/N.Y.S. coll. For. Lot No. K-33/*Pinus ponderosa*/TYPE *Pityophthorus acutus* Blackman/Type No. 41321 U.S.N.M. The allotype and 15 paratypes bear the same data. Additional paratypes are: 17, same locality and host, under lot No. K-18, K-87 and K-88; 13, Montezuma N.F. 5-28-22/N.Y.S. coll. For. Lot No. 1349/A.F. Hough, collector; 19, various localities in Arizona and New Mexico.

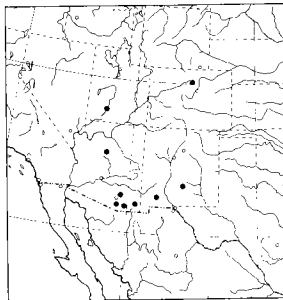
All type material is in the USNM.

**HOSTS.** *Pinus flexilis*, *leiophylla*, *ponderosa*, and *strobiformis*. *Pseudotsuga menziesii* is listed as a questionable host on one series.

**DISTRIBUTION.** Southwestern United States (Map 50). Specimens (101) examined from:

#### UNITED STATES

**Arizona:** Carr Canyon, Santa Cruz Co., 8.VIII.62, *Pinus flexilis*, S.L. Wood (SLWC) 1; Madera Canyon, Santa Rita Mtns., 29.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 1; Mount Lemmon, Santa Catalina Mtns., 31.VII.74, *Pinus leiophylla*, D.E. Bright (CNC) 10; Oak Creek Canyon, 30.VII.60, *Pinus ponderosa*, S.L. Wood (DEBC, SLWC) 5; Rustlers Park, Chiricahua Mtns., 26.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 14. **Colorado:** Estes Park, 6.VIII.58, D.E. Bright (DEBC) 6. **New Mexico:** Cloudcroft, 3.VI.69, *Pinus strobiformis*, S.L. Wood (SLWC) 2; Emory Pass, Sierra Co., 24.VII.74, *Pinus ponderosa*, D.E. Bright (CNC) 7. **Utah:** Sanford Canyon, Dixie National Forest, 22.VI.60, *Pseudotsuga taxifolia* (?), S.L. Wood (SLWC) 2.



MAP 50. Collection localities for *P. (Pityophthorus) acutus*.

**BIONOMICS.** Blackman (1928) stated that this species was common on the Kaibab Plateau in twigs of trees killed by *Dendroctonus ponderosae*. Adults were found in twigs from ¼ to 3 in. in diameter.

REMARKS. The adults of this species are very much like those of a miniature *spadix*. The steep, moderately sulcate elytral declivity with the strongly elevated and granulate first and third interstriae (Fig. 243) and the small size will distinguish adults of *acutus* from those of all other species.

216. *Pityophthorus (P.) delicatus* Wood

*Pityophthorus delicatus* Wood, 1978b, (1969), p. 399.

Length 1.6-2.3 mm, about 2.9-3.0 times longer than wide.

**Female.** Frons broadly flattened to weakly planoconcave on a semicircular area extending from epistoma to well above eyes, about one-third to one-half of flattened area above eyes; surface minutely punctured, with densely placed, short setae over entire flattened area, those setae on periphery much longer and incurved. Antennal club oval, about 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 weakly arcuate, transverse; segments 1 and 2 together occupy slightly more than half of total club length. Pronotum about 1.1 times longer than wide, widest at posterior angle; sides subparallel; asperities on anterior slope rather large, erect, isolated, scattered in no apparent order; summit distinct; posterior area of disc strongly punctured, punctures rather large, close and deeply impressed, lateral or posterior margins frequently elevated or armed by a minute granule; surface between punctures shining, with numerous fine points and/or lines, sometimes appearing subgranulose. Elytra about 1.8-1.9 times longer than wide; apex strongly acuminate; discal striae punctured in regular rows, punctures about equal in size and depth to those on pronotum; discal interstriae about 1.5 times wider than striae, surface smooth and shining, with a median row of setiferous punctures in all except 4, 6, and 8, setae erect. Declivity narrowly bisulcate; interstriae 1 weakly elevated, with a median row of fine, setiferous granules; interstriae 2 moderately sulcate, distinctly wider than discal width, surface as on disc except devoid of setae and punctures; interstriae 3 moderately elevated, as high as 1 on upper half, bearing a median row of small, setiferous granules, setae longer than on disc on both 1 and 3; punctures in striae 1 and 2 indistinct.

**Male.** Similar to female except frons transversely impressed from epistoma to upper level of eyes, with a weakly elevated transverse carina on upper margin of impression, surface sparsely pubescent; posterior portion of pronotum more strongly rugose; declivity more deeply sulcate, granules on interstriae 1 and 3 larger.

**TYPE MATERIAL.** The holotype (♀) is in the SLWC and bears the data: 35 mi. SW El Salto, Durango, Mexico, VII-23-53, 8400 ft./Taken on *Pinus* sp./**HOLOTYPE** *Pityophthorus delicatus* S.L. Wood 1978. The allotype and 2 paratypes bear the same data. Forty-eight paratypes from localities from Durango to Honduras were also designated.

All of the type material is in the SLWC.

**HOSTS.** Recorded from *Pinus ayacahuite*, *leiophylla*, *oocarpa*, and *tenuifolia*. Probably occurs in many species of pines in its range.

**DISTRIBUTION.** Known from Durango to Honduras. Specimens (40) examined from:

**Chiapas:** 8 mi E of San Cristobal (de las Casas), 6.VI.69, *Pinus ayacahuite*, D.E. Bright (CNC) 39. **Durango:** 23 mi W of Durango, 4.VI.65, *Pinus leiophylla*, S.L. Wood (SLWC) 1.

**REMARKS.** Adults of this species are most easily recognized by the following combinations of characters: the broadly flattened to planoconcave, densely pubescent female frons, the presence of minute granules or uplifted edges on the punctures on the posterior portion of the pronotum, the moderately strong transverse impression on the male frons, and the declivital characters as brought out in the diagnosis.

217. *Pityophthorus (P.) cuspidatus* Blackman

*Pityophthorus cuspidatus* Blackman, 1942, p. 217.

Length 1.8-2.2 mm, about 3.0 times longer than wide.

**Female.** Frons broadly flattened on a semicircular area extending from epistoma to well above upper margin of eyes, laterally occupying about 85% of distance between eyes; surface of flattened area shining and finely, densely punctured, bearing abundant, long setae, those on periphery incurved. Antennal club oval, 1.2 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy slightly more than half of total club length. Pronotum 1.1-1.2 times longer than wide; sides weakly arcuate on posterior half; asperities on anterior slope moderately elevated, rather small, usually isolated but several may be basally contiguous, scattered in no apparent order; summit prominently elevated; posterior area of disc densely punctured, punctures large, deep and close with lateral margin very weakly elevated; surface between punctures shining, densely micro-punctate or with fine lines. Elytra about 1.9 times longer than wide; apex distinctly acuminate; discal striae punctured in somewhat irregular rows, punctures slightly larger and deeper than those on posterior portion of pronotum; discal interstriae about as wide as striae, generally impunctate but occasionally 1 or 2 punctures may be seen, surface of interstriae moderately shining, with numerous fine lines or points. Declivity sloping, weakly bisulcate; interstriae 1 rather broad, moderately elevated, bearing a median row of very fine granules; interstriae 2 broader than discal width, weakly sulcate, surface as on disc; interstriae 3 weakly elevated, as high as 1, bearing a row of very fine granules; punctures in striae 1 and 2 indistinct, much smaller than those on disc in 2.

**Male.** Frons weakly, transversely impressed on lower half, upper margin of impression usually distinctly elevated into a transverse carina; surface deeply, densely punctured. Pronotum and elytra essentially as in female. Declivity as in female except interstriae 2 slightly more deeply impressed.

**TYPE MATERIAL.** The holotype (♀) is deposited in the USNM and bears the data: 663-6/ Jacala, V.C. 1-18-36/*Pinus lawsoni*/D. De Leon, colr./Type No. 55991 U.S.N.M. The allotype and 12 paratypes bear the same data.

All type material is in the USNM.

**HOSTS.** *Pinus lawsoni*, *ponderosa*, and *strobiformis* and probably other species of pines in its range.

**DISTRIBUTION.** Arizona to Veracruz. Specimens (46) examined from:

**UNITED STATES**

**Arizona:** Rucker Canyon, Chiricahua Mtns., 21.VII.68, *Pinus ponderosa*, D.E. Bright (CNC) 18; Rustler Park, Cochise Co., 19.VII.68, *Pinus strobiformis*, D.E. Bright (CNC) 12.

**MEXICO**

**Jalisco:** 14 mi NW of Guadalajara, 19.VII.53, *Pinus*, S.L. Wood (SLWC) 1. **Veracruz:** See type material.

**REMARKS.** Adults of this species resemble those of *acutus* but may be distinguished by the less deeply sulcate elytral declivity and by the narrower second declivital interstriae.

218. *Pityophthorus (P.) clarus* Blackman

*Pityophthorus clarus* Blackman, 1928, p. 130; Chamberlin, 1939, p. 397.

Length 1.9-2.2 mm, 2.8 times longer than wide.

**Female.** Frons weakly to moderately flattened on a vague semicircular area extending from epistomal margin to slightly above upper level of eyes, laterally occupying about 70% of distance between eyes; surface densely, finely punctured, punctures of moderate size and almost touching; frequently a fine, longitudinal carina is evident or at least an indication

of a carina is visible; median portion of upper margin of impression frequently bears a small, weakly elevated, impunctate callus; setae moderately abundant to rather sparse, those on periphery slightly longer and incurved; area above and lateral to flattened area smooth, shining, with scattered, large, deep, punctures. Antennal club about 1.5 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy about half of total club length. Pronotum less than 1.1 times longer than wide, widest at about middle; sides distinctly but weakly arcuate; asperities on anterior slope low, broad, scattered in no apparent order; summit distinct but not high; posterior area of disc densely punctured, punctures large, deep, and close; surface between punctures shining, smooth to minutely reticulate. Elytra 1.6-1.7 times longer than wide; apex weakly acuminate; discal striae punctured in regular rows, punctures equal to or slightly larger than those on posterior portion of pronotum, rather deeply impressed and almost touching; discal interstriae about as wide as striae, smooth or bearing numerous, very fine points or lines, frequently interstriae 1, 3, 5, 7, 9 each bear from 1-3 large, setiferous punctures equal in size to those in striae. Declivity steep, moderately bisulcate; interstriae 1 moderately, acutely elevated, equal in height to slightly higher than 3, bearing a median row of about 5 very small, acute granules, each with a long seta on posterior margin; interstriae 2 only slightly wider than discal width, slightly wider than 1, moderately impressed, surface dull, densely microreticulate; interstriae 3 moderately elevated, bearing a median row of about 5 very small granules, these about equal to or slightly smaller than those in interstriae 1; punctures in striae 1 and 2 generally distinct, smaller and shallower than those on disc.

**Male.** Frons deeply, transversely impressed from epistoma to upper level of eyes, median portion of upper margin of impression strongly elevated, impunctate on a subtriangular area; surface of impression densely, rather deeply punctured. Pronotum and elytra and essentially as in female except asperities and punctures stronger. Declivity essentially as in female except interstriae 2 slightly more deeply impressed and granules on interstriae 1 and 3 slightly larger.

**TYPE MATERIAL.** The holotype (♀) is in the USNM and bears the labels: Kaibab N.F., Ariz., 8-10-25/M.W. Blackman, collector/K-1131 *Pinus ponderosa*/TYPE *Pityophthorus clarus* Blackman/Type No. 41328 U.S.N.M. The allotype and 61 paratypes bear the same labels. Two additional paratypes bear the same locality, host, and collector labels but were collected on "8-17-25".

Most of the type material is in the USNM, additional paratypes are in the CNC and the DFEC.

**HOSTS.** Recorded from *Pinus leiophylla* and *ponderosa*. Probably occurs in other pine species in its range.

**DISTRIBUTION.** Arizona. Specimens examined (84) from:

#### UNITED STATES

**Arizona:** Miller Canyon, Huachuca Mtns., 23.VII.68, *Pinus leiophylla*, D.E. Bright (CNC) 19.

**REMARKS.** This species is sympatric over much of its range with *acutus* and *solers*. Adults of *clarus* are most easily distinguished from those of *acutus* by the much less strongly acuminate elytral apex, by the much steeper elytral declivity, by the very sparsely punctured elytral interstriae and by the characters of the female frons as mentioned in the key and description. From *solers*, adults of *clarus* are distinguished by the differences in the female frons as mentioned in the respective descriptions, by the punctured elytral interstriae, and by the different host.

#### 219. *Pityophthorus (P.) solers* Blackman

Figs. 244-246; Map 51

*Pityophthorus solers* Blackman, 1928, p. 138; Chamberlin, 1939, p. 401.

Length 1.8-2.5 mm, about 2.7 times longer than wide.

**Female.** Frons flattened to weakly planoconcave on a broad area extending from epistoma to only slightly above upper margin of eye, laterally occupying about 80% of distance between eyes; surface densely punctured, punctures larger and deeper than on related species, setae somewhat shorter and finer. Antennal club oval, about 1.4 times longer than wide, widest through segment 2; sutures 1 and 2 transverse; segments 1 and 2 together occupy slightly more than half the total club length. Pronotum about 1.1 times longer than wide, widest at middle; sides weakly arcuate to subparallel on posterior half; asperities on anterior slope large, erect, isolated, arranged in no apparent order; summit distinct; posterior portion of disc deeply punctured, punctures very large and deep; surface between punctures shining, with numerous fine points. Elytra about 1.7 times longer than wide; apex weakly acuminate; discal striae punctures in regular rows, punctures about equal in size and shallower than those on posterior surface of pronotum; discal interstriae about equal in width to striae or slightly wider, impunctate, except sometimes near declivity, the surface opaque, marked with fine lines and points or fine microreticulation. Declivity moderately to shallowly bisulcate; interstriae 1 moderately elevated, equal in height to 1, with a median row of about 7 small granules; interstriae 2 broader than discal width, moderately to shallowly impressed, surface opaque, densely microreticulate; interstriae 3 slightly elevated, equal in height to 1, bearing a median row of about 6 small granules, these about equal in size to those in interstriae 1; punctures in striae 1 and 2 obsolete, only slightly visible in 2.

**Male.** Frons transversely impressed on lower half, upper margin of impression elevated into a arcuate carina; surface deeply, densely punctured. Pronotum and elytra as described for female except asperities slightly larger and punctures slightly larger and deeper. Declivity slightly more deeply bisulcate; interstriae 1 and 3 more distinctly elevated and granules larger.

**TYPE MATERIAL.** The holotype (♀) in the USNM bears the data: Hopk U.S. 3979/W.F. Fiske, collector/Cloudcroft, N.M./*Abies concolor*/TYPE Pityophthorus solers Blackman/Type No. 41323 U.S.N.M. The allotype and 5 paratypes bear the same labels. Numerous paratypes are from: Cloudcroft, N. Mex., *Abies magnifica* and *Pseudotsuga taxifolia*; Meek, N. Mex., *Abies concolor*; Capitan Mtns., N. Mex., *Abies concolor* and *Pseudotsuga taxifolia*; Sta. Catalina Mtns., Ariz., *Abies concolor*; Sacramento Mtns., N. Mex., *Abies concolor*.

**HOSTS.** *Abies concolor*, *lasiocarpa*, and *magnifica*; *Picea engelmannii* and *Pseudotsuga menziesii*.

**DISTRIBUTION.** Southwestern United States into northern Mexico (Map 51). Specimens (533) examined from:

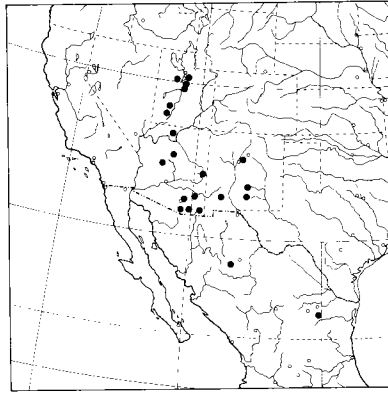
#### UNITED STATES

**Arizona:** Alpine 11.VII.68, *Pseudotsuga menziesii*, D.E. Bright (CNC) 3; Bear Wallow, Santa Catalina Mtns., 11.VI.69, *Pseudotsuga taxifolia*, S.L. Wood (SLWC) 17; 13 mi S of Flagstaff, 14.VIII.68, *Pseudotsuga menziesii* (CNC) 5; Graham Mtns., 5.VIII.60, *Abies* sp., S.L. Wood (DEBC) 4; Hospital Flat, Pinaleno Mtns., 3.VIII.65, *Abies* sp., H.B. Leech (CNC) 3; Jacob Lake, 31.V.69, *Abies concolor*, W. Harwood (SLWC) 6; Miller Canyon, Huacahua Mtns., 23.VII.68, *Pseudotsuga menziesii*, D.E. Bright (CNC) 34; Mount Lemmon, Pima Co., 5.VIII.68 and 31.VII.74, *Abies lasiocarpa*, D.E. Bright (CNC) 83; Pinery Canyon, Chiricahua Mtns., 20.VII.68, *Pseudotsuga menziesii*, D.E. Bright (CNC) 27; 9 mi S and 5 mi E of Prescott, 5.VI.69, *Abies concolor*, W. Harwood (SLWC) 17; Rustlers Park, Chiricahua Mtns., 26.VII.74, *Pseudotsuga menziesii*, D.E. Bright (CNC) 7; Santa Catalina Mtns., 5.VIII.68, *Pseudotsuga menziesii*, D.E. Bright (CNC) 3; Santa Rita Mtns., Santa Cruz Co., 29.VII.68, *Picea engelmannii*, D.E. Bright (CNC) 1; 3 mi SW of Walker, 3.VIII.62, *Abies lasiocarpa*, S.L. Wood (SLWC) 25. **New Mexico:** Cloudcroft (and environs), various dates, 1969-74, *Abies concolor* or *Pseudotsuga menziesii*, D.E. Bright or S.L. Wood (CNC, SLWC) 103; Emory Pass, 24.VII.74, *Pseudotsuga menziesii*, D.E. Bright (CNC) 15; Sandia Mtns., 30.V.69, *Pseudotsuga taxifolia*, S.L.

Wood (SLWC) 1. **Utah:** Alta, 24.VIII.57, *Abies concolor*, D.E. Bright (DEBC) 6; Beaver, 21.IV.50, *Abies concolor*, S.L. Wood (SLWC) 1; Hobble Creek Canyon, Utah Co., 14.VI.60, *Abies concolor*, D.E. Bright (DEBC) 4; Nebo Loup Road, Utah Co., 19.VII.58, *Abies concolor*, D.E. Bright (DEBC) 2; Parawan Canyon, Iron Co., 20.VI.60, *Abies concolor*, S.L. Wood (SLWC) 1; Payson Canyon, Utah Co., 14.V.60, *Abies concolor*, D.E. Bright (DEBC) 48; Pin Hollow, Fishlake National Forest, 9.VI.60, *Abies concolor*, S.L. Wood (SLWC) 2; Provo Canyon, 12.IV.57, H.P. Shurtlett (DEBC) 2; Tooele Canyon, Tooele Co., 30.IV.58, *Abies concolor*, D.E. Bright (CNC) 14.

#### MEXICO

**Chihuahua:** San Juanito, 16.III.74, *Pseudotsuga menziesii* or *Pinus* (?), M.M. Furniss (SLWC) 4. **Nuevo León:** Cerro Potosi, 2-3.V.71, *Pseudotsuga menziesii* or *Abies* sp., D.E. Bright (CNC) 88.



MAP 51. Collection localities for *P. (Pityophthorus) solers*.

**REMARKS.** This species is sympatric with *acutus* but the adults of *solers* can be distinguished by the much less strongly acuminate elytral apex (Fig. 246), by the smaller flattened and pubescent area on the female frons (Fig. 244), and by the host. *P. solus* is most closely related to *solatus* and the characters given in the key should readily distinguish the two species.

This species is common in *Abies concolor* and *Pseudotsuga menziesii* in the southwestern United States.

#### 220. *Pityophthorus (P.) solatus* Wood

*Pityophthorus solatus* Wood, 1977a, p. 215.

Length 1.9-2.2 mm, about 2.7 times longer than wide.

**Female.** Frons as described for *solers* except flattened area extending further above upper margin of eyes, vestiture more abundant and longer. Antennal club as in *solers*. Pronotum as in *solers* except punctures on posterior area of disc deeper and closer. Elytra as in *solers* except surface of discal interstriae smoother. Declivity as in *solers* except interstriae 2 more strongly impressed, broader and more strongly reticulate; granules on interstriae 1 and 3 larger and more distinct, vestiture distinctly longer.

**Male.** As described for *solers* except elytral declivity narrower and interstriae 1 and 3 more strongly elevated.

**TYPE MATERIAL.** The holotype (♀) is in the CNC and is labeled: MEX., Oax., 51 mi. NW Oaxaca, V.IV.71, 7500', D.E. Bright/Quercus/HOLOTYPIC *Pityophthorus solatus* S.L. Wood. The allotype and 12 paratypes bear the same data. Two additional specimens, not designated as paratypes, bear the same data.

Most of the type material is in the CNC, additional paratypes are in the SLWC.

HOSTS. *Pinus lawsoni* and other species of pines (see remarks).

DISTRIBUTION. Known only from Oaxaca. Specimens examined from:

MEXICO

**Oaxaca:** 3.5 mi S of Suchixtepec, *Pinus lawsoni*, D.E. Bright (CNC) 2.

REMARKS. The host label on the type series of this species is "Quercus" and is an obvious labeling error. Because of the two additional specimens mentioned above and because of relationships of *solatus*, the host should be considered to be *Pinus* species.

This species is closely related to *solers* and the adults of *solatus* may be distinguished by the characters in the key and diagnosis.

INCERTAE SEDIS

*Pityophthorus novellus* Blackman, 1928, p. 96; Bright, 1971, p. 68 (= *tuberculatus*).

This species was described from three callow, completely distorted and shriveled specimens from *Pinus sabiniana* at Tehachapi, California. No subsequently collected specimens have been referred to it. After an examination of the allotype and the female paratype, I placed it in synonymy under *P. tuberculatus* (Bright 1971). The male allotype was unrecognizable but the female paratype retained enough characters to definitely establish that it was *tuberculatus*. However, a recent examination of the female holotype showed that it was *not* the same species as the female paratype. The synonymy is therefore in error. The frons of the holotype is completely pubescent and there is no tubercle or projection on the lateral margin of the oral cavity. The holotype is in very poor condition but seems to resemble the female of *pseudotsugae* Swaine or *infulatus* Blackman. Based on host and locality, the most likely of these is *infulatus*. No synonymy is proposed at this time. Additional specimens from the same host and locality must be obtained.

*Pityophthorus timidus* Blandford, 1904, p. 241.

This species was described from one specimen from Cordova, Mexico. The type has been examined but proper placement is at present not possible.

The type is in good condition but the frons is not readily visible. Therefore, the sex is not known but I believe it to be a female. The pronotum is narrowly rounded at the anterior margin but it is possible that this condition is caused by the differential drying of the specimen rather than an actual condition of the species. The pronotal asperities are in fairly regular concentric rows, the elytral apex is rounded, and the stria punctures on the declivity are fairly distinct. I would place this species near *sambuci* but the adults differ from those of *sambuci* by the more deeply impressed second declivital interstriae and by the smaller body size.

*Pityophthorus cincinnatus* Blandford, 1904, p. 242.

This species was described from one specimen from Quiche Mountains, Guatemala. When the holotype was received on loan from the British Museum (Natural History), the head and pronotum were broken off and missing. Accurate placement of the species therefore becomes very difficult if not impossible.

The remaining elytra appear to be identical with a species I described as *Pseudopityophthorus montanus* which Wood (1973) placed as a synonym of *P. hondurensis* Wood. The original description of *cincinnatus* also closely matches specimens of *montanus* except that the size stated for *cincinnatus* is 2.2 mm whereas the maximum size of *montanus* (*hondurensis*) is only 2.0 mm.

Since there is a question about the placement of *cincinnatus*, I recommend placing the species in incertae sedis until more information is available. Wood (pers. comm.) places this species in *Pseudopityophthorus*.



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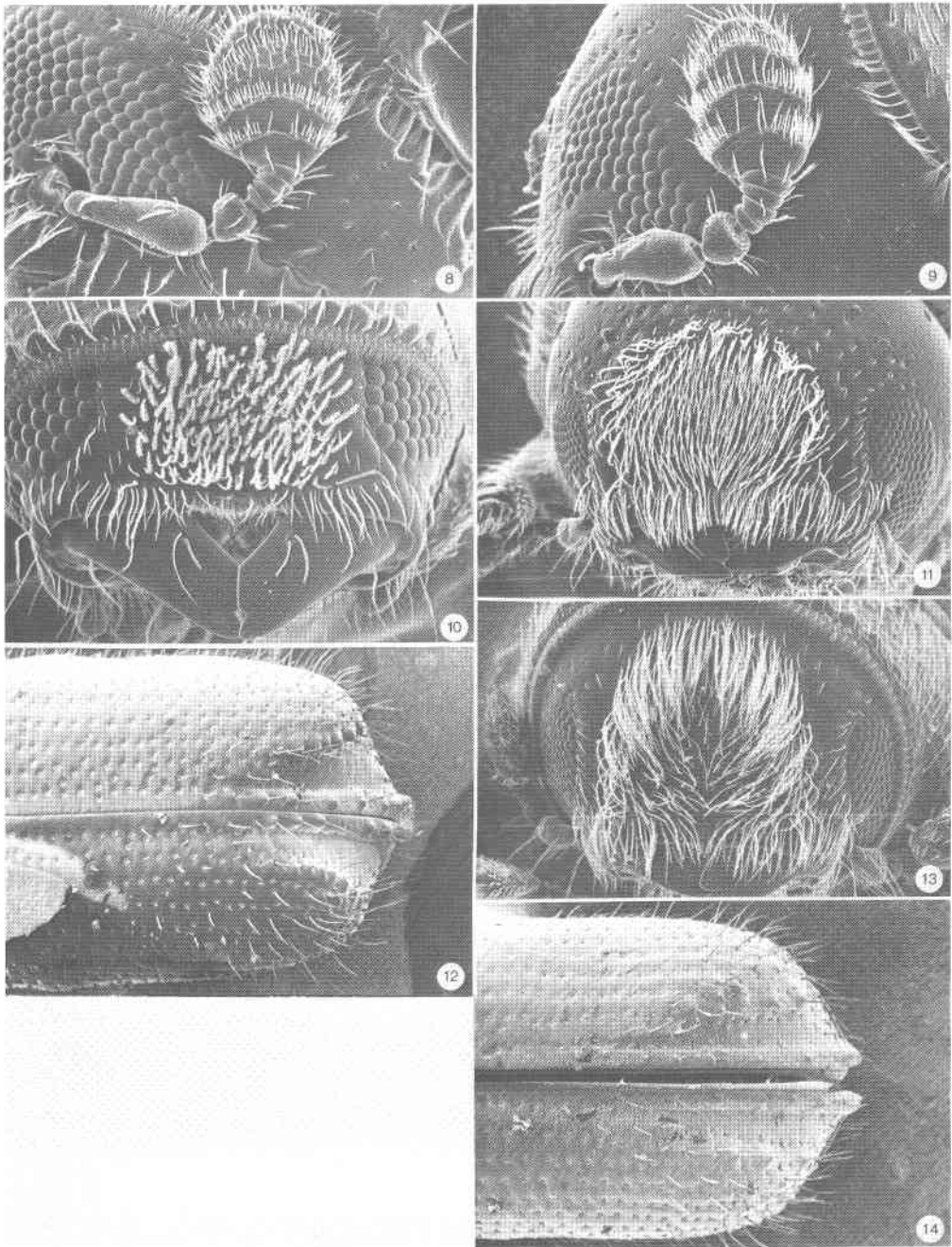
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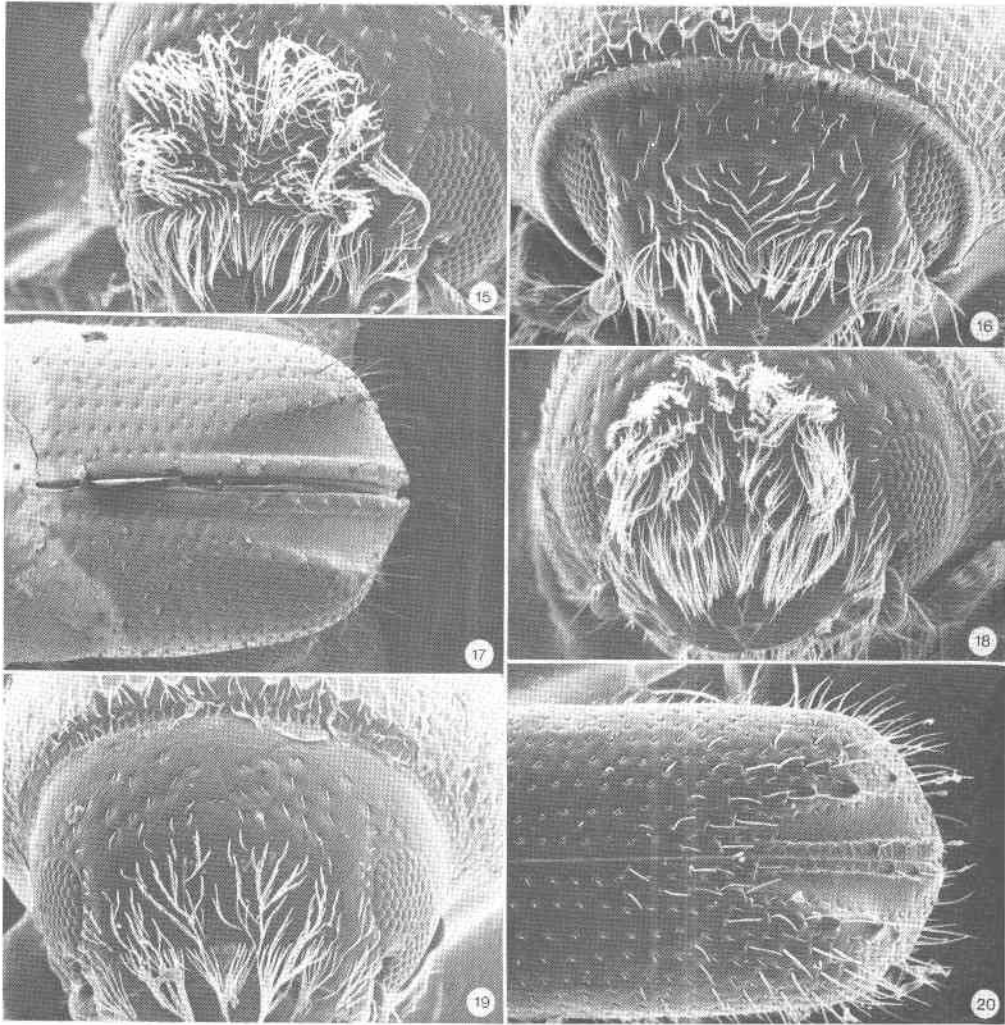
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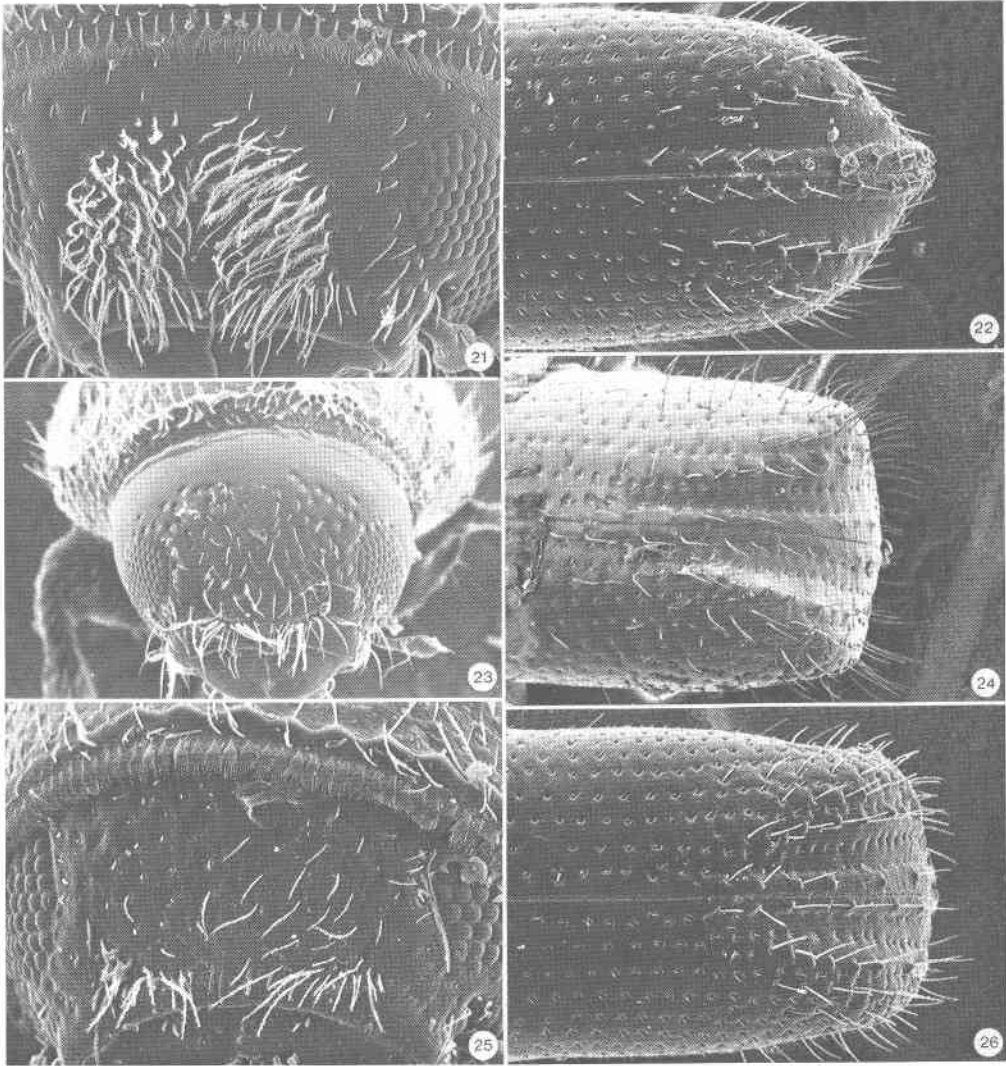
Figures 8-246



FIGS. 8-14. 8, antenna of *P. nitidus*; 9, antenna of *P. pulchellus pulchellus*;  
 10, frons and mandibles of ♀ *P. shannoni*; 11-12, *P. mexicanus*: 11, ♀ frons; 12, ♂ declivity.  
 13-14, *P. coronarius*: 13, ♀ frons; 14, ♂ declivity.

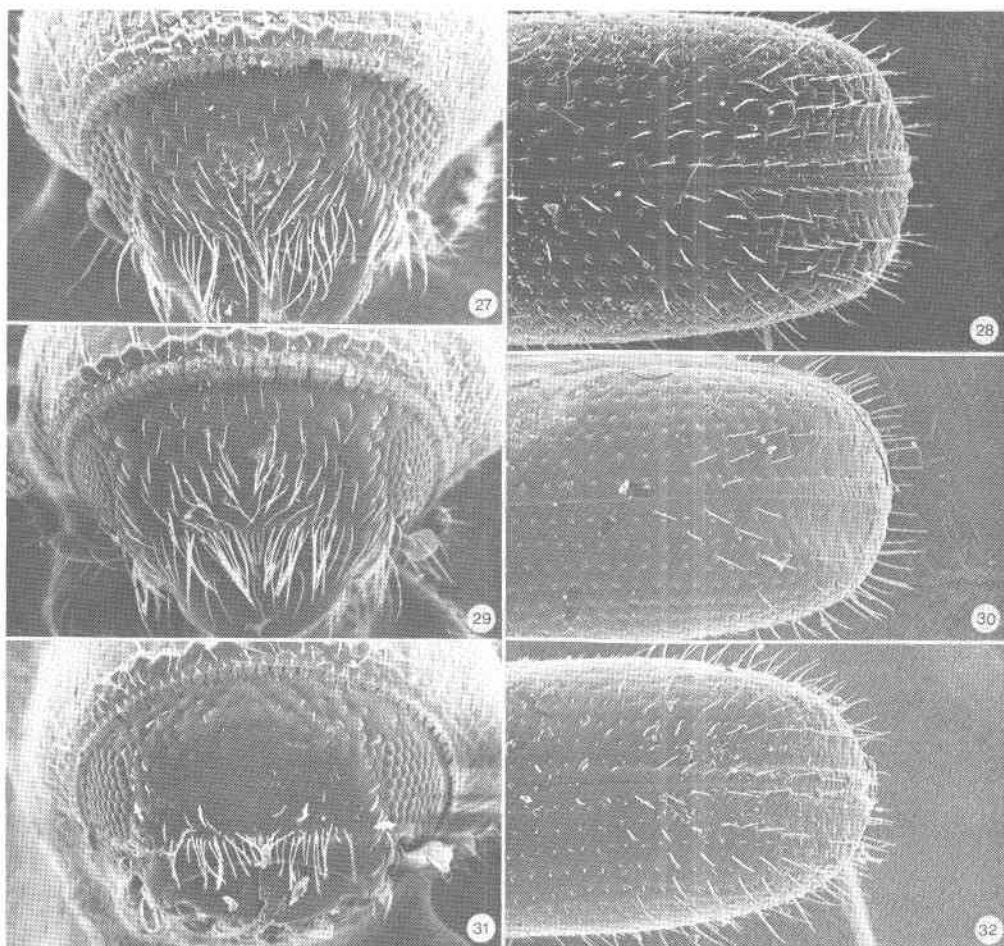


FIGS. 15-20. 15-17, *P. arcanus*: 15, ♀ frons; 16, ♂ frons; 17, ♂ declivity.  
 18-20, *P. virilis*: 18, ♀ frons; 19, ♂ frons; 20, ♂ declivity.

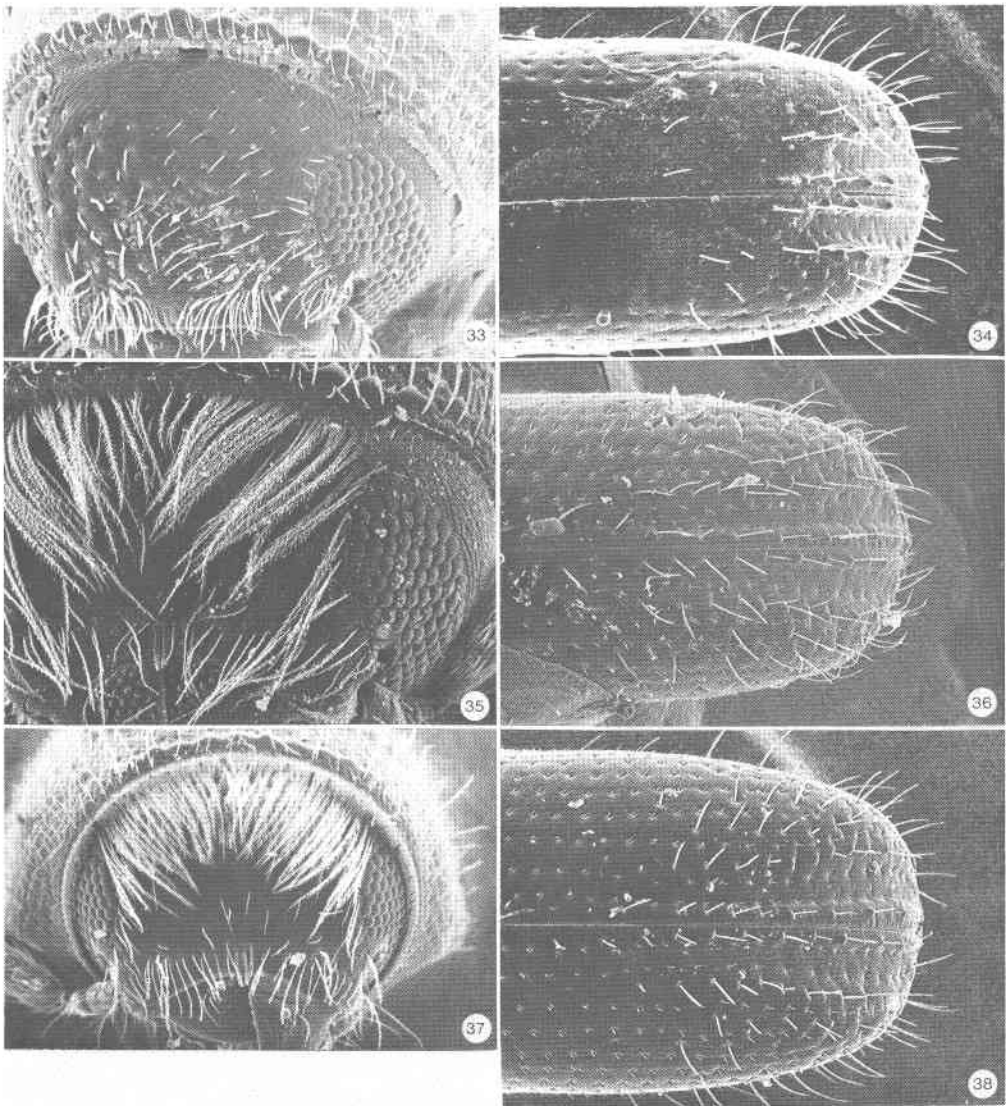


FIGS. 21-26. 21-22, *P. attenuatus*: 21, ♀ frons; 22, ♂ declivity. 23-24, *P. obtusipennis*: 23, ♀ frons; 24, ♂ declivity. 25-26, *P. occultus*: 25, ♀ frons; 26, ♂ declivity.

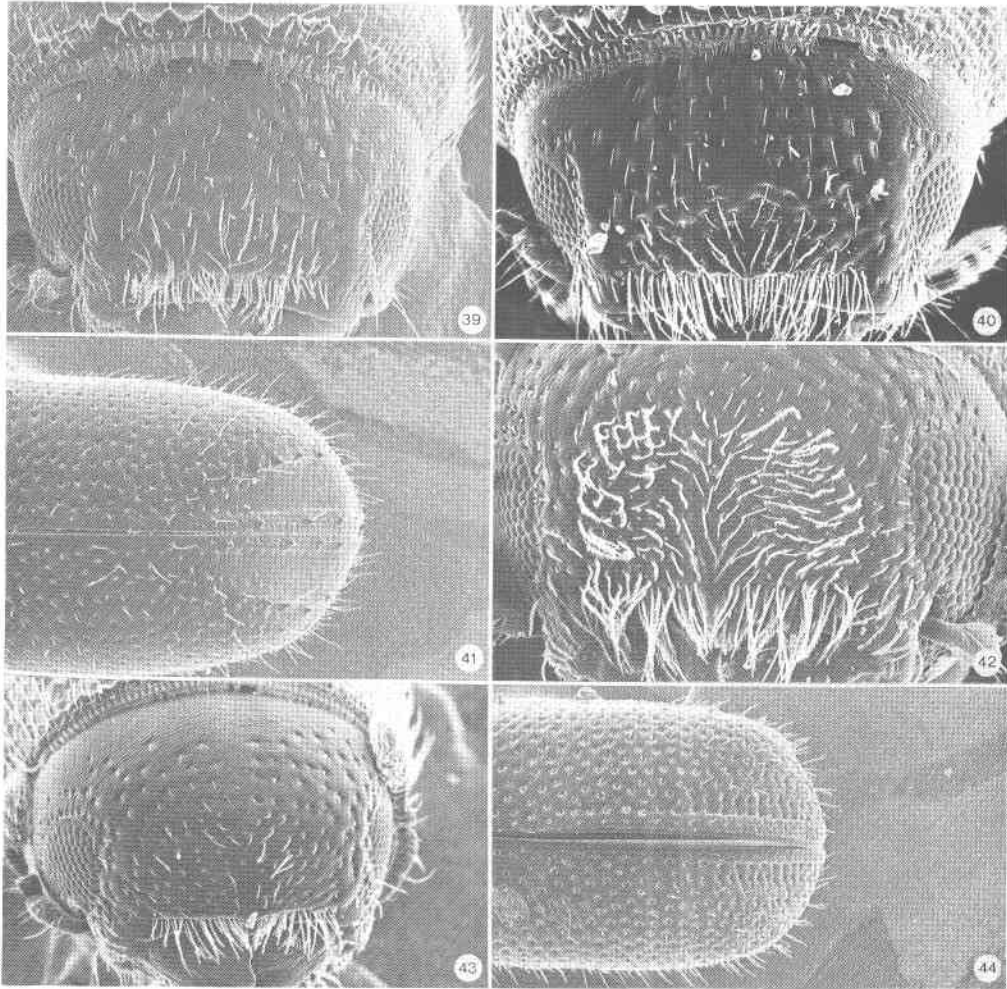




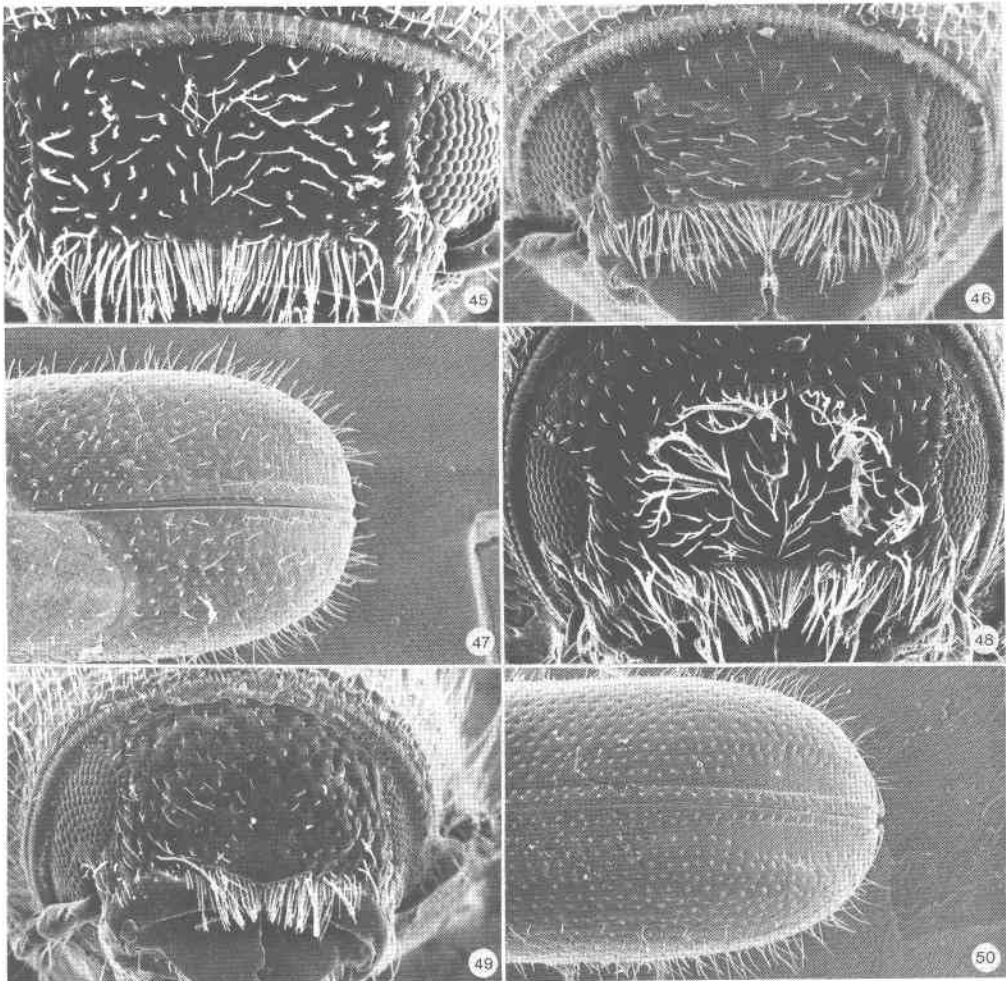
FIGS. 27-32. 27-28, *P. centralis*: 27, ♀ frons; 28 ♂ declivity. 29-30, *P. sambuci*: 29, ♀ declivity.  
31-32, *P. lautus*: 31, ♀ frons; 32, ♂ declivity.



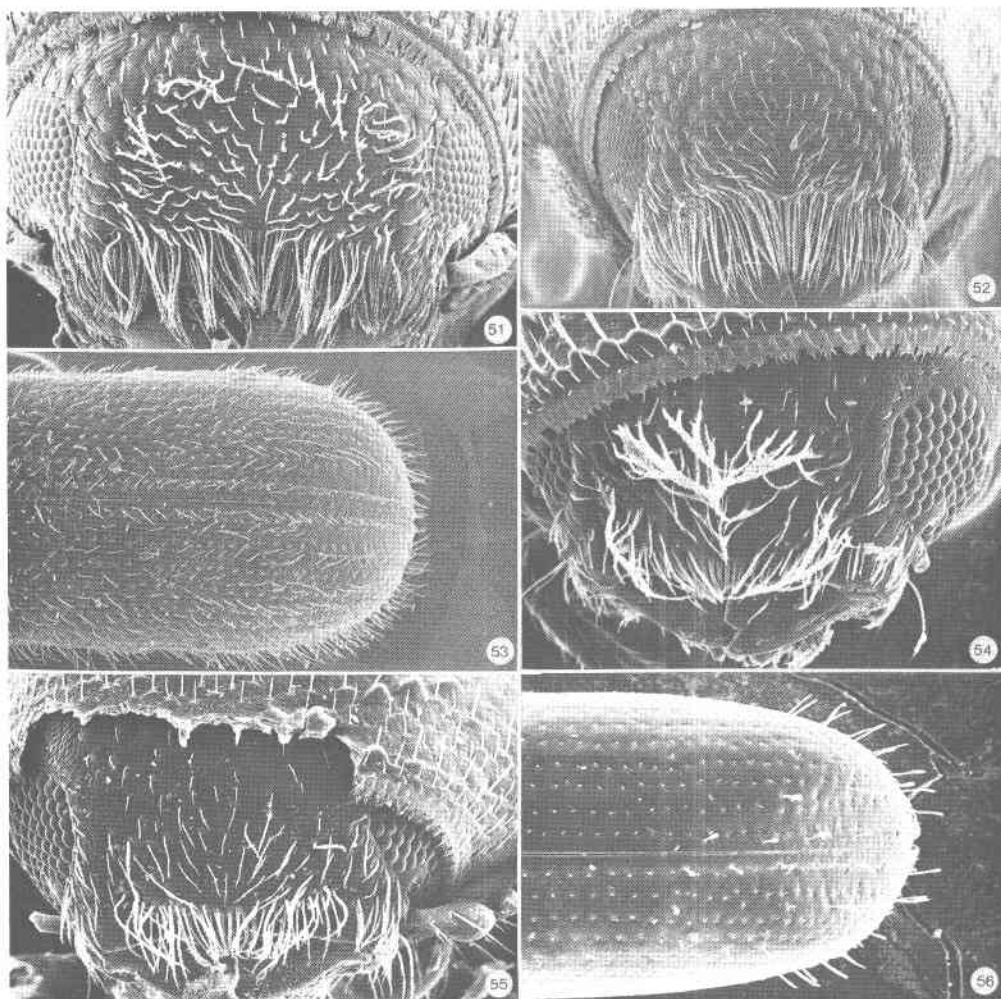
FIGS. 33-38. 33-34, *P. morosus*: 33, ♀ frons; 34, ♂ declivity. 35-36, *P. liquidambaris*: 35, ♀ frons; 36, ♂ declivity. 37-38, *P. crinalis*: 37, ♀ frons; 38, ♂ declivity.



FIGS. 39-44. 39-41, *P. barberi*: 39, ♀ frons; 40, ♂ frons; 41, ♀ declivity.  
 42-44, *P. pulicarius*: 42, ♀ frons; 43, ♂ frons; 44, ♀ declivity.

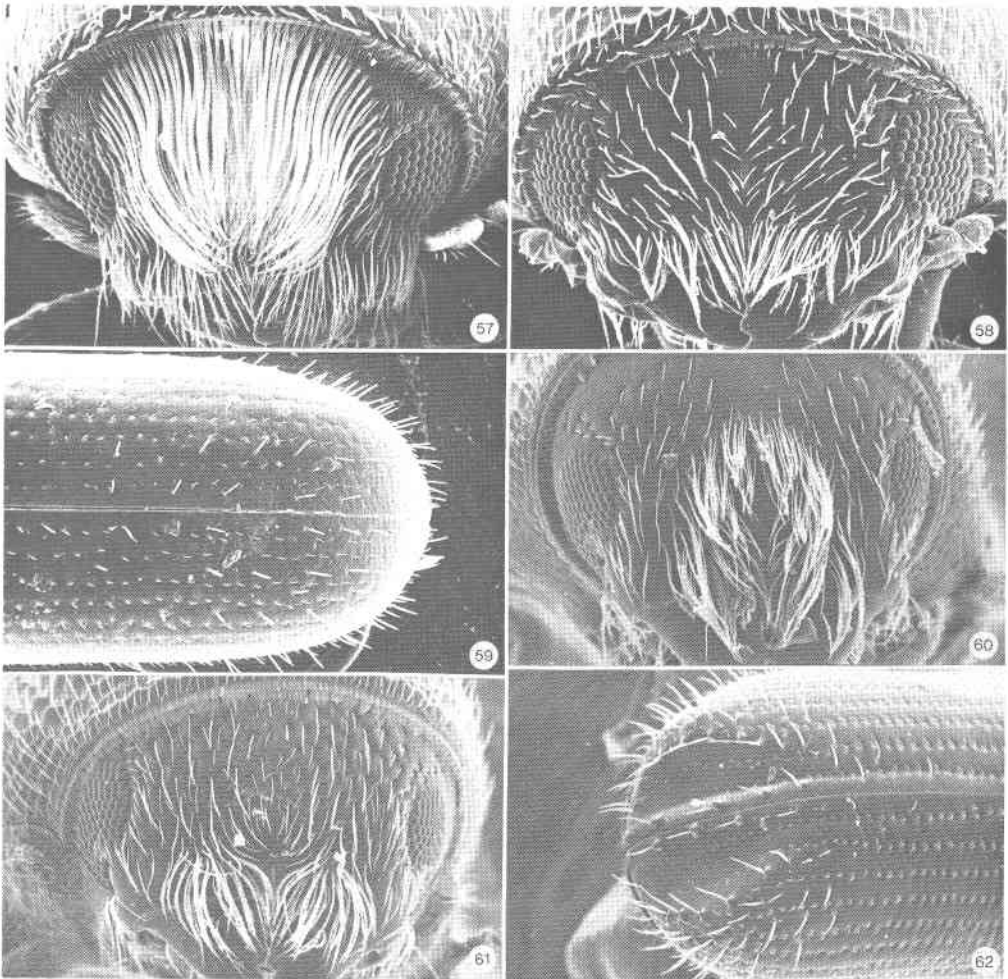


FIGS. 45-50. 45-47, *P. schwerdfegeri*: 45, ♀ frons; 46, ♂ frons; 47, ♂ declivity.  
48-50, *P. aztecus*: 48, ♀ frons; 49, ♂ frons; 50, ♂ declivity.

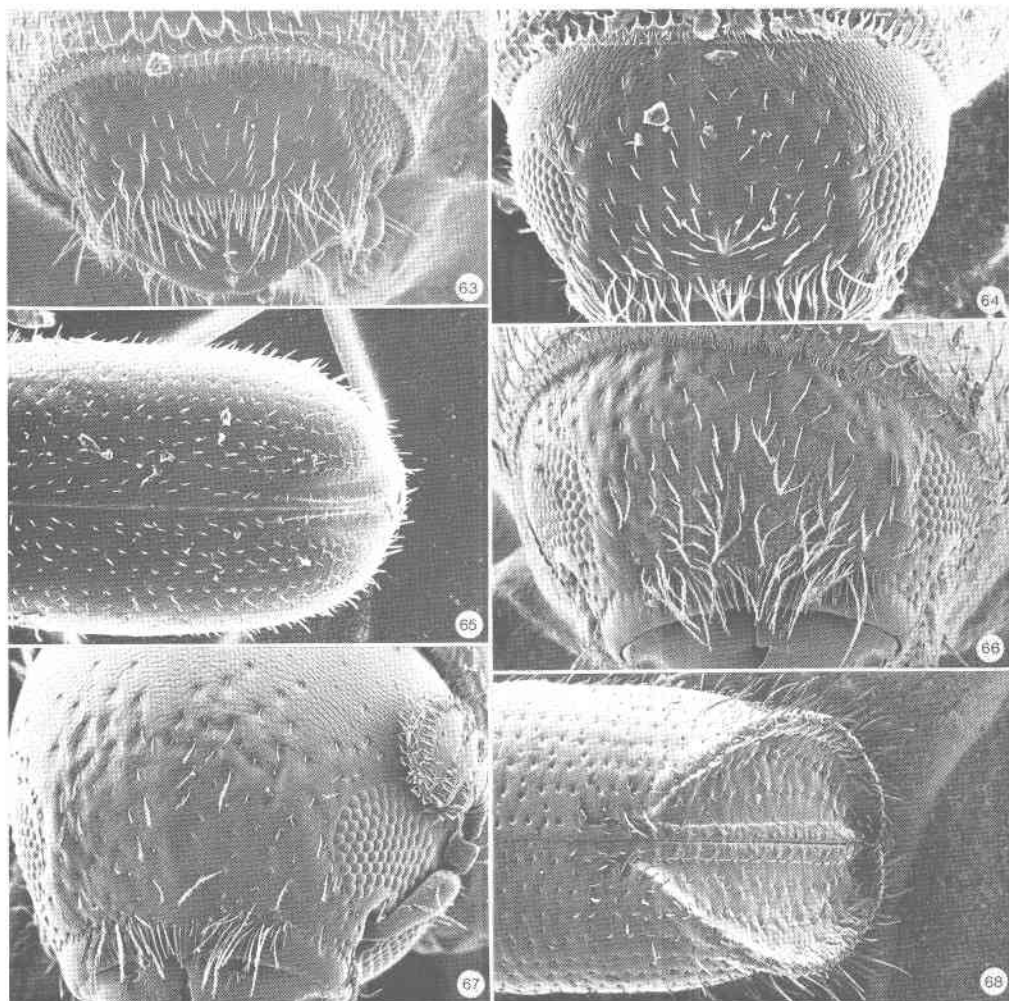


FIGS. 51-56. 51-53, *P. dispar*: 51, ♀ frons; 52, ♂ frons; 53, ♂ declivity.  
54-56; *P. nebulosus*: 54, ♀ frons; 55, ♂ frons; 56, ♂ declivity.

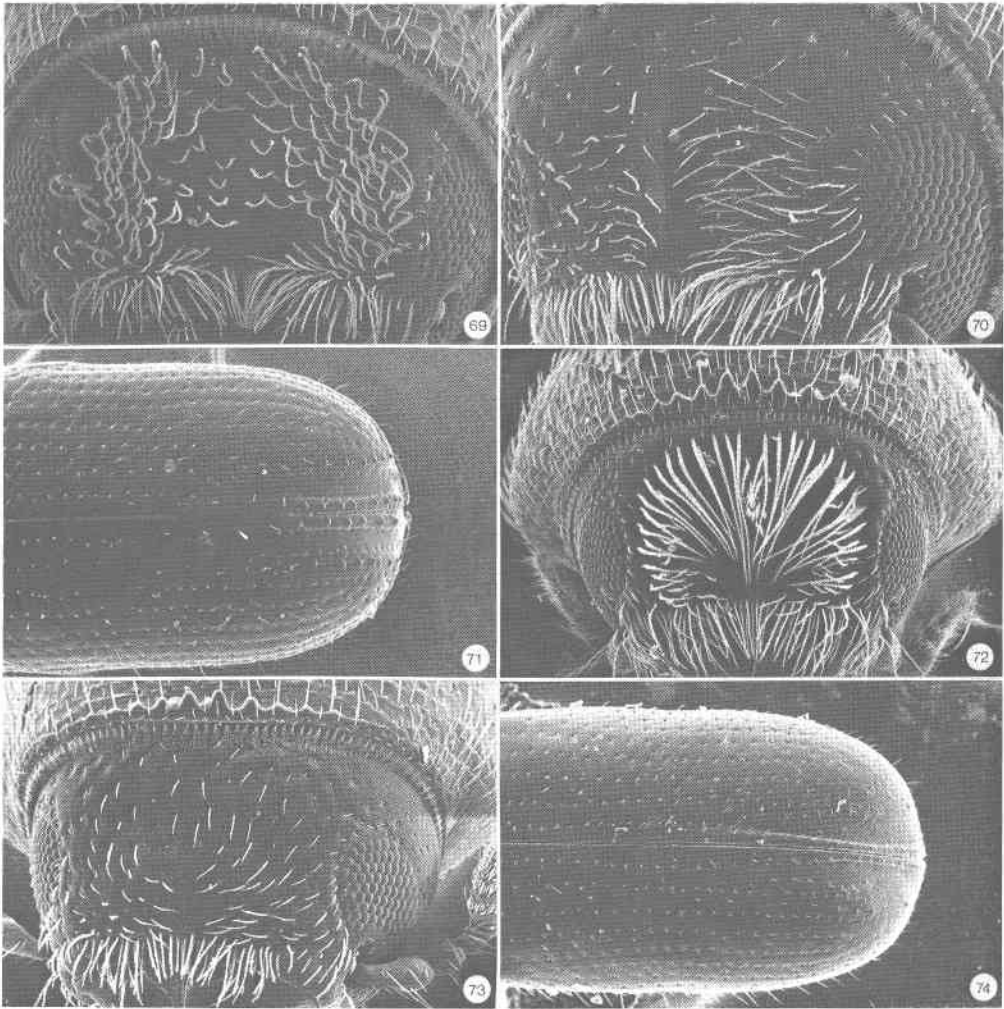




FIGS. 57-62. 57-59, *P. exquisitus*: 57, ♀ frons; 58, ♂ frons; 59, ♂ declivity.  
60-62, *P. guatemalensis*: 60, ♀ frons; 61, ♂ frons; 62, ♂ declivity.

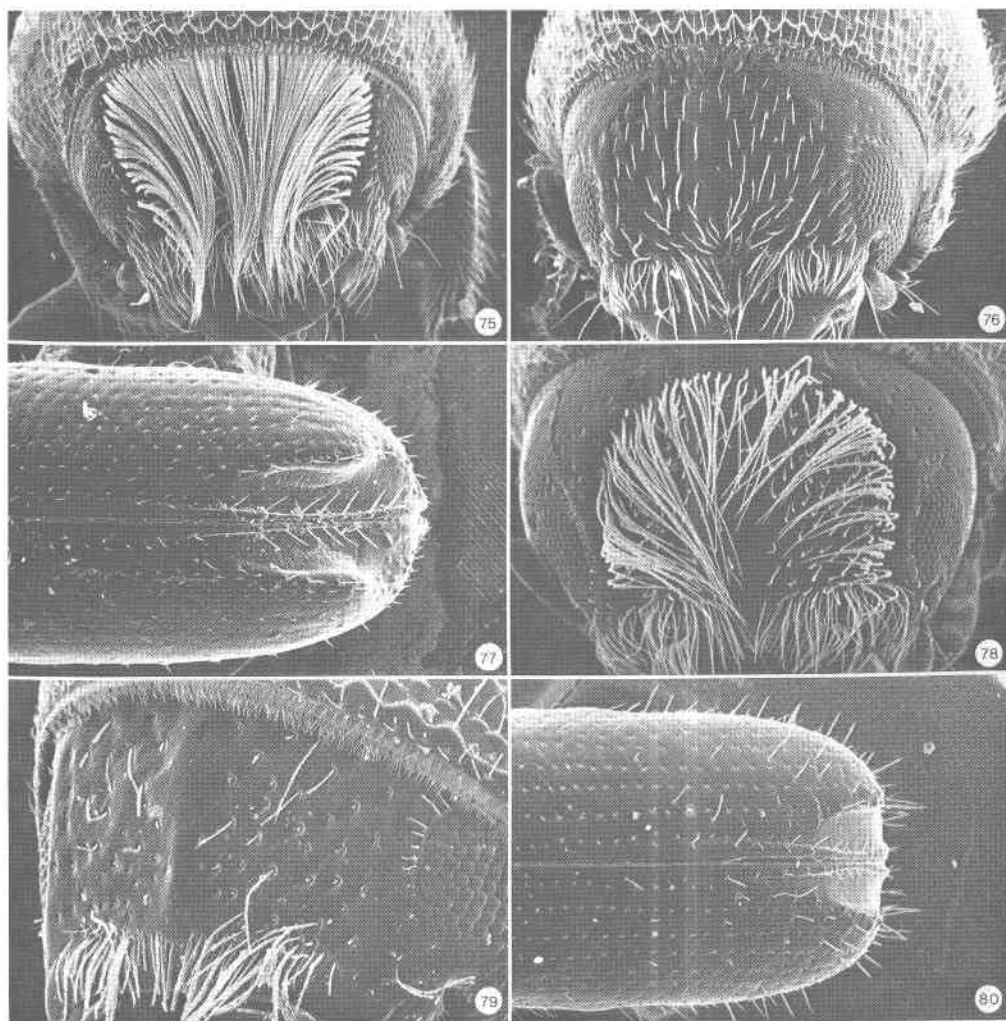


FIGS. 63-68. 63-65, *P. deletus*: 63, ♀ frons; 64, ♂ frons; 65, ♂ declivity.  
66-68, *P. cristatus*: 66, ♀ frons; 67, ♂ frons; 68, ♂ declivity.

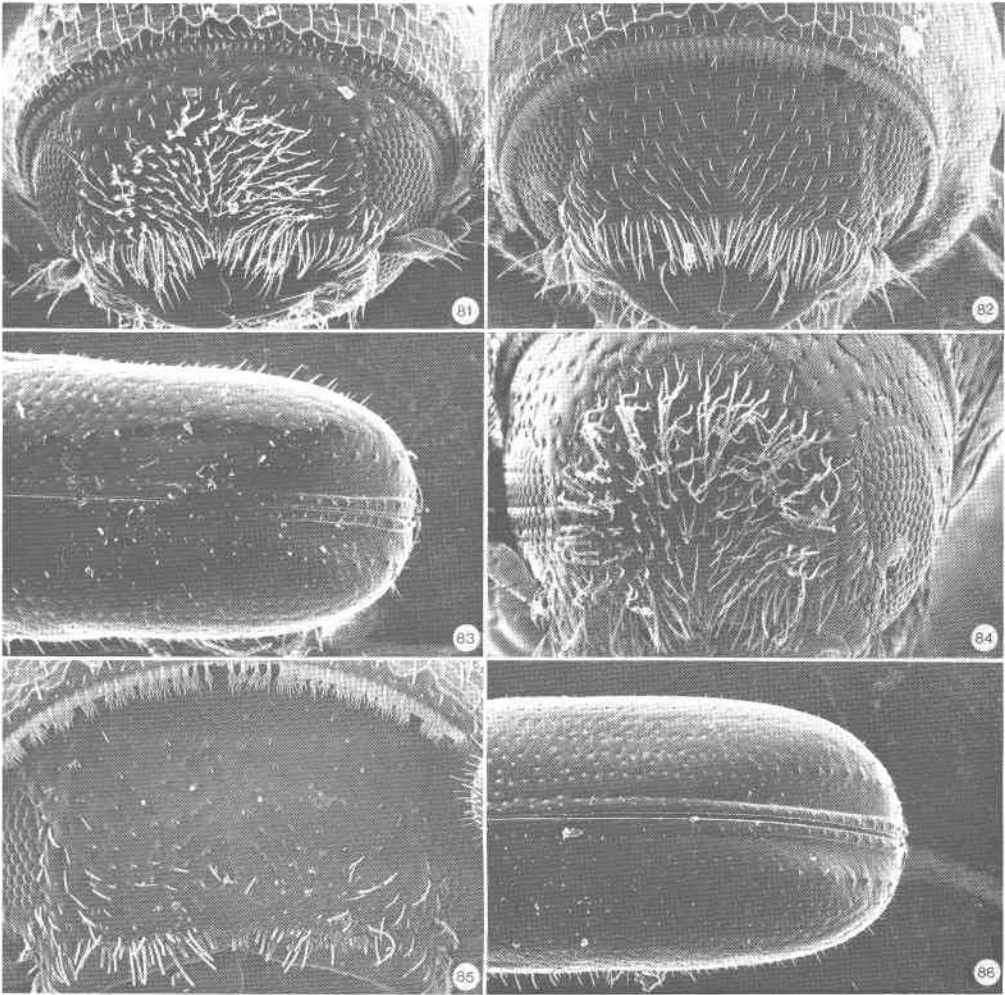


FIGS. 69-74. 69-71, *P. glabratus*: 69, ♀ frons; 70, ♂ frons; 71, ♂ declivity.  
72-74, *P. modicus*: 72, ♀ frons; 73, ♂ frons; 74, ♂ declivity.

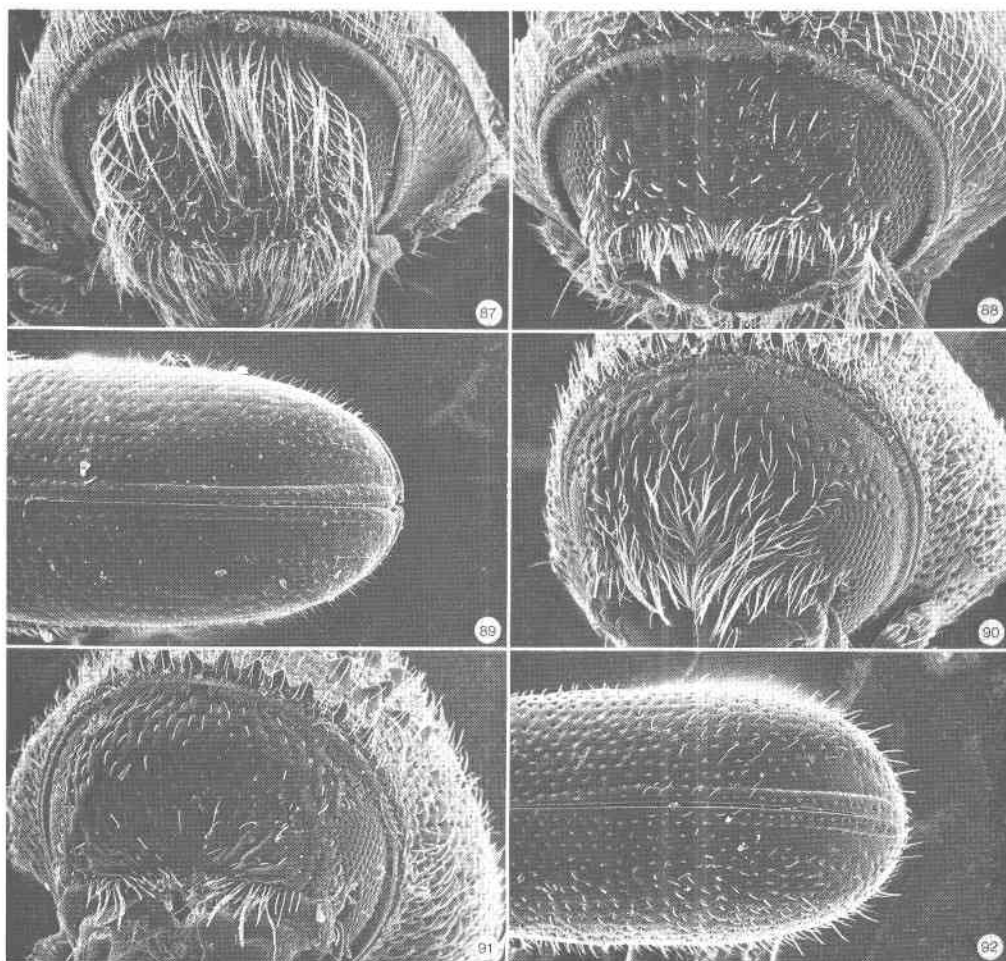




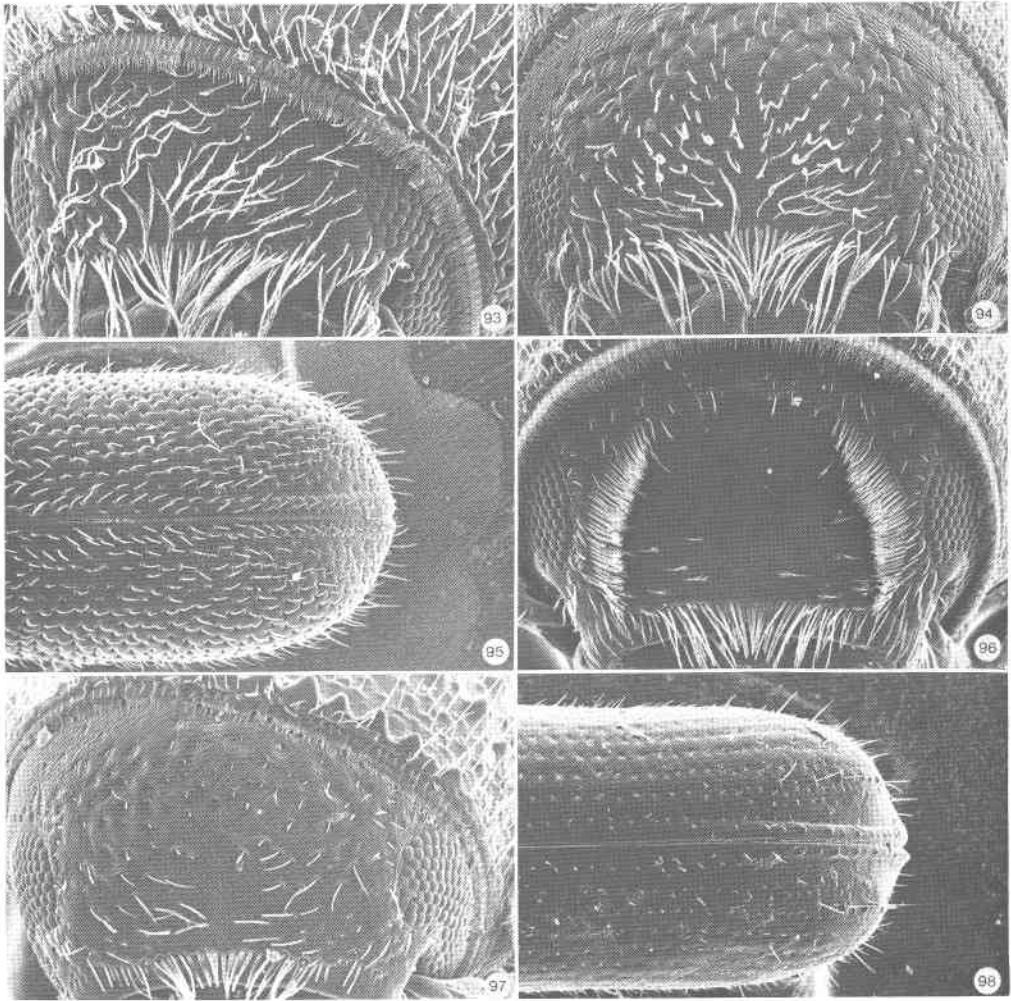
FIGS. 75-80. 75-77, *P. elatinus*: 75, ♀ frons; 76, ♂ frons; 77, ♂ declivity.  
 78-80, *P. speculum*: 78, ♀ frons; 79, ♂ frons; 80, ♂ declivity.



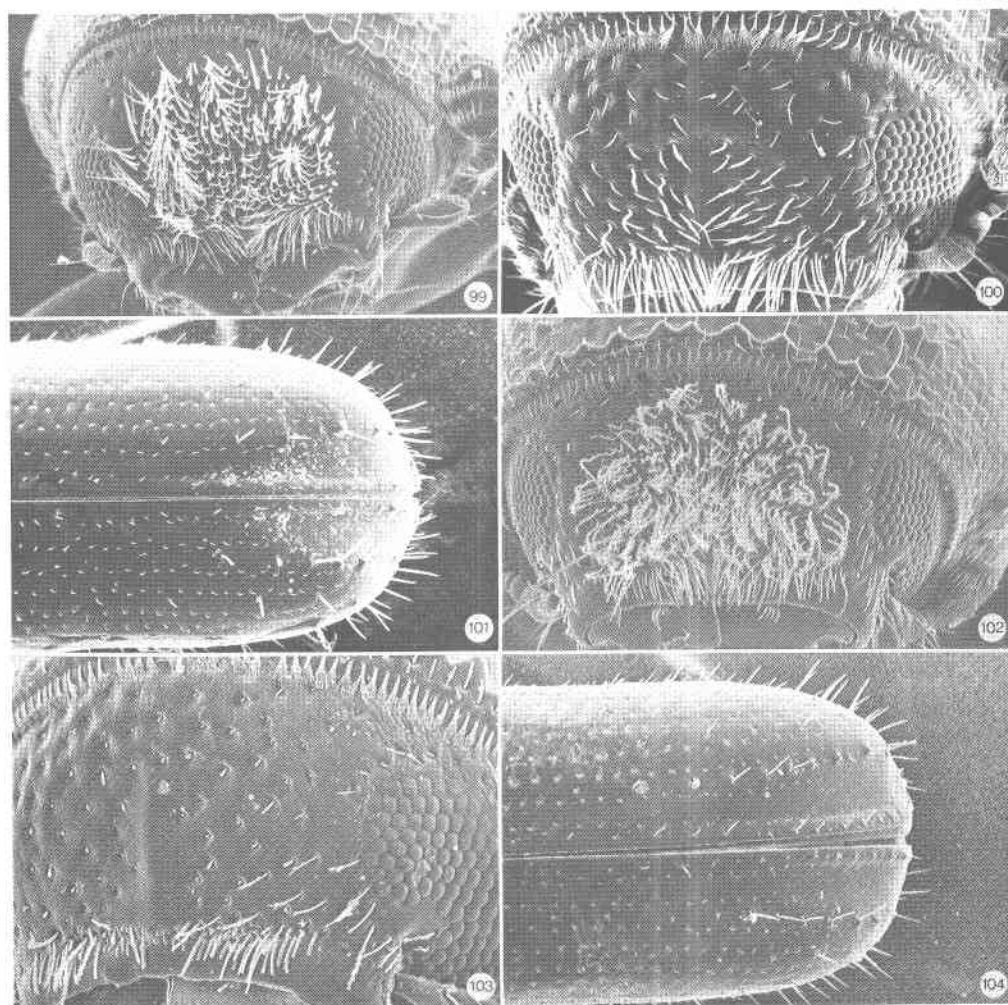
FIGS. 81-86. 81-83, *P. nitidus*: 81, ♀ frons; 82, ♂ frons; 83, ♂ declivity.  
 84-86, *P. toralis*: 84, ♀ frons; 85, ♂ frons; 86, ♂ declivity.



FIGS. 87-92. 87-89, *P. carmeli*: 87, ♀ frons; 88, ♂ frons; 89, ♂ declivity.  
90-92, *P. aciculatus*: 90, ♀ frons; 91, ♂ frons; 92, ♂ declivity.

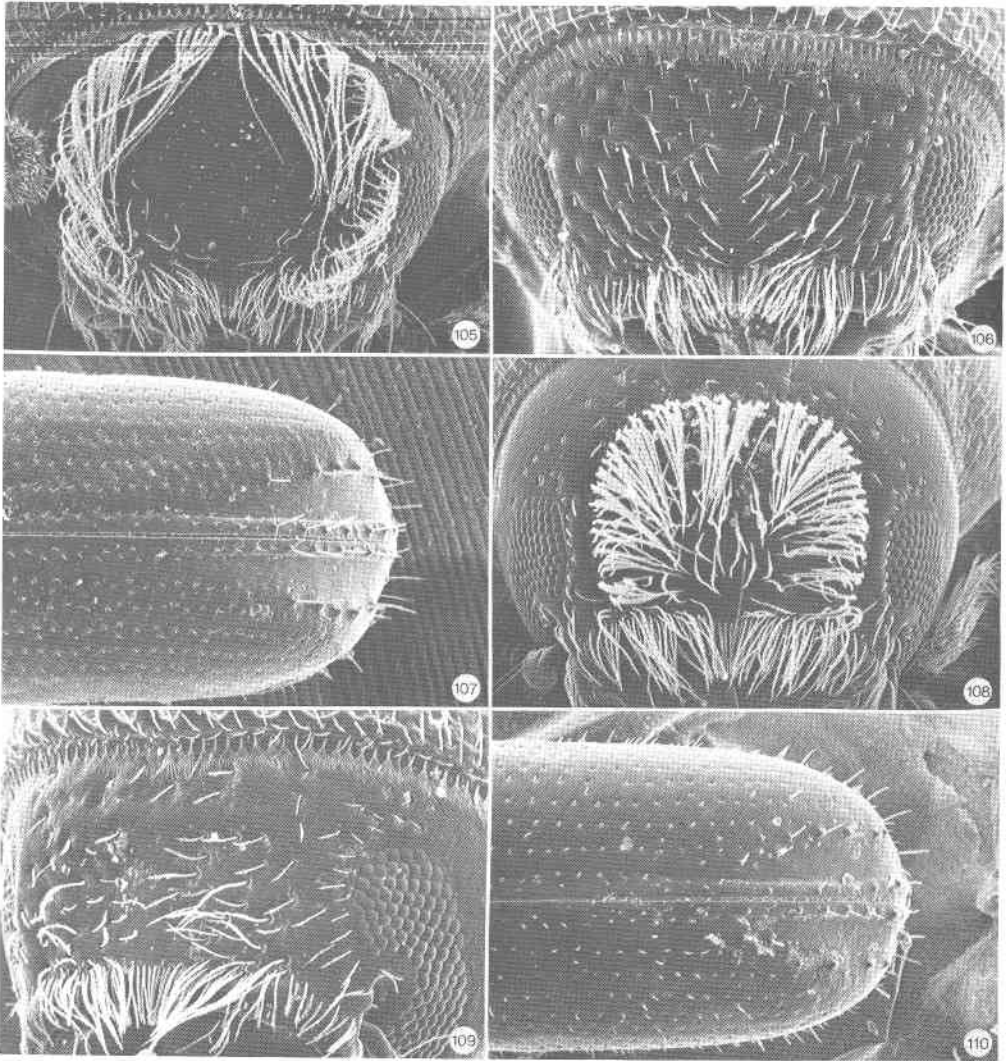


FIGS. 93-98. 93-95, *P. solus*: 93, ♀ frons; 94, ♂ frons; 95, ♂ declivity.  
96-98, *P. montivagus*: 96, ♀ frons; 97, ♂ frons; 98, ♂ declivity.

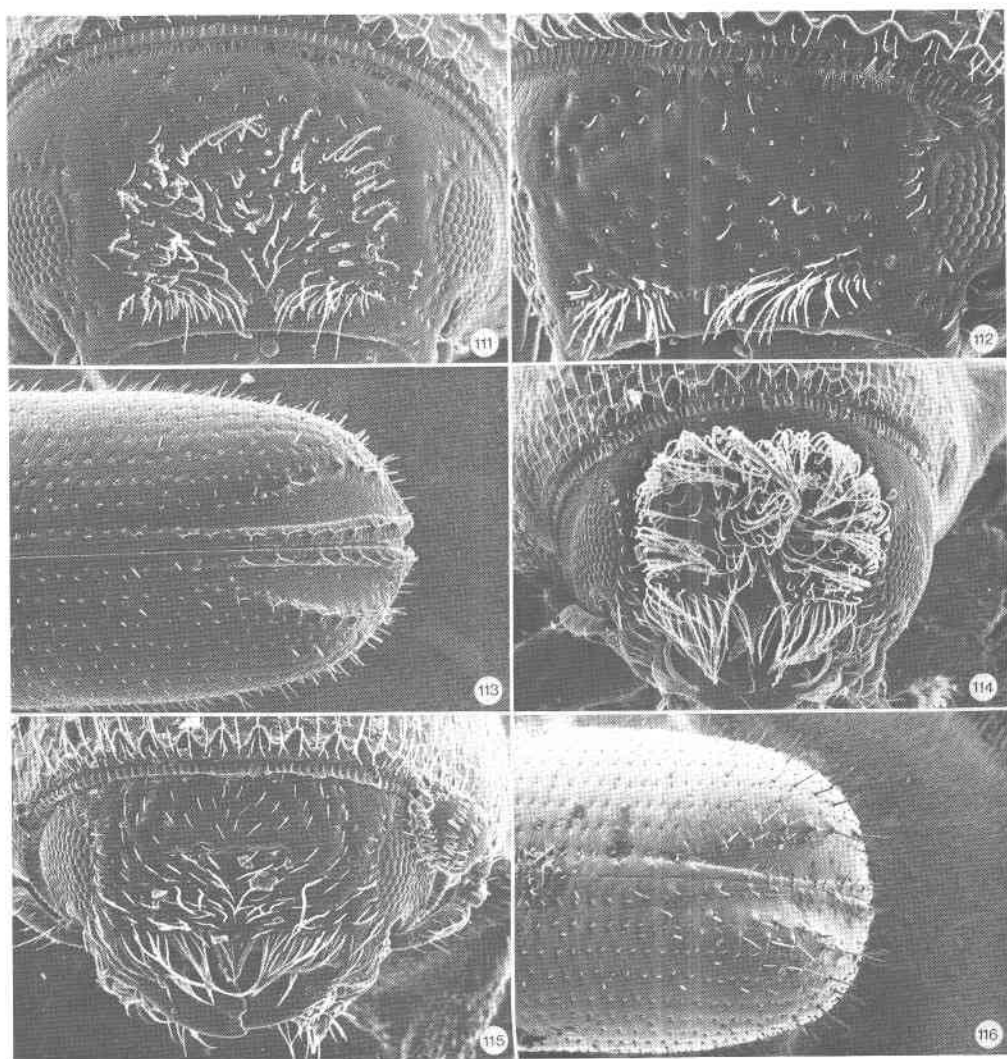


FIGS. 99-104. 99-101, *P. intextus*: 99, ♀ frons; 100, ♂ frons; 101, ♂ declivity.  
102-104, *P. cascoensis*: 102, ♀ frons; 103, ♂ frons; 104, ♂ declivity.

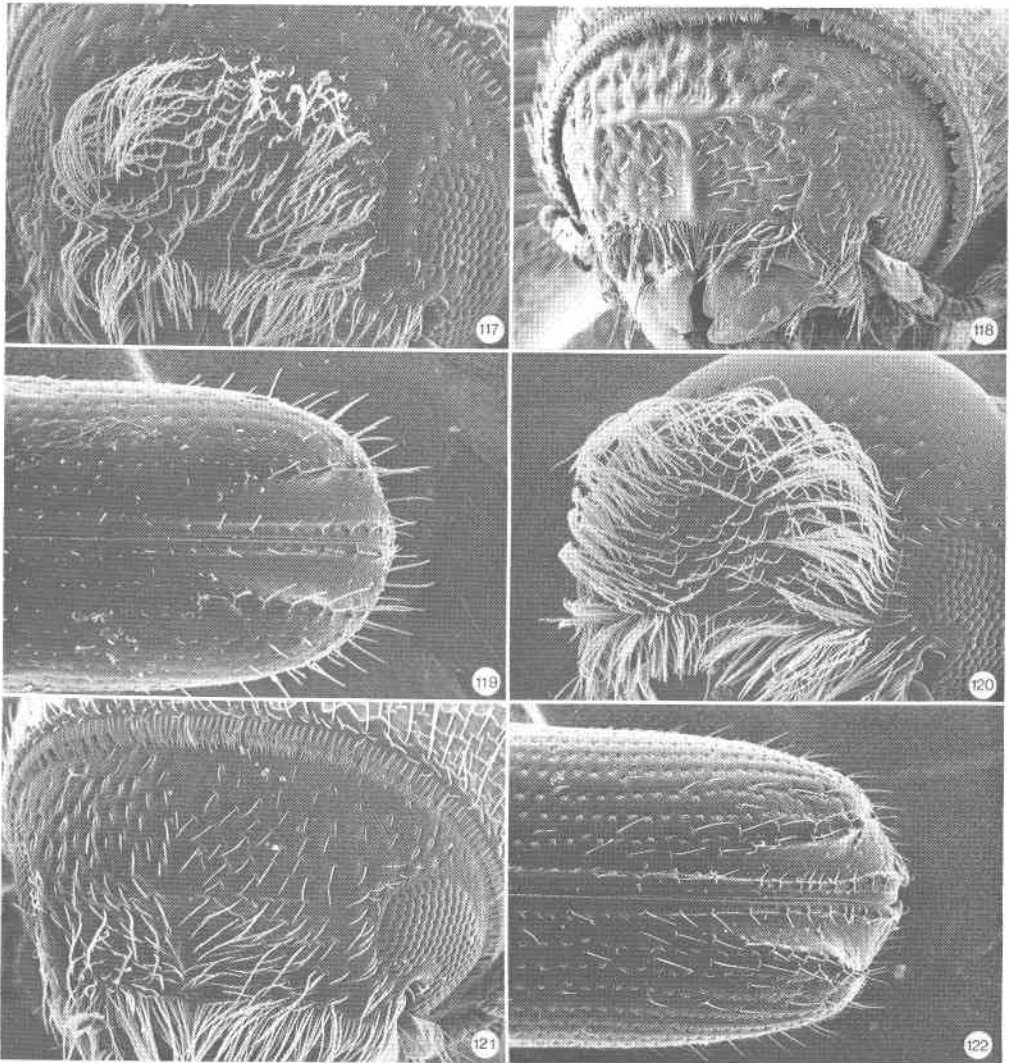




FIGS. 105-110. 105-107, *P. pulchellus tuberculatus*: 105, ♀ frons; 106, ♂ frons; 107, ♂ declivity.  
108-110, *P. pseudotsugae*: 108, ♀ frons; 109, ♂ frons; 110, ♂ declivity.

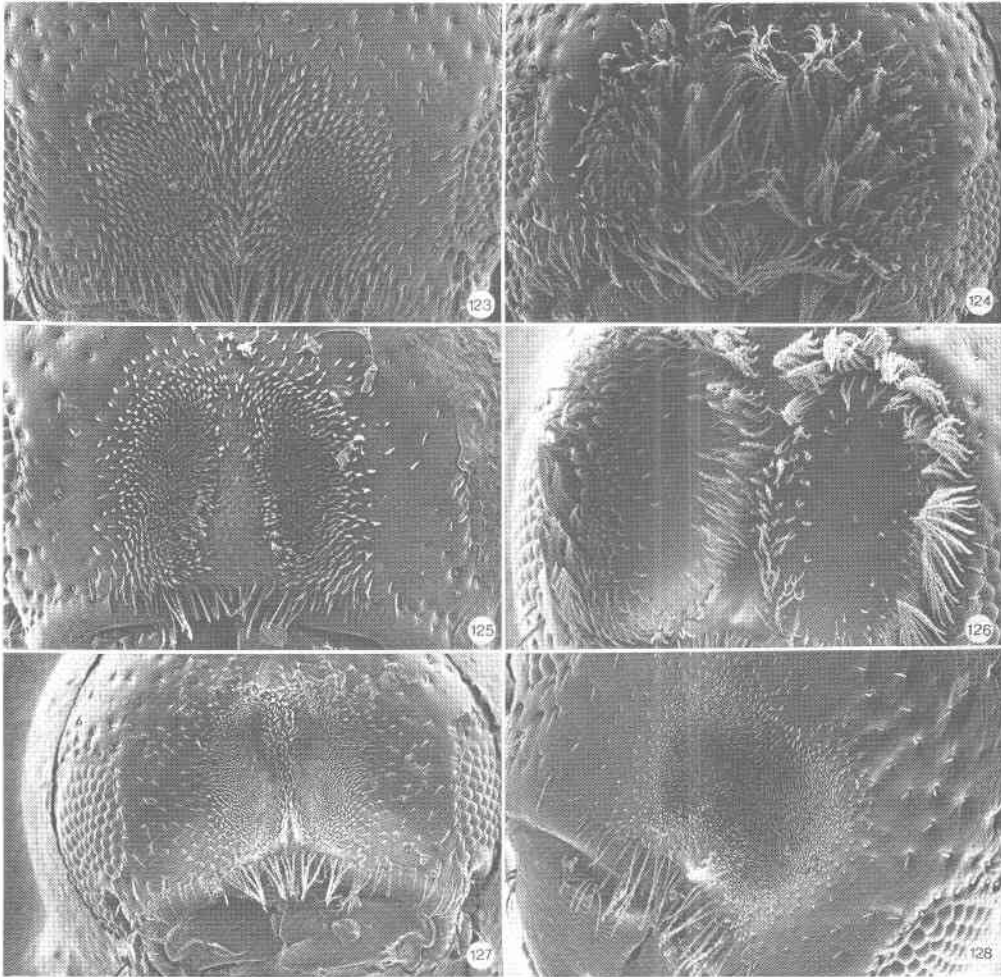


FIGS. 111-116. 111-113, *P. malleatus*: 111, ♀ frons; 112, ♂ frons; 113, ♂ declivity.  
114-116, *P. nitidulus*: 114, ♀ frons; 115, ♂ frons; 116, ♂ declivity.

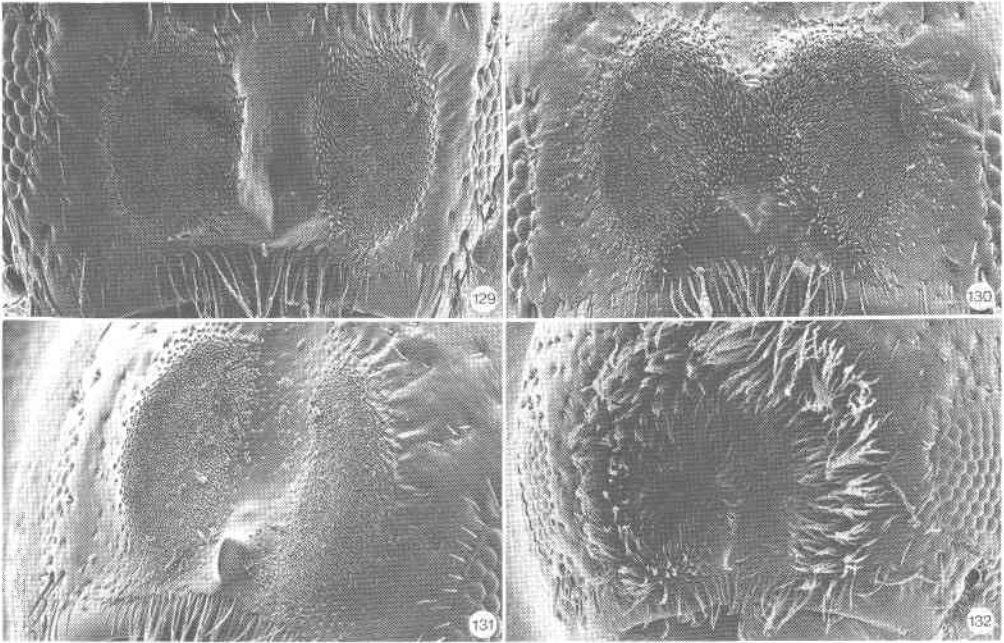


FIGS. 117-122. 117-119, *P. sulcatus*: 117, ♀ frons; 118, ♂ frons; 119, ♂ declivity.  
120-122, *P. cortezi*: 120, ♀ frons; 121, ♂ frons; 122, ♂ declivity.

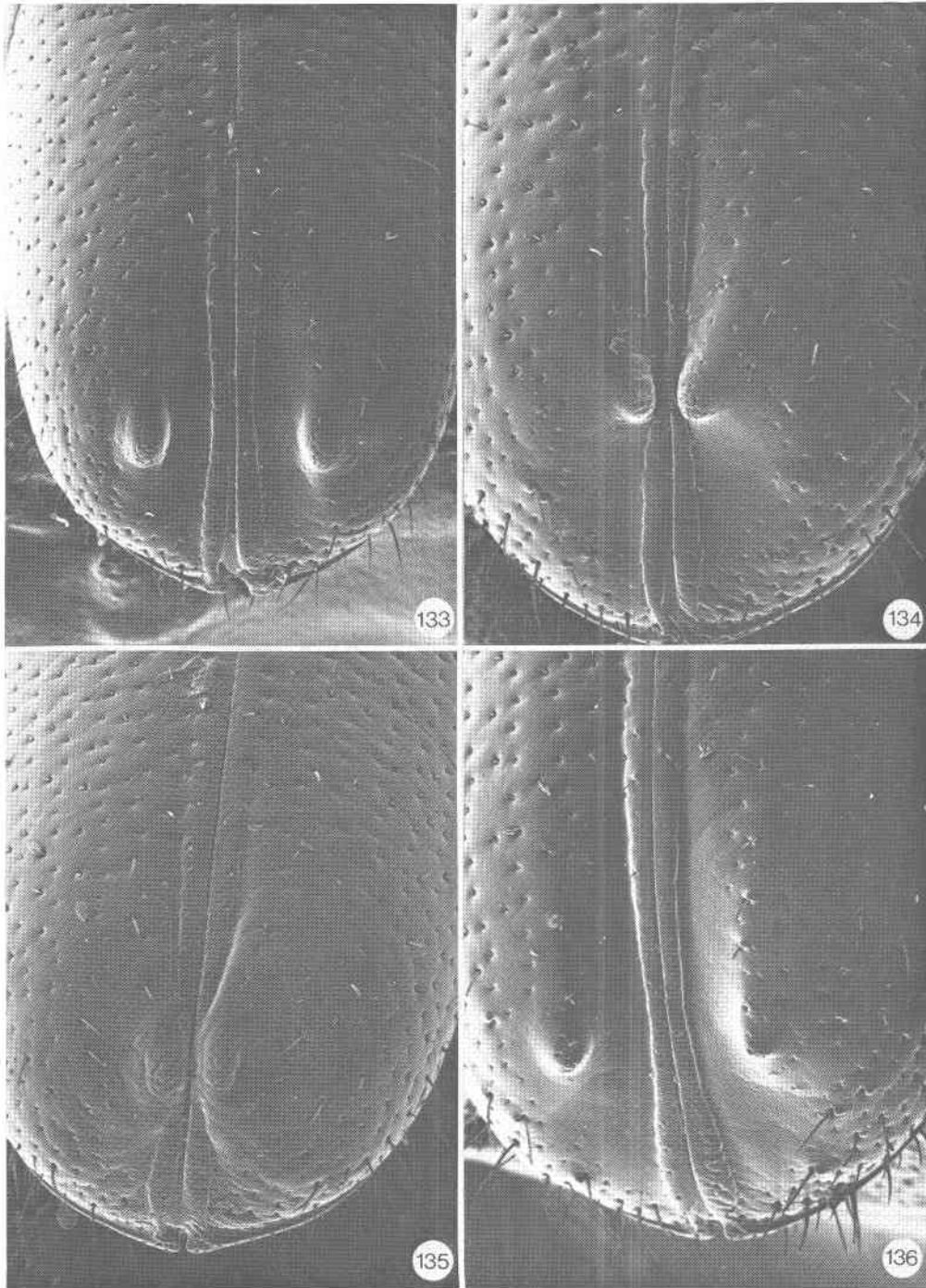




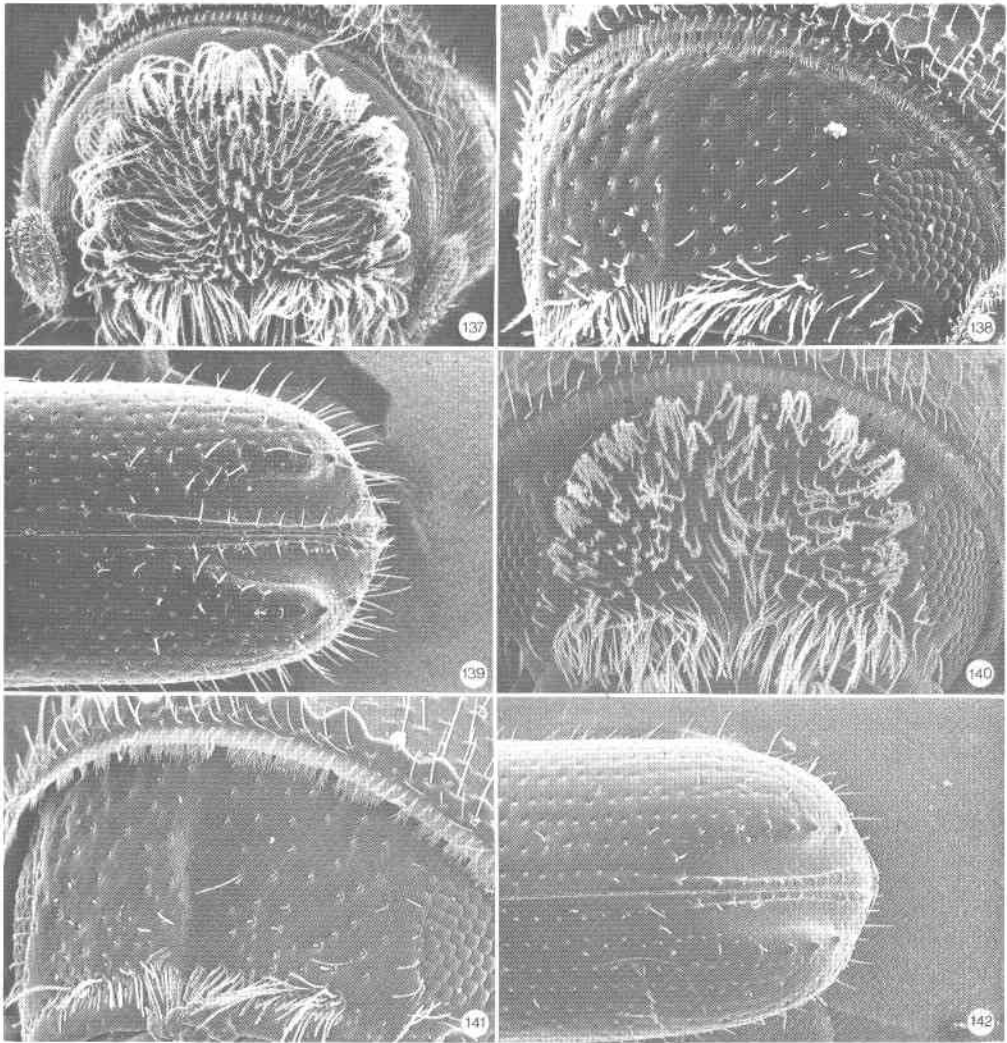
FIGS. 123-128. ♀ frons: 123-125, *P. cariniceps*; 126, *P. biovalis*; 127, *P. carinatus carinatus*; 128, *P. balsameus*.



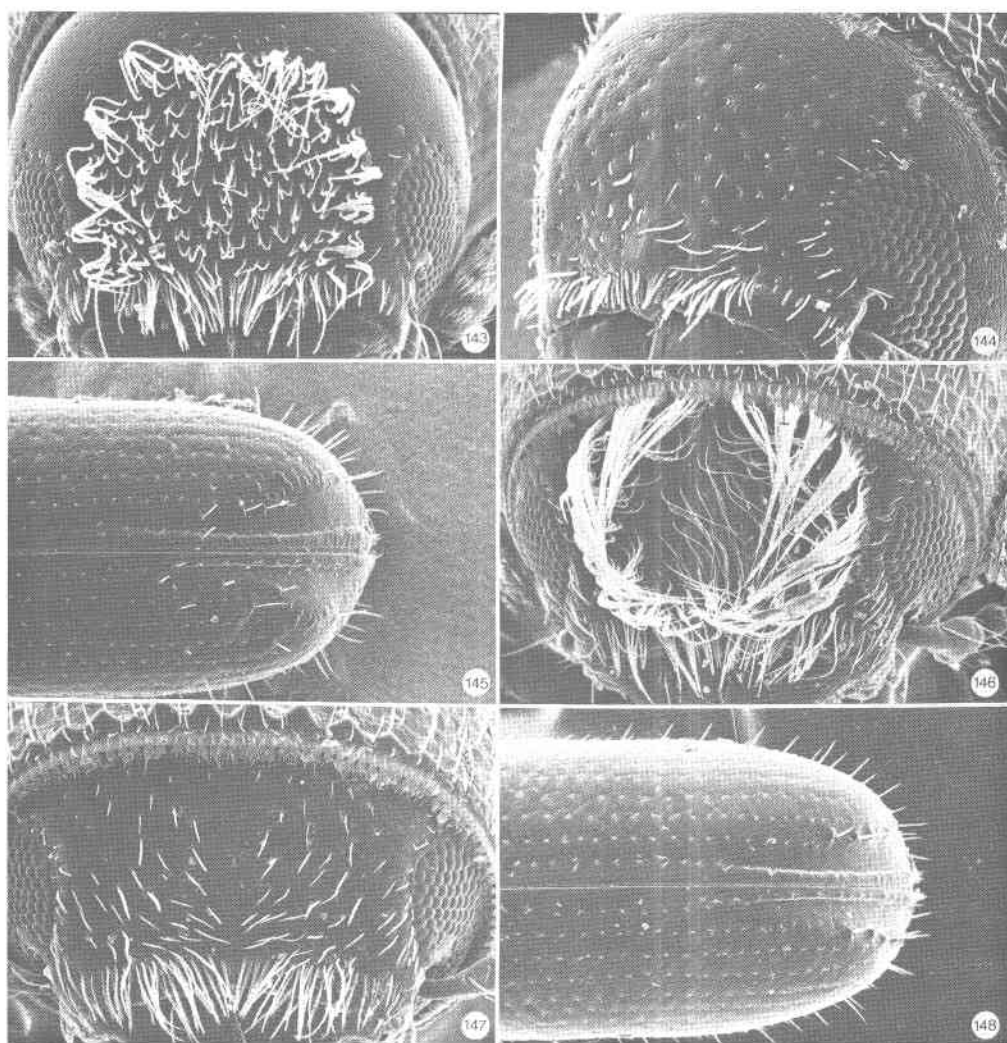
FIGS. 129-132. ♀ frons: 129-130, *P. briscoei*; 131, *P. concavus*; 132, *P. cavatus*.



Figs. 133-136. ♂ declivities: 133-134, *P. cariniceps*; 135-136, *P. balsameus*.

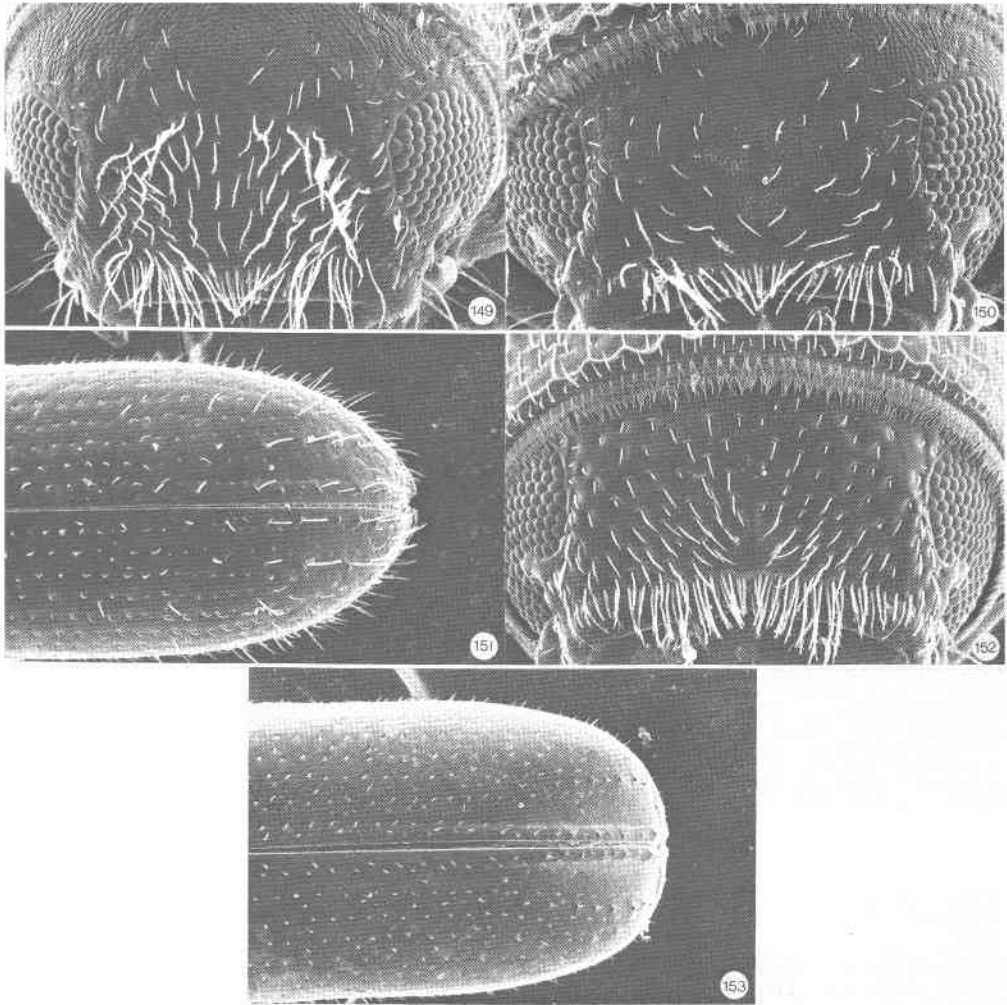


FIGS. 137-142. 137-139, *P. nigricans*: 137, ♀ frons; 138, ♂ frons; 139, ♂ declivity.  
 140-142, *P. lepidus*: 140, ♀ frons; 141, ♂ frons; 142, ♂ declivity.

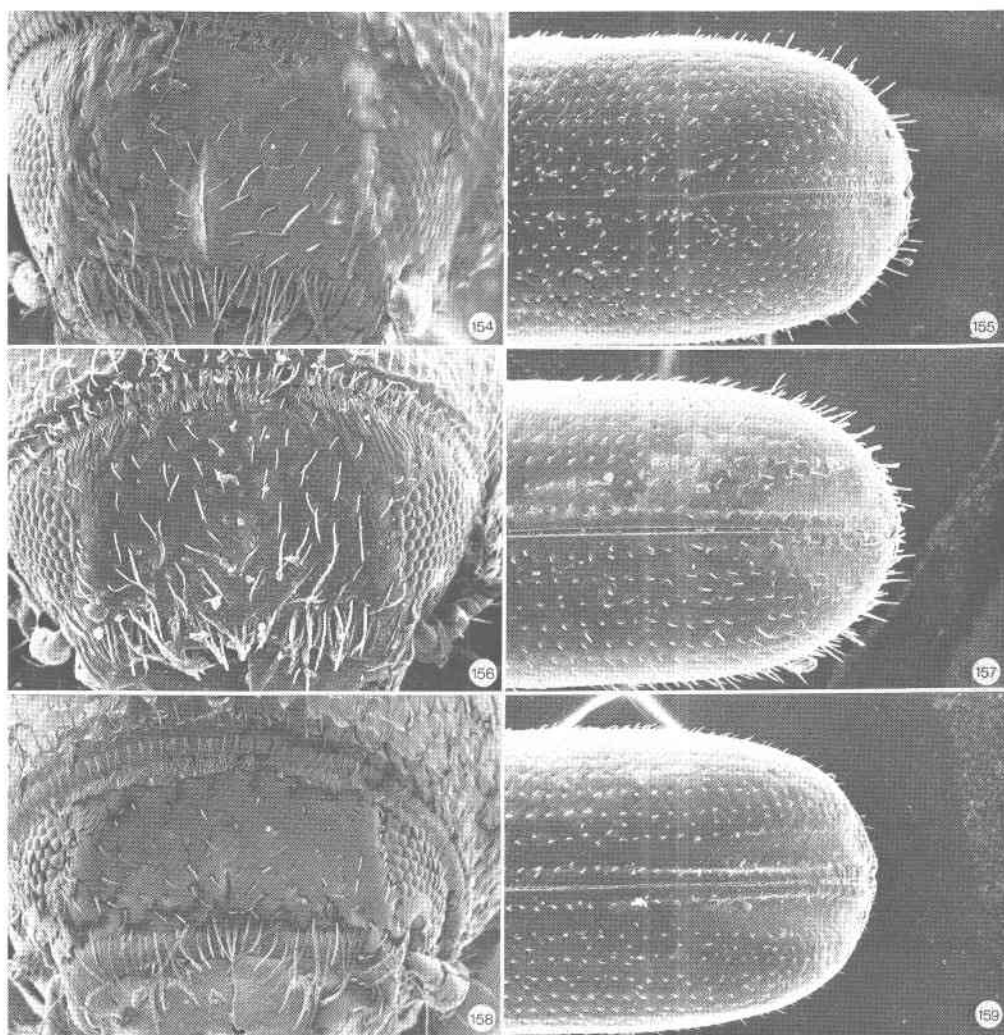


FIGS. 143-148. 143-145, *P. nocturnus*: 143, ♀ frons; 144, ♂ frons; 145 ♂ declivity.  
146-148, *P. sapineus*: 146, ♀ frons; 147, ♂ frons; 148, ♂ declivity.

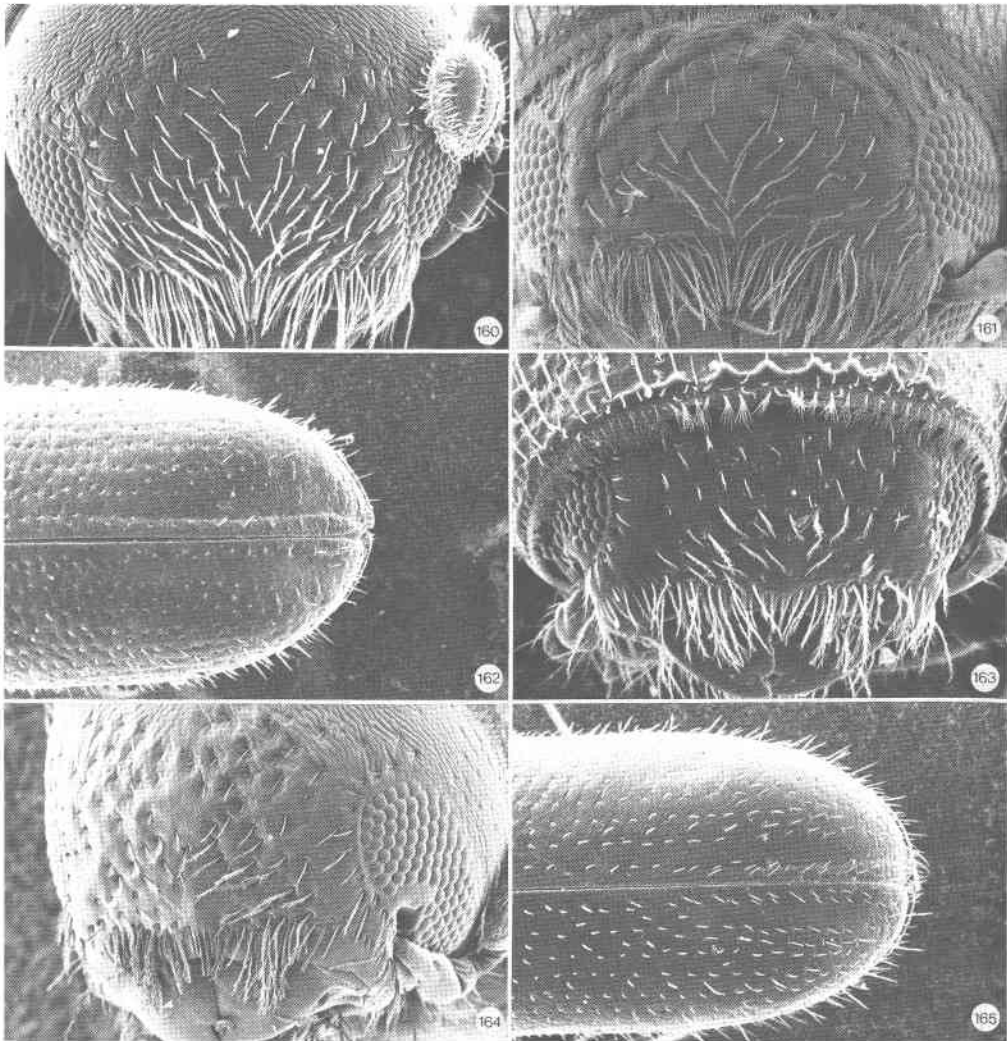




Figs. 149-153. 149-151, *P. segnis segnis*: 149, ♀ frons; 150, ♂ frons; 151, ♂ declivity.  
152-153, *P. boycei*: 152, ♀ frons; 153, ♂ declivity.

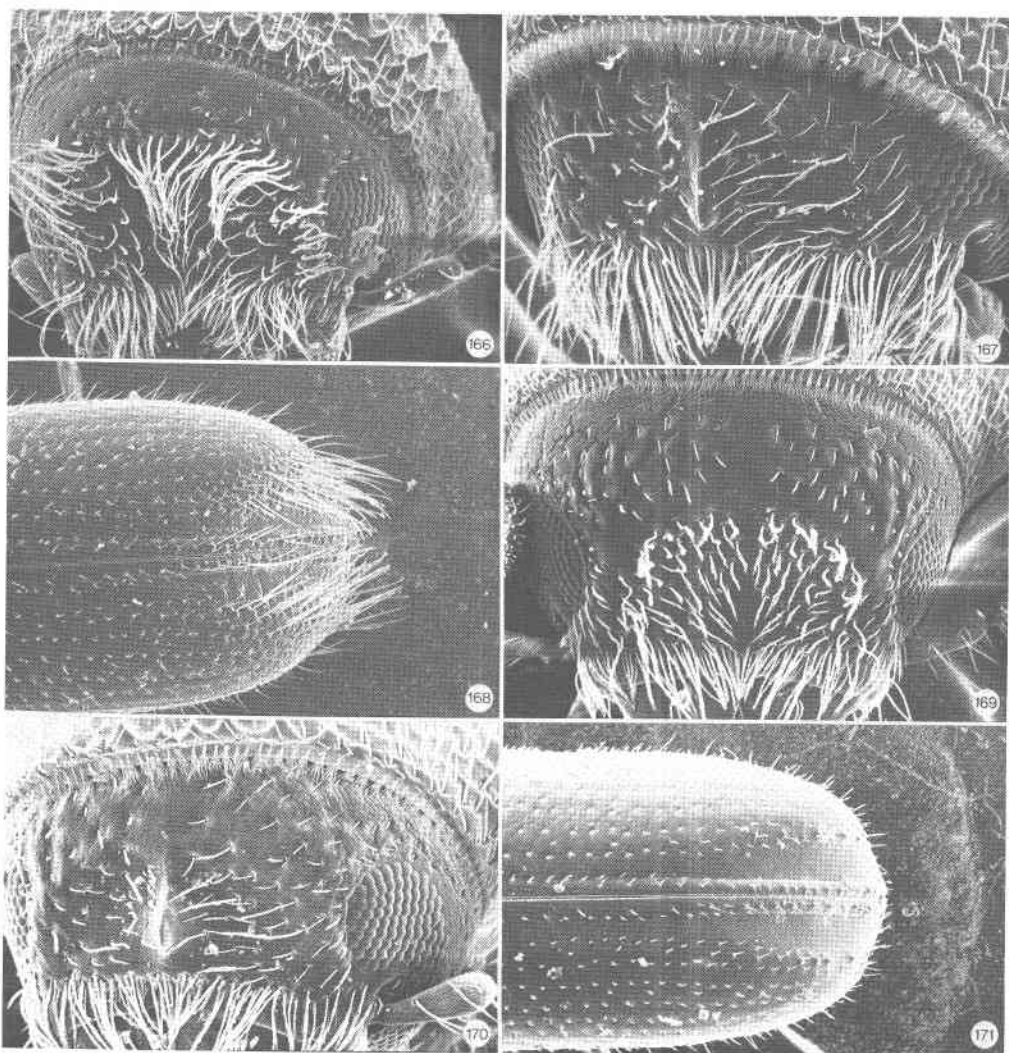


FIGS. 154-159. 154-155, *P. aplanatus*: 154, ♀ frons; 155, ♂ declivity. 156-157, *P. festus*: 156, ♀ frons; 157, ♂ declivity. 158-159, *P. culminicola*: 158, ♀ frons; 159, ♂ declivity.

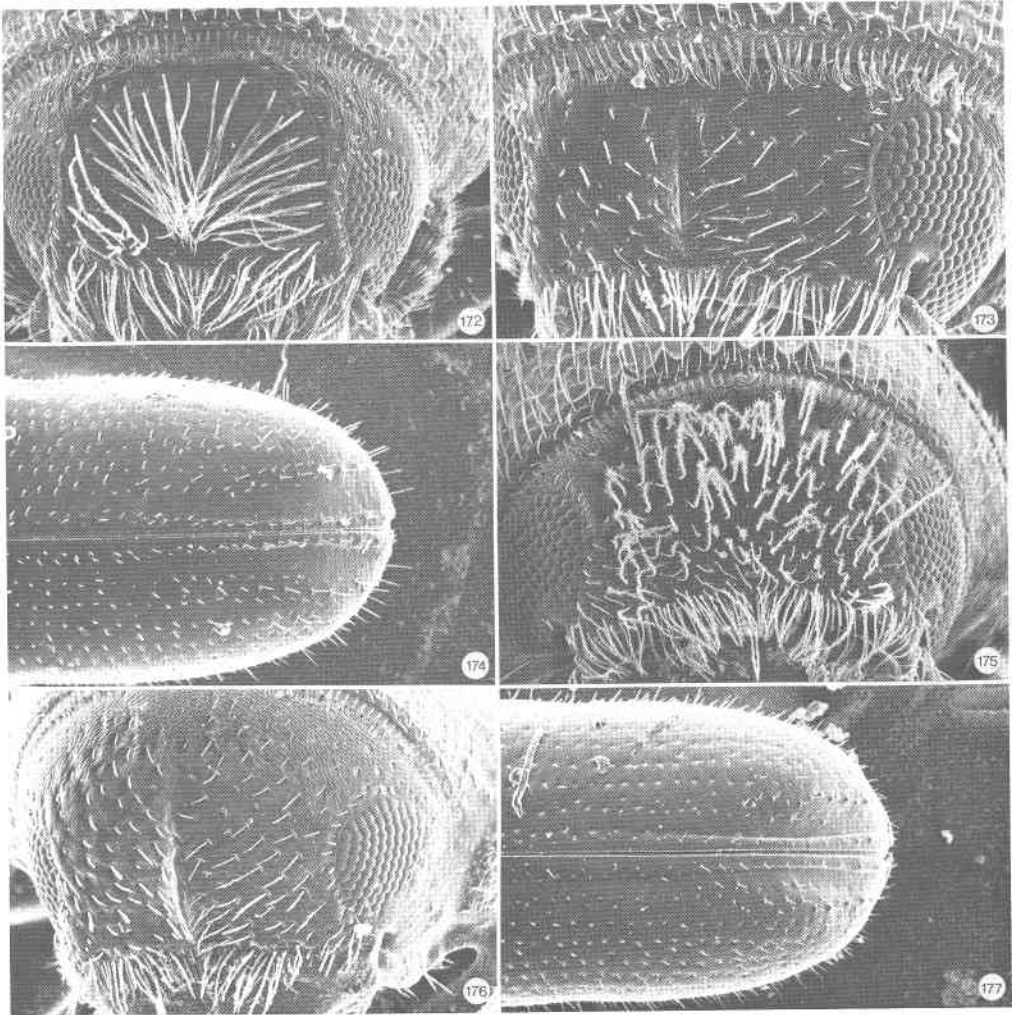


FIGS. 160-165. 160-162. *P. pellitus*: 160, ♀ frons; 161, ♂ frons; 162, ♂ declivity.  
163-165, *P. opaculus*: 163, ♀ frons; 164, ♂ frons; 165, ♂ declivity.

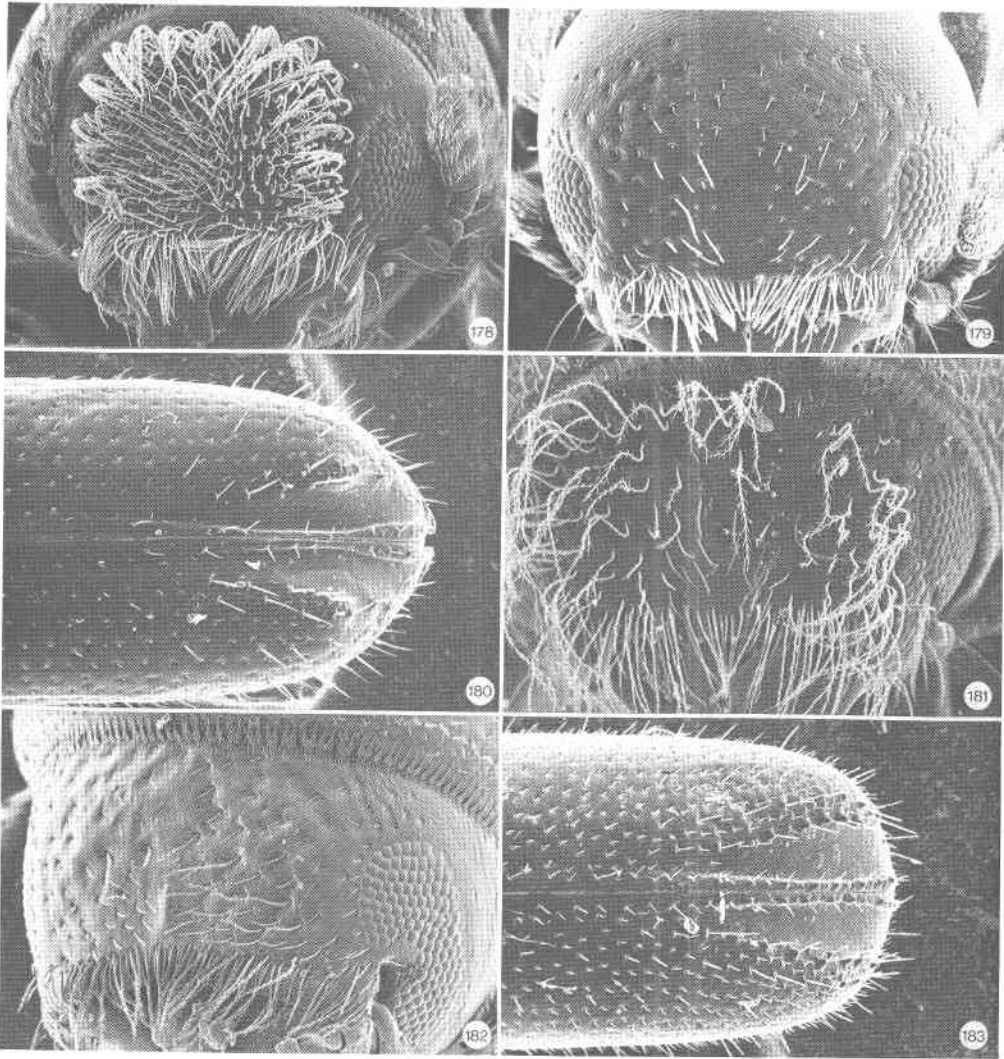




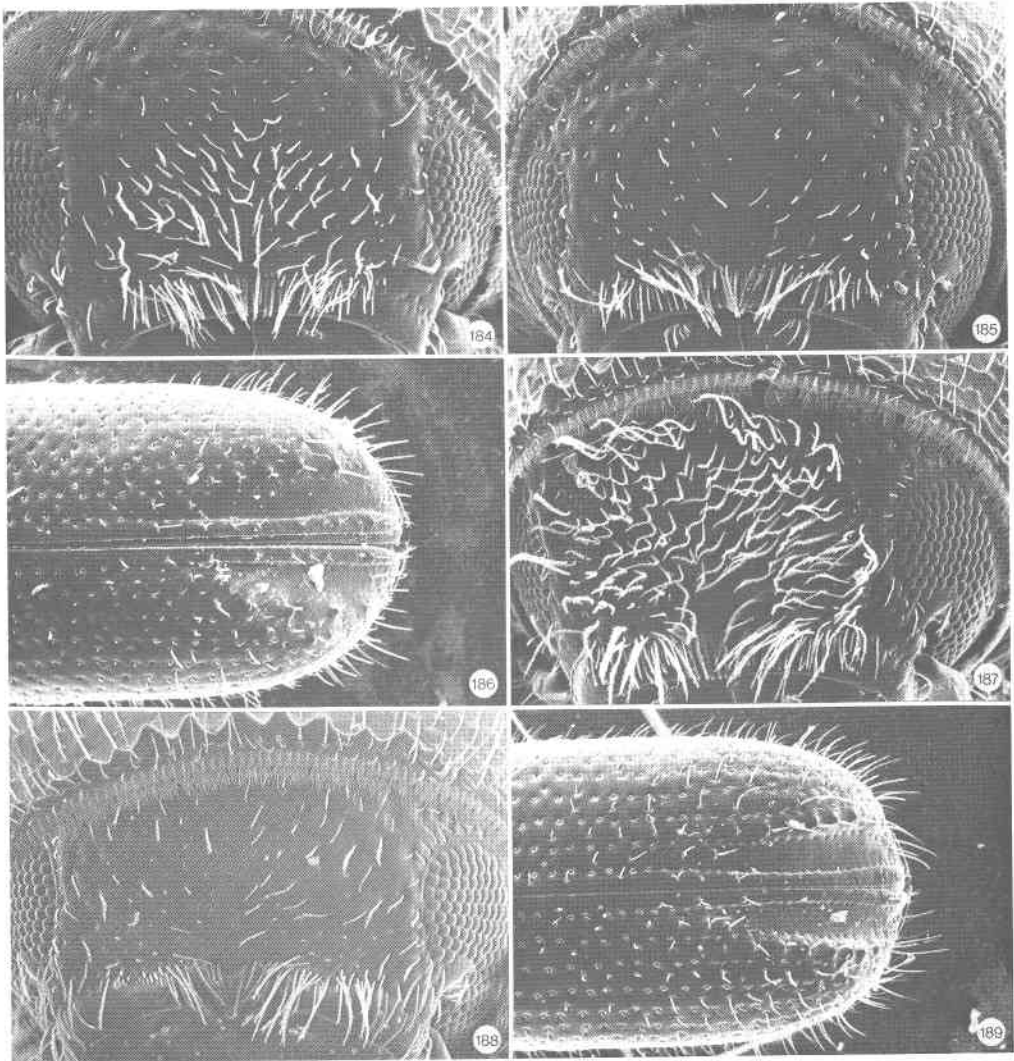
FIGS. 166-171. 166-168, *P. setosus*: 166, ♀ frons; 167, ♂ frons; 168, ♀ declivity.  
169-171, *P. aquilus*: 169, ♀ frons; 170, ♂ frons; 171, ♂ declivity.



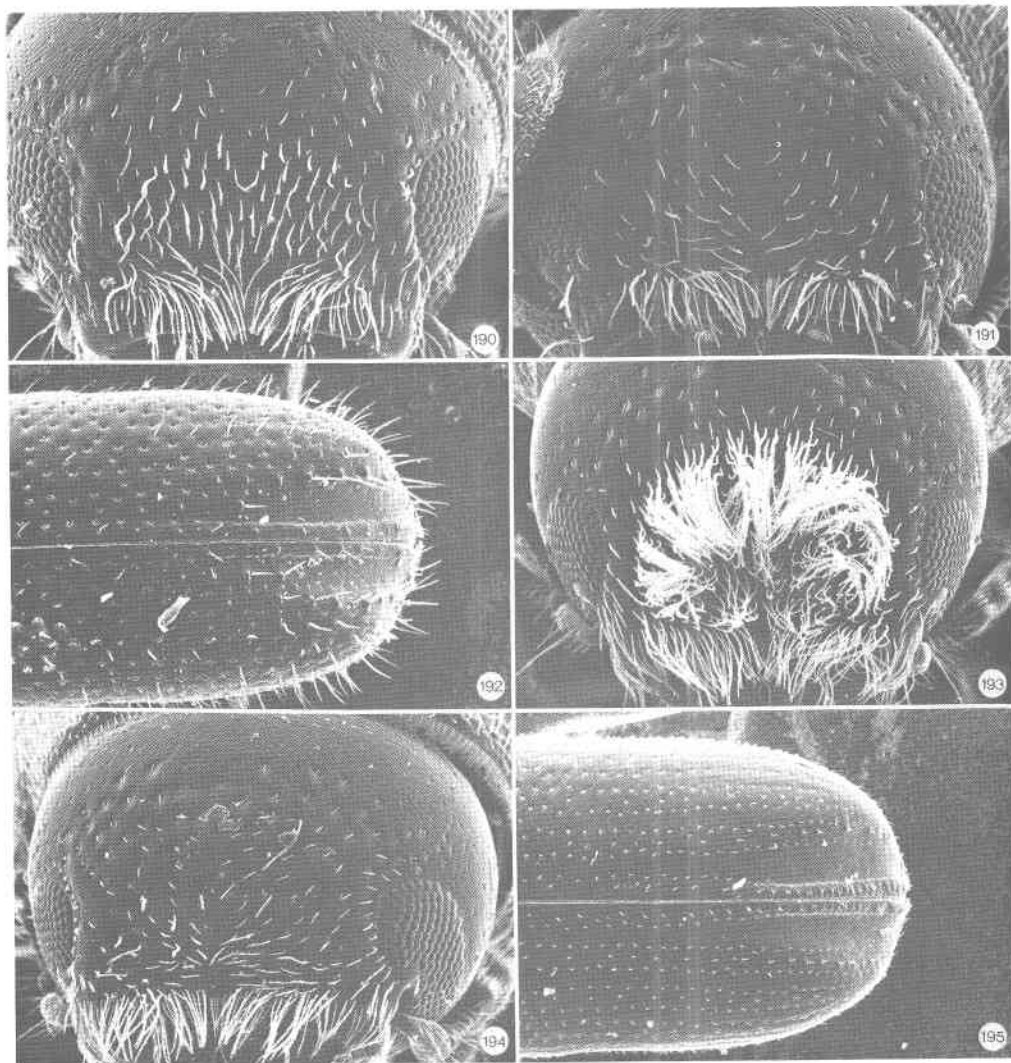
FIGS. 172-177. 172-174, *P. absonus*: 172, ♀ frons; 173, ♂ frons; 174, ♂ declivity.  
175-177, *P. venustus*: 175, ♀ frons; 176, ♂ frons; 177, ♂ declivity.



FIGS. 178-183. 178-180, *P. blandulus*: 178, ♀ frons; 179, ♂ frons; 180, ♂ declivity.  
 181-183, *P. blandus*: 181, ♀ frons; 182, ♂ frons; 183, ♂ declivity.

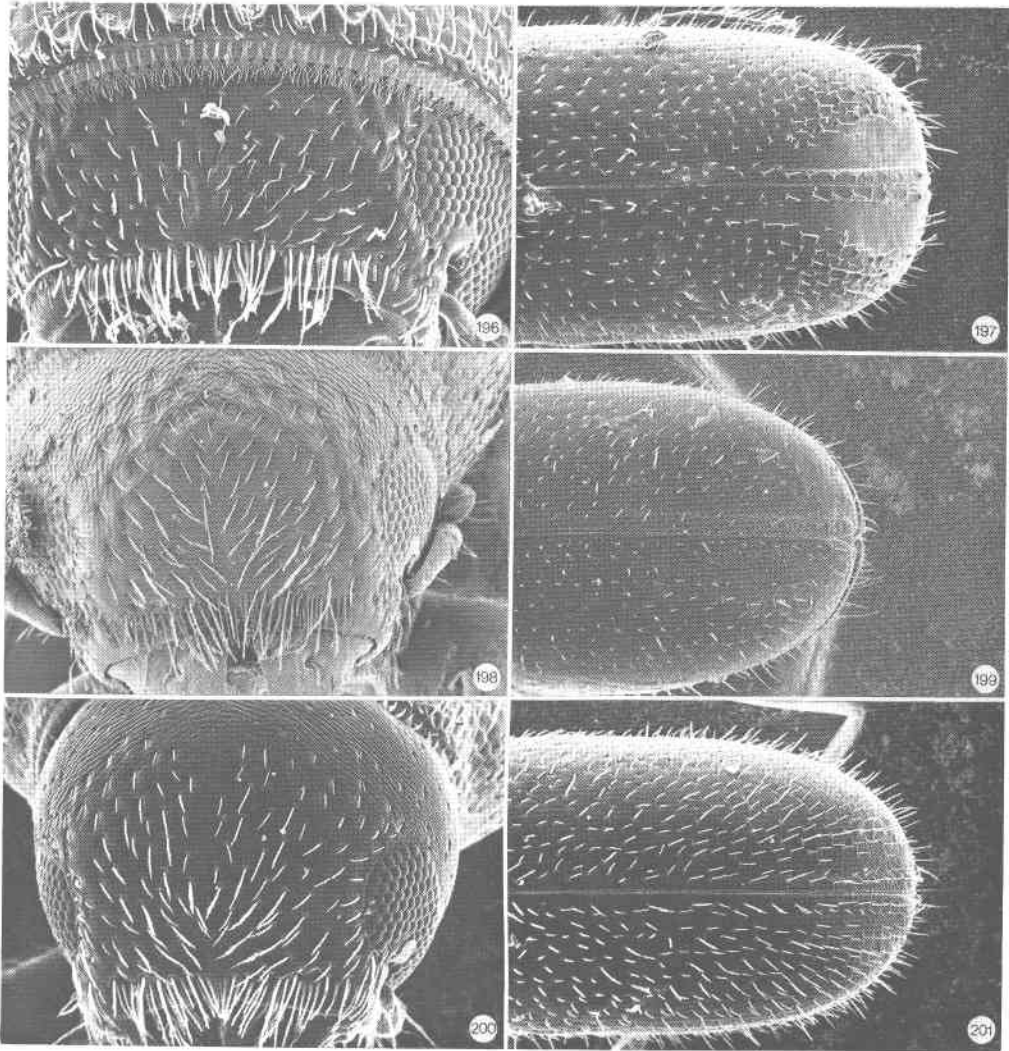


FIGS. 184-189. 184-186, *P. brevis*: 184, ♀ frons; 185, ♂ frons; 186, ♂ declivity.  
187-189, *P. durus*: 187, ♀ frons; 188, ♂ frons; 189, ♂ declivity.

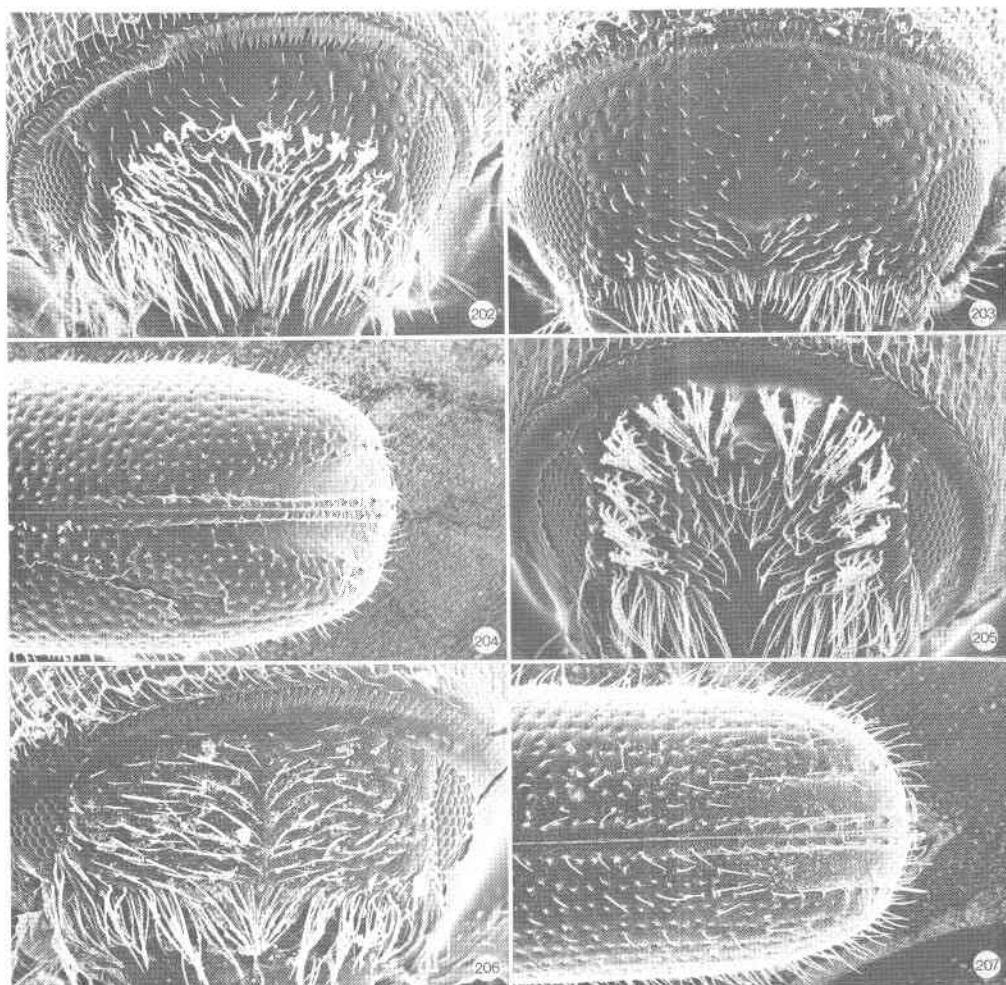


FIGS. 190-195. 190-192, *P. scabridus*: 190, ♀ frons; 191, ♂ frons; 192, ♂ declivity.  
193-195, *P. sierraensis*: 193, ♀ frons; 194, ♂ frons; 195, ♂ declivity.

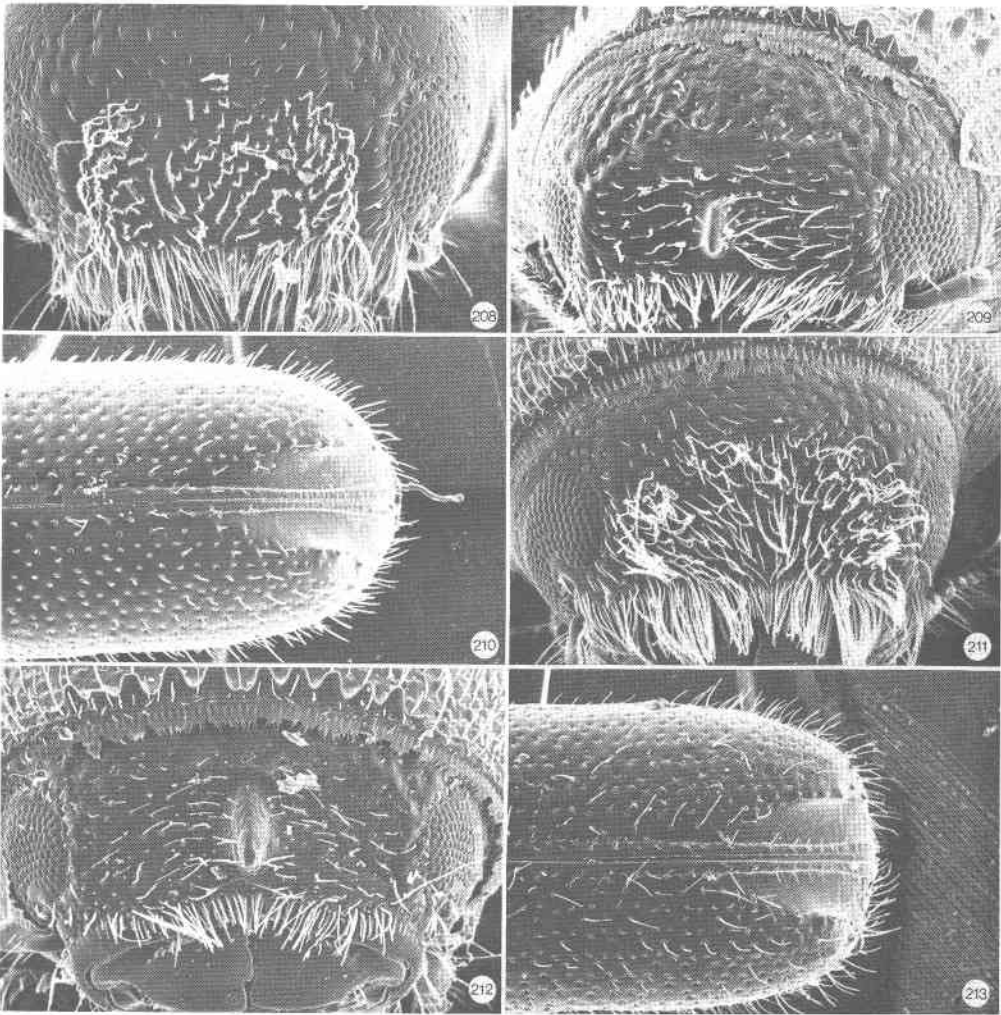




FIGS. 196-201. 196-197, *P. lecontei*: 196, ♀ frons; 197, ♂ declivity. 198-199, *P. digestus*: 198, ♀ frons; 199, ♂ declivity. 200-201, *P. puberulus*: 200, ♀ frons; 201, ♂ declivity.

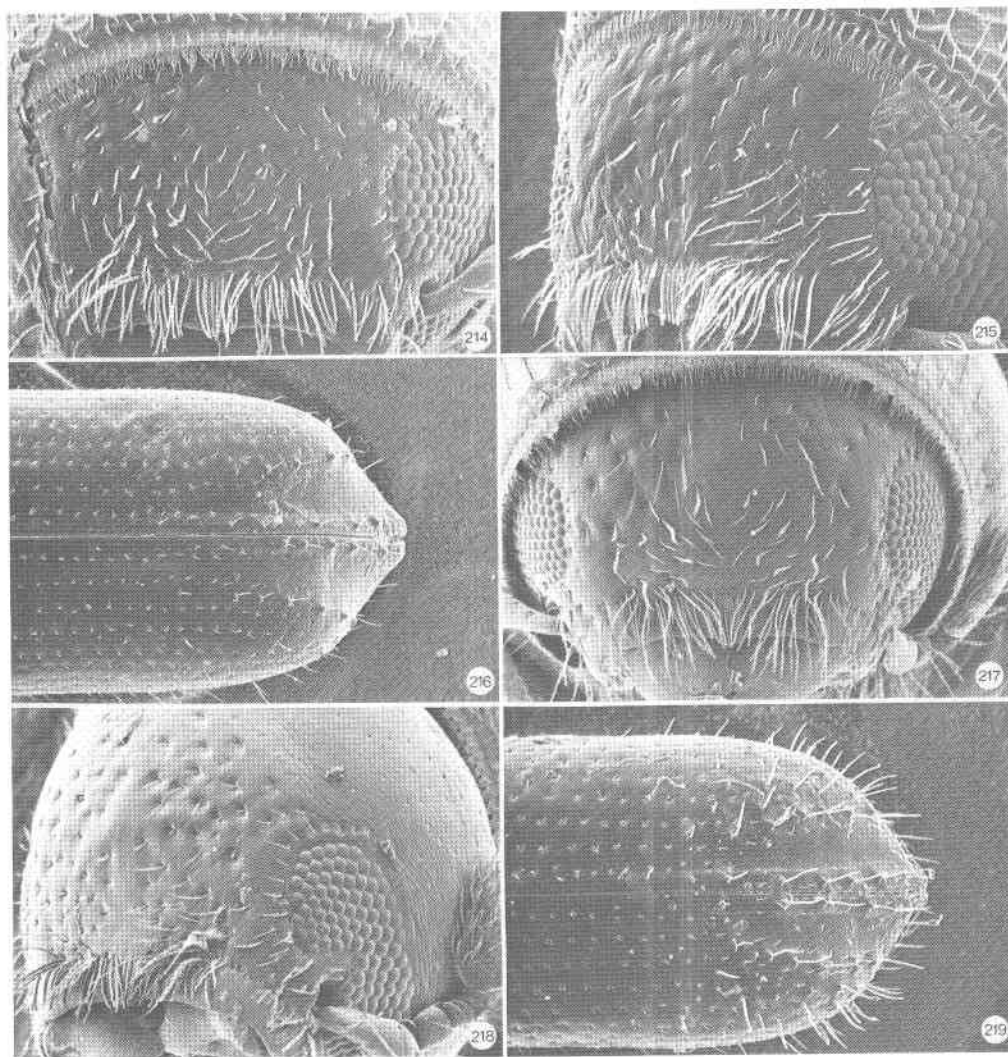


FIGS. 202-207. 202-204, *P. confinis*: 202, ♀ frons; 203, ♂ frons; 204, ♂ declivity.  
205-207, *P. montezumae*: 205, ♀ frons; 206, ♂ frons; 207, ♂ declivity.

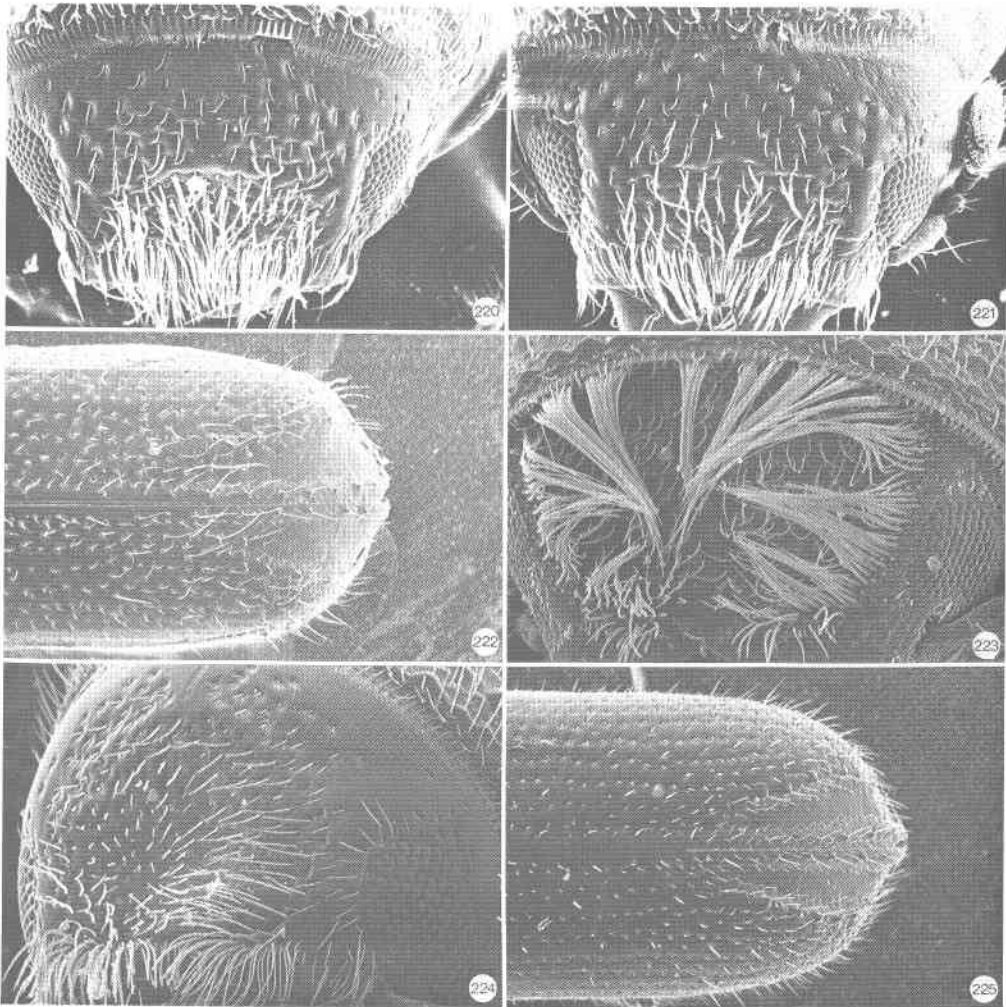


FIGS. 208-213. 208-210, *P. schwarzi*: 208, ♀ frons; 209, ♂ frons; 210, ♂ declivity.  
211-213, *P. crassus*: 211, ♀ frons; 212, ♂ frons; 213, ♂ declivity.

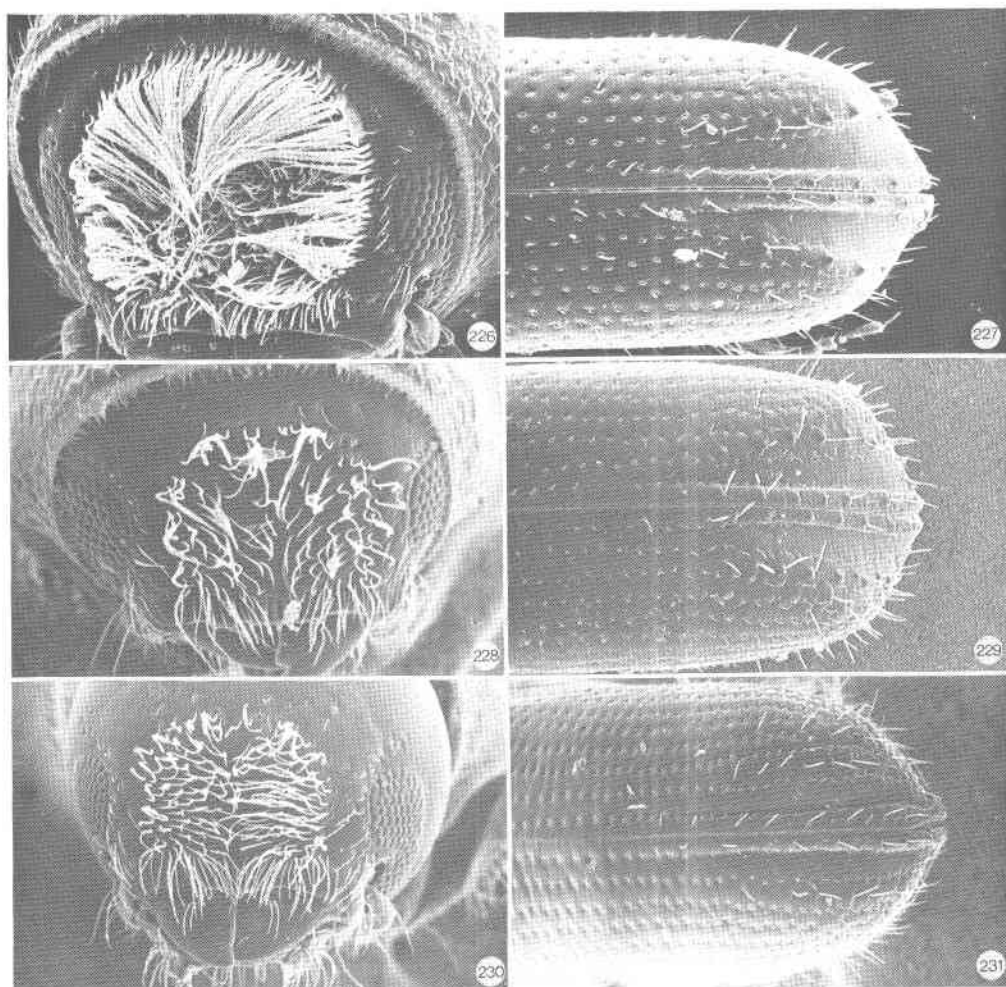




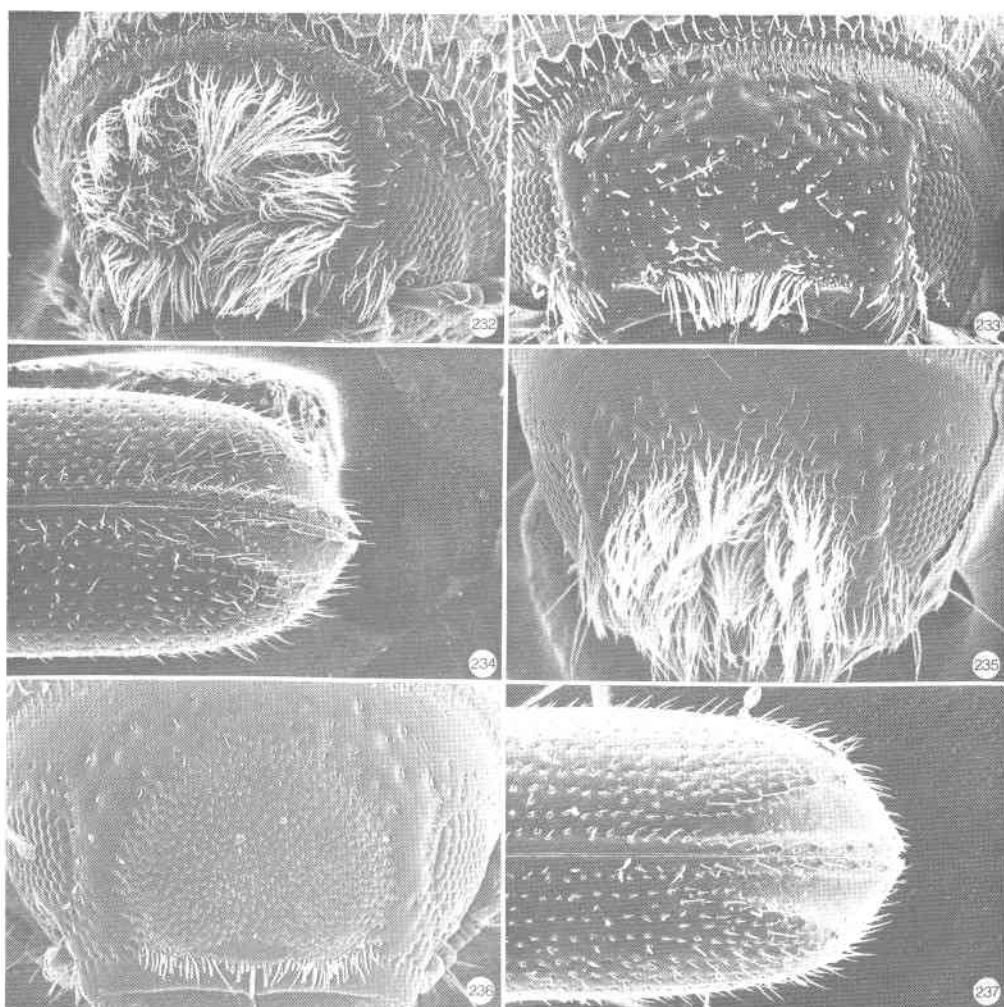
FIGS. 214-219. 214-216, *P. consimilis*: 214, ♀ frons; 215, ♂ frons; 216, ♂ declivity.  
217-219, *P. intentus*: 217, ♀ frons; 218, ♂ frons; 219, ♂ declivity.



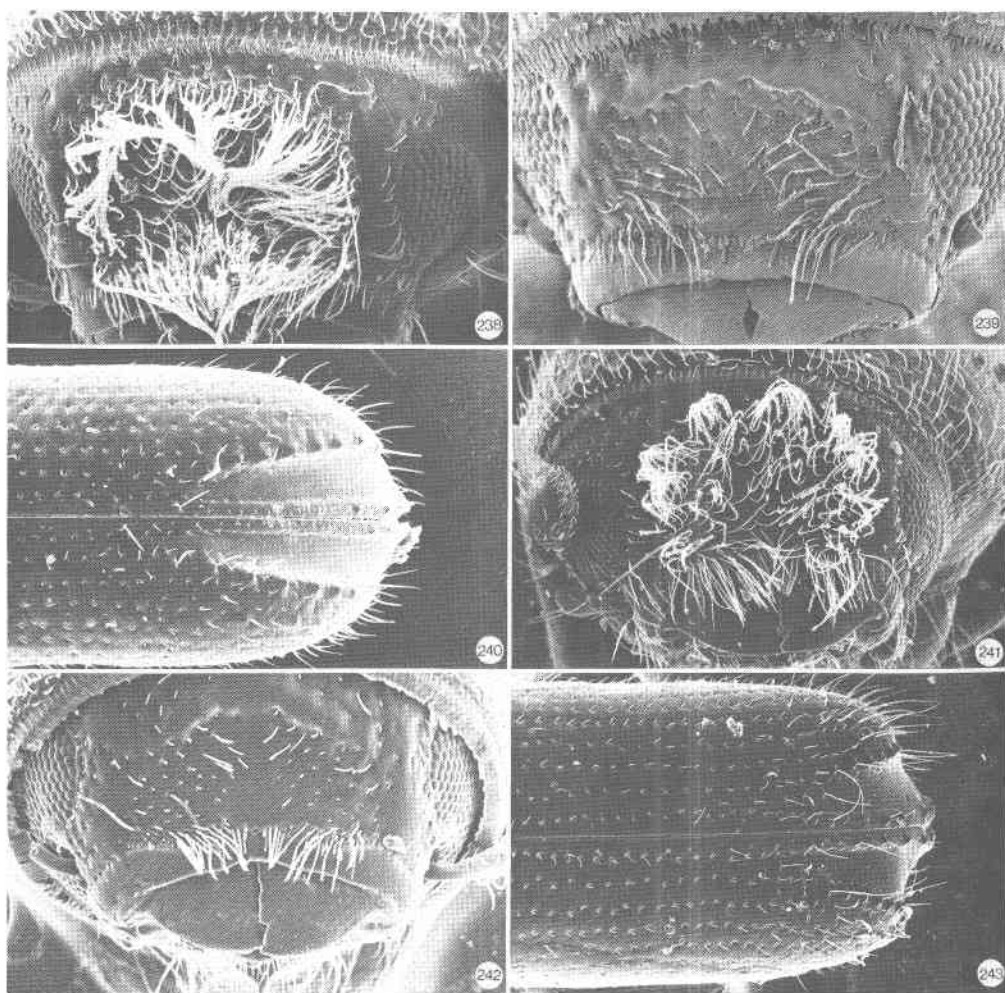
FIGS. 220-225. 220-222, *P. grandis*: 220, ♀ frons; 221, ♂ frons; 222, ♂ declivity.  
223-225, *P. confusus bellus*: 223, ♀ frons; 224, ♂ frons; 225, ♂ declivity.



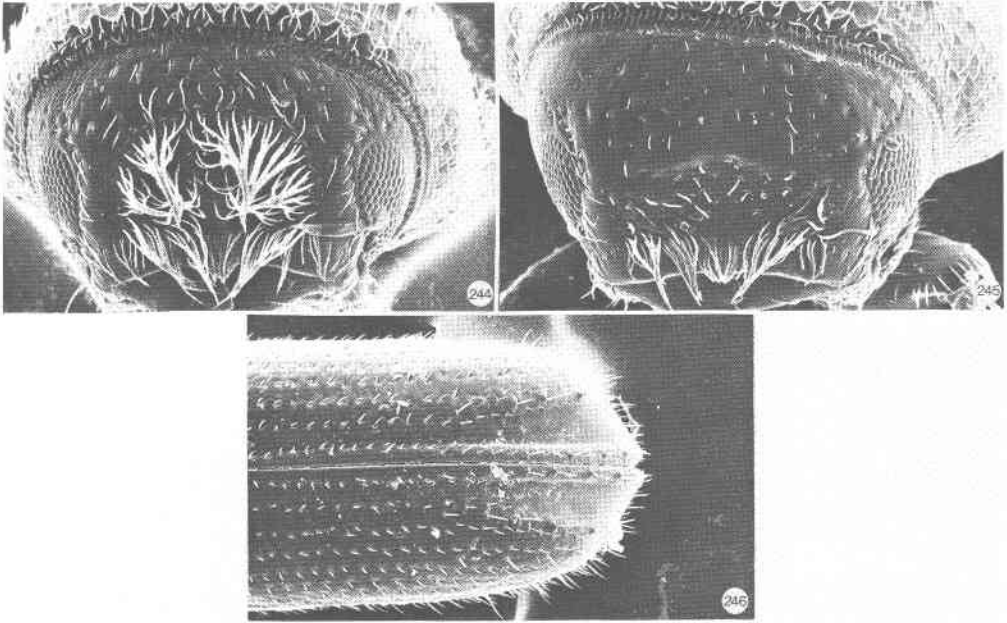
FIGS. 226-231. 226-227, *P. annectens*: 226, ♀ frons; 227, ♂ declivity. 228-229, *P. subsimilis*: 228, ♀ frons; 229, ♂ declivity. 230-231, *P. subimpresus*: 230, ♀ frons; 231, ♂ declivity.



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236-237, *P. murrayanae murrayanae*: 235-236, ♀ frons; 237, ♂ declivity.



FIGS. 238-243. 238-240, *P. bassetti*: 238, ♀ frons; 239, ♂ frons; 240, ♂ declivity.  
241-243, *P. acutus*: 241, ♀ frons; 242, ♂ frons; 243, ♂ declivity.



FIGS. 244-246. *P. solers*: 244, ♀ frons; 245, ♂ frons; 246, ♂ declivity.



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