

AN ABSTRACT OF THE THESIS OF

Armando Equihua-Martinez for the degree of Doctor of Philosophy in Entomology June 20, 1995. Title: Revision of the genus *Platylygus* (Heteroptera:Miridae).

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John D. Lattin

The genus *Platylygus* Van Duzee was erected in 1915 and revised by Kelton and Knight in 1970 describing 26 new species from United State and Mexico. Despite this prior revision, taxonomic problems have been encountered with the use of the keys and in the identification given the close similarity among species. The present study includes a revision of the most important collections in Canada, United States and Canada, limited collecting in the state of Oregon, study of male and female genitalia, analysis of the external morphology, study of host associations and the study of biogeography and a cladistic analysis.

In the current revision, five species are synonymized (*Platylygus alpinus*, *P. fuliginosus*, *P. hirtus*, *P. intermedius*, and *P. magnus*). Species of this genus are distributed from The Yukon Territory to the south State of Chiapas, Mexico; four in Canada, 14 in the United States, and nine in Mexico. Concentrations of species are found in northwestern California, southeastern Arizona and southwestern New Mexico region, and Central and southwestern Mexico.

Of the twenty-six species of *Platylygus*, 23 are associated with species of *Pinus*, two with species of *Pseudotsuga*, two with species *Abies*, and one

with *Picea*. Twenty-five species of *Pinus* serve as hosts for these insects from about 82 species of pines known from the American Continent. Previous collecting in Mexico has shown the potential for more species diversity considering the great variety of pines (about 50 species). Limited collecting, particularly in Mexico, points out the need for further research in order to clarify the uncertainty about species only known from a few specimens.

Morphological variation among the species of this genus is still poorly understood. The male and female genitalia provide the most definitive tools for species separation. Variation of some characters appears to be more evident in the species present in the southern point of the distribution of the genus. The primary observations of close related genera *Proba* and *Lygus* are not definitive and more research is needed to understand the coevolutionary relationships of the genus. The cladistic analysis shows close relationship of most species of the genus except for the species *P. vanduzeei*, and *P. keltoni*.

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Revision of the genus *Platylygus* (Heteroptera:Miridae)

by

Armando Equihua-Martinez

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Armando Equihua-Martinez, Author

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Revision of the genus *Platylygus* (Heteroptera:Miridae)

INTRODUCTION

The genus *Platylygus* was erected by Van Duzee in 1915 for *Lygidea rubecula* Reuter, known previously as *Lygidea rubecula* var. *lurida* Reuter (1909). In 1918, Knight added three species to the genus: *P. fuliginosus* and *P. intermedius* from Arizona and *P. grandis* from Arizona and California. Usinger (1931), added one more species, *P. vanduzeei*, from Arizona and Colorado. Kelton and Knight (1970) reviewed the genus and described 26 more species from the United States and Mexico. In the same revision, a study of the male genitalia for most species was included and some additional data on distribution and hosts for all species were given.

P. luridus is the only species for which the biology has been studied. According to Rauf et al, (1984), one generation occurs in northern Wisconsin. The winter is spent as an egg within the shoots of the host (*Pinus banksiana*), eclosion of eggs occurs the following spring. Five instars are reported for this species and adults were observed in early summer. Oviposition occurs from late summer to early fall. According to Kelton and Knight (1970), all species overwinter in the egg stage, nymphs appearing in the spring or early summer, depending on the region.

The majority of species of *Platylygus* are associated with the genus *Pinus* Linnaeus in North America, with the exception of *P. piceicola* which is associated with *Picea* spp., *P. balli* which is associated with *Abies* spp. and *Pseudotsugae menziesii* (Mirbel), and *P. pseudotsugae* which are associated with *Pseudotsuga menziesii*. Two contrasting patterns are observed in the

diversity and distribution of the species of the genus; one in which few species appear to be associated with a wide number of hosts, and the other being highly specific in host association.

Since the review of the genus by Kelton and Knight (1970), only *P. luridus* has received some attention (Rauf *et al*, 1984a,b). Even though a review was completed for the genus, many taxonomic, biological, and behavioural aspects remain unknown in the group. Separation of species (Kelton and Knight, 1970) was based on the coloration of the adult, length of several characters (ex.: rostrum, antennal segments, scutellum), pubescence on dorsal surface, legs and antennal segments, and the male genitalia.

External morphology also shows interesting variations in several structures used extensively in the key to species. Variation of characters, even in the same species, suggests that a close analysis of them is needed. Because of these questions, and the diverse host association patterns in the genus, this study was planned with the following objectives: 1) to study external morphology and the male and female genitalia for all species in order to gain a better understanding of the classification; 2) to study patterns of distribution and host associations of each species with special emphasis on species present in the United States where extensive collecting has occurred; and 3) to resolve taxonomic, biological, and behavioral questions.

The genus *Platylygus* Van Duzee (1915)

The genus *Platylygus* Van Duzee is placed in the subfamily Mirinae and tribe Mirini. At present, it is represented by 31 species on the North

American Continent. Species of *Platylygus* are known from The Yukon Territory in Canada to the state of Chiapas in Mexico.

Species of *Platylygus* are similar to one another in general appearance; they are generally shiny, reddish in color, large, robust, and slightly flattened. The head is gently sloping and the frons is striate. The rostrum is relatively long with the tip extending beyond the hind coxae. The dorsal surface is generally glabrous and shiny. A few exceptional, species are highly pubescent on the dorsal surface, legs and antennal segments. The variation in the length of the rostrum is used extensively to separate species. The rostrum is generally longer in females than in males. Most species show great similarity in the antennae, with the exception of *P. crassicornis* and *P. chamulans* in which the second segment is thickened.

The anterior angles of the pronotum vary from angulate to rounded. Hemelytra are similar in most species, with the exception of some maculations and slight differences in the color in few species. The genital capsule has a prominent tubercle or knob on the left dorsolateral margin that varies between species. The genital claspers are similar in most species, but some differences have been noted and can be used to separate species without dissecting the genitalia. The vesica, when inflated, show differences between species and in general show interspecific relationships between species.

Taxonomic questions

Despite the taxonomic revision of the genus by Kelton and Knight (1970), and the major differences among species indicated by them (ex. size,

color and pubescence), some problems are encountered when one tries to identify the species by means of their key. Differences between some species are based on the absolute length of rostrum and on coloration. These patterns were found to vary among populations and even among individuals from the same locality and host.

Are physical factors influencing morphological variation along gradients of distribution for some species of the genus? Are host associations in species strong enough to allow separation among species? Are many of the species very closely associated taxonomically, given the great similarities in internal and external morphology? Do some populations represent variation of the same species along the distributional gradient? Are the male genitalia the only tool that we can use with certainty to define species in this genus? Are the differences in host association indicating major evolutionary lines in *Platylygus*?

It is obvious that there are many taxonomic questions in this and in other genera of the Miridae. Given the lack of information on the biology and distribution of many species of *Platylygus*, only partial answers may be obtained, but it is hoped that the current effort will make it possible to clarify species status and facilitate future identifications in the genus. This will lead to a better understanding of the biologies of the different species.

Hosts and distribution

Species of *Platylygus* are mainly associated with species of *Pinus* Linnaeus and follow the natural distribution of these trees across the North

American continent, to which these species are confined. Records are known from The Yukon Territory (Canada) to the southern state of Chiapas (Mexico). Twenty-eight species of *Platylygus* are associated with 22 species of *Pinus* (of the 82 species reported for the American continent (Farjon, 1984; Perry, 1991; Millar, 1993; Kral, 1993). Usually, one tree species will serve as the host for one species of *Platylygus*. In addition to *Pinus*, three other genera of trees are recorded hosts for species of *Platylygus*; two bug species are associated with *Picea*, two with *Pseudotsuga*, and one with *Abies*.

Pines had originated by the Jurassic (Farjon, 1984; Perry, 1991; Millar, 1993; Kral, 1993) in the northern hemisphere and spread east and west throughout Laurasia, achieving with high diversity in eastern Asia, eastern United States, and western Europe. Pines and relatives disappeared from middle latitudes in the early Tertiary because of the humid tropical/subtropical climate but persisted in three major refugia during the three warm periods of the Eocene in the Northern Hemisphere: the high latitude, low latitude, and upland regions of the middle latitude, particularly in western North America (Millar, 1993).

The genus *Pinus* Linnaeus is represented on the American continent by 82 species (Perry, 1991; Kral, 1993) of the approximately 100 species recognized world-wide (Mirov, 1967; Farjon, 1984; Little & Critchfield, 1969; Perry, 1991; Kral, 1993; Millar, 1993).

Of the 31 known species of *Platylygus*, five are recorded from Canada, 18 from the United States and 14 from Mexico. Except for *P. luridus*, *P. piceicola*, *P. rolfsi*, and *P. rubripes*, most species of the genus apparently are localized in their distribution, perhaps reflecting a lack of information about them or the more restricted distribution of their hosts.

MATERIALS AND METHODS

A study of the external morphology of each species of *Platylygus* was conducted in order to better understand the taxonomy of the genus. As a complementary tool for separating species, male and female genitalia were dissected, drawn and compared between species. Because of the great similarity between several groups of species, a search for new morphological characters was conducted to facilitate identification. In order to expand information about hosts and distribution of the species on the continent, loans were obtained from institutions in Canada, United States and Mexico. A close analysis of host distribution was done along with the correlation of species of insect associated with them. Because biology is not known for most species, the life cycles of two species of *Platylygus* were studied in Oregon. Finally, a cladistic analysis was performed and the biogeography of the various species was clarified.

Loans from museums.

With the intention of updating information on hosts and distribution, to obtain better insight into the variability of the species, and to facilitate the study of external morphology and genitalia of the species, loans were obtained from the Biosystematics Museum of Ottawa, Canada, the California Academy of Sciences, American Museum of Natural History, National Museum of Natural History (Smithsonian Institution), Washington State University,

University of Minnesota, South Dakota State University, University of California at Berkeley, University of California at Davis, University of California at Riverside, University of Kansas, Cornell University, Oregon State University, Utah State University, Washington State University, and the collection of the Biology Institute of the National University of Mexico, Mexico City.

Study of external morphology and male and female genitalia.

Previously, primary recognition of the species was based on the original descriptions and on characters used in the previous review of the genus. Because of the great similarity of many species, a search for new morphological characters was carried out to facilitate later identification.

Traditionally, male genitalia have been used to separate genera and species in the family Miridae. Variation in the claspers and the inflation of the vesica facilitated this separation. Male genitalia for most species were utilized in the revision of the genus *Platylygus* by Kelton and Knight (1970). Given the great similarity among several species and the fact that descriptive illustrations for some of them were only partial, all of the species were studied again comparing genitalia and claspers. In cases in which vesica did not inflate or no males were available for study drawings from Kelton and Knight (1970) were taken and used for comparison as indicated in some figures.

Female genitalia have been used in Miridae to illustrate separation among genera and, more recently, to illustrate some species and facilitate identification. Even though the taxonomic value of the characters of the

female genitalia has been pointed out by Slater (1950), Davis (1955), and Ehanno (1990). They are not often used to separate species in any genus of Miridae. A study of female genitalia of *Platylygus* was conducted to improve understanding of interspecific relationships and as a tool for separating similar species. In this study, the sclerotized rings and the dorsum of the posterior wall were studied for most species, following the paper of Davis (1955).

The genital capsule was removed from the abdomen in both sexes, placed in a KOH solution until cleared and softened, placed into cold water, and parts studied and drawn. Drawings were made using holotypes or paratypes when possible. Dissections of male and female genitalia for all species were performed throughout the range of species and from every host plant to look for patterns of variation. SEM photographs were taken for several species of *Platylygus* to complement the study of male and female genitalia and to clarify the dimension of the drawings.

Study of hosts and distribution.

Herbivorous insects show different types of associations with their hosts. Although much information has been written about it, the variation of the insect-plant interactions is little known, even between species within the same genus. It is generally believed that species of Miridae are host specific, a belief that is corroborated within the species of *Platylygus*. There are exceptions in the few species that are associated with several species of trees, sometimes even with different tree genera.

Most species of *Platylygus* are associated with *Pinus* spp., with the exception of the four species recorded from species of *Picea*, *Pseudotsuga*, and *Abies*. Given the scarcity of information on species in this genus of insects, a review was conducted of the available information about their hosts and distribution. Interpretations of these patterns considering natural distribution of host species was done following the books by Mirov (1967), Farjon (1984), and Perry (1993) and volume 2 of Flora of North America (1993). To complement the analysis, fossil record (Mirov, 1967; Farjon, 1984; Millar, 1993) and cladistics (Strauss and Doerksen, 1990; Krupkin, 1992) for *Pinus* were reviewed for interpretations on species of *Platylygus*.

Life cycle of *Platylygus pseudotsugae* and *P. rubripes* in Western Oregon.

Except for the Wisconsin study on *Platylygus luridus*. (Rauf *et al.*, 1984), life cycles and biologies of the species of the genus are unknown. The life cycles of *Platylygus pseudotsugae* and *P. rubripes* were studied in the field in order to gain a better understanding of the biology of the genus. These two species were selected not only because of the generic difference in their host trees;(one is associated with *Pseudotsuga menziesii* at high elevations, and the other with *Pinus contorta* along the shore of the Pacific Ocean in Oregon), but also because it provided an opportunity to study the two main lines of host associations. It was the intent to study colonization patterns, dispersion, feeding habits, and the life cycle for the two species living under different environments. *Platylygus pseudotsugae* was studied at Mary's Peak (1200 m) and *P. rubripes* along the Oregon Coast at Newport. Sampling was

done from late spring to late fall of 1993. Visits to both places were done every two weeks to follow the life cycle in the field and to do field observations on biology and behavior of both species.

Cladistic analysis and biogeography.

A cladistic analysis was done in order to generate hypotheses about generic and specific relationships which are needed for the study of evolutionary biogeography and ecological patterns.

The analysis included 26 species and was conducted using taxonomic characters from the original descriptions and those covered during my own morphological studies. It was done on the IBM PC using the PAUP phylogenetic inference program (1991).

For the biogeographical analysis, the distribution of each species was determined, looking for the main areas of diversity. It is important to note that the fauna of the United States is the best known on the continent.

RESULTS

Genus *Platylygus* Van Duzee.

Platylygus Van Duzee, 1915, p. 111 (new genus).- Carvalho, 1952:91 (classification).- Kelton, 1955:532 (generic key).- Carvalho, 1959:226 (catalogue).- Kelton and Knight, 1970:1458 (revision).- Henry and Wheeler, 1988:353 (catalogue).

TYPE OF THE GENUS: *Platylygus luridus* Van Duzee, 1915, male

U.S.A.: New York: Lake Placid, 12 August 1904, E.P. Van Duzee (deposited in United States National Museum, Washington, D.C.).

DIAGNOSIS: Species of the genus *Platylygus* are similar in general appearance (Fig. 1). Most species are shiny, reddish brown, and some may exhibit variation in color that may suggest a different species. Most species are dorsally glabrous, except *P. brevirostris*, *P. crinitus*, *P. piceicola*, *P. pilosus*, and *P. teocotae*. General coloration is homogeneous except for some marks on *P. scutellatus* and *P. pilosipes* (scutellum), *P. usingeri* and *P. aztecus* (opaque spots near the apex of the clavus, corium or both), *P. contortae* (hemelytra), and the greatly contrasting *P. vanduzeei* which shows consistent marks on the hemelytra and pronotum. The species are large and robust and appear slightly flattened. The head is gently sloping and the frons is striate with striations more strongly marked in some species (Fig. 20; clypeus varies from rounded (Fig. 3) to angulated. The rostrum is long in most species and extends beyond the hind coxae (except *P. brevirostris*, *P. crassicornis*, *P. pilosus*, and *P. vanduzeei*). Most species are glabrous, however, pubescence on the legs (Fig. 4), antennae (Fig. 5) or on the dorsal surface (Fig. 6b) help to separate some species. The pronotum has anterior

angles varying from rounded (Fig. 7) to angulated, with dorsal punctures well marked or not (Fig. 7).

Male genitalia.

A classification based on four major conditions of the vesica was used in this study to separate species of *Platylygus* into larger groups; 1) ***luridus-piceicola*** type, in which the vesica is small and constant in shape and shows only minor variation in the shape of the central knobs, it includes: *andrei*, *brevirostris*, *crinitus*, *piceicola*, *pilosus*, and *teocotae*; 2) the ***contortae-angulatus*** type, which is close to the first type but which has more lobules and is generally larger in size; it includes: *angulatus*, *contortae* and *crassicornis*; 3) ***keltoni-chamulans*** type (Fig. 8), in which the vesica is much larger and shows some variation in the ridge of spines of different positions among species. In this type, part of the variation includes the number of spines on the inflated vesica, which ranges from one spine in *keltoni* to a ridge of spines in the main lobe in *chamulans*; it is represented by: *balli*, *chamulans*, *chiapasensis*, *grandis*, *keltoni*, *knighti*, *pilosipes*, *pseudotsugae* (Fig. 9a), *rolfsi*, *rubripes*, *scutellatus*, and *vanduzeei*; 4) ***longirostris-usingeri*** type, in which the main lobe is surrounded by spines at the apex; it is represented by *longirostris* and *usingeri*; and 5) ***mexicanus***, a unique type of male genitalia represented by *P. mexicanus*, in which a series of sclerotized plates are present at the apex of the main lobe instead of ridges of spines.

In the present study, it was observed that in some specimens the vesica did not inflate completely. This can create the wrong impression about

the shape of the vesica itself and the true directions of vesical lobes, a factor that may create confusion in identification.

Genital claspers.

Drawings of the genital claspers were included in the revision by Kelton and Knight (1970), but there was no discussion of the variation in this structure. In the present study (Fig. 9b), variation of the claspers was studied throughout the range of distribution. In general, minor variation was observed in the same species. The left clasper is highly homogeneous in most species of the genus, but the right clasper shows enough variation to allow division of species into major groups. Even though this division does not coincide with the shape of vesica, it was used as another element for separation of species, and as a tool for considering phylogenetic relationships between close genera within the Mirini. Three major types of claspers were recognized here; 1) **vanduzeei-keltoni** type, in which the apex of the clasper is only slightly curved and resembles species of *Proba*; it includes *keltoni*, *usingeri*, and *vanduzeei*; 2) the **luridus-piceicola** type, with a more curved apex of the clasper than in the previous type, and with a truncate shoulder or sharply projection; it was the most common type in the genus and is represented by *andrei*, *angulatus*, *balli*, *brevirostris*, *chamulans chiapasensis*, *crinitus*, *grandis*, *knighti*, *longirostris*, *luridus*, *mexicanus*, *piceicola*, *pilosus*, *pseudotsugae*, *rolfsi*, *rubripes* and *teocotae*; and 3) the **contortae-scutellatus** type, in which apex and shoulder of the clasper almost meet each other to

form a circle; it is represented by *contortae*, *crassicornis*, *pilosipes*, and *scutellatus*.

Female genitalia.

Except for *P. grandis* (Slater, 1950) female genitalia had not been studied in the genus. The posterior wall (Fig. 10) and sclerotized rings (Fig. 11) were studied for most species of *Platylygus* in this study. Terminology used here is based on Davis (1955), with the only addition a structure that appeared to be different in one species of the genus (*contortae*) (Fig.16a ,**abc**).

In general, the shape of the female genitalia is consistent in all species of the genus; sclerotized rings are generally elongated (Fig. 12) and the distance of separation between them usually does not exceed their length except on *crinitus*, *luridus*, and *piceicola*; the ventral labiate plate extends dorsally and the length, shape and degree of sclerotization is consistent except for *pilosipes* and *scutellatus*. The dorsal labiate plate appears to be very consistent in the genus, but some variation helps to separate some of the species. The posterior wall does not show much variation of the sigmoid process, inter-ramal sclerite or the ramus of the first valvula, and it was concluded from this study that the female genitalia may be used to separate this genus from other genera in the family.

Key to species of *Platylygus*.

All the species of *Platylygus* are similar in general appearance, external morphology help to separate them into larger groups in some cases, but in most cases species determination is difficult base on the morphology along. The following key incorporate morphological variation suggested by Kelton and Knight (1970), new external characters found in this study, male and female genitalia, patterns of distribution, and host associations. In some cases, combinations of all elements will be required to make correct identifications of species. Until biological data is known as well as enough information on morphological variation, determination of species will remain uncertain. The following keys tried to integrate all elements previously mentioned or only include those considered distinctive for each species.

Key to species of *Platylygus* (Modified from Kelton and Knight, 1970)

1. Dorsum hairy, pubescence short or prominent.....2
 Dorsum practically glabrous.....6
2. Hind tibia strongly pilose.....3
 Hind tibia not strongly pilose.....4
3. Pubescence short on dorsum and most prominent on costal margins of the
 hemelytra; hind tibia pilose; reddish; Mexico.....*teocotae* Kelton, p. 66
 Pubescence on dorsum prominent; Mexico.....*pilosus* Kelton, p. 54
4. Only apex of scutellum pale.....5
 Margins of scutellum pale.....*crinitus* Kelton, p. 34
5. Short rostrum; all tibiae without long hairs; associated with pines; Mexico...
 *brevirostris* Kelton, p. 25
 Longer rostrum; hairy tibiae; primarily associated with *Picea* spp.; mostly
 western USA.....*piceicola* Kelton, p. 50
6. Callus of pronotum marked with reddish dots; black marks on hemelytra;
 associated with pinyon pines.....*vanduzeei* Usinger, p. 70
 Callus of pronotum not marked with reddish dots; marks when present
 not as defined as above; other than pinyon pines.....7
7. Tibia strongly pilose, hairs longer than spines.....8
 Tibia not strongly pilose.....9
8. Front tibia strongly pilose, hairs longer than spines; hind tibia with short
 pile; Arizona.....*andrei* Knight, p. 19
 Front tibia with short pile; hind tibia with long pile; Arizona and Durango,
 Mexico.....*pilosipes* Kelton. p. 52

9. Clavus and corium without opaque white spots.....10
 Clavus and corium with opaque white spots near apex; California and Colorado.....*usingeri* Knight, p. 68
10. Scutellum with brown or reddish triangular marks on each side of middle; Arizona and New Mexico to Durango, Mexico.....*scutellatus* Kelton, p. 65
 Scutellum without triangular marks.....11
11. Corium without diagonal marks.....12
 Corium with diagonal brown or reddish marks; California, Nevada and New Mexico.....*contortae* Kelton, p. 30
12. Second antennal segment not pilose.....13
 Second antennal segment pilose; frons with striations not well defined; Mexico*chiapasensis* Kelton, p. 28
13. Anterior angles of pronotum prominent.....14
 Anterior angles of pronotum rounded.....18
14. Corium with longitudinal reddish bar along radial vein; sometimes faint.....15
 Corium without reddish bar.....16
15. More than 8.0 mm; anterior angles very pronounced; reddish; Mexico.....
*angulatus* Kelton, p. 20
 Less than 8.0 mm; anterior angles not as marked as above; pale-brown; Mexico.....*mexicanus* Kelton, p. 48
16. Second antennal segment slender.....17
 Second antennal segment incrassate at apex; reddish; Central Mexico.....
*crassicornis* Kelton, p. 32

17. Pronotum and scutellum light yellowish brown, not marked with reddish; pale; Durango, Mexico.....*longirostris* Kelton, p. 42
 Pronotum and scutellum marked with reddish; body reddish, Durango, Mexico.....*keltoni* Knight, p. 38
18. Clypeus angulated.....19
 Clypeus rounded.....20
19. Tip of rostrum extending to base of ovipositor; pale; Chiapas, Mexico.*chamulans* Kelton, p. 26
 Tip of Rostrum extending to middle ovipositor; dark brown, Central Mexico*aztecus* Kelton, p. 22
20. Species less than 8.0 mm.....21
 Species more than 8.0 mm.....25
21. Body reddish; mostly western U.S.; generally associated with fewer species of pines.....22
 Body from pale to dark brown; widely distributed in U.S.; wide range of hosts (several subsections of *Pinus*).....*luridus* (Reuter), p. 43
22. Rostrum 3.6 mm or longer; usually non-pine hosts.....23
 Rostrum less than 3.6 mm; on *Pinus*; western U.S....*rubripes* Knight, p. 61
23. Rostrum less than 4.0 mm; body reddish.....24
 Rostrum more than 4.0 mm; Arizona, Colorado and New Mexico; body yellowish.....*balli* Knight, p. 23
24. Rostrum more than 3.8 mm; scutellum reddish brown; on *Pinus*; Arizona and Colorado.....*knighti* Kelton, p. 40
 Rostrum less than 3.8 mm; scutellum brown; western Canada and U.S.; on *Pseudotsuga menziesii*.....*pseudotsugae* Kelton, p. 56

25. Rostrum usually less than 4.0 mm (except for populations in central and south California); wide range of hosts; Pacific Northwest...*rolfsi* Knight, p. 58
 Rostrum more than 4.0 mm; from Arizona to North Dakota; on *Pinus ponderosa*.....*grandis* Knight, p. 35

***Platylygus andrei* Knight, 1970** (Figs. 13a, 20a, 27d, 29)

Platylygus andrei Knight, 1970:1439, fig. 21 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:352 (catalogue).

HOLOTYPE: Male, **U.S.A.: Arizona:** Hannagan, Apache National Forest, 26 August 1937, Drake and Andre. (in United States National Museum, Washington, D.C.).

PARATYPES: Ten paratypes as cited by Kelton and Knight (1970) from Arizona.

DIAGNOSIS: *P. andrei* is distinguished by the almost glabrous dorsum, and the pilose legs. The pile on the legs, especially that on the tibia, is prominent. Male genitalia is of the *luridus-piceicola* type and resembles that of *pilosus*. Female genitalia are typical for the genus and resembles that of *teocotae*, but smaller in size and with the dorsal labiate plate almost meeting at the dorso-central area (Fig. 13a).

REDESCRIPTION: (**Male**) length 6.08-6.86 mm; width 2.4-2.64 mm. Head: 1.26-1.28, vertex 0.49-0.54, with striations defined. Antenna (in mm): I, 0.66-0.72, II, 2.0-2.24, III, 0.58-0.64, IV, 0.52. Rostrum 3.36-3.44 mm in length and extending to middle of abdomen. Pronotum 2.16-2.40 mm wide at base with punctuations well defined, pilose. Dorsal surface almost glabrous. General coloration varying from dark brown to yellowish-brown. Legs pilose

(Fig.). **Female.** length 5.92-7.44 mm; width 2.64-3.04 mm. Head: 1.28-1.36, vertex 0.56-0.64, with striations defined. Antenna (in mm): I, 0.70-0.96, II, 2.10-2.24, III, 0.64-0.80, IV, 0.56-0.63. Rostrum 2.64-3.60 mm in length and extending to middle of abdomen. Pronotum 2.24-2.64 mm wide at base. Similar in general appearance to male but a little larger and more robust.

HOSTS: *P. monticola* Douglas (**new host**) and *Pinus ponderosa* Douglas.

DISTRIBUTION: Kelton and Knight (1970) cited this species from Arizona; it is also known from New Mexico.

SPECIMENS EXAMINED: **U.S.A.: Arizona: Coconino Co.:** Kehl Point on Mogollon Rim, T12N R10E, ex.: *Pinus monticola*; San Francisco National Mountains, Coconino National Forest, ex.: *Pinus ponderosa*. **New Mexico:** Mountain Park (Co.?).

DISCUSSION: Knight (1970) described *P. andrei* from Hannagan, Apache National Forest, Arizona from an elevation of 9000 feet (holotype). This species was also collected at Coconino National Forest, Arizona. The host cited was *Pinus ponderosa* but without defined localities. It was also reported recently on *Pinus monticola* (Arizona).

***Platylygus angulatus* Kelton, 1970** (Figs. 27e, 30).

Platylygus angulatus Kelton, 1970:1445, fig. 23 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Male, **MEXICO: Durango:** 9 mi W Cd. Durango, 9000 ft, 11 June 1964, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,059).

PARATYPES: Only one paratype (female) is known from the type locality (Kelton and Knight, 1970).

DIAGNOSIS. *P. angulatus* is distinguished by the almost glabrous dorsum, the prominent anterior angles of the pronotum, and the long rostrum. It is a large and robust species, resembling *P. keltoni* in size and in the length of the rostrum. The vesica is of the *contorta-angulatus* type with prominent lobes; the right clasper is of the *luridus-piceicola* type (Fig. 27e).

REDESCRIPTION: (**Male**) length 8.75 mm; width 3.64 mm. Head: 1.61, vertex 0.73, with striations defined. Antenna (in mm): I, 1.33, II, 3.64, III, 0.94, IV, 0.57. Rostrum 4.55 mm in length and extending to middle of abdomen. Pronotum 2.80 mm wide at base, with anterior angles prominent and punctuations well defined. General coloration reddish with dorsal surface almost glabrous. **Female**. length 8.40 mm; width 3.36 mm. Head: 1.61, vertex 0.84, with striations more defined than male. Antenna (in mm): I, 1.33, II, 3.64, III, 1.12, IV, 0.70. Rostrum 4.69 mm in length and extending to middle of abdomen. Pronotum 2.80 mm wide at base. Similar in general appearance to male but a little larger and more robust.

HOST: *Pinus* sp.

DISTRIBUTION: **MEXICO: Durango:** Ciudad de Durango.

SPECIMENS EXAMINED: **MEXICO: Durango:** Buenos Aires, 10 mi W Cd. Durango, ex.: *Pinus* sp.

DISCUSSION: Kelton (1970) described the species from Durango City (Mexico) from two specimens. The host is cited as *Pinus* sp. The type locality is shared with *Platylygus keltoni* and *P. longirostris* and, given the fact that they live in the same area, more collecting is needed to clarify host

associations as well as the distribution within the Sierra Madre Occidental (Mexico).

***Platylygus aztecus* Kelton, 1970** (Figs. 14a, 31).

Platylygus aztecus Kelton, 1970:1449, fig. 11 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Female, **MEXICO: D.F.:** La Marquesa, 9 July 1969, L.A. Kelton,. (in Canadian National Collection, Ottawa, No. 11,060).

PARATYPES: No paratypes are known.

DIAGNOSIS: *P. aztecus* is distinguished by the large size and brown color, the strongly marked striations on vertex, the white opaque areas on the corium, and the angulate clypeus. It is a large and robust species. Female genitalia are typical for the genus, except for the ventral labiate plate which does not extend through the apex of sclerotized rings (Fig. 14a).

REDESCRIPTION: (**male**). Unknown.(**female**) length 8.75 mm; width 3.50 mm. Head: width 1.54 mm, vertex 0.70 mm with striations strongly marked; clypeus angulate. Antenna (n mm) I, 1.12, II, 2.80. III, 1.12, IV, broken. Rostrum 4.13 mm in length. Pronotum 3.01 mm width at base with lateral dark marks and punctuations well defined, General coloration dark-brown and with opaque white areas on the corium resembling those found in *Platylygus usingeri*.

HOST: *Pinus montezumae* Lamb.

DISTRIBUTION: **MEXICO: D.F.:** La Marquesa.

SPECIMENS EXAMINED: **MEXICO: D.F.:** La Marquesa.

DISCUSSION: Kelton (1970) described the species based on one specimen collected at La Marquesa, D.F. (Mexico); the host cited was *Pinus montezumae*. Further collecting in the area may make possible the description of the male of the species. The host is abundant in the area as well as in other areas of central Mexico.

***Platylygus balli* Knight, 1970** (Figs. 15a, 22a, 27f, 32).

Platylygus balli Knight, 1970:1953, fig. 38 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:352 (catalogue).

HOLOTYPE: Male, **U.S.A.: Arizona:** San Francisco Mountains, 9 August 1930, E.D. Ball, (in United States National Museum, Washington, D.C.).

PARATYPES: Fifteen paratypes as cited by Kelton and Knight (1970) from Arizona (12), Colorado (2), and New Mexico (1).

DIAGNOSIS; *P. balli* is distinguished by the almost glabrous dorsum, the long rostrum, and the reddish hind legs. It resembles *P. knighti* and *P. rubripes*. The male genitalia is of the *keltoni-chamulans* type with the main lobe of the vesica bearing a small ridge of spines in the apex, right clasper is of the *luridus-piceicola* type, but with a truncation on the shoulder. Typical female genitalia as other species of *Platylygus*, and resembling those of *grandis* (Fig. 15a).

REDESCRIPTION: (**Male**) length 6.6-7.0 mm; width 2.56-2.66 mm. Head: 1.36-1.40, vertex 0.63-0.80, with striations defined, but not marked. Antenna (in mm): I, 0.72-0.80, II, 0.96-1.12, III, 0.58-0.64, IV, 0.68-0.84. Rostrum 4.13-4.16 mm in length and extending to middle of abdomen.

Pronotum 2.16-2.17 mm wide at base and punctuations well defined. Dorsal surface almost glabrous. **Female.** length 6.88-8.0 mm; width 2.72-3.04 mm. Head: 1.32-1.47, vertex 0.70-0.80, with striations more defined than male. Antenna (in mm): I, 0.84-0.96, II, 2.80-2.96, III, 1.19-1.28, IV, 0.72-0.77. Rostrum 4.12-4.34 mm in length and extending to middle of abdomen. Pronotum 2.16-2.32 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOSTS: *Pinus strobiformis* Engelmann, *P. flexilis* James (**new host**), *Abies concolor* (Gordon & Glendinning), *Pseudotsuga menziesii* var. *glauca* (Mirbel) (host ?).

DISTRIBUTION: **U.S.A.: Arizona, Colorado and New Mexico** (Kelton and Knight, 1970).

SPECIMENS EXAMINED: **Arizona:** Apache Co.: Big Lake, Apache National Forest, ex.: *Pinus flexilis*; Cochise Co.: Rustler Park, Chiricahua Mts, ex.: *Abies concolor*; Graham Co.: Hospital, Graham Mountains.

DISCUSSION: Knight (1970) described *P. balli* from San Francisco Mountains, Arizona (holotype) and from additional material from Apache National Forest and Rustler Park, all in Arizona. The stated hosts were *Pinus strobiformis* Engelmann, *Abies concolor* (Gordon & Gledening) and *Pseudotsuga menziesii* (Mirbel). The largest series collected was found on *Abies concolor*, but two pine species are also known as host for this species. Because differences in hosts are quite distinctive, more collecting must be conducted to explain the host associations. Kelton and Knight (1970) also cited *Pseudotsuga menziesii* as a host, based on one specimen collected at Cloudcroft, New Mexico, and they also mentioned that *P. balli* may be found with *Platylygus pseudotsugae* Kelton (associated also with *Pseudotsuga*

menziesii). The specimen collected in New Mexico probably is not associated with *Pseudotsuga menziesii* or, if it is then it is associated with a different variety of *P. menziessi* (*glauca*) and probably restricted to the southwestern United States. *Platylygus pseudotsugae* in contrast is only associated with *Pseudotsuga menziesii* var. *menziesii*, and it has been found only in the Pacific Northwest.

***Platylygus brevirostris* Kelton, 1970** (Figs. 27g, 30).

Platylygus brevirostris Kelton, 1970:1436, fig. 15 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Male, **MEXICO: Durango:** 10 mi W El Salto, 9000 ft, 28 July 1964, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,061).

PARATYPES: One male as cited by Kelton and Knight (1970) from the type locality.

DIAGNOSIS: *P. brevirostris* is distinguished by the long pubescence on the dorsum, the short rostrum, and the absence of long pile on the tibia (a character that separates this species from other pubescent species in the genus). The general pattern of the vesica (according to Kelton and Knight (1970)) is of the *luridus-piceicola* type, and the right clasper is of the *luridus-piceicola* type with a sharp projection on the shoulder.

REDESCRIPTION: (**Male**) length 6.30-6.32 mm; width 2.45-2.47 mm. Head: 1.06-1.12, vertex 0.41-0.42, with striations defined, but not marked. Antenna (in mm): I, 0.60-0.63, II, 1.90-1.96, III, 0.66-0.70, IV, 0.52-0.54. Rostrum 2.90-2.94 mm in length. Pronotum 2.0-2.03 mm wide at base and with punctuations well defined. General coloration reddish-brown with dorsal

surface homogeneously pubescent. Hind tibia not pubescent. **Female.**
Unknown.

HOST: *Pinus* sp.

DISTRIBUTION: **MEXICO: Durango:** El Salto.

SPECIMENS EXAMINED: **MEXICO: Durango:** 10 mi W El Salto.

DISCUSSION: *P. brevirostris* was described by Kelton (1970) from El Salto, Durango (Mexico) at an elevation of 9000 ft. The host was said to be *Pinus* sp. The species shares the type locality with *Platylygus mexicanus* Kelton and *P. pilosipes* Kelton. More collecting is needed to clarify host associations, and to obtain specimens of the female. *P. brevirostris* may be confused with *P. crinitus* because both species are dorsally pubescent and the male genitalia are of the same type. No female genitalia comparison was possible because females are unknown in *P. brevirostris*; the only differences known at this point are the distribution pattern and minor differences in external morphology.

***Platylygus chamulans* Kelton, 1970** (Figs. 3b, 14c, 23a, 27h, 33).

Platylygus chamulans Kelton, 1970:1447, fig. 33 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Male, **MEXICO: Chiapas:** San Cristobal de las Casas, 14 July 1969, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,062).

PARATYPES: Only one female is known from the type locality as cited by Kelton and Knight (1970).

DIAGNOSIS: *P. chamulans* is distinguished by the almost glabrous dorsum, the thickened second antennal segment, and the very long rostrum. It

resembles *angulatus* but is smaller and the second antennal segment is thicker (but not as strongly marked as *crassicornis*), and with different male genitalia. Male genitalia are of the *keltoni-chamulans* type, and the vesica is unique in that the main lobe is quite large and almost encircled by a ridge of spines before the apex. Female genitalia are typical for the genus, with elongated sclerotized rings (Fig. 14c).

REDESCRIPTION: (**Male**) length 8.26 mm; width 3.08 mm. Head: 1.47, vertex 0.70, with striations defined; clypeus angulated. Antenna (in mm): I, 1.12, II, 3.08, III, 0.77, IV, broken. Rostrum 4.50 mm in length and extending to genital segment. Pronotum 2.52 mm wide at base and with punctuations well defined. General coloration reddish-brown, dorsal surface with short pubescence and not very abundant. **Female.** length 8.12 mm; width 3.22 mm. Head: 1.47, vertex 0.77, with striations more defined than male. Antenna (in mm): I, 1.12, II, 3.08, III, 0.91, IV, broken. Rostrum 4.65 mm in length. Pronotum 2.66 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOST: *Pinus pseudostrobus* Lindl.

DISTRIBUTION: **MEXICO: Chiapas.**

SPECIMENS EXAMINED: **MEXICO: Chiapas:** 3 mi S Lomatan; 5 mi S San Carlos; San Cristobal de las Casas. EX.: *Pinus pseudostrobus*.

DISCUSSION: Kelton (1970) described *P. chamulans* from San Cristobal de las Casas, Chiapas (Mexico) based on two specimens collected on *Pinus pseudostrobus* Lindl., and it is the only material known. This species is found at the same locality in the state of Chiapas with *Platylygus chiapasensis* Kelton but there are differences in host association. The diversity of pines in south Mexico may foster a broader range of *Platylygus*

spp. and more collecting is needed to verify this assumption. It is also suggested that more collecting is needed to better understand the natural distribution of this species because *Pinus pseudostrobus* is distributed from central Mexico to Chiapas.

***Platylygus chiapasensis* Kelton, 1970** (Figs. 1a, 14d, 23a, 27i, 33).

Platylygus chiapasensis Kelton, 1970:1444, fig. 30 (*In*: Kelton and Knight, 1970) (revision).

Platylygus alpinus Kelton, 1970:1445, fig. 31, (***New Syn.***).

HOLOTYPE: Male, **MEXICO: Chiapas:** San Cristobal de las Casas, 14 July 1969, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,063).

HOLOTYPE FOR SYNONYM: *Platylygus alpinus* Kelton: male, Tlahuapan, Puebla, Mexico, 28 August, 1969, L.A. Kelton. (in Canadian National Collection, No. 11,058).

PARATYPES: A total of 106 specimens as cited by Kelton and Knight (1970) from the state of Chiapas, Mexico. Additional 18 paratypes are cited by Kelton and Knight (1970) for *Platylygus alpinus* Kelton from the Mexican states of Puebla (15), Mexico (1) and Chiapas (2)

DIAGNOSIS: *P. chiapasensis* is distinguished by the almost glabrous dorsum, the pilose antenna, the reddish-brown color, the pilose hind tibia, and the long rostrum. Vesica of the *keltoni-chamulans* type, with main lobe of the vesica elongated and bearing a ridge of spines at the apex; right clasper of the *luridus-piceicola* type. Female genitalia typical for the genus (Fig. 14d).

REDESCRIPTION: (**Male**) length 7.56-7.76- mm; width 2.87-2.96 mm. Head: 1.33-1.36, vertex 0.57-0.59, with striations well defined. Antenna (in

mm): I, 0.78-0.96, II, 2.38-2.40, III, 1.04-1.05, IV, 0.68-0.70. Rostrum 4.13-4.32 mm in length and extending to genital segment. Pronotum 2.24-2.48 mm wide at base and with punctuations well defined. General coloration reddish-brown with dorsal surface shiny and with longitudinal mark well defined on the hemelytra. **Female.** length 7.35-8.0 mm; width 2.88-3.08 mm. Head: 1.40-1.44, vertex 0.63-0.72, with striations more defined than male. Antenna (in mm): I, 0.80-0.87, II, 2.48-2.59, III, 1.12-1.13, IV, 0.64-0.70. Rostrum 4.27-4.436 mm in length. Pronotum 2.40-2.52 mm wide at base. Similar in general appearance to male, but more robust.

HOSTS: *Pinus ayacahuite* Ehren.(**new host**), *Pinus montezumae*, Lamb. *Pinus oocarpa* var. *ochoteranai* Schiede.

DISTRIBUTION: Previously known from the Mexican state of Chiapas (Kelton and Knight, 1970). The type locality of *Platylygus alpinus* Kelton (Puebla, Mexico) is added to the distribution of this species; also added is the state of Mexico.

SPECIMENS EXAMINED: **MEXICO: Chiapas:** San Cristobal de las Casas, ex.: *Pinus ayacahuite*. **Edo. de Mexico:** Rio Frio. **Puebla:** Tlahuapan.

DISCUSSION: Kelton (1970) described the species from San Cristobal de las Casas, Chiapas, Mexico (holotype), and additional specimens from various localities in the Mexican state of Chiapas. The stated host was said to be *Pinus oocarpa* var. *ochoteranai* Schiede, but without defined locality for this host tree. *Platylygus alpinus* described also by Kelton (1970) from the state of Puebla, Mexico, was also collected in the states of Mexico and Chiapas and is now considered a synonym of *P. chiapasensis* given the similarity on external morphology, male and female genitalia. Due to the synonymy of this species natural distribution of *P. chiapasensis* is extended,

but shows a disjunct distribution. Further collecting will clarify the true status of these populations. It is also appropriate to mention that previous collecting in Mexico has been quite localized and current distribution for *P. chiapasensis* (and other species as well) may create the wrong impression because of inadequate information.

***Platylygus contortae* Kelton, 1970** (Figs. 16a, 21a, 28h, 34).

Platylygus contortae Kelton, 1970:1443, fig. 22 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988, p. 352 (catalogue).

HOLOTYPE: Male, **U.S.A.: California: Shasta Co.**: Lake Eiler, 9 July 1947, R.L. Usinger. (*In* California Academy of Sciences, San Francisco, California).

PARATYPES: Eight paratypes as cited by Kelton and Knight (1970) from California. Two additional specimens from the type locality (deposited at the National Museum of Natural History, Washington, D.C.) labeled as *Platylygus murrayanae* Kelton (never published) were examined and found to be *Platylygus contortae*.

DIAGNOSIS: *P. contortae* is distinguished by the almost glabrous dorsum, the dark brown diagonal area on the corium, and the pallid basal areas on the scutellum. General dorsal marks on the hemelytra resemble those of *P. vanduzeei* but clearly separated from it by the different male and female genitalia. The male genitalia are of the *contorta-angulatus* type with the membranous lobes being more developed; right clasper is of the *contorta-scutellatus* type with prominent shoulder. Female genitalia typical for the genus, with elongated sclerotized rings and with the ventral labiate plate

truncate at the apex. *P. contortae* is the only species of the genus in which the sclerites (located at base of ventral labiate plate) for attachment of the seminal depository (Fig. 16a, **sds**) are different in shape.

REDESCRIPTION: (**Male**) length 6.70-7.20 mm; width 2.40-3.04 mm. Head: 1.36-1.40, vertex 0.63-0.64, with striations well defined. Antenna (in mm): I, 0.80-0.88, II, 2.16-2.56, III, 1.04-1.12, IV, 0.66-0.80. Rostrum 3.84-4.0 mm in length and extending to middle of abdomen. Pronotum 2.16-2.24 mm wide at base and with punctuations well defined. General coloration reddish-brown with dorsal surface shiny; general marks resembles those of *P. vanduzeei* except for the reddish marks on the pronotum; corium with diagonal area at middle dark brown (some specimens may not show this character very strongly or appeared not to be very contrasting with the coloration of the hemelytra). **Female**. length 6.80-7.76 mm; width 2.87-3.20 mm. Head: 1.40-1.60, vertex 0.70-0.73, with striations more defined than male. Antenna (in mm): I, 0.87-1.04, II, 2.52-2.72, III, 1.08-1.20, IV, 0.70-0.88. Rostrum 3.84-4.4.16 mm in length. Pronotum 2.31-2.56 mm wide at base. Similar in general appearance to male, but more robust.

HOST: *Pinus contorta* Douglas.

DISTRIBUTION: Cited previously from California by Kelton and Knight (1970), and now also known from Nevada.

SPECIMENS EXAMINED: **U.S.A.: California:** Lassen Co.: 7 mi W Westwood, ex.: *Pinus contorta*; Nevada Co.: Near Hobart Mills; Sagehen Creek; Shasta Co.: Lake Eiler, ex.: *Pinus contorta* var. *murrayana*; Sierra Co.: 3.1 mi W Calpine, Plumas National Forest; Tahoe National Forest; Yuba pass; Tehama Co.: 12 mi W Hwy. 89, Lassen National Forest, e.x.; *Pinus contorta*;

12 mi W of Mineral on Trail 36, ex.: *Pinus contorta*. **Nevada:** Washoe Co.: Pyramid lake.

DISCUSSION: Kelton (1970) described *P. contortae* from Lake Eiler, Shasta County, California. The host was said to be *Pinus contorta* Douglas. *P. contortae* appears to be associated with one of the three varieties of this pine species (var. *murrayana*) and confined to northeastern California and western Nevada. Even though the natural distribution of the host extends from south Washington to Baja California, Mexico, the insect shows very restricted distribution. It is replaced by *Platylygus rolfsi* Knight to the north and south of its distribution on the same host tree. The two *Platylygus* species may occur sympatrically, but differences in external morphology and male and female genitalia easily separate them.

***Platylygus crassicornis* Kelton, 1970** (Figs. 17a, 21b, 28i, 35).

Platylygus crassicornis Kelton, 1970:1447, fig. 24 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Male, **MEXICO: D.F.:** La Venta, 10,000 ft, 9 July 1969, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,065).

PARATYPES: Sixteen paratypes as cited by Kelton and Knight (1970) from the Mexican states of Mexico (4) and Puebla (1), and from D.F (11)

DIAGNOSIS: *P. crassicornis* is distinguished by the incrassate second antennal segment, the short rostrum, and the prominent anterior angles of pronotum. The vesica is of the *contorta-angulatus* type; the right clasper is of the *contorta-scutellatus* type with a prominent shoulder. Female genitalia are typical for the genus (Fig. 17a).

REDESCRIPTION: (**Male**) length 6.64-6.96 mm; width 2.31-2.40 mm. Head: 1.11-1.12, vertex 0.47-0.64, with striations well defined. Antenna (in mm): I, 0.77-0.80, II, 2.24-2.32, III, 0.63-0.65, IV, 0.54-0.56. Rostrum 3.25-3.36 mm in length. Pronotum 1.26-2.0 mm wide at base with anterior angles prominent, and with punctuations well defined. General coloration yellowish-brown to reddish with dorsal surface pubescent and short setae. **Female.** length 7.0-7.04 mm; width 2.56-2.66 mm. Head: 1.19-1.28, vertex 0.57-0.60, with striations more defined than male. Antenna (in mm): I, 0.87-0.96, II, 2.45-2.56, III, 0.68-0.70, IV, 0.62-0.63. Rostrum 3.48-4.3.50 mm in length. Pronotum 2.03-2.16 mm wide at base. Similar in general appearance to the male.

HOST: *Pinus pseudostrobus* Lindl.

DISTRIBUTION: Reported by Kelton and Knight (1970) from the Mexican states of Mexico, Puebla, and D.F.

SPECIMENS EXAMINED: **MEXICO: Edo. de Mexico:** Real de Arriba.

DISCUSSION: Kelton (1970) described *P. crassicornis* from La Venta, D.F., Mexico at 10,000 ft (holotype) and from additional specimens from the Mexican states of Puebla and Mexico. The stated host was said to be *Pinus pseudostrobus* Lindl., but without specific localities for the host tree. This species of pine is widely distributed from central Mexico to the southern state of Chiapas, but the bug has been collected only in central Mexico. Further collecting may provide more specimens to study variation of the species along the gradient of distribution.

***Platylygus crinitus* Kelton, 1970** (Figs. 13b, 20b, 27j, 36).

Platylygus crinitus Kelton, 1970:1435, fig. 14 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988, p. 352 (catalogue).

HOLOTYPE. Male, **U.S.A.: California:** Shepherd's Crest, Yosemite National Park, ex.: *Pinus albicaulis*, 5 Aug. 1939, R.L. Usinger. (in California Academy of Sciences, San Francisco, California).

PARATYPES: Twenty -four paratypes as cited by Kelton and Knight (1970) from the type locality in California.

DIAGNOSIS: *P. crinitus* is distinguished from other species of the genus basically by the long pubescence on the dorsum, and its distribution and association with pine species. The vesica is of the *luridus-piceicola* type and the main lobe is dome shaped. Female genitalia show the sclerotized rings elongated and separated for more than their own length; general pattern resembles that of *andrei*, but with sclerotized rings more separated (Fig. 13b).

REDESCRIPTION: (**Male**) length 5.76-6.56 mm; width 2.48-2.80 mm. Head: 1.2-1.4, vertex 0.54-0.56, with striations well defined. Antenna (in mm): I, 0.70-0.72, II, 2.16-2.17, III, 0.68-0.80, IV, 0.48-0.56. Rostrum 3.36-3.68 mm in length. Pronotum 2.0-2.24 mm wide at base and with punctuations well defined. General coloration yellowish-brown with dorsal surface pubescent. **Female.** length 6.40-6.64 mm; width 2.70-2.88 mm. Head: 1.26-1.36, vertex 0.48-0.62. Antenna (in mm): I, 0.63-0.96, II, 1.96-2.28, III, 0.78-0.80, IV, 0.52-0.56. Rostrum 3.50-4.3.68 mm in length. Pronotum 2.17-2.24 mm wide at base. Similar in general appearance to male.

HOSTS: *Pinus albicaulis* Engelman, *P. monticola* Douglas and *P. ponderosa* Douglas (**new host**)

DISTRIBUTION: Reported from California by Kelton and Knight (1970) and now also known from Oregon.

SPECIMENS EXAMINED: **U.S.A.: California:** El Dorado Co.: Fallen Leaf Lake; Tuolumne Co.: McCables Lakes, Yosemite National Park, ex.: *Pinus monticola*; Shepherd's Crest, Yosemite National Park, e.x: *Pinus albicaulis*. **Oregon:** Klamath Co.: Cleetwod Cove trail, Crater Lake National Park. ex.: *Pinus ponderosa*.

DISCUSSION: Kelton (1970) described *P. crinitus* from Shepherd's Crest, Yosemite National Park, California. The stated host was *Pinus monticola* Douglas. Additional specimens were collected on the same host as well as from *Pinus albicaulis* at Yosemite National Park. Three specimens collected at Crater Lake National Park, Oregon, but on a different host. Further collecting will likely provide a clearer picture on these separated populations associated with distinct host trees in western United States. Of all dorsally pubescent species of the genus, only two are known to be associated with pines; one occurs in Mexico (*brevirostris*) and the other in western United States (*crinitus*).

***Platylygus grandis* Knight 1918** (Figs. 18a, 24a, 27k, 37).

Platylygus grandis Knight, 1918:17, fig. 3 (description).- Carvalho, 1959:226 (catalogue).- Kelton and Knight, 1970:1451, fig. 37 (revision).- Henry and Wheeler, 1988:353 (catalogue).

HOLOTYPE: Male, **U.S.A.: Arizona:** Cochise Co.: Mt. Lemmon, Sta. Catalina Mts., 9000 ft, H.H. Knight. (in United States National Museum, Washington, D.C.).

NOTE ABOUT TYPE LOCALITY: Ten specimens were originally collected from the type locality (4 males and 6 females), six specimens in the same series were examined in this present study and found to comprise two species. Type (male), two paratypes (male and female) were correctly identified as *P. grandis* (currently deposited in the National Museum of Natural History). The other three specimens from the type locality (females) belong to *Platylygus scutellatus* Kelton; two are deposited in the National Museum and the other at the University of Minnesota. An additional specimen from the type locality (not found) was used by Kelton (1959) in his study of female genitalia, but his drawings of the species correspond to *P. grandis*.

PARATYPES: Three paratypes are currently deposited at the National Museum of Natural History and were collected at Mt. Lemmon, Santa Catalina Mountains, Arizona.

DIAGNOSIS: *P. grandis* is distinguished by the almost glabrous dorsum, the large size, and the reddish brown color. It resembles *P. pilosipes* and *P. scutellatus* with which it may occur sympatrically, but can be separated from them because the tibia are not hairy and do not show marks in the scutellum. The male genitalia are of the *keltoni-chamulans* type. The main lobe of the vesica is distinctive in that it has a longitudinal row of spines on one side and a membranous thumb-like projection before the apex. Vesica resembles that of *pilosipes* and may be confused with it when vesica does not inflate well; right clasper is of the *luridus-piceicola* type. Female genitalia are the typical for the genus (Fig. 18a) and resemble those of *rolfsi* and *rubripes*.

REDESCRIPTION: (**Male**) length 8.75-9.28 mm; width 3.36-3.76 mm. Head: 1.59-1.76, vertex 0.64-0.80, with striations defined. Antenna (in mm): I, 1.12-1.28, II, 3.23-3.44, III, 1.04-1.22, IV, 0.74-0.80. Rostrum 4.16-4.56 mm in

length and generally extending to middle of abdomen. Pronotum 2.56-3.20 mm wide at base with punctuations poorly defined. General coloration reddish-brown with dorsal surface glabrous and shiny. **Female.** length 8.40-9.44 mm; width 3.04-3.76 mm. Head: 1.50-1.76, vertex 0.56-0.72. Antenna (in mm): I, 1.04-1.36, II, 2.72-3.44, III, 1.20-1.60, IV, 0.71-0.92. Rostrum 3.76-4.448 mm in length. Pronotum 2.64-3.04 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOST: *Pinus ponderosa* Douglas.

DISTRIBUTION: *P. grandis* originally described from Arizona (Knight, 1917), but also cited in the same paper from Colorado. Kelton and Knight (1970) added Montana, California and South Dakota. I did not find any specimens of *P. grandis* from California during the course of this revision and I consider previous identifications from the state of California as erroneous. During this study the states of Nevada and Utah were added to the distribution of this species.

SPECIMENS EXAMINED: **Arizona:** Navajo Co.: 4 mi SW Forestdale, Pine Forest; Pima Co.: Santa Catalina Mountains, e.x.; *Pinus ponderosa*; Cochise Co.: Rustler Park, Chiricahua Mts., e.x.; *Pinus ponderosa*; Deer Park, Chiricahua Mts; Greenlee Co.: Hannagan, Apache National Forest, e.x.; *Pinus ponderosa*; Pima Co.: Mt. Lemmon, Sta. Catalina Mts. **Colorado:** Boulder Co.: Longs Park; La Plata Co.: 4 mi NE Durango, e.x.; *Pinus ponderosa*; Las Animas Co.: 3 mi N Stonewall, e.x.; *Pinus ponderosa*; Stonewall; Park Co.: Florissant; Teller Co.: Green Mts. Falls; . **Nevada:** White Pine Co.: Lehman Creek Campground, Humboldt National Forest, ex.: *Pinus ponderosa*. **South Dakota:** Lawrence Co.: Spearfish; Custer Park, Black Hills, ex.: *Pinus ponderosa* (Co.); Pennington Co.: Dutchman Campground, ex.: *Pinus*

ponderosa. **Utah:** Dagget Co.: Uintah Mts., T2N R22E; Uintah Co.: Blue Mountains, T5S R25E, ex.: *Pinus ponderosa*.

DISCUSSION: Knight (1918) described *P. grandis* from Mt. Lemmon, Santa Catalina Mountains, Arizona at an elevation of 9000 feet . Kelton and Knight (1970) cited numerous records from Arizona and a few more from California, Colorado and South Dakota. However, of all the specimens studied from California, I found no *P. grandis* and now consider previous records for this state as erroneous. The species is widely distributed in western United States except for the Pacific Northwest in which a different variety of *P. ponderosa* is present (var. *ponderosa*). *P. grandis* may be associated with the variety *arizonicus* of ponderosa pine at the northern limits of its distribution, but the current data are limited in the United States and no records are known from Mexico. *P. grandis* occurs sympatrically with *P. scutellatus* Kelton at several localities, but differences in host associations are now known (at least for one locality). Further collecting may clarify differences in host associations and pattern of distribution for these two species

***Platylygus keltoni* Knight, 1970** (Figs. 17b, 23c, 27a, 30).

Platylygus keltoni Knight, 1970:1448, fig. 25 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988, p. 353 (catalogue).

HOLOTYPE: Male, **MEXICO: Durango:** 10 mi W El Salto, 9000 ft, 10 July 1964, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,064.

PARATYPES: Twenty-three as cited by Kelton and Knight (1970) from Durango, Mexico.

DIAGNOSIS: *P. keltoni* is distinguished by the almost glabrous dorsum and homogeneous punctures, the angulate clypeus, the prominent anterior angles of the pronotum, the long rostrum, and reddish marks on the pronotum resembling those of *P. vanduzeei*. The vesica is of the *keltoni-angulatus* type and bears a single spine on the main lobe (unique among the species of the genus); the right clasper is of the *vanduzeei-keltoni* type. Female genitalia typical for the genus (Fig. 17b).

REDESCRIPTION: (**Male**) length 7.52-9.04 mm; width 3.04-3.08 mm. Head: 1.36-1.46, vertex 0.61-0.80, with striations well defined and clypeus angulated. Antenna (in mm): I, 0.88-1.12, II, 2.96-3.22, III, 0.98-1.12, IV, 0.68-0.80. Rostrum 4.69-4.92 mm in length and generally extending to the genital segment. Pronotum 2.48-2.64 mm wide at base, with prominent anterior angles and reddish marks resembling those of *vanduzeei*, posterior half with punctures deep and very homogeneous. General coloration reddish-brown with dorsal surface glabrous and shiny. **Female.** length 7.36-8.40 mm; width 2.80-3.12 mm. Head: 1.44-1.54, vertex 0.71-0.80. Antenna (in mm): I, 0.96-1.17, II, 2.88-3.50, III, 1.17-1.36, IV, 0.80-0.84. Rostrum 4.80-4.96 mm in length. Pronotum 2.64-3.04 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOST: *Pinus durangensis* Martinez.

DISTRIBUTION: **MEXICO: Durango.**

SPECIMENS EXAMINED: **MEXICO: Durango:** Buenos Aires, 9 mi W. Cd., Durango; 10 MI W El Salto.

DISCUSSION: Knight (1970) described *P. keltoni* from El Salto, Durango, Mexico from an elevation of 9000 feet (holotype) and from additional specimens from several localities in the same state. The stated host was said

to be *Pinus durangensis* Martinez, but without specific localities. The species shares the type locality with *P. angulatus* and *P. longirostris* and further collecting is needed to clarify host association differences in the area. *Pinus durangensis* is known from eastern Sonora to Durango Mexico, but most collecting has been carried out in southwestern Durango, Mexico.

***Platylygus knighti* Kelton, 1970** (Figs. 15b, 22b, 27l, 38).

Platylygus knighti Kelton, 1970:1455, fig. 40 (*In: Kelton and Knight, 1970*) (revision).- Henry and Wheeler, 1988, p. 353 (catalogue).

HOLOTYPE: Male, **U.S.A.: Arizona:** Big Lake, Apache National Forest, 12 August 1967, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11, 067).

PARATYPES: One hundred and fifty-three paratypes as cited from Kelton and Knight (1970) from Arizona (37) and Colorado (116).

DIAGNOSIS: *P. knighti* is distinguished by the almost glabrous dorsum, the reddish-brown coloration, and the reddish hind tibia. The main lobe of the vesica is distinctive in shape and bears a prominent ridge of spines and resembles that of *rubripes* in general shape. Specimens studied from Colorado are quite similar to *rubripes* (also studied from the same state and host), but the male genitalia are different (Fig. 15b). Despite the minor differences, variation in the male and female genitalia are quite similar in these two species.

REDESCRIPTION: (**Male**) length 7.49-7.60 mm; width 2.66-2.88 mm. Head: 1.40-1.60, vertex 0.56-0.64, with striations not well defined. Antenna (in mm): I, 0.87-1.04, II, 2.80-2.96, III, 0.98-1.04, IV, 0.66-0.80. Rostrum 3.76-

4.08 mm in length and generally extending to middle of abdomen. Pronotum 2.32-2.80 mm wide at base with punctures not well marked on posterior half. General coloration reddish-brown with dorsal surface glabrous. **Female.** length 7.36-7.42 mm; width 2.66-2.96 mm. Head: 1.38-1.60, vertex 0.64-0.72. Antenna (in mm): I, 0.91-1.04, II, 2.59-2.92, III, 0.98-1.08, IV, 0.73-0.92. Rostrum 3.99-4.16 mm in length. Pronotum 2.10-2.48 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOSTS: *Pinus ponderosa* Douglas and *P. aristata* Engelm.

DISTRIBUTION: **U.S.A.: Arizona and Colorado.**

SPECIMENS EXAMINED: **Arizona:** Apache Co.: Big Lake, Apache National Forest; Paradise Creek; Graham Co.: Hospital, Graham Mountains. **Colorado:** Boulder Co.: Ward, Roosevelt National Forest. ex.: *Pinus ponderosa*.

DISCUSSION: Kelton (1970) described *P. knighti* from Big Lake, Apache National Forest, Arizona and from Hannagan, Arizona and from Colorado based on specimens from Gunnison, Roosevelt and Pike National Forests and from Rocky Mountain National Park. The stated hosts were *Pinus ponderosa* Douglas and *P. aristata* Engelm., the former being the most common host for this species in Arizona and Colorado. *P. knighti* shares a host association (*Pinus ponderosa* var. *scopulorum*) with *P. grandis* but with distribution restricted to Colorado and Arizona. According to current data, it also shares host association with *Platylygus rubripes* Knight, especially with the sympatric populations in Colorado. Further collecting will likely provide a clearer picture of relationships between these three species.

***Platylygus longirostris* Kelton, 1970** (Figs. 17c, 26a, 27m, 30).

Platylygus longirostris Kelton, 1970:1448 fig. 27 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Male, **MEXICO: Durango:** 9 mi W Cd. Durango, 9000 ft, 23 June 1964, L.A. Kelton. (in Canadian National Collection, Ottawa, No.11,068.

PARATYPES: Ninety paratypes as cited by Kelton and Knight (1970) from Durango, Mexico.

DIAGNOSIS: *P. longirostris* is distinguished by the almost glabrous dorsum (short pubescence), the anterior angles of the pronotum prominent, the long rostrum, and the yellowish-brown coloration. The vesica is of the *longirostris-usingeri* type. The main lobe of the vesica resembles that of *usingeri* but is different in shape, the right clasper is of the *luridus-piceicola* type. Female genitalia are typical for the genus and with the dorsal labiate plate lightly extending dorsally (Fig. 17c).

REDESCRIPTION: (**Male**) length 8.24-8.40 mm; width 2.80-3.08 mm. Head: 1.53-1.40, vertex 0.64-0.80, with striations defined, clypeus angulated. Antenna (in mm): I, 0.91-0.96, II, 2.87-3.20, III, 1.12-1.19, IV, 0.73-0.88. Rostrum 4.44-4.80 mm in length and generally extending to middle of ovipositor. Pronotum 2.17-2.40 mm wide at base with anterior angles prominent and punctuations poorly defined. General coloration yellowish-brown with dorsal surface shiny and short pubescence. **Female.** length 6.88-7.88 mm; width 2.72-3.04 mm. Head: 1.40-1.44, vertex 0.64-0.80. Antenna (in mm): I, 0.91-1.0, II, 2.80-3.08, III, 1.10-1.19, IV, 0.79-0.80. Rostrum 4.56-4.59 mm in length. Pronotum 2.24-2.32 mm wide at base. Similar in general appearance to the male but slightly larger and more robust.

HOST: *Pinus cooperi* Blanco.

DISTRIBUTION: **MEXICO: Durango.**

SPECIMENS EXAMINED: **MEXICO: Durango:** 9 MI W Ciudad de Durango; 8 mi E. El Salto; 10 mi W. El Salto.

DISCUSSION: Kelton (1970) described *P. longirostris* from Durango City, Mexico at 9000 feet (holotype) and from other localities in the same state of Durango. The stated host was *Pinus cooperi* Blanco, but without defined localities. This species shares its type locality with *P. keltoni* and *P. angulatus* but differences in host association are apparent. *P. longirostris* appears to be the only species associated with *Pinus cooperi*, whose distribution is restricted to the state of Durango, Mexico, although the insect has been collected in the southwest part of the state.

***Platylygus luridus* (Reuter), 1909** (Figs. 1d, 19a,b,c, 20c, 27n, 39).

Calocoris tinctus Uhler, 1895, p. 34 (n. preoc.).

Lygidea rubecula var. *lurida* Reuter, 1909, p. 46

Calocoris uhleri: Van Duzee, 1912, p. 490 (new n. for *tinctus*).

Platylygus uhleri: Carvalho, 1959:226.

Platylygus luridus Van Duzee, 1915:111 (description).- Van Duzee, 1917:339.- Knight, 1918:16.- Knight, 1923:572.- Blatchley, 1926:758.- Knight, 1941:147.- Carvalho, 1952:91 (type design.).- Kelton and Knight, 1970:1458, fig. 20 (revision).- Rauf, *et al.*, 1984:1213 (biol.).-Rauf, *et al.*, 1984:1219 (biol.).- Henry and Wheeler, 1988:353 (catalogue).

Platylygus intermedius Knight, 1918:16, fig. 2 (description). (**New Syn.**)- Carvalho, 1959:226 (catalogue).- Kelton and Knight, 1970:1455, fig. 18 (revision).- Henry and Wheeler, 1988:353 (catalogue).

Platylygus fuliginosus Knight, 1918:17, fig. 4. (**New Syn.**)- Carvalho, 1959:226 (catalogue).- Kelton and Knight, 1970:1455, fig. 19 (revision).- Henry and Wheeler, 1988:353 (catalogue).

HOLOTYPE: Male, **U.S.A.: New York:** Lake Placid, 12 August 1904 (date corrected by Equihua and Lattin from the original label), E. P. VanDuzee. (in United States National Museum, Washington, D.C.).

HOLOTYPE OF SYNONYM: *Platylygus intermedius* Knight: male, Mount Lemmon, Santa Catalina Mountains, Arizona, 9000 ft, July 26, 1917, H.H. Knight; deposited at Cornell University Collection.

HOLOTYPE OF SYNONYM: *Platylygus fuliginosus* Knight: male, Mount Lemmon, Santa Catalina Mountains, Arizona, 9000 ft, July 26, 1917, H.H. Knight; deposited at Cornell University Collection.

PARATYPES: One female was designated by Knight (1970) from Ringwood, Ithaca, New York. Six additional topotypes of *Platylygus uhleri* Carvalho are known from Estes park, Colorado. All these specimens are deposited in the National Museum of Natural History, Washington, D.C. Forty-three paratypes of *Platylygus intermedius* Knight were cited by Knight (1918) from the type locality. Five more specimens as paratypes of *Platylygus fuliginosus* Knight were cited by Knight (1918) from Arizona.

DIAGNOSIS: *P. luridus* is distinguished by the almost glabrous dorsum, by the reddish markings on the cuneus, and by the relatively short rostrum. It is the most abundant and widespread species in the genus. It is quite variable in size and general coloration. The male genitalia are of the *luridus-piceicola* type. Female genitalia are the typical for the genus, but with sclerotized rings separated by more than their own length (Fig. 19a,b,c), resembling those of *crinitus* and *pilosus*.

REDESCRIPTION: (**Male**) length 6.16-7.20 mm; width 2.16-2.80 mm. Head: 1.08-1.36, vertex 0.48-0.58, with striations varying among populations. Antenna (in mm): I, 0.56-0.88, II, 1.76-2.56, III, 0.68-0.96, IV, 0.48-0.61.

Rostrum 2.96-3.40 mm in length and generally extending to middle of ovipositor. Pronotum 1.60-2.40 mm wide at base with punctuations well defined. General coloration varying from yellowish-brown to almost black with dorsal surface glabrous and shiny. **Female.** length 5.68-8.24 mm; width 2.48-3.68 mm. Head: 1.20-1.44, vertex 0.63-0.75. Antenna (in mm): I, 0.68-0.88, II, 1.84-3.20, III, 0.80-1.04, IV, 0.56-0.68. Rostrum 3.36-3.76 mm in length. Pronotum 1.84-2.56 mm wide at base. Similar in general appearance to male.

HOSTS: *Pinus albicaulis* Engelmann, *P. aristata* Engelmann, *P. banksiana* Lambert, *P. contorta* Douglas, *P. flexilis* James, *P. monticola* Douglas, *P. ponderosa* Douglas, *P. strobiformis* Engelmann, *P. resinosa* Haiton, *P. rigida* Miller (**new host**), *P. strobus* Linnaeus, and *P. sylvestris* Linnaeus.

DISTRIBUTION: In Canada from The Yukon Territory and from British Columbia to Nova Scotia. In the United States from New York to Kansas and from Colorado to Arizona (Kelton and Knight, 1970). Rauf *et al* (1980) cited this species from Wisconsin. New records include the states of Kansas, Michigan, Nevada and Utah.

SPECIMENS EXAMINED: **CANADA: British Columbia:** Kaslo; Summit Lake, ex.: *Pinus contorta*; Vancouver, Rt. 703 Bald Knob, ex.: *Pinus rigida*. **Nova Scotia:** Halifax, ex.: Scotch Pine; Mt. Uniache, Ex.: White Pine. **Ontario:** Nepean Piney Forest, ex.: *Pinus contorta*. **Yukon Territory:** Carcross Road, ex.: *Pinus contorta*; Rancheria, ex.: *Pinus contorta*; Squanga Lake, ex.: *Pinus contorta*; Watson lake, ex.: *Pinus contorta*. **U.S.A.: Arizona:** Apache Co.: Big Lake, Apache National Forest; Cochise Co.: Dear Park, Chiricahua Mountains; Huachuca Mountains; San Francisco Mts, ex.: *Pinus ponderosa*; Rustler Park; Coconino Co.: Williams; Geenlee Co.: Hannagan,

ex.: *Pinus ponderosa*; Graham Co.: Hospital, Graham Mountains; Pima Co.: Mt. Lemmon, Santa Catalina Mts, ex.: *Pinus ponderosa*; Yavapai Co.: Prescott; Santa Rita Mountains (Co.?). **Colorado:** Boulder Co.: Longs Park; Nederland, ex.: *Pinus ponderosa*; Roosevelt Nat. For., ex.: *Pinus ponderosa*; Clear Creek Co.: Juniper Pass, Chambers Lake, Crested Butte, ex.: *Pinus aristata*; 11 mi W Idaho Springs; Jackson Co.: 2 mi S Gould; Muddy Pass; Steamboat Springs; Jefferson Co.: Indian Hills; Larimer Co.: Estes Park, ex.: *Pinus ponderosa* var. *scopulorum*; Las Animas Co.: Trinidad, Stonewall, ex.: *Pinus ponderosa*; Park Co.: Leadville; Wilkerson Pass, Pike Nat. For., ex.: *Pinus ponderosa*; Pitkin Co.: Aspen; Teller Co.: Green Mts. Falls, e.x., western yellow pine; Midland; Pingree Park; Rainbow Lakes, Roosevelt Nat. For., ex.: *Pinus contorta* var. *murrayana*; Estes Park. **Kansas:** Cheyenne Co. **Michigan:** Chippewa Co.: Drummond Island, ex.: *Pinus banksiana* and *P. sylvestris*. **Nevada:** White Pine Co. Wheeler Peak Campground, Humboldt National Forest, ex.: *Pinus flexilis*; Wheeler Peak Drive, ex.: *Pinus ponderosa*. **New Hampshire:** Claremont. **New Mexico:** Otero Co.: Cloudcroft. **New York:** Essex Co.: Lake Placid, ex.: *Pinus sylvestris*; Ringwood, Ithaca. **Oregon:** Clakamas Co.: Mount Hood, ex.: *Pinus albicaulis*; Linn-Lane Co.: H.J. Andrews Experimental Forest, ex.: *Pinus monticola*. **Utah:** Box Elder Co.: Raft River Mountains, e.x.; *Pinus flexilis*; Duchesne Co.: 0.5 mi S Avintaquin Camp. ex.: *Pinus flexilis*; Summit Co.: 20 mi E Kamas, ex.: *Pinus contorta*. **Wisconsin:** Oneida co.: ex.: *Pinus banksiana*; Vilas Co.: Northern Highland, ex.: *Pinus banksiana*. **Wyoming:** Albany Co.: 9 mi E Laramie, e.x. *Pinus flexilis*; Tie Siding, ex.: *Pinus ponderosa*; Big Horn Co.: 27 mi W Burgess, ex.: *Pinus flexilis*; Carbon Co.: 10 mi E Medicine Bow; Baggs; Laramie Co.:

Natural Fork, 9 mi S Cheyenne; Sheridan Co.: Big Horn Mts.; Yellowstone National Park; Sublette Co.: Wind River Mts, ex.: *Pinus flexilis*.

DISCUSSION: Reuter (1909) described *P. luridus* as *Lygidea rubecula* var. *lurida* from a single specimen (male) collected at Lake Placid, New York. Van Duzee (1909) erected the genus *Platylygus* based on the same specimen. Numerous records of *P. luridus* were reported in subsequent years from southern Canada and northeastern and central United States. In addition to the wide distribution of the insect reported by Kelton and Knight (1970), numerous host trees also were reported in the same article. Another species, described by Uhler (1895) as *Calocoris tinctus* from Estes Park, Colorado, was later placed within the genus *Platylygus* by Van Duzee (1915) and later synonymized with *P. luridus* by Kelton and Knight (1970). *Platylygus intermedius* Knight and *Platylygus fuliginosus* Knight, described originally from Mount Lemmon, Santa Catalina Mountains, Arizona are here considered new synonyms of *Platylygus luridus* (Reuter). Specimens studied from throughout the range and from all host associations show that morphological variation is not strong enough to give independent species status to the several variants. Male and female genitalia of these populations only show slight variations and the characters previously given to separate these species are now only considered variations among populations of the same species. Populations of these species from Canada and northeastern United States appear to be consistent in their external morphology. Some variation is observed in western United States, but despite these primary observations, the patterns of variation of morphology and host associations along the gradient of distribution do not justify the recognition of additional species. More collecting is suggested, particularly, in western United States, and along with careful

study of host associations to clarify differences between populations. Most species of the genus show patterns of distribution which are closely related to those hosts but, in the case of this species, such patterns are not observed. It is necessary to obtain true host associations to facilitate recognition of this *P. luridus*.

***Platylygus mexicanus* Kelton 1970** (Figs. 17d, 26c, 28a, 40).

Platylygus mexicanus Kelton, 1970:1446, fig. 32 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: Male, **MEXICO; Durango**: 3 mi E El Salto, 8400 ft, 30 June 1964, L.A. Kelton, ex.: *Pinus leiophylla*. (in Canadian National Collection, Ottawa, No. 11,070).

PARATYPES: Eight paratypes as cited by Kelton and Knight (1970) from Durango, Mexico.

DIAGNOSIS: *P. mexicanus* is distinguished by the almost glabrous dorsum, the prominent anterior angles of the pronotum (but not as strongly marked as in *P. angulatus*), and the reddish brown longitudinal bar on the corium. It resembles *P. angulatus* in the coloration of scutellum and corium, but it has a shorter rostrum. The main lobe of the vesica is distinct from other species of the genus in that it terminates with a cluster of closely packed sclerites; the right clasper is of the *luridus-piceicola* type. The female genitalia are typical for the genus (Fig. 17d).

REDESCRIPTION: (**Male**) length 6.75-6.79 mm; width 2.50-2.52 mm. Head: 1.20-1.26, vertex 0.45-0.48, with striations marked. Antenna (in mm): I, 0.82-0.84, II, 2.80-2.85, III, 0.98-1.01, IV, 0.70-0.73. Rostrum 3.65-3.71 mm in

length. Pronotum 2.0-2.10 mm wide at base with the anterior angles prominent and punctuations poorly defined. General coloration yellowish-brown with dorsal surface almost glabrous (short pubescence and not very consistent) and shiny. **Female.** length 7.00-7.20 mm; width 2.80-2.87 mm. Head: 1.33-1.36, vertex 0.52-0.56. Antenna (in mm): I, 0.87-0.96, II, 2.73-3.12, III, 1.04-1.05, IV, 0.64-0.70. Rostrum 3.90-4.08 mm in length. Pronotum 2.31-2.40 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOSTS: *Pinus leiophylla* Schl. & Cham. According to Kelton and Knight (1970) *P. mexicanus* was collected on mistletoe on *Pinus leiophylla*; however, no other records are known from non-coniferous hosts and I believe the true host is *Pinus leiophylla*. Species of the mirid genus *Neoborella* Knight are known to feed on dwarf mistletoe.

DISTRIBUTION: Previously known from the state of Durango and Mexico (Kelton and Knight, 1970), and now the state of Oaxaca is added.

SPECIMENS EXAMINED: **MEXICO:** **Durango:** 3 mi E El Salto, ex.: *Pinus leiophylla*; 10 mi W El Salto, ex.: *Pinus leiophylla*; 33 mi W El Salto. **Oaxaca:** Hwy. 175, 3 mi N Suchitepec.

DISCUSSION: Kelton (1970) described *P. mexicanus* from El Salto, Durango, Mexico from an elevation of 8400 feet (holotype) and from western Durango, Mexico. The host was said to be mistletoe on *Pinus leiophylla* Schl. & Chamb., but no species of the genus shows this kind of host association and I believe the real host is the pine itself. Despite the several localities cited by Kelton and Knight (1970) no indication is given regarding the host locality. Further collecting will likely provide a clearer picture of the distribution and host associations for the species.

***Platylygus piceicola* Kelton, 1970** (Figs. 13c, 20d, 28b, 41).

Platylygus piceicola Kelton, 1970:1436, fig. 16 (*In*: Kelton and Knight, 1970) revision).- Henry and Wheeler, 1988:353 (catalogue).

Platylygus hirtus Kelton, 1970:1437, fig. 17 (*In*: Kelton and Knight, 1970) (revision) (**New Syn.**)- Henry and Wheeler, 1988:353 (catalogue).

HOLOTYPE: Male, **CANADA: Yukon Territory:** mi 1061 Alaska Highway, 30 July 1963. (in Canadian National Collection, Ottawa, No. 11,071).

HOLOTYPE OF SYNONYM: *Platylygus hirtus* Knight: male, Big lake, Apache National Forest, Arizona, 12-13 August 1967, L.A. Kelton, on *Picea engelmanni*; deposited in the Canadian National Collection, Ottawa, No. 11,053.

PARATYPES: One hundred and thirty-eight paratypes as cited by Kelton and Knight (1970) from Yukon Territory (7), British Columbia (3), Arizona (1) and Colorado (127). Forty-six paratypes of *Platylygus hirtus* Knight are also cited by Kelton and Knight (1970) from Arizona.

DIAGNOSIS: *P. piceicola* is distinguished from other pubescent forms by the longer rostrum, the presence of a white area on the apex of scutellum, and the host association. It is quite variable in size and color. The vesica is of the *luridus-piceicola* type, but with a pointed lobe; the right clasper is of the *luridus-piceicola* type. Female genitalia are typical for the genus (Fig. 13c).

REDESCRIPTION: (**Male**) length 6.24-6.68 mm; width 2.24-2.56 mm. Head: 1.12-1.20, vertex 0.45-0.56, with striations marked. Antenna (in mm): I, 0.56-0.66, II, 2.17-2.46, III, 0.77-0.96, IV, 0.48-0.62. Rostrum 3.85-4.0 mm in length. Pronotum 1.89-2.08 mm wide at base with punctuations well defined. General coloration from yellowish-brown to dark-brown. **Female.** length 6.65-7.20 mm; width 2.59-2.88 mm. Head: 1.19-1.28, vertex 0.48-0.52. Antenna (in

mm): I, 0.66-0.80, II, 2.10-2.40, III, 0.91-0.96, IV, 0.56-0.64. Rostrum 3.92-4.40 mm in length. Pronotum 1.96-2.24 mm wide at base. Similar in general appearance to male but slightly bigger and more robust.

HOSTS: *Picea glauca* (Moench), *P. engelmanni* Parry, *Abies lasiocarpa* (Hooker) (**new host ?**) and *Pinus contorta* Douglas (**new host ?**).

DISTRIBUTION: Widely distributed species. Cited by Kelton and Knight (1970) from Yukon Territory to Arizona. Distribution data from *Platylygus hirtus* added to the record of this species. New records include the states of Montana, Montana-Idaho border, Utah, New Mexico, Tennessee, and Wyoming.

SPECIMENS EXAMINED: **CANADA: Yukon Territory:** Mile 1061 Alaska Hwy.; Destruction Bay, ex.: *Picea* sp. **Alberta:** Banff-Jasper Hwy., ex.: *Picea* sp.. **U.S.A: Arizona:** Apache Co.: Big Lake, Apache National Forest, ex.: *Picea engelmanni*. **Colorado:** Clear Creek Co.: Juniper Pass, ex.: *Abies lasiocarpa*; Jackson Co.: Muddy Pass; Rio Blanco Co.: Rio Blanco; San Juan Co.: Molas Lake Pass, San Juan National Forest, ex.: *Picea* sp.; Summit Co.: Dillon; Teller Co.: Woodland Park, ex.: *Picea engelmanni*. **Montana:** Carbon Co.: Rock Creek Vista, ex.: *Picea engelmanni*. **Montana-Idaho:** Targhee Pass. **New Mexico:** Los Alamos Co.: 15 mi W Los Alamos. **Utah:** Duchesne Co.: Uinta Mts., Ashley National Forest, ex.: *Picea engelmanni*; Wasatch Co.: Wolf Creek Campground, Uinta national Forest, ex.: *Picea engemanni*. **Wyoming:** Big Horn Co.: 17 mi W Burgess, ex.: *Picea engelmanni*; Sublette Co.: Wind River Mountains, ex.: *Picea angelmanni*.

DISCUSSION: Kelton (1970) described *P. piceicola* from mp 1061, Alaska Highway, Yukon Territory, Canada (holotype) and from locations in British Columbia, Arizona and Colorado. The hosts were said to be *Picea*

engelmanni Parry and *Picea glauca* (Moench). Later collecting included: *Abies lasiocarpa* (Hooker) and *Pinus contorta* Douglas as hosts. This insect has been collected mainly on *Picea* spp., which appear to be the true host. Discovery of additional hosts may necessitate additional research to clarify host associations. *P. piceicola* is widely distributed in western North America from the Yukon Territory to New Mexico and its distribution coincides in large measure to that with of *Picea engelmanni*, which appears to be the main host for the species. *Platylygus hirtus* Knight is considered a synonym of *P. piceicola*. Variation among populations throughout the range of distribution is not considered strong enough to warrant separate species status, nor are these species level differences in male and female genitalia or external morphology.

***Platylygus pilosipes* Kelton, 1970** (Figs. 18c, 25b, 28j, 42).

Platylygus pilosipes Kelton, 1970:1441, fig. 29 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:353 (catalogue).

HOLOTYPE: Male, **MEXICO: Durango:** 3 mi E El Salto, 8400 ft, 24 June 1964, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,072.

PARATYPES: Eleven paratypes as cited by Kelton and Knight (1970) from Durango, Mexico (5) and Arizona (6).

DIAGNOSIS: *P. pilosipes* is distinguished by the almost glabrous and opaque dorsum, the well defined striations on the vertex, the marks on the scutellum (resembling *P. scutellatus*), and the pilose legs. It resembles *grandis* and *scutellatus*, but it is separated from them by the pilose tibia. The main lobe of the vesica is distinctive in shape and in the arrangement of the

spines along the apical margin which resembles that of *grandis*; the right clasper is of the *contorta-scutellatus* type. The female genitalia are the typical of the genus, and unique in not showing any separation of the dorsal labiate plate, which is continuous along all its length (Fig. 18c).

REDESCRIPTION: (**Male**) length 8.40-9.10 mm; width 2.80-3.28 mm. Head: 1.36-1.60, vertex 0.48-0.56, with striations well marked. Antenna (in mm): I, 1.08-1.16, II, 2.64-3.40, III, 1.12-1.40, IV, 0.80-0.84. Rostrum 3.76-3.85 mm in length. Pronotum 2.64-2.73 mm wide at base with punctuations poorly defined. General coloration reddish-brown with dorsal surface glabrous and opaque, distinctive pilose legs. **Female.** length 8.05-9.08 mm; width 3.26-3.76 mm. Head: 1.47-1.60, vertex 0.56-0.70. Antenna (in mm): I, 1.04-1.20, II, 2.92-3.44, III, 1.20-1.44, IV, 0.77-0.80. Rostrum 3.36-4.12 mm in length. Pronotum 2.66-3.20 mm wide at base. Similar in general appearance to male but more robust.

HOSTS: *Pinus leiophylla* Schl. & Cham., and *P. strobiformis* Engelmann (probably a resting plant).

DISTRIBUTION: **From Arizona to Durango (Mexico).**

SPECIMENS EXAMINED: **U.S.A.: Arizona:** Cochise Co.: Rustler Park, Chiricahua Mountains, e.x.; *Pinus strobiformis* (?); Turkey Flat. **MEXICO:** **Durango:** 3 mi E El Salto, e.x.; *Pinus leiophylla*.

DISCUSSION: Kelton (1970) described *P. pilosipes* from El Salto, Durango, Mexico from an elevation of 8400 ft (holotype) and additional specimens from the same area in Durango, Mexico and The Chiricahua Mountains, Rustler Park and Turkey Flat in Arizona. The host was said to be *Pinus leiophylla* Schl & Cham. but without specific localities. This tree occurs from western Chihuahua to the southern state of Oaxaca. Specimens

collected in the United States are larger but no host associations are well documented. The only specimen collected in *Pinus strobiformis* (Rustler Park) was found with a large series of *Platylygus scutellatus* Kelton and this may not be the true host for this insect. Further collecting (especially in southwestern Arizona) will likely provide a better understanding of host associations of this species, primarily because the species occurs sympatrically with *Platylygus scutellatus* and *P. grandis*.

***Platylygus pilosus* Kelton, 1970** (Figs. 5b, 6b, 13d, 20e, 28c, 43).

Platylygus pilosus Kelton, 1970:1435, fig. 13 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE. Male, **MEXICO: Edo. de Mexico:** Rio Frio, ex.: *Pinus teocote*, 10,500 ft, 1 Sept. 1969, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,073).

PARATYPES: Fourteen paratypes as cited by Kelton and Knight from the type locality.

DIAGNOSIS: *P. pilosus* is distinguished by its general reddish color, the poorly defined striations on the vertex, the long and dense pubescence on the dorsum, the pilose tibiae, the short rostrum, and small size. It is the most pubescent species in the genus. The vesica is of the *luridus-piceicola* type and most closely resembles that of *P. teocotae* with the lobe sharply bent. Female genitalia are typical of the genus, but the sclerotized rings are separated from each other by more than their own length (Fig. 13d).

REDESCRIPTION: (**Male**) length 5.60-5.88 mm; width 2.24-2.40 mm. Head: 1.11-1.12, vertex 0.48-0.56, with striations poorly marked. Antenna (in

mm): I, 0.52-0.56, II, 1.52-1.56, III, 0.51-0.52, IV, 0.47-0.49. Rostrum 2.80-2.88 mm in length. Pronotum 1.89-2.0 mm wide at base. with punctuations well defined General coloration reddish-brown with dorsal surface pilose, distinctive pilose tibia. **Female.** length 5.84-6.24 mm; width 2.38-2.56 mm. Head: 1.08-1.20, vertex 0.48-0.63. Antenna (in mm): I, 0.52-0.56, II, 1.36-1.54, III, 0.56-0.64, IV, 0.44-0.50. Rostrum 2.87-2.96 mm in length. Pronotum 1.96-2.0 mm wide at base. Similar in general appearance to male but slightly more robust.

HOST: *Pinus teocote* Schl & Cham.

DISTRIBUTION: Previously cited from the Mexican state of Mexico (Kelton and Knight, 1970). Arizona and Nuevo Leon, Mexico are added to the distribution of the species in this treatment.

SPECIMENS EXAMINED: **USA.: Arizona:** Cochise Co.: Rustler Park, Chiricahua Mountains. **MEXICO: Edo. de Mexico:** Rio Frio, e.x.; *Pinus teocote*. **Nuevo Leon:** Cerro Potosi.

DISCUSSION: Kelton (1970) described *P. pilosus* from Rio Frio, Mexico from an elevation of 10, 500 ft (holotype). The host was said to be *Pinus teocote* Schl & Cham., a pine species widely distributed in Mexico. The specimens collected at Rustler Park did not indicate a host. Further collecting will likely clarify natural distribution of the species along the distribution of the host in Mexico, and it will show host associations in southwestern United States.

***Platylygus pseudotsugae* Kelton, 1970** (Figs. 2b, 7b, 8b, 9a,b, 10b, 11b, 12b, 15c, 22c, 28d, 32).

Platylygus pseudotsugae Kelton, 1970:1454, fig. 39 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:353 (catalogue).- Parsons, *et al.*, 1991. p. 32 (list).

HOLOTYPE: Male, **CANADA: British Columbia:** Greenwood, 12 July 1958, ex.: *Pseudotsuga menziesii*. (in Canadian National Collection, Ottawa, No. 11, 074).

PARATYPES: Five paratypes as cited by Kelton and Knight (1970) from British Columbia (4) and Oregon (1).

DIAGNOSIS: *P. pseudotsugae* is distinguished by the almost glabrous and shiny dorsum, the yellowish-red color of the hemelytra, and the long rostrum. Male genitalia are of the *keltoni-chamulans* type, with the main lobe of the vesica distinctive in shape and bearing a transverse ridge of heavy spines as in *P. keltoni*. The species may be confused with *P. rubripes* because of the general coloration pattern and distribution, but host associations help to separate them. Female genitalia resembles those of *rolfsi* and *rubripes*, but smaller (Fig. 15c).

REDESCRIPTION: (**Male**) length 6.40-7.14 mm; width 2.48-2.56 mm. Head: 1.28-1.32, vertex 0.48-0.56, with striations poorly defined. Antenna (in mm): I, 0.73-0.80, II, 2.31-2.48, III, 0.92-0.96, IV, 0.77-0.92. Rostrum 3.71-3.92 mm in length and extending to middle of the abdomen. Pronotum 2.10-2.24 mm wide at base with punctuations poorly defined. General coloration yellowish-red with dorsal surface glabrous and shiny. **Female.** length 6.72-7.44 mm; width 2.73-3.20 mm. Head: 1.28-1.40, vertex 0.56-0.64. Antenna (in mm): I, 0.76-0.80, II, 2.24-2.31, III, 0.92-1.08, IV, 0.77-0.88. Rostrum 3.99-

4.16 mm in length. Pronotum 2.0-2.24 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOST: *Pseudotsuga menziesii* var. *menziesii* (Mirbel).

DISTRIBUTION: **From British Columbia to Oregon.**

SPECIMENS EXAMINED: **CANADA: British Columbia:** Greenwood, ex.: *Pseudotsuga menziesii*; **U.S.A.: Oregon:** Benton Co.: Mary's Peak, ex.: *Pseudotsuga menziesii*; Coos Co.: Tugman State Park; Curry Co.: Harris Beach State Park; Lane-Linn Co.: H.J. Andrews Experimental Forest, ex.: *Pseudotsuga menziesii*; Lincoln Co.: Grass Mountain Summit; Tillamook Co.: Nehalem Bay State Park; Yamhill, Co.: Top of Bald Mountain. **Washington:** Pierce Co.: Orting.

BIOLOGY: *P. pseudotsugae* was studied at Mary's Peak, Benton Co, which is located at 1000 m in elevation. Five instar nymphs were observed in the field, first nymphs appear on early June, and the last instar on late August. Adults were first observed on early September with the peak of the adult population on late September, in early October population decreased dramatically, and by November no adults were observed in the field. The species is univoltine and the life cycle is completed between 3.5-4.0 months. Adults have been collected in the state from middle July to middle October, but the higher numbers of adults on August or September. About 200 m down hill adults of this species were collected early in the year than the main study area. Climatic conditions may vary enough in these two elevations to be reflected in the life cycle of both sites. It was also observed that the species prefer to colonize open areas at high elevations. Even though *Pseudotsuga menziesii* is present all mountain range, insects were mostly collected at high elevations, and occasionally few adults were collected at low elevations.

DISCUSSION: Kelton (1970) described *P. pseudotsugae* from Greenwood, British Columbia, Canada (holotype), with additional specimens from Phoenix, British Columbia and Mary's Peak, Oregon. The stated host was *Pseudotsuga menziesii* (Merbel). The distribution of this species appears to follow the host range (var. *menziesii*), except for one record in British Columbia that appears to be on *P. menziesii* var. *glauca*. It is evident that this is the only species of *Platylygus* clearly associated with Douglas-fir in the United States and Canada. Further collecting may clarify association with *Pseudotsuga menziesii* var. *glauca* as indicated by type locality in the northern distribution of this tree. General morphology and range of distribution is similar to that of *rubripes*, but male genitalia and host associations clearly separate them.

Platylygus rolfsi Knight, 1970 (Figs. 2a, 3a, 4a, 5a, 6a, 7a, 8a, 10a, 11a, 12a, 16c, 24b, 28e, 44).

Platylygus rolfsi Knight, 1970:1450, fig. 35 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:353 (catalogue).- Parson, *et al.*, 1991. p. 32 (list).

Platylygus magnus Kelton, 1970:1451, fig. 36 (*In*: Kelton and Knight, 1970) (revision) (**New Syn.**).- Henry and Wheeler, 1988:353 (catalogue).

HOLOTYPE: Male, **U.S.A.: Washington:** Mt. Adams, 3 August 1930, A.R. Rolfs. (in United States National Museum, Washington, D.C.).

HOLOTYPE OF SYNONYM: *Platylygus magnus* Kelton: male, Yosemite Creek, R.S., Yosemite National Park, California, July 21 1946, R.L. Usinger; deposited in the California Academy of Sciences, San Francisco, California.

PARATYPES: One hundred and eleven paratypes as indicated by Kelton and Knight (1970) from British Columbia (10), Washington (6), Oregon (250, and California (70). Seventeen additional paratypes are cited by Kelton and Knight (1970) for *Platylygus magnus* Kelton from California.

DIAGNOSIS: *P. rolfsi* is distinguished by the reddish-brown color, the almost glabrous dorsum, the large size, and the pale basal angles of the scutellum. Male genitalia is of the *keltoni-chamulans* type with the main lobe bearing a ridge of spines and resembles that of *rubripes*. Female genitalia are typical for the genus and resemble those of *grandis* and *rubripes* (Fig. 16c).

REDESCRIPTION: (**Male**) length 6.88-9.44 mm; width 2.64-3.68 mm. Head: 1.12-1.61, vertex 0.59-0.66, with striations defined. Antenna (in mm): I, 0.88-1.28, II, 2.40-3.36, III, 0.98-1.22, IV, 0.68-0.77. Rostrum 3.48-4.55 mm in length. Pronotum 2.32-3.04 mm wide at base with punctuations well defined. General coloration reddish-brown with dorsal surface glabrous and shiny. **Female.** length 8.0-9.60 mm; width 3.20-4.40 mm. Head: 1.42-1.84, vertex 0.64-0.80. Antenna (in mm): I, 0.96-1.08, II, 2.56-3.36, III, 0.99-1.28, IV, 0.70-0.92. Rostrum 3.90-4.88 mm in length. Pronotum 2.0-2.24 mm wide at base. Similar in general appearance to male but larger and more robust.

HOSTS: *Pinus albicaulis* Engelman, *P. attenuata* Lemmon (**new host**), *P. contorta* Douglas, *P. coulteri* D. Don, *P. jeffreyi* Greville & Balfour and *P. ponderosa* Douglas.

DISTRIBUTION: This species is cited by Kelton and Knight (1970) from British Columbia to California. The state of Montana is added here. Distribution data from *Platylygus magnus* is added to the distribution of this species.

SPECIMENS EXAMINED: **CANADA: British Columbia:** Malahat.

U.S.A.: California: Alpine Co.: 4 MI Ebbetts Pass, Stanislaus National Forest; El Dorado Co.: Fallen Leaf; Tallac; Fresno Co.: Florence Lake; Inyo Co.: Big Pino Creek; Madera Co.: Bass Lake; Mendocino Co.: Hamm Pass Rd; Mono Co.: Sardine Creek; Monterey Co.: Junipero Serra Peak, Santa Lucia Mts.; Siskiyou Co.: 15 mi NNE McCloud Swamp Creek, ex.: *Pinus contorta*; Medicine Lake, ex.: *Pinus ponderosa*; Trinity Co.: Big Flat Coffee Creek; Tuolumne Co.: Dodge Ridge, Strawberry; Yosemite Cr., Yosemite National Park, ex.: *Pinus contorta*; McCable Lakes, Yosemite National Park (Co.); Shasta Co.: Shasta Springs; Sisson; Riverside Co.: Idyllwild, San Jacinto Mts.

Montana: Ravalli Co.: Blue Nose Peak, 15 mi S Alta. **Oregon:** Clakamas Co.: Mount Hood, ex.: *Pinus albicaulis*; Crook Co. 20 mi E Prineville Walton., e.x.; *Pinus ponderosa*; Deschutes Co.: Mckenzie Pass; Pine Mountain; 5 mi S of Sisters; Three Creeks Meadow, e.x.; *Pinus ponderosa* & *P. albicaulis*; 4.2 mi E Millican, ex.: *Pinus ponderosa*; Hood River: Mount Hood, T2S, R10E, Sec. 9. ex.: *Pinus contorta*; Jackson Co.: .5 mi S Siskiyou Summit, ex.: *Pinus ponderosa*; Union Creek; Klamath Co.: 12 mi S Chemult, ex.: *Pinus ponderosa*; Collier Memorial State Park, ex.: *Pinus ponderosa*; Crater Lake; Siskiyou Summit, ex.: *Pinus ponderosa*; 11 mi W Jct. Hwy. 97; 28 mi SE JCT Hwy 97 on Hwy 31, ex.: *Pinus ponderosa*; Lake Co: W Slope Drake Peak, 21 km NW Lakeview, ex.: *Pinus contorta*; 16 mi NW Lakeview, Mud Creek, ex.: *Pinus contorta*; Wheeler Co.: 4.5 mi S Mitchell on Summit Prairie Rd., ex.: *Pinus ponderosa*.

Washington: Skamania Co.: Signal Peak, Mt. Adams.

DISCUSSION: Knight (1970) described *P. rolfsi* from Mount Adams, Washington (holotype), with additional specimens from the type locality and several other localities of California. The hosts were said to be *Pinus contorta*

Douglas, *P. albicaulis* Engelmann and *P. ponderosa*. *Platylygus magnus*, described by Kelton (1970) from California, is considered a synonym because although most specimens are larger, they have similar external morphology and male and female genitalia. *P. rolfsi* resembles *grandis* in general appearance, but distribution and male genitalia help to separate them. It also may be confused with *P. rubripes* (from the Pacific Northwest), but the overall reddish color of the antennae and legs is absent, and the male genitalia show some differences. It is important to mention that the distribution of *P. rolfsi* and *P. rubripes* may overlap in the Pacific Northwest. *P. rolfsi* appears to be associated primarily with ponderosa pine (var. *ponderosa*) and, when associated with *Pinus contorta*, mostly with the variety *murrayana*. In contrast, *P. rubripes* is mostly associated with *Pinus contorta contorta*. Further collecting will likely better illustrate the close relationships of these two species of *Platylygus* with their hosts.

***Platylygus rubripes* Knight, 1970** (Figs. 15d, 22d, 28f, 45).

Platylygus rubripes Kelton, 1970:1456, fig. 41 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:354 (catalogue).

HOLOTYPE: Male, **U.S.A.: California:** Chester, 18 July 1959, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,056).

PARATYPES; Two hundred and fifty-one paratypes as cited by Kelton and Knight (1970) from British Columbia (16), Alberta (1), Washington (1), Oregon (53), California (17), Wyoming (28) and Colorado (135).

DIAGNOSIS: *P. rubripes* is distinguished by the reddish-brown coloration, the almost glabrous and shiny dorsum, and the red second

antennal segment and red hind tibia. *P. rubripes* most closely resembles *P. knighti* and *P. rolfsi* but may be separated from them by the shorter rostrum. The main lobe of the vesica is distinctive in shape and bears a transverse ridge of spines. Female genitalia are typical for the genus and resemble those of *knighti* (Fig. 15d).

REDESCRIPTION: (**Male**) length 6.48-8.48 mm; width 2.60-3.20 mm. Head: 1.24-1.48, vertex 0.54-0.61, with striations defined. Antenna (in mm): I, 0.76-1.04, II, 2.24-2.96, III, 0.96-1.04, IV, 0.72-0.92. Rostrum 3.36-4.0 mm in length. Pronotum 2.32-3.04 mm wide at base with punctures on the posterior half not very deep. General coloration reddish-brown with dorsal surface glabrous and shiny. **Female.** length 6.64-8.32 mm; width 2.40-3.28 mm. Head: 1.36-1.52, vertex 0.64-0.73. Antenna (in mm): I, 0.94-0.96, II, 2.45-2.64, III, 1.0-1.12, IV, 0.80-0.88. Rostrum 3.71-4.0 mm in length. Pronotum 2.08-2.72 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOSTS: *Pinus albicaulis* Engelmann (**new host**), *P. attenuata* Lemmon, *P. banksiana* Lambert (**new host**), *P. contorta* Douglas, *P. flexilis* James (**new host**), *P. ponderosa* Douglas (**new host**), and *Abies* sp. (**new host ?**).

DISTRIBUTION: Kelton and Knight (1970) cited numerous records for this species from Alberta and British Columbia in Canada, and from Colorado, Oregon, Washington, and Wyoming in the United States. New Brunswick, Montana, Utah and Wisconsin are now added to the distribution.

SPECIMENS EXAMINED: **CANADA: Alberta:** Cirrus Mt. Campground, Banff National Park, e.x: *Pinus contorta*. **New Brunswick:** Sussex, ex.: *Pinus banksiana*. **U.S.A.: California:** Lassen Co.: Bogard Campground, ex.: *Pinus*

ponderosa; Westwood, ex.: *Pinus ponderosa*; El Dorado Co.: El Dorado National Forest, West of Lutter Pass; Siskiyou Co.: 1 mi E Bartel Hwy 84, ex.: *Pinus contorta*; 6.5 mi S Lava Beds National Monument, ex.: *Pinus contorta*; Medicine Lake, ex.: *Pinus ponderosa*; McCloud, ex.: *Pinus attenuata*; Fresno Co.: Eisenhower Jct., Huntington Lake; 19 mi NE Shaver Lakes; Madera Co.: Jackass Meadows; Plumas Co.: Chester; Tehama Co.: 12 mi E Mineral, ex.: *Pinus ponderosa*; Sierra Co.: Kuybutz Flat, 14 mi SE Sierraville; Humboldt Co.: Shovel Creek Meadow, Willow Creek; Mono Co.: Mammoth Lakes; Riverside Co.: San Jacinto Mts. **Colorado:** Boulder Co.: Nederland, Roosevelt National Forest, ex.: *Pinus contorta* var. *murrayana*; Clear Creek Co.: Squaw Pass, ex.: *Pinus contorta*; Jackson Co.: Steamboat Springs. **Montana:** Glacier Co.: Glacier National Park, ex.: *Pinus contorta*. **Montana-Idaho:** Targhee Pass, ex.: *Pinus contorta*. **Oregon:** Blue Mountains; Baker Co.: Wallowa Mountains; Clakamas Co.: Gov't. Camp; Mount Hood; Deschutes Co.: Three Creeks Meadow, ex.: *Pinus contorta*; R15E-T20S-Sec; Douglas Co.: Diamond Lake; Klamath Co.: R8E-T30S-Sec. 9, ex.: *Pinus ponderosa*; Skookum Meadows, ex.: *Pinus contorta*; Lane Co.: Frog Camp, ex.: *Pinus albicaulis*; 1 mi S Hya't Reservoir, Whitman National Forest (Co.?); Lincoln Co.: Newport, ex.: *Pinus contorta*. **Wisconsin:** Vilas Co.: Northern Highland, ex.: *Pinus banksiana*. **Utah:** Cache Co.: Logan Canyon; Duchesne Co.: Uintah Mountains, Ashley National Forest, ex.: *Pinus contorta*; Summit Co.: Beaver Creek, Kamas; 20 mi E Kamas, ex.: *Pinus contorta*. **Wyoming:** Fremont Co.: Wind Rivere Mts., Shoshone National Forest, ex.: *Pinus contorta*; Lincoln Co.: 10 mi SE Smoot; 12 mi SE Smoot; Sheridan Co.: Big Horn Mountains, ex.: *Pinus contorta*; Teton Co.: Grand Teton National Park, ex.: *Pinus contorta*.

BIOLOGY: *P. rubripes* was studied at Newport, Lincoln Co., Oregon associated with natural populations of *Pinus contorta contorta*. The first nymphs appear in the season of 1993 on late April and last instar was collected late May. First adults were observed on early June with the peak on the population from late June to early July. By early August adults decreased in number dramatically when only a few adults were observed in the field. Oviposition was not observed in the field, but probably occurred late July. Nymphs and adults were observed feeding on pollen of conelets. Both stages of development are really abundant on the host plant. The species is almost present in every plant along the coastal range of the distribution of the host. Not all conelets are attack, but they are present in many branches of the same tree.

DISCUSSION: *P. rubripes* was described by Kelton (1970) from Chester, California (holotype), with additional specimens from British Columbia, Alberta, Washington, Oregon, California, Wyoming and Colorado. The hosts were said to be *Pinus contorta* Douglas and *P. attenuata*. *P. rubripes* is widely distributed in central and western United States. Specimens collected in central U.S. are smaller from those of the Pacific Northwest. Populations from the Pacific Northwest may be confused with *rolfsi*, but male genitalia may help to separate them. The same may be said for the central U.S. populations which are similar to *knighti*, but again the male genitalia help in the separation. Further collecting will likely help to clarify pattern of distribution and host associations for these three related species of *Platylygus*.

***Platylygus scutellatus* Kelton, 1970** (Figs. 1c, 18b, 25a, 28k, 46).

Platylygus scutellatus Kelton, 1970:1443, fig. 34 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:354 (catalogue).

HOLOTYPE: Male, **Mexico: Durango:** 9 mi E Cd. Durango, 9000 ft, 23 June 1964, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,075.

PARATYPES: Eighty-eight paratypes as indicated by Kelton and Knight (1970) from Arizona (80), New Mexico (1), and Durango, Mexico (7).

DIAGNOSIS: *P. scutellatus* is distinguished by the almost glabrous and shiny dorsum, the reddish brown or brown triangular marks on the scutellum, and the long rostrum. It resembles *grandis* and *pilosipes*, but it is separated from them by the marks on the scutellum and the distinctive female genitalia. The vesica is of the *keltoni-chamulans* type with the main lobe distinctive in shape, and bears a short ridge of spines near the apex; the right clasper is of the *vanduzeei-keltoni* type. Female genitalia are distinctive from other species of the genus and resembles those of *Lygus atriflaxus*. Sclerotized rings are less elongated and the ventral labiate plate extending up almost the same distance as the length of the rings at the central area (Fig. 18b).

REDESCRIPTION: (**Male**) length 8.40-8.80 mm; width 3.29-3.44 mm. Head: 1.52-1.60, vertex 0.64-0.72, with striations poorly defined. Antenna (in mm): I, 1.12-1.26, II, 2.94-3.04, III, 1.12-1.28, IV, 0.64-0.77. Rostrum 4.0-4.24 mm in length and extending to middle of the abdomen. Pronotum 2.72-2.80 mm wide at base, shiny, glabrous, and with punctuations well defined. General coloration reddish-brown with dorsal surface glabrous and shiny. **Female.** Length 8.0-9.20 mm; width 3.60-3.68 mm. Head: 1.52-1.68, vertex 0.64-0.72. Antenna (in mm): I, 1.12-1.28, II, 3.01-3.20, III, 0.92-1.26, IV, 0.80-

0.84. Rostrum 4.24-4.48 mm in length. Pronotum 2.80-3.04 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOSTS: *Pinus flexilis* James (**new host**) and *P. strobiformis* Engelmann.

DISTRIBUTION: **From Arizona and New Mexico to Durango (Mexico).**

SPECIMENS EXAMINED: **U.S.A.: Arizona:** Cochise Co.: Rustler Park, Chiricahua Mountains, ex.: *Pinus strobiformis*; Pima Co.: Mt. Lemmon, Santa Catalina Mountains, ex.: *Pinus flexilis*; **MEXICO: Durango:** 9 mi W El Salto.

DISCUSSION: Kelton (1970) described *P. scutellatus* from Ciudad Durango, Mexico from an elevation of 9000 ft (holotype), with additional specimens from El Salto, Durango, several localities in southwestern Arizona, and Cloudcroft, New Mexico. The host was said to be *Pinus strobiformis* Engelmann but without specific localities for this host tree. Later collecting of this species confirmed the host tree and also added *Pinus flexilis* from Mount Lemmon, Santa Catalina Mountains, Arizona. This species of *Platylygus* has been found with *P. grandis* and *P. pilosipes*, but external morphology and male and female genitalia help to separate them. Further collecting of this species will clarify the host associations of these three species, which appear to be closely related and occur sympatrically in part of the range of their distribution.

***Platylygus teocotae* Kelton, 1970** (Figs. 4b, 14b, 20f, 28g, 31).

Platylygus teocotae Kelton, 1970:1433, fig 12 (*In*: Kelton and Knight, 1970) (revision).

HOLOTYPE: **MEXICO: Edo. de Mexico:** Rio Frio, 10,500 ft, 1 Sept. 1969, L.A. Kelton. (in Canadian National Collection, Ottawa, No. 11,076).

PARATYPES: Thirty-two paratypes as cited by Kelton and Knight (1970) from the type locality.

DIAGNOSIS: *P. teocotae* is distinguished by the reddish brown color, the anterior angles of the pronotum prominent, the long pubescence on the pronotum and costal margins of the hemelytra, and the pilose hind tibiae. The pubescence is shorter on the dorsum. It resembles *P. andrei* and *P. pilosus* in general appearance as well as in the male genitalia. The vesica is of the *luridus-piceicola* type, but with a prominent lobe, right clasper resembles *luridus*, but slender. Female genitalia show sclerotized rings separated from each other by approximately their own length; dorsal labiate plate resembles that of *andrei*, but differs from that of *pilosus* (Fig. 14b).

REDESCRIPTION: (**Male**) length 6.30-6.40 mm; width 2.38-2.40 mm. Head: 1.12-1.19, vertex 0.48-0.49, with striations well marked. Antenna (in mm): I, 0.66-0.72, II, 2.10-2.16, III, 0.80-0.84, IV, 0.56-0.66. Rostrum 3.36-3.44 mm in length and extending to middle of the abdomen. Pronotum 2.10-2.16 mm wide at base, shiny and pubescent and with punctuations well defined. General coloration reddish-brown with dorsal surface pubescent (pubescence longer on costal margins of the hemelytra and pronotum) and shiny. **Female.** length 6.30-6.40 mm; width 2.56-3.44 mm. Head: 1.20-1.26, vertex 0.48-0.56. Antenna (in mm): I, 0.77-0.80, II, 2.0-2.24, III, 0.72-0.91, IV, 0.56-0.863. Rostrum 3.64-3.76 mm in length. Pronotum 2.16-2.24 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOST: *Pinus teocote* Schl. & Cham.

DISTRIBUTION: **MEXICO: Edo. de Mexico:** Rio Frio.

SPECIMENS EXAMINED: **MEXICO: Edo. de Mexico:** Rio Frio., ex.:
Pinus teocote.

DISCUSSION: Kelton (1970) described *P. teocotae* from Rio Frio, Mexico, from an elevation of 10,500 ft (holotype) and additional specimens from the type locality. The stated host *Pinus teocote* Schl & Cham. The species shares the type locality and host with *P. pilosus*, which is similar morphologically to *P. teocotae* except for male and female genitalia. It appears to be closely related to *P. andrei* but the current data show different distribution ranges for the two species. Further collecting will likely help in understanding range of distribution and host associations among these three species, and especially between *P. teocotae* and *P. pilosus* which occur sympatrically in central Mexico and share host association.

***Platylygus usingeri* Knight, 1970** (Figs. 19d, 26b, 27b, 36).

Platylygus usingeri Kelton, 1970:1442, fig. 26 (*In*: Kelton and Knight, 1970) (revision).- Henry and Wheeler, 1988:354 (catalogue).

HOLOTYPE: Male, **U.S.A.: California: Mendocino Co.:** Ft. Bragg, 30 May 1937, R.L. Usinger. (in California Academy of Sciences, San Francisco, California).

PARATYPES: Thirty-two paratypes as cited by Kelton and Knight (1970) from California.

DIAGNOSIS: *P. usingeri* is distinguished by the almost glabrous dorsum, the white opaque areas on the clavus and corium, and the white median line the scutellum. The vesica is of the *longirostris-usingeri* type and

resembles that of *longirostris*, the main lobe of the vesica is distinctive in shape and the terminal portion shows numerous spines; the right clasper is of the *vanduzeei-keltoni* type. General shape of the vesica resembles that of *longirostris*. Female genitalia are typical for the genus, with the sclerotized rings pear-like and with the ventral labiate plate not extending far beyond apex of sclerotized rings (Fig. 19d).

REDESCRIPTION: (**Male**) length 6.24-7.14 mm; width 2.56-3.60 mm. Head: 1.20-1.33, vertex 0.59-0.68, with striations well defined. Antenna (in mm): I, 0.80-0.94, II, 2.08-2.59, III, 0.88-0.92, IV, 0.72-0.80. Rostrum 3.64-4.0 mm in length and extending to middle of abdomen. Pronotum 2.0-2.27 mm wide at base with the posterior half with wide punctures (poorly defined) and opaque. General coloration reddish-brown with dorsal surface glabrous and shiny. **Female.** length 5.84-6.88 mm; width 2.56-3.80 mm. Head: 1.28-1.44, vertex 0.56-0.63. Antenna (in mm): I, 0.80-0.94, II, 2.08-2.59, III, 0.88-0.92, IV, 0.72-0.80. Rostrum 3.64-4.0 mm in length. Pronotum 2.0-2.27 mm wide at base. Similar in general appearance to male but slightly larger and more robust.

HOSTS: *Pinus muricata* D. Don, and *P. radiata* D. Don (**new host**).

DISTRIBUTION: Known only from the state of California (Kelton and Knight, 1970).

SPECIMENS EXAMINED: **U.S.A.: California:** Mendocino Co.: Ft. Bragg; Pygmy Forest; Monterey Co.: Carmel; Monterey; San Mateo Co.: Coastways Ranch, ex.: *Pinus radiata*; Sonoma Co.: Salt Pt. State Park, ex.: *Pinus muricata*.

DISCUSSION: Knight (1970) described *P. usingeri* from Fort Bragg, Mendocino Co., California (holotype), with additional specimens from The

Pygmy Forest and from Carmel, California. The stated host was *Pinus muricata* D. Don but without specific localities for this host tree. More recent records show specific localities for both hosts. The species appears to be restricted to western California, a distribution that coincides with the hosts along the coast of California. The two known hosts for *P. usingeri* are known to be sympatric but they do not hybridize naturally. Further collecting will likely clarify host associations of this endemic species of *Platylygus*.

***Platylygus vanduzeei* Usinger, 1931** (Figs. 1b, 16b, 23e, 27c, 47).

Platylygus vanduzeei Usinger, 1931:129 (description).- Usinger, 1933, P. 172.- Carvalho, 1959:227 (catalogue).- Knight, 1968:192, fig. 249.- Kelton and Knight, 1970:1439, fig. 28 (revision).- Henry and Wheeler, 1988:354 (catalogue).

HOLOTYPE: Male, **U.S.A.: Arizona:** Grand Canyon, 17 July 1921, C.D. Duncan. (in California Academy of Sciences, San Francisco, California, No. 2997).

PARATYPES: Thirteen paratypes as cited by Usinger (1931) from Grand Canyon and Mesa Verde National Parks, Arizona.

DIAGNOSIS: *P. vanduzeei* is distinguished by yellowish-brown coloration, the almost glabrous and shiny dorsum, the brown diagonal area on the middle of corium, the red dots and lines on the callus of pronotum, and the short rostrum. The main lobe of the vesica is distinctive in shape, and bears a longitudinal ridge of spines near the apex; the right clasper is of the *vanduzeei-keltoni* type. This species is the one that most resembles species of *Proba* Distant based on the coloration pattern and the shape of the right clasper. Female genitalia are typical for the genus, with sclerotized rings

separated by no more than their own length, sclerites for attachment of the seminal depository small and close (Fig. 16b).

REDESCRIPTION: (**Male**) length 5.60-8.0 mm; width 2.48-3.04 mm. Head: 1.12-1.44, vertex 0.56-0.64, with striations well defined. Antenna (in mm): I, 0.80-1.04, II, 2.0-2.64, III, 0.80-1.12, IV, 0.64-0.72. Rostrum 2.0-2.72 mm in length and extending to hind coxa. Pronotum 1.92-2.64 mm wide at base with the anterior half with reddish dots and lines, punctuations well defined. General coloration yellowish-brown to dark-brown with dorsal surface glabrous and shiny. **Female.** length 6.56-8.40 mm; width 2.64-3.52 mm. Head: 1.28-1.44, vertex 0.63-0.64. Antenna (in mm): I, 0.88-1.20, II, 2.24-2.68, III, 0.87-1.20, IV, 0.59-0.72. Rostrum 2.73-2.96 mm in length. Pronotum 2.24-2.80 mm wide at base. Similar in general appearance to male but larger and more robust.

HOSTS: *Pinus edulis* Engelman (**new host**), *P. cembroides* Zuccarini (**new host**) and *P. monophylla* Torrey & Fremont..

DISTRIBUTION. This species was previously recorded from Colorado and New Mexico (Kelton and Knight, 1970). Equihua and Schwartz (In preparation) cited the species for the first time from the Mexican state of Coahuila, extending its distribution to the south.

SPECIMENS EXAMINED: **U.S.A.:** **Arizona:** Coconino Co.: 27 mi NW Flagstaff, ex.: *Pinus edulis*; 11 mi N Jacob Lake; Grand Canyon; Pima Co.: Sta. Catalina Mts., ex.: *Pinus cembroides*. **California:** Alpine Co.: Hwy. 4/89 Indian Creek, ex.: *Pinus monophylla*; Inyo Co.: Bishop; Lone Pine; Westgard Pass Plateau, ex.: *Pinus monophylla*; 9 mi. W Rt. 395; Tulare Creek, ex.: *Pinus monophylla*; Mono Co.: Coleville; 7.4 mi NW Benton Hot Springs, ex.: *Pinus monophylla*; San Bernardino Co.: New York Mountains. **Colorado:**

Gardfield Co.: MacAndrews Lake, ex.: *Pinus edulis*; Mesa Co.: Colorado National Monument, ex.: *Pinus edulis*. **Nevada:** Elko Co.: Ruby Lake, ex.: *Pinus monophylla*; Esmeralda Co.: 2 mi W Lida; Lander Co.: Bob Scott Summit Campground, Toiyabe National Forest; Lyon Co.: 3 mi SE Toiyabe National Forest, ex.: *Pinus monophylla*; Nye Co.: Nevada Test Site, ex.: *Pinus monophylla*; 3.5 mi SE Manhattan, ex.: *Pinus monophylla*; 3 mi SE Manhattan, Toiyabe National Forest, ex.: *Pinus monophylla*; 4.2 mi W Baker; Wheeler Peak, Humboldt National Forest, ex.: *Pinus monophylla*; Murray Summit, ex.: *Pinus monophylla*. **Utah:** Carbon Co.: Minnie Maud Creek, ex.: *Pinus edulis*; Emery Co.: 2 mi W Temple, ex.: *Pinus edulis*; Gardfield Co.: Capitol Reef National Park, ex.: *Pinus edulis*; Grand Co.: 11 mi Jct. 313 and 163, ex.: *Pinus edulis*; San Juan Co.: Brush Basin Rim Road, ex.: *Pinus edulis*; Natural Bridge National Mon., ex.: *Pinus edulis*; 2.7 mi W on Rt 263, T37S R17e, ex.: *Pinus edulis*; 3 mi of Clay Hills, T39S R15E; Sevier Co.: Clear Creek Narroes Summit, ex.: *Pinus edulis* Uintah Co.: Blue Mountains, e.x.; *Pinus edulis*; Washington Co.: Zion National Park, ex.: *Pinus monophylla*; Leeds Canyon. **MEXICO: Coahuila:** 16 mi SE Saltillo.

DISCUSSION: Usinger (1931) described *P. vanduzeei* from Grand Canyon National Park, Arizona (holotype), with additional specimens from Mesa Verde National Park, Arizona. The hosts (Kelton and Knight, 1970) were said to be *Pinus monophylla* Torrey & Fremont and *Pinus ponderosa* Douglas. However, later collecting did not confirm association with ponderosa pine and it is not considered a true host for this species. During this study, two new hosts were added; *Pinus cembroides* Zuccarini and *Pinus edulis* Engelmann, confirming the strong association of this species with Pinyon pines. *P. vanduzeei* more closely resembles the genus *Proba* because of the general

marks on the dorsum and the right clasper of the male. Further collecting of this species, particularly in Mexico, will help in understanding the association with this subsection of pines or may show patterns of variation, if any, given the presence of more species of pines of this subsection in the country.

DISCUSSION AND CONCLUSIONS

Species of the genus *Platylygus* are quite similar in general appearance: pubescence, anterior angles of the pronotum, and marks on dorsal surface appear to be the strongest external morphological characters. Male and female genitalia provide useful tools to separate species, considering the strong external similarity of species of the genus. Twenty-six species are recognized in the genus and they are distributed from The Yukon Territory, Canada to the southern State of Chiapas, Mexico. Morphological variation appears to increase in its more southerly range.

Of the 26 species of the genus *Platylygus*, 23 are associated with *Pinus*, two with *Pseudotsuga*, two with *Abies*, and one with *Picea*. Most species of the genus appear to be highly host specific. Cases of wide host range need to be reexamined to clearly understand these patterns or to clarify true host associations. The close association of *Platylygus* with New World pines offers a unique opportunity to examine coevolution on the continent.

Areas of higher species diversity are found in northwestern California, the southeastern Arizona southwestern New Mexico region, and northwestern and south Mexico. In North America, species appear to be restricted to the west; most species of pines occurring in the east and south are not known to serve as host for these insects. The great diversity of pines in Mexico and Central America will likely be found to serve as hosts for many more *Platylygus* species.

Even though the biology of most species remains unknown, most species have been collected in late spring or early summer, depending on the region. Species collected in the field (Minnesota and Oregon) have been

observed feeding on first-year cones (conelets) at late spring or early summer. Even though no close analysis was done in this study on the effects of feeding habits by these insects, it has been reported (Rauf *et al*, 1984a,b) that *P. luridus* may cause conelet abortion because they feed on the ovules, something that may be also true for the species collected in Oregon (particularly *P. pseudotsugae* and *P. rubripes*) and possibly for most species in the genus. The life cycle (3-4 months in the studied species) appears to be synchronized with pollen production. Based on general collecting in the state of Oregon, two general patterns of colonization were observed; one in which the insects appear to be restricted to open host areas at higher elevations (*P. pseudotsugae*, and *P. rolfsi*), and the other in which insects follow the natural distribution of the host through its entire range (*P. rubripes*).

The phylogenetic analysis performed for the 26 known species of *Platylygus* shows the close relationship of most species with one another. Exceptions are *P. vanduzeei* and *P. keltoni*, which appear to be closely related to *Proba californica* (used as an outgroup in the cladistic analysis). Additional information on poorly known species and the possible discovery of new species, particularly in Mexico and Central America, may give us a better idea of the morphological variation found in the genus on the continent and clarify phylogenetic relationships within the genus as well as to related genera in the Miridae.

Previous collecting of *Platylygus* has produced little information on intraspecific morphological variation or on host associations. In addition, previous descriptions of species based on only a few specimens makes questionable the true status of some species. It is hope that further collecting and research will clarify these taxonomic problems.

Host associations.

Of the 26 species of *Platylygus*, 23 are associated with *Pinus*, two with *Pseudotsuga*, and two with *Abies* (Table 1). It is evident that species of the genus are primarily associated with *Pinus* in North America. Twenty-five species of pines are now known to serve as hosts to one or more species of *Platylygus*.

Several species of pines serve as hosts to only one species of insect such as in *Pinus cooperi*, *P. monophylla*, *P. muricata*, *P. oocarpa* var. *ochoterani*, and *P. radiata*, but others may serve as host to two or more species of *Platylygus*. *Pinus ponderosa* is utilized as host by 8 species of *Platylygus*.

It is well known that species of Miridae may be highly host specific, which is the case for some species of this genus. Even though one species of insect is associated with more than a single host, in most cases the different host tree species are closely related taxonomically and perhaps phylogenetically.

An extreme case of host specificity involves two species of *Platylygus* (*P. balli* and *P. pseudotsugae*), each of which is associated with one of the two different varieties of *Pseudotsuga menziesii* in western U.S. The contrasting pattern of host specificity involves *Platylygus mexicanus* and *P. pilosipes*, both of which share a single host (*Pinus leiophylla*) in Durango, Mexico. This may be an indication of incipient speciation of *Platylygus* in this region.

Only two New World subsections of the genus *Pinus* support most species of *Platylygus*; subsections *Ponderosa* and *Strobi*. Other subsections

Table 1. Host associations of *Platylygus* species in North America.

Species:	Hosts:
<i>Platylygus andrei</i> Knight	<i>Pinus albicaulis</i> , <i>P. monticola</i> , <i>P. ponderosa</i>
<i>P. angulatus</i> Kelton	<i>Pinus</i> sp.
<i>P. aztecus</i> Kelton	<i>Pinus montezumae</i>
<i>P. balli</i> Knight	<i>Abies concolor</i> , <i>Pinus flexilis</i> , <i>P. strobiformis</i> , <i>Pseudotsuga menziesii</i> var. <i>glauca</i> (?).
<i>P. brevirostris</i> Kelton	<i>Pinus</i> sp.
<i>P. chamulans</i> Kelton	<i>Pinus pseudostrobus</i>
<i>P. chiapasensis</i> Kelton	<i>Pinus ayacahuite</i> , <i>P. oocarpa</i> var. <i>ochoteranai</i> , <i>P. montezumae</i>
<i>P. contortae</i> Kelton	<i>Pinus contorta</i> , <i>P. ponderosa</i>
<i>P. crassicornis</i> Kelton	<i>Pinus pseudostrobus</i>
<i>P. crinitus</i> Kelton	<i>Pinus albicaulis</i> , <i>P. monticola</i> , <i>P. ponderosa</i>
<i>P. grandis</i> Knight	<i>Pinus ponderosa</i>
<i>P. keltoni</i> Knight	<i>Pinus durangensis</i>
<i>P. knigthi</i> Kelton	<i>Pinus aristata</i> , <i>P. ponderosa</i>
<i>P. longirostris</i> Kelton	<i>Pinus cooperi</i>
<i>P. luridus</i> (Reuter)	<i>Pinus albicaulis</i> , <i>P. aristata</i> , <i>P. banksiana</i> , <i>P. contorta</i> , <i>P. flexilis</i> , <i>P. monticola</i> , <i>P. ponderosa</i> , <i>P. resinosa</i> , <i>P. rigida</i> , <i>P. strobus</i> , <i>P. sylvestris</i> .

Table 1: Continued....

Species:	Hosts:
<i>P. mexicanus</i> Kelton	<i>P. leiophylla</i>
<i>P. piceicola</i> Kelton	<i>Picea glauca</i> , <i>P. engelmanni</i> , <i>Abies lasiocarpa</i> (?), <i>Pinus contorta</i> (?).
<i>P. pilosipes</i> Kelton	<i>Pinus leiophylla</i> , <i>P. strobiformis</i> (?)
<i>P. pilosus</i> Kelton	<i>Pinus teocote</i>
<i>P. pseudotsugae</i> Kelton	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>
<i>P. rolfsi</i> Knight	<i>Pinus albicaulis</i> , <i>P. attenuata</i> , <i>P. contorta</i> , <i>Pinus ponderosa</i> .
<i>P. rubripes</i> Knight	<i>Pinus attenuata</i> , <i>P. albicaulis</i> , <i>P. banksiana</i> , <i>P. flexilis</i> , <i>P. ponderosa</i> .
<i>P. scutellatus</i> Kelton	<i>Pinus flexilis</i> , <i>P. strobiformis</i>
<i>P. teocotae</i> Kelton	<i>Pinus teocote</i>
<i>P. usingeri</i> Knight	<i>Pinus muricata</i> , <i>P. radiata</i>
<i>P. vanduzeei</i> Usinger	<i>Pinus cembroides</i> , <i>P. edulis</i> , <i>P. monophylla</i>

of *Pinus* that also serve as hosts for *Platylygus* species are *Cembra*, *Cembroides*, *Balfouriana*, *Leiophylla*, *Contorta* and *Oocarpa*, but with fewer species.

Host specificity is demonstrated in *Platylygus* by association with one host or association with several tree species of the same subsection. Of the

26 species of *Platylygus*, only *P. luridus*, *P. rolfsi* and *P. rubripes* do not show a high grade of specificity and are associated with more than one subsection of pines. However, this pattern of host specificity may include species of trees used as resting plants by the insect and may need clarification on the host association.

Pines show different patterns of distribution throughout the continent; in some areas pines may occur sympatrically or parapatrically, show disjunct populations, or be highly endemic. The same pattern also was found for their associated species of *Platylygus*. Most areas in which pines occur sympatrically do not always show the same diversity of species of insects associated with them but, where diversity was present, clear separations among species of insects were also defined by the species of hosts. It is evident, then, that host specificity is clearly demonstrated in the genus *Platylygus*. These observed patterns may be an indications of localized collecting and these primary considerations should not be considered as conclusive

Biogeography.

Species of *Platylygus* range from The Yukon Territory, Canada south to the State of Chiapas, Mexico. They likely follow the natural distribution of their main hosts (pines) throughout Central America, but collecting data are lacking. The highest known concentration of *Platylygus* species on the continent is in southern Arizona (10 species), followed by the Pacific Coast of the United States (7 species), and central-western United States (5). Even though

Mexico has been poorly collected, the State of Durango shows a high density of species (7), followed by central Mexico (4) and the southern state of Chiapas (3). Considering current data on areas of endemism, the coastal region of northern California and southwestern Arizona stand out. Presently, endemism observed in various regions of Mexico may only represent incomplete data on distribution ranges of the genus.

Most bug species are highly host-specific and their distribution tends to coincide with that of their hosts. Despite the high diversity of pines in the eastern United States, only two species of *Platylygus* are known to occur in northeastern Canada-southeastern United States region (*P. luridus* and *P. piceicola*).

Considering current data, the genus appears to have originated in southeastern Arizona and southwestern New Mexico (high diversity of species), or in the northwestern California region (high number of endemic species). Another strong possibility is that the genus may have originated in northwestern Mexico (Durango) and radiated north and south. Resolution of the problem awaits further field work.

Phylogenetic analysis.

A phylogenetic analysis was performed using the cladistic computer package PAUP (1991) which permits investigation of the consistency of characters and determines the most parsimonious classification of the data. The data set used to determine the species phylogeny contained the following character categories: head (3 characters), pronotum (3 characters), scutellum

(1 character), hemelytra (3 characters), legs (1 character), male genitalia (2 characters), and female genitalia (3 characters). Description of the characters is shown in table 2.

Table 2. Descriptions of characters and character states used in the phylogenetic analysis of *Platylygus* species.

Head:

- 1) 0 - Clypeus rounded.
1 - Clypeus angulated.
- 2) 0 - Vertex with striations well defined.
1 - Vertex with striations poorly defined.
- 3) 0 - Antennae with short pubescence.
1 - Antennae with long pubescence.

Pronotum:

- 4) 0 - Anterior angles rounded.
1 - Anterior angles prominent
- 5) 0 - Short pubescence on dorsal surface.
1 - Long pubescence on dorsal surface.
- 6) 0 - With reddish lines on anterior half.
1 - Without reddish lines on anterior half

Scutellum:

- 7) 0 - Without dark marks.
1 - With dark marks.

Hemelytra:

- 8) 0 - Short pubescence or no pubescence on dorsal surface.
1 - Long pubescence on dorsal surface.
- 9) 0 - Without longitudinal or diagonal dark marks on the corium.
1 - With longitudinal or diagonal dark marks on the corium.
- 10) 0 - Without opaque spots on the corium or the clavus.
1 - With opaque spots on the corium, on the clavus or both.

Legs (hind tibia):

- 11) 0 - Hind tibia with short pubescence.
1 - Hind tibia with long pubescence.
-

Table 2: Continued....

Male genitalia:

-
- 12) 0 - Main lobe of the vesica with at least one spine.
1 - Main lobe of the vesica without spines.
- 13) 0 - Right clasper not strongly bent at apex.
1 - Right clasper from strongly bent at the apex, sometimes almost forming a circle with the shoulder.

Female genitalia:

- 14) 0 - Sclerotized rings separated from each other by more than their own length.
1 - Sclerotized rings separated from each other by less their own length.
- 15) 0 - Dorsal labiate plate separated anteriorly.
1 - Dorsal labiate plate showing a continuous sclerotization anteriorly.
- 16) 0 - Sclerites for attachment of seminal depository "u" shaped.
1 - Sclerites for attachment of the seminal depository not "u" shaped.
-

The reason for using *Proba californica* as the outgroup was based on its close similarity to *Platylygus vanduzeei* and *P. contortae* in most external character similarities, the right clasper of the male, and the fact that some species identified as *Proba* from Central America resemble many species of *Platylygus* in general appearance, coloration, and male genitalia.

Characters used in this analysis were binary coded (Table 3). The condition of each character assumed to be '0' was based on its dominance in the genus or in its presence as a distinctive character of the outgroup (*Proba*).

Table 3. Character matrix for 26 species of *Platylygus* analyzed on PAUP (1991).

Species	Characters															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>andrei</i>	0	0	0	0	1	1	0	0	0	0	1	1	1	0	0	0
<i>angulatus</i>	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0
<i>aztecus</i>	1	0	0	0	0	1	0	0	0	1	0	1	1	1	0	0
<i>balli</i>	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>brevirostris</i>	0	0	0	1	0	1	0	1	0	0	0	1	1	1	0	0
<i>chamulans</i>	1	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0
<i>chiapasensis</i>	0	0	1	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>contortae</i>	0	0	0	0	0	1	0	0	1	0	0	1	1	1	0	1
<i>crassicornis</i>	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0
<i>crinitus</i>	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0
<i>grandis</i>	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>keltoni</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>knighti</i>	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>longirostris</i>	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0
<i>luridus</i>	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>mexicanus</i>	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0
<i>piceicola</i>	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0
<i>pilosipes</i>	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	0

Table 3: Continued....

Species	characters															
<i>pilosus</i>	0	1	1	1	1	1	0	1	0	0	1	1	1	0	0	0
<i>pseudotsugae</i>	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>rolfsi</i>	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>rubripes</i>	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
<i>scutellatus</i>	0	1	0	0	0	1	1	0	0	0	0	0	1	1	0	0
<i>teocotae</i>	0	0	0	1	1	1	0	1	0	0	1	1	1	1	0	0
<i>usingeri</i>	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0
<i>vanduzeei</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
<i>Proba californica</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1

Analysis of the characters revealed one minimal length tree of 30 steps with a consistency index of 0.533. The reason for using *Proba californica* as the outgroup to establish the polarity of characters was based on the close similarity in its external morphology to *Platylygus vanduzeei* as well as some similarities in the male genitalia. Results of the phylogenetic analysis (Fig. 49) indicate that *P. vanduzeei* stands closest to *Proba*, and is clearly separate from most other species of the genus. *P. keltoni* is closely related to *P. vanduzeei*, with which it shares the presence of dorsal lines on the anterior half of the pronotum. Most pubescent species are clearly separated from the shiny ones and appear to a more derived character, and, except for the

Mexican species of *P. teocotae*, most species of this group appear to closely related.

Even though groups of species are separated in the cladogram, it should be remembered that morphological variation of the species of this genus is not totally understood, since the Mexican fauna still remains poorly collected and studied.

Direction for future research.

Because of the great similarity between species of *Platylygus* and the lack of information on most species the following research is suggested:

- Study of the life cycles, host associations, patterns of distribution and morphological variation through their ranges.
- Because description of several species in western United States and Mexico were based on a few specimens more collecting is needed, which may provide material for the study of external and internal morphology.
- Given the fact that most species of *Platylygus* appear to be highly host specific, more collecting through out the ranges of distribution of their host.
- Previous collecting from Mexico have been very localized and only few specimens are known from all described species. More material is needed in order to study morphological variation and even recognize the species status for some species. Because of the species richness of *Pinus* is high in Mexico and Central America more collecting will likely increase the number of species of *Platylygus* known.

- Most species of *Platylygus* are associated with pine trees and are endemic of the American Continent and offer a great opportunity to study the coevolutionary relationships.

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APPENDIX

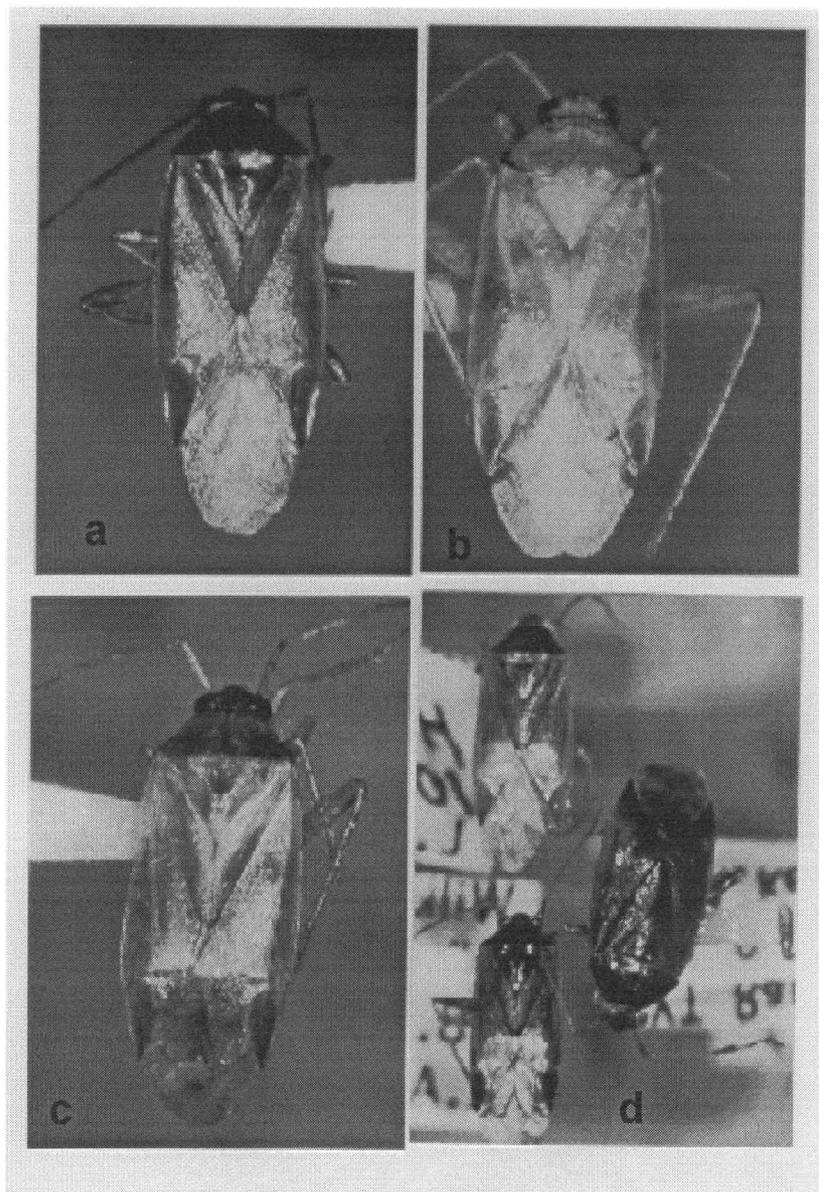


Fig. 1. General view of *Platylagus*. a) *P. chiapasensis*, b) *P. vanduzeei*, c) *P. scutellatus*, and d) *P. luridus*.

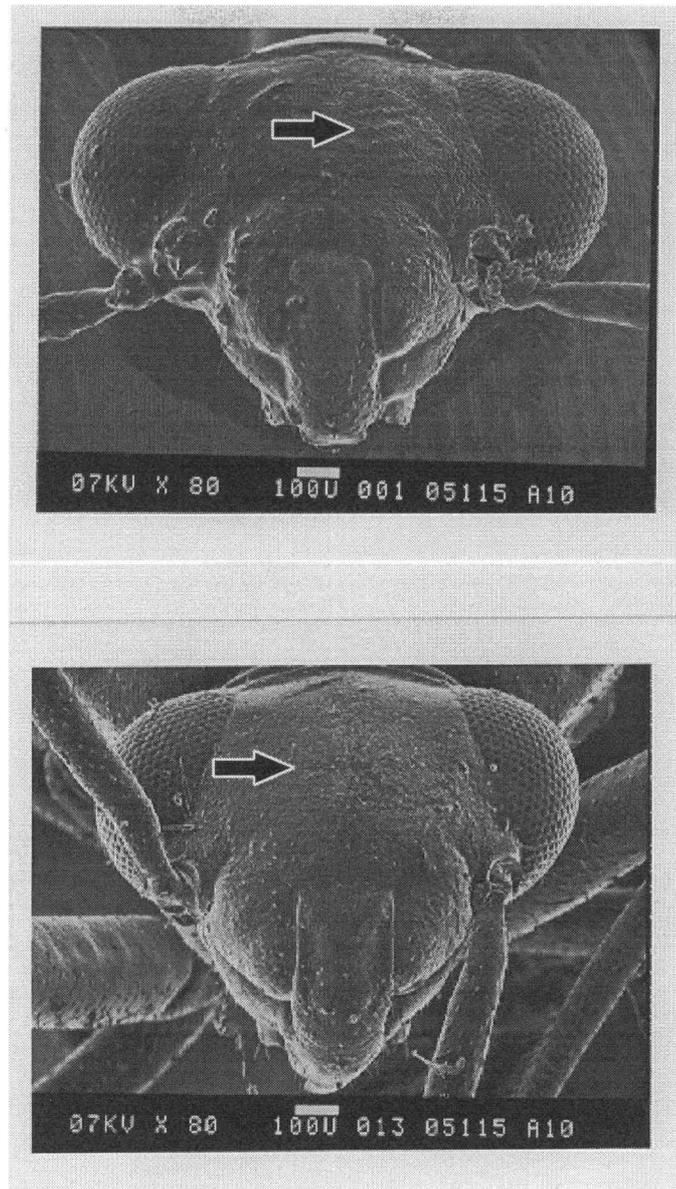


Fig. 2. Frontal view of *Platylagus* spp. showing variation on striations on the vertex. a) *Platylagus rolfsi*, and b) *Platylagus pseudotsugae*.

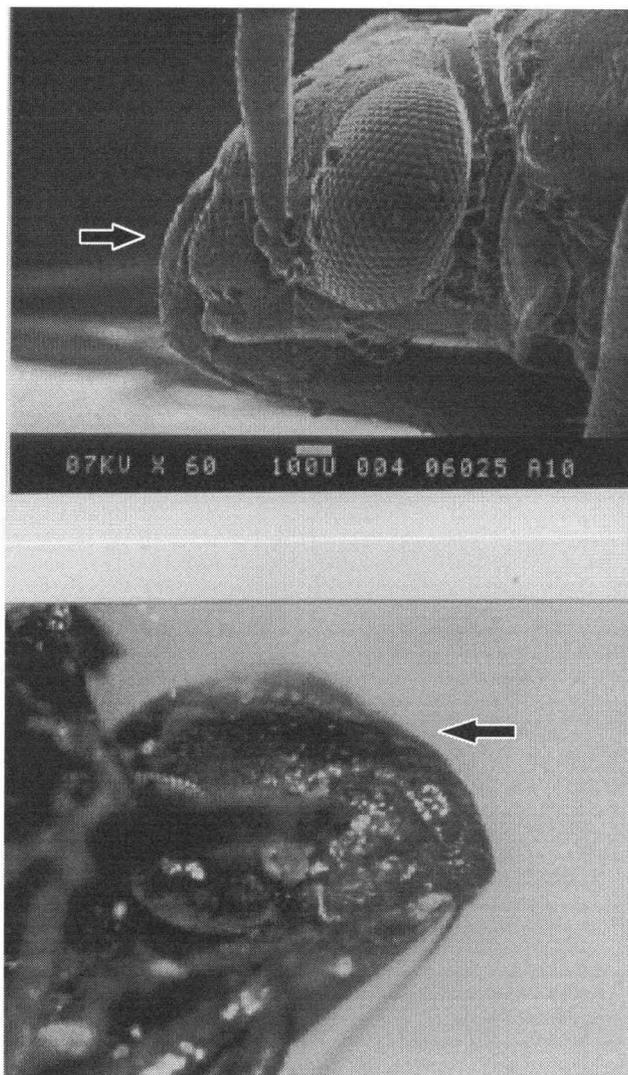


Fig. 3. Variation of clypeus on *Platylagus*. a) *Platylagus rolfsi*, b) *Platylagus teocotae*.

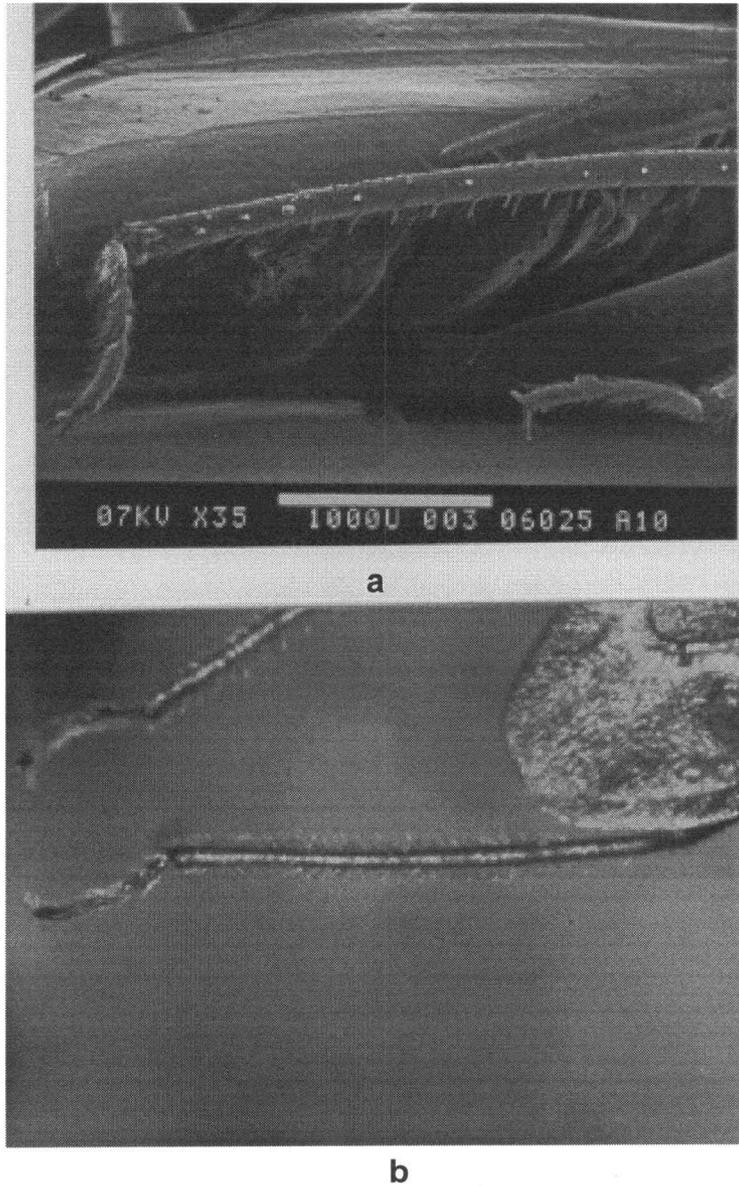


Fig. 4. Different grades of pubescence of hind tibia on *Platylagus*. a) *P. rolfsi*, and b) *P. pilosus*.

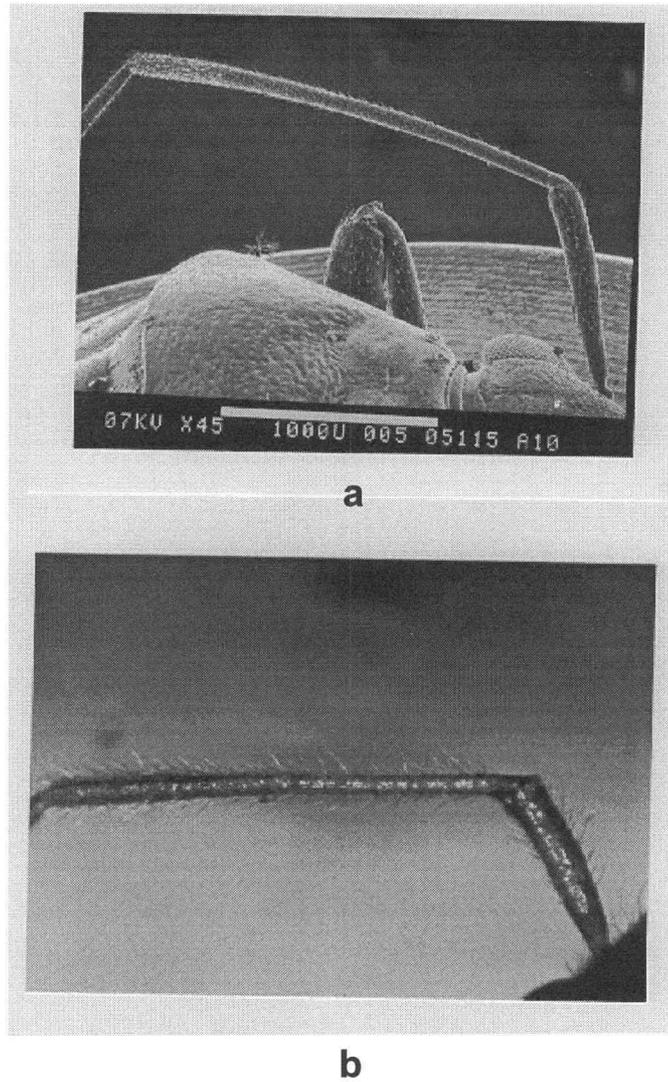


Fig. 5. Variation of pubescence on antennae of *Platylagus* spp. a) *Platylagus rolfsi*, and b) *Platylagus pilosus*.

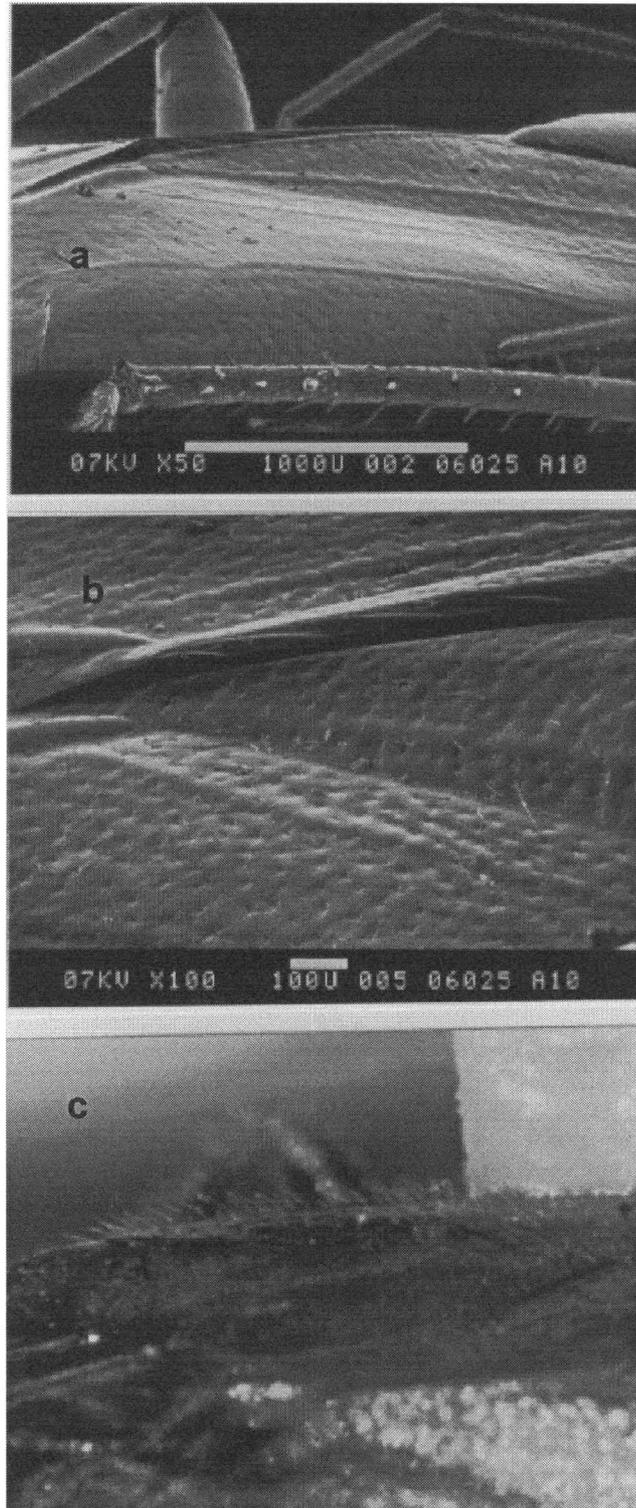


Fig. 6. Dorsal pubescence on hemelytra of *Platilygus*. a) *P. rolfsi*, b) *P. pseudotsugae*, and c) *P. pilosus*.

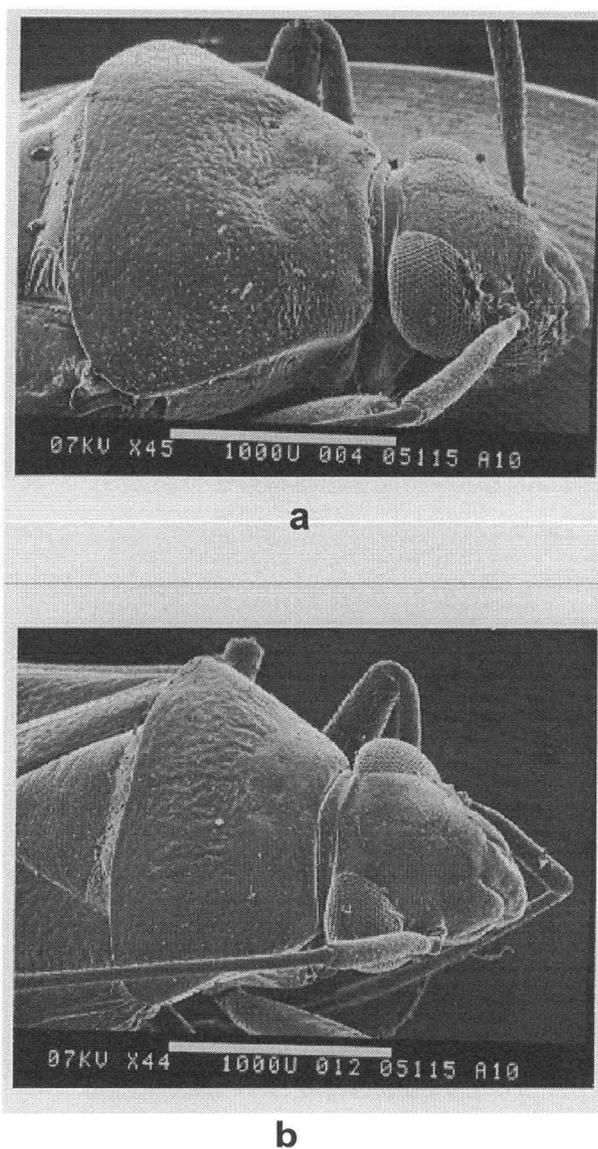


Fig. 7. Anterior angles of pronotum. a) *Platylygus rolfsi*, and b) *Platylygus pseudotsugae*.

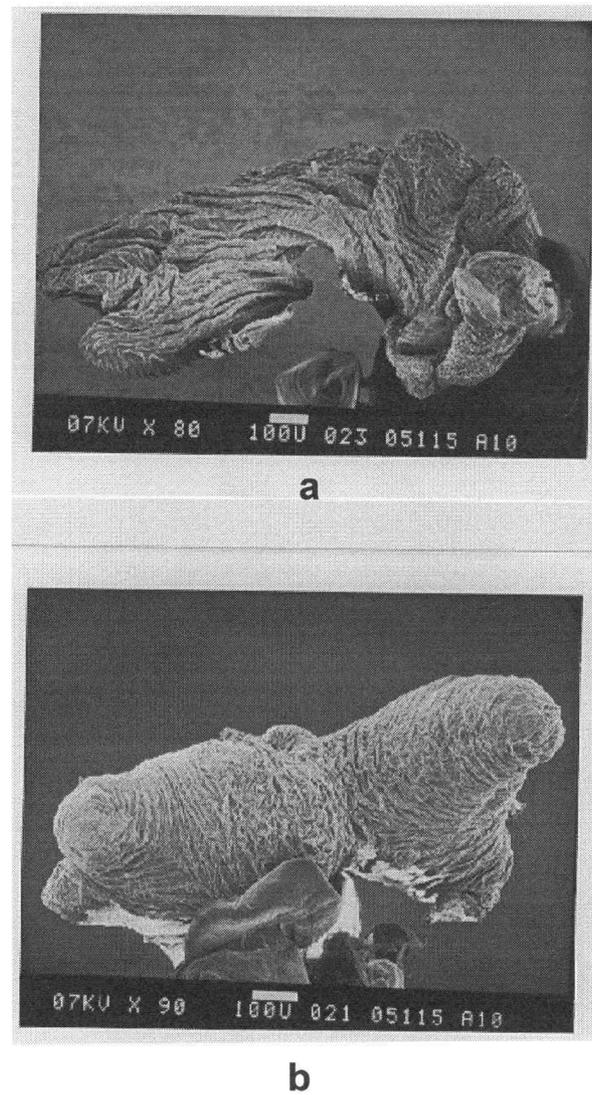


Fig. 8. Male genitalia of *Platylagus*. a) *Platylagus rolfsi*, and b) *Platylagus pseudotsugae*.

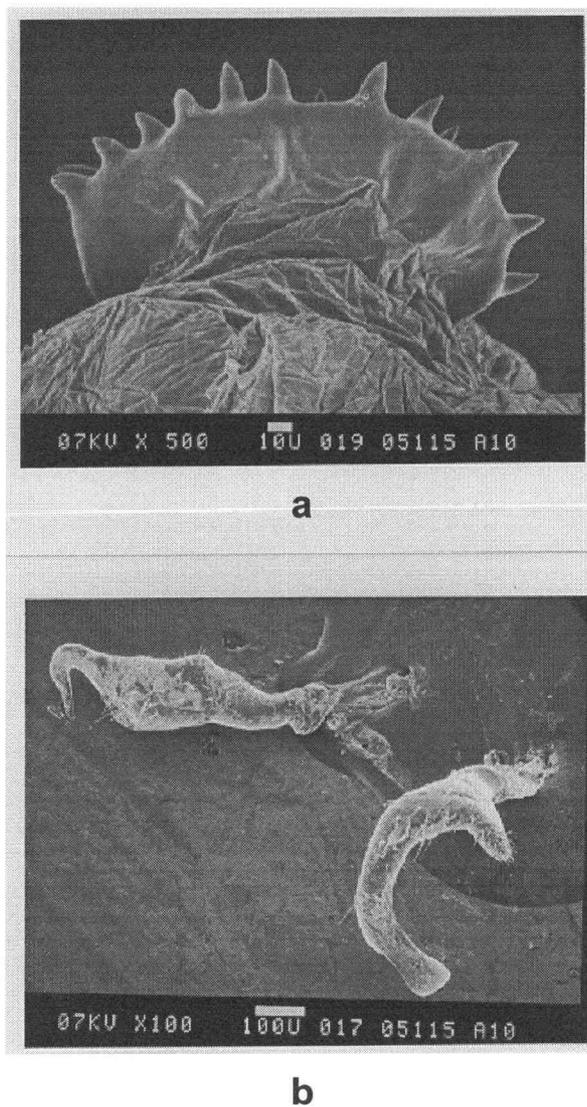


Fig. 9. Male genitalia. a) spines on main lobe of the vesica of *Platylagus pseudotsugae*, and b) genital claspers of *Platylagus pseudotsugae*.

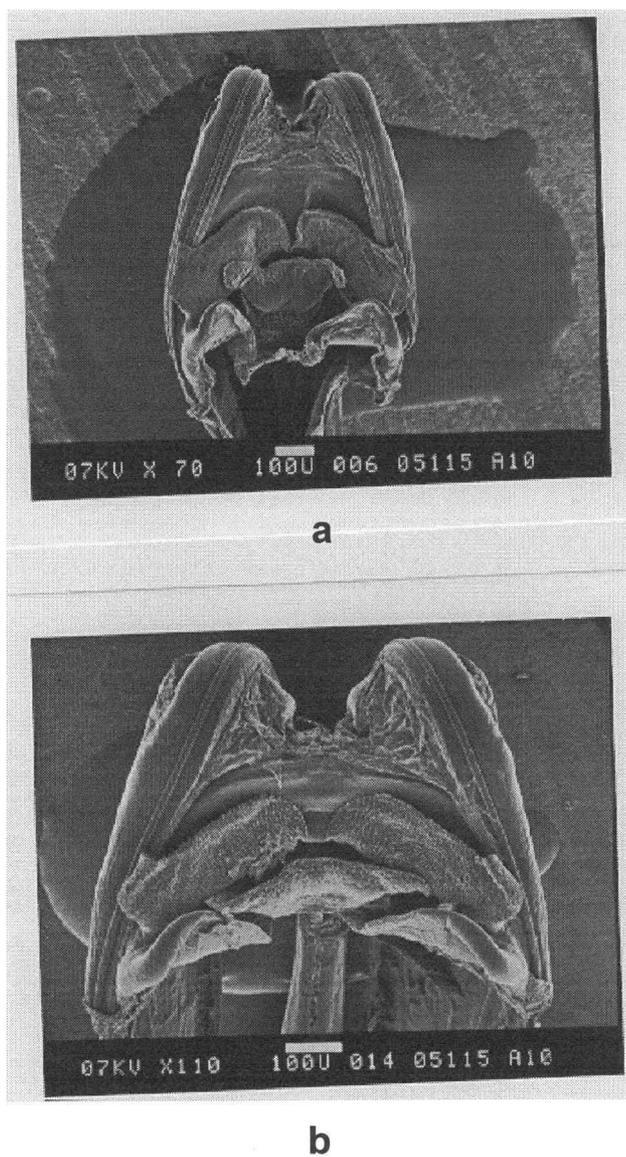


Fig. 10. Posterior wall of *Platylagus* spp. a) *Platylagus rolfsi*, and b) *Platylagus pseudotsugae*.

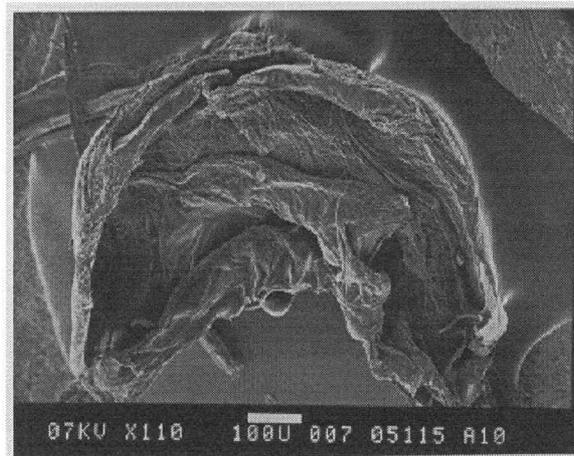
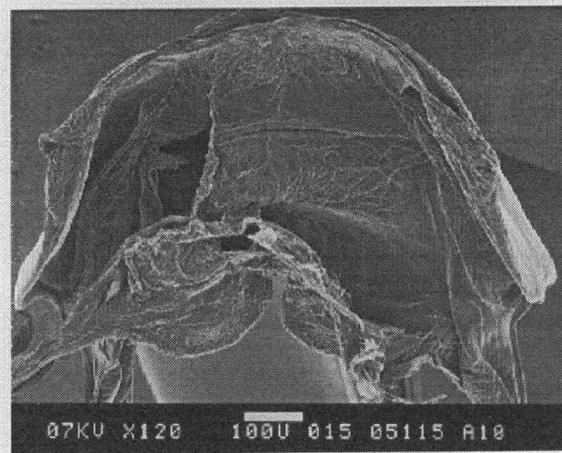
**a****b**

Fig. 11. General view of sclerotized rings. a) *Platylagus rolfsi*, and b) *Platylagus pseudotsugae*.

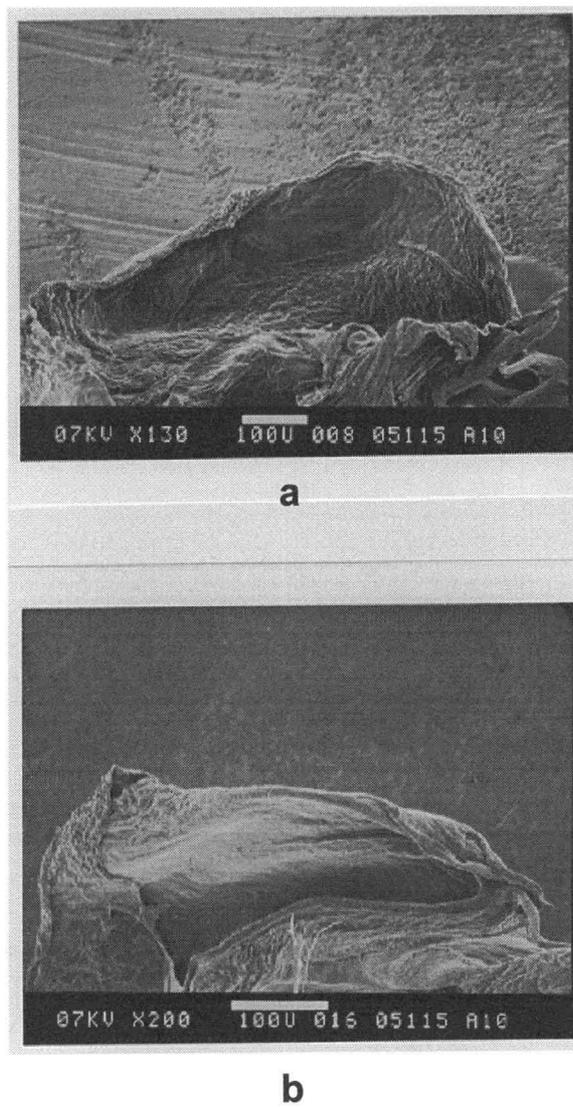


Fig. 12 Close-up of right sclerotized ring. a) *Platylagus rolfsi*, and b) *Platylagus pseudotsugae*.

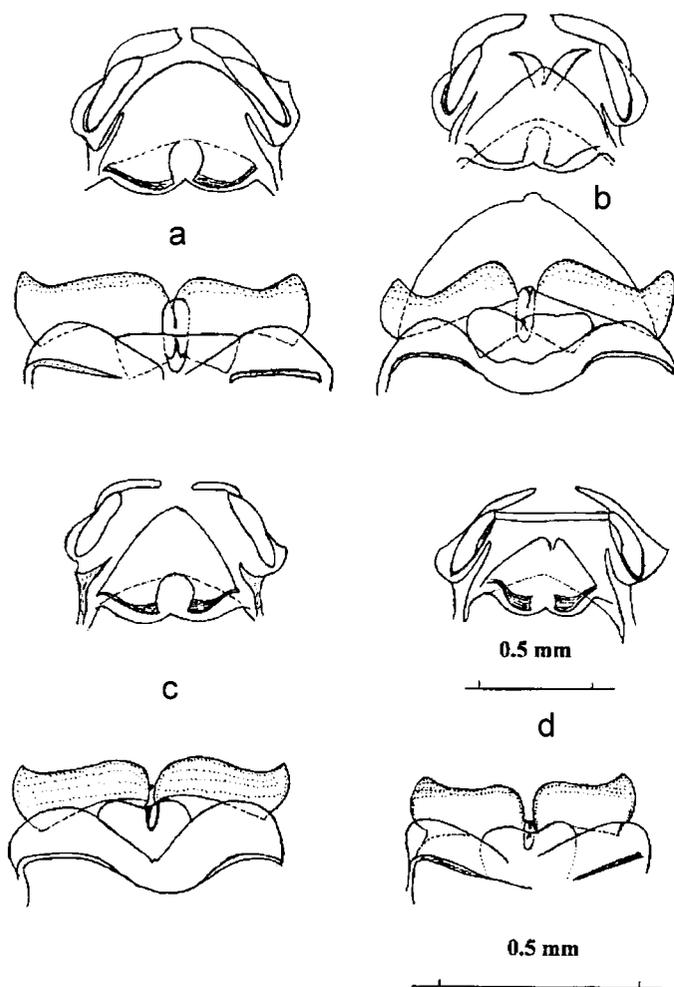


Fig. 13. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. andrei*, b) *P. crinitus*, c) *P. piceicola*, d) *P. pilosus*.

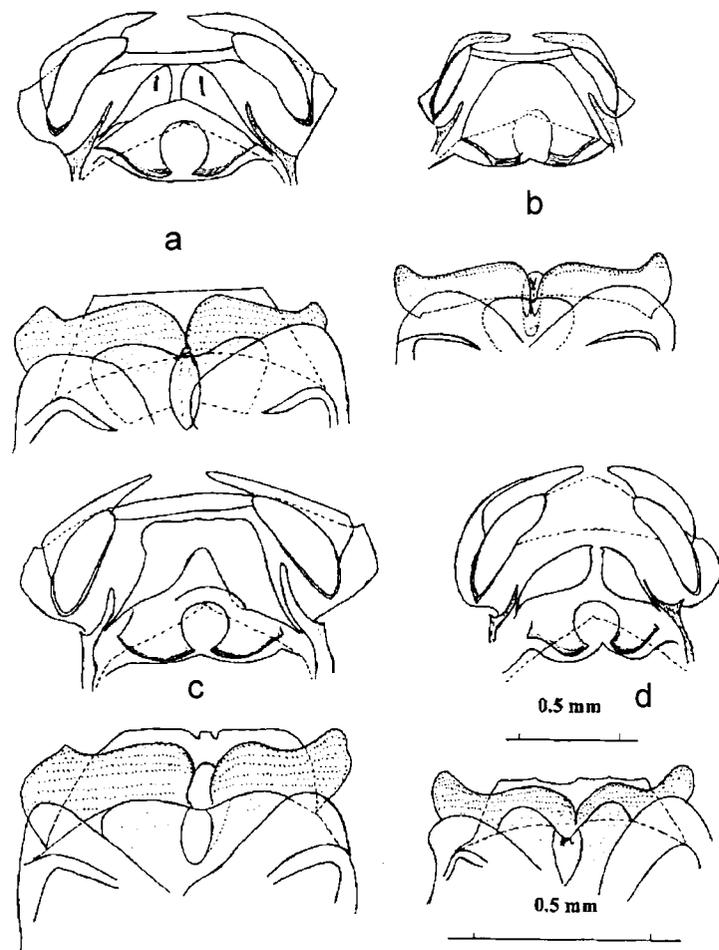


Fig. 14. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. aztecus*, b) *P. teocotae*, c) *P. chamulans*, d) *P. chiapasensis*.

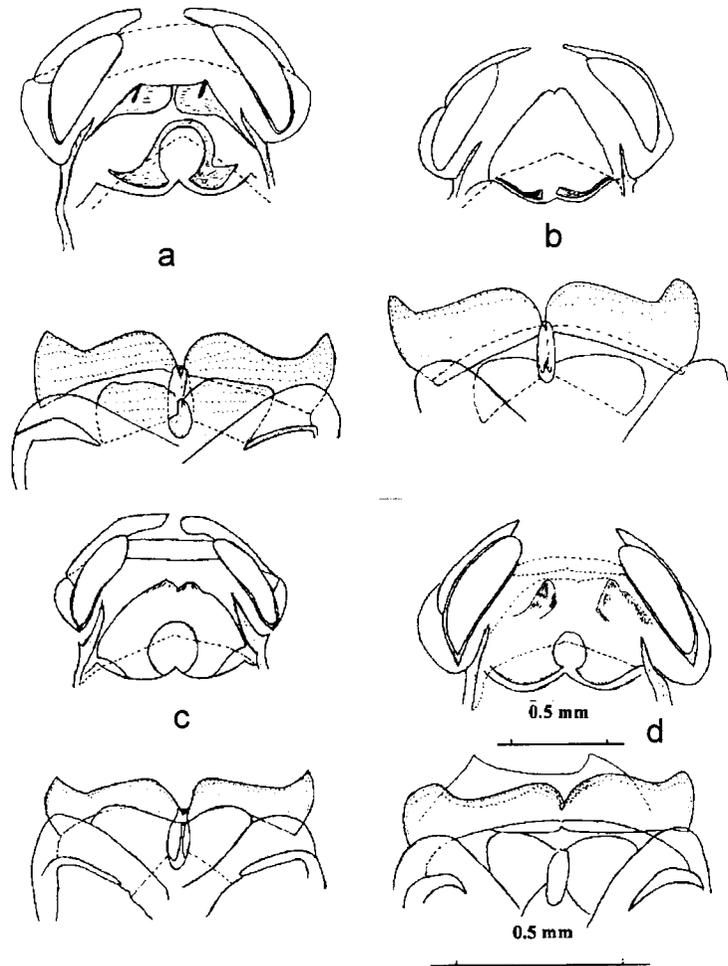


Fig. 15. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. balli*, b) *P. knighti*, c) *P. pseudotsugae*, d) *P. rubripes*.

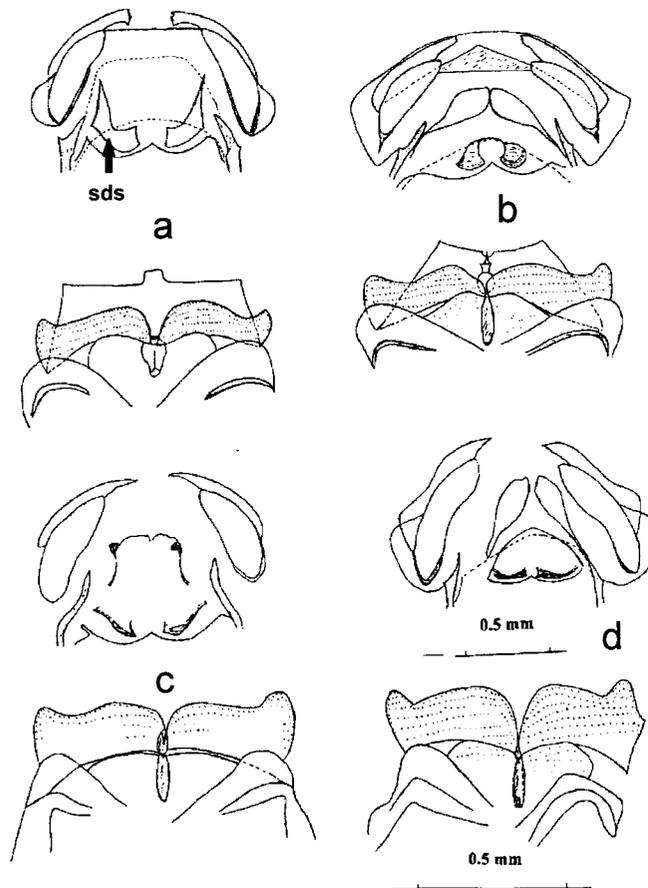


Fig. 16. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. contortae*, b) *P. vanduzei*, c) *P. rolfsi*, and d) *P. magnus* (=rolfsi). sds=seminal depository sclerite.

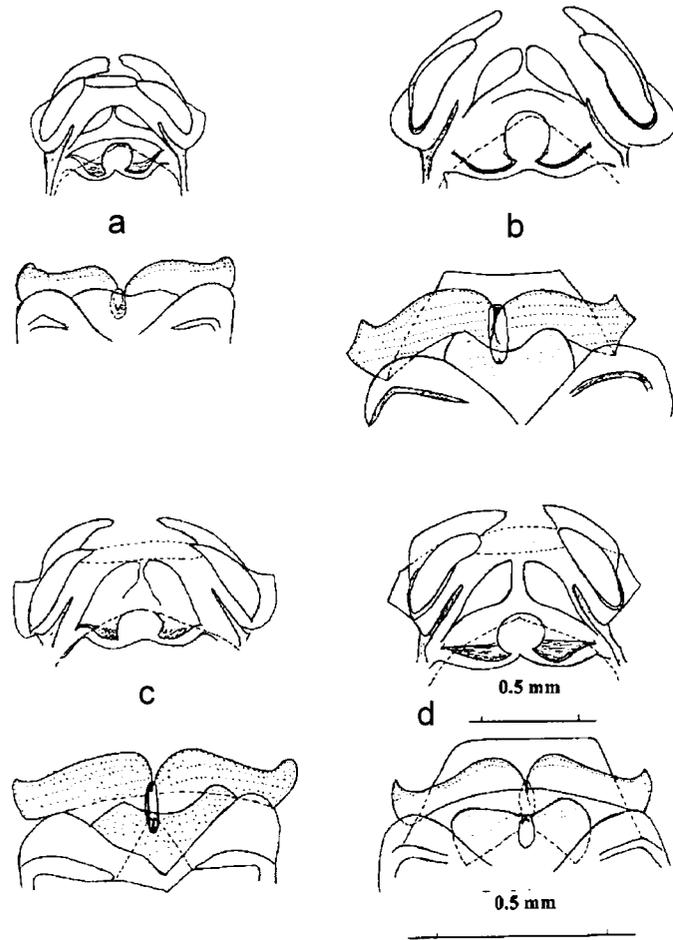


Fig. 17. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. crassicornis*, b) *P. keltoni*, c) *P. longirostris*, d) *P. mexicanus*.

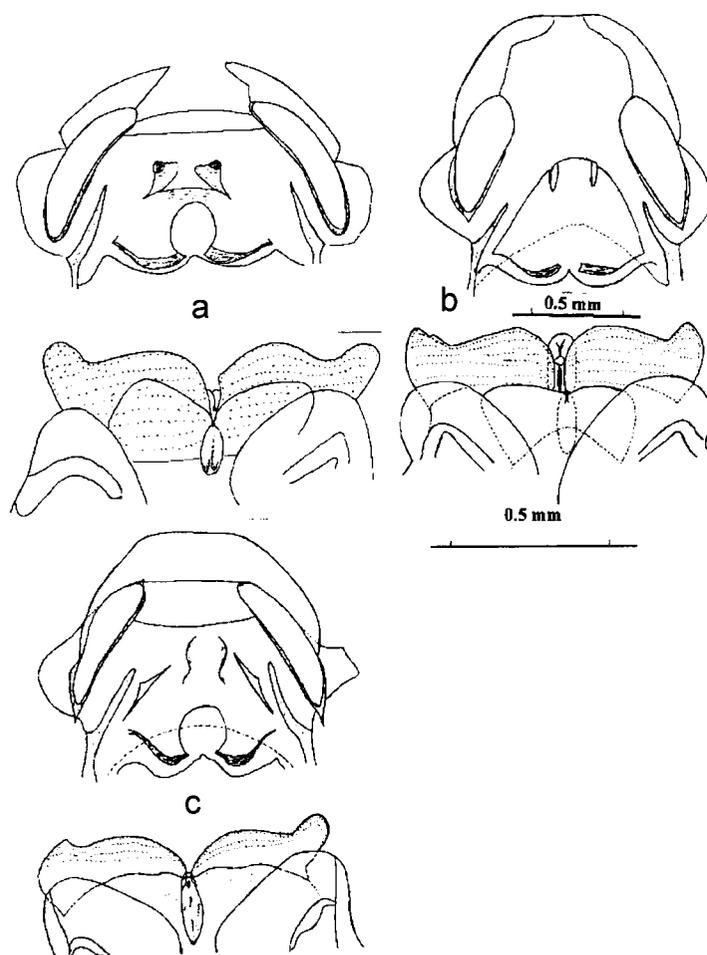


Fig. 18. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. grandis*, b) *P. scutellatus*, c) *P. pilosipes*.

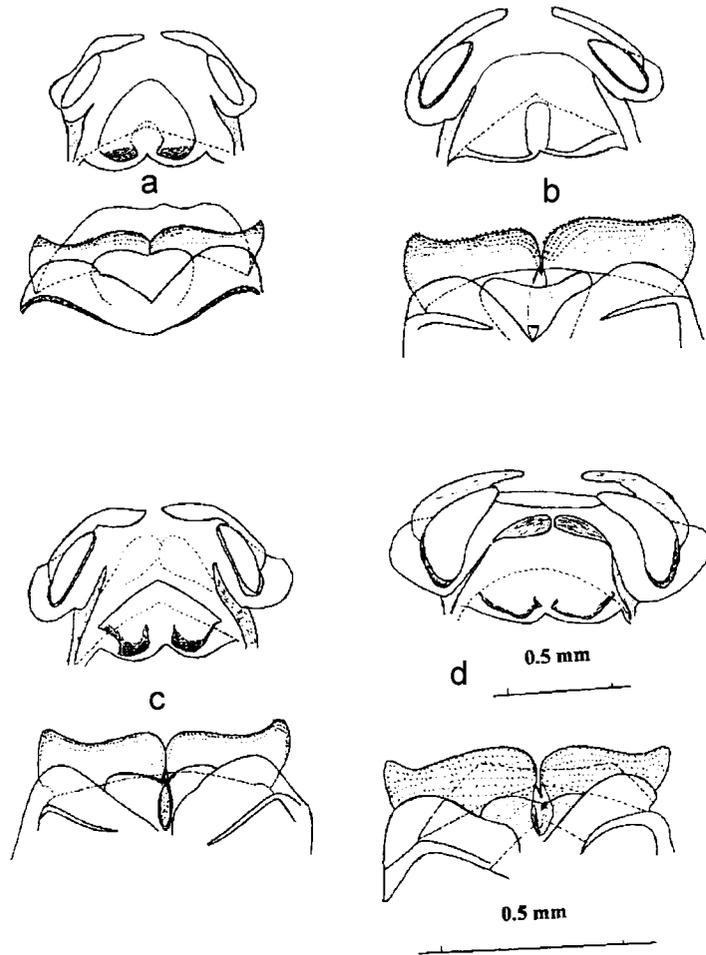


Fig. 19. Posterior wall and sclerotized rings of *Platylagus* spp. a) *P. luridus*, b) *P. intermedius* (= *luridus*), c) *P. fuliginosus* d) *usingeri*.

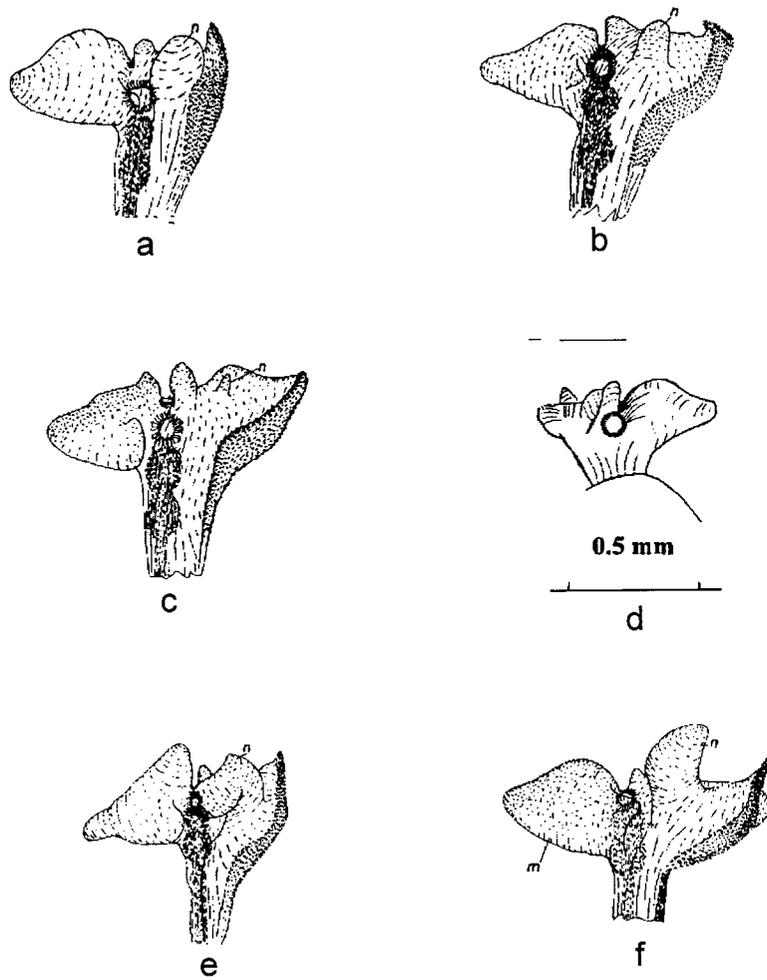


Fig. 20. Male vesica of *Platylagus* spp. a) *P. andrei* (taken from Kelton and Knight, 1970), b) *P. crinitus* (taken from Kelton and Knight, 1970), c) *P. luridus* (taken from Kelton and Knight, 1970) d) *piceicola*, e) *pilosus* (taken from Kelton and Knight, 1970), f) *teocotae* (taken from Kelton and Knight, 1970).

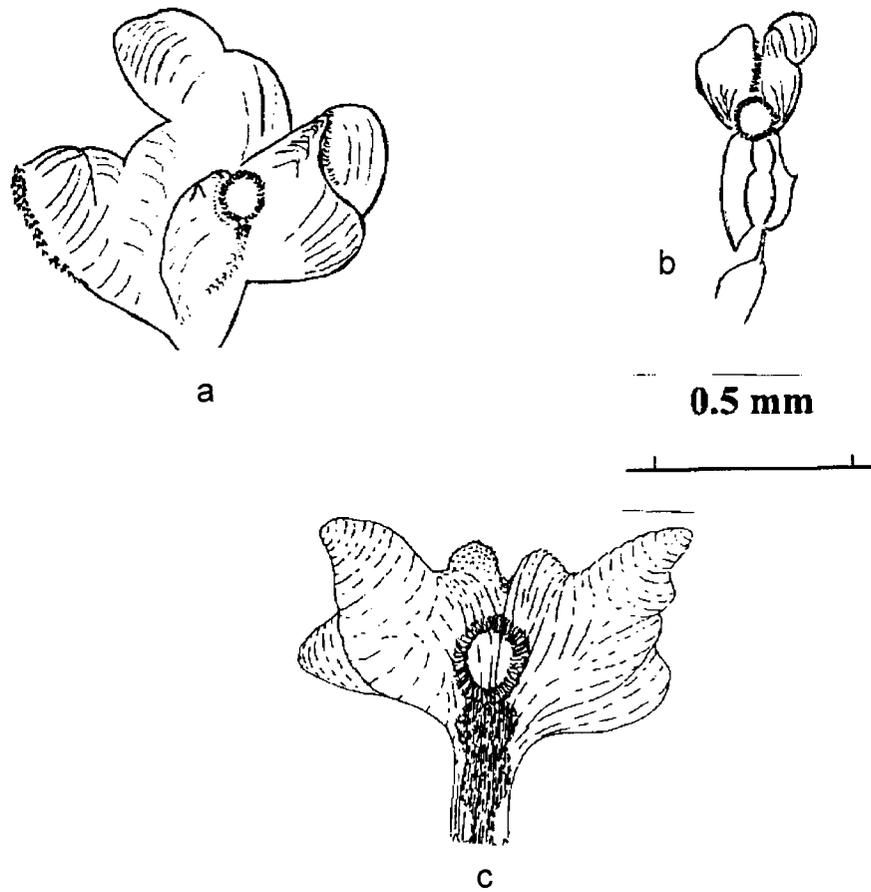


Fig. 21. Male vesica of *Platylagus* spp. a) *P. contortae*, b) *P. crassicornis*, c) *P. angulatus* (taken from Kelton and Knight, 1970).

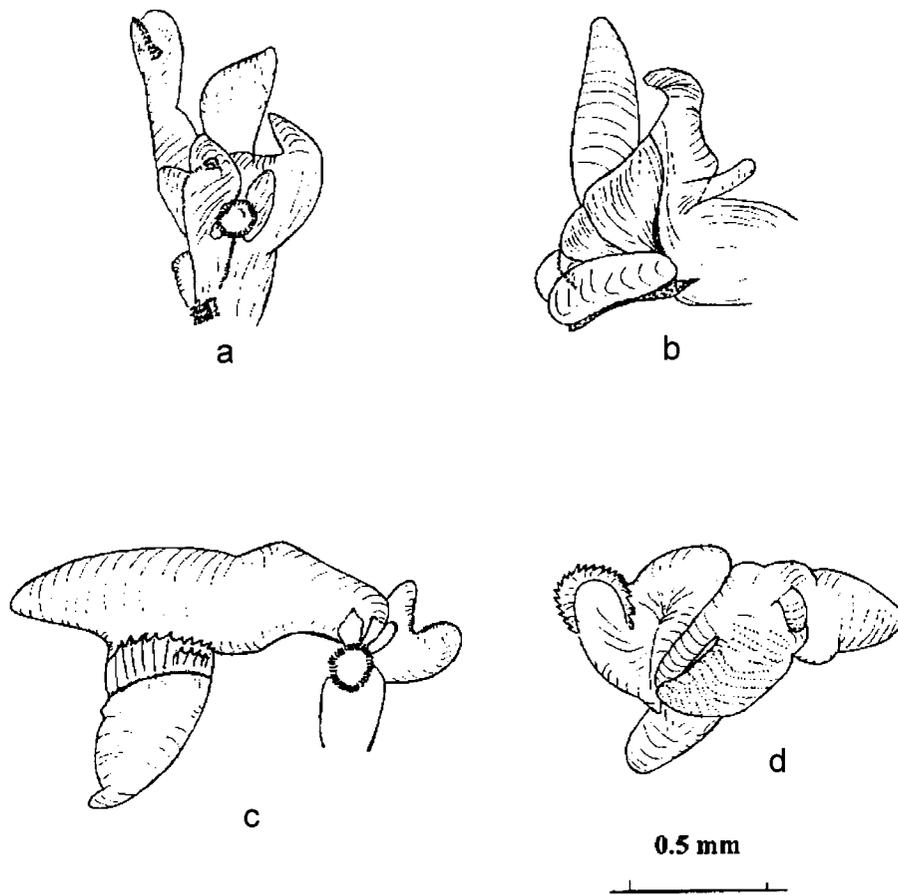


Fig. 22. Male vesica of *Platylagus* spp. a) *P. balli*, b) *P. knighti*, c) *P. pseudotsugae*, d) *P. rubripes*.

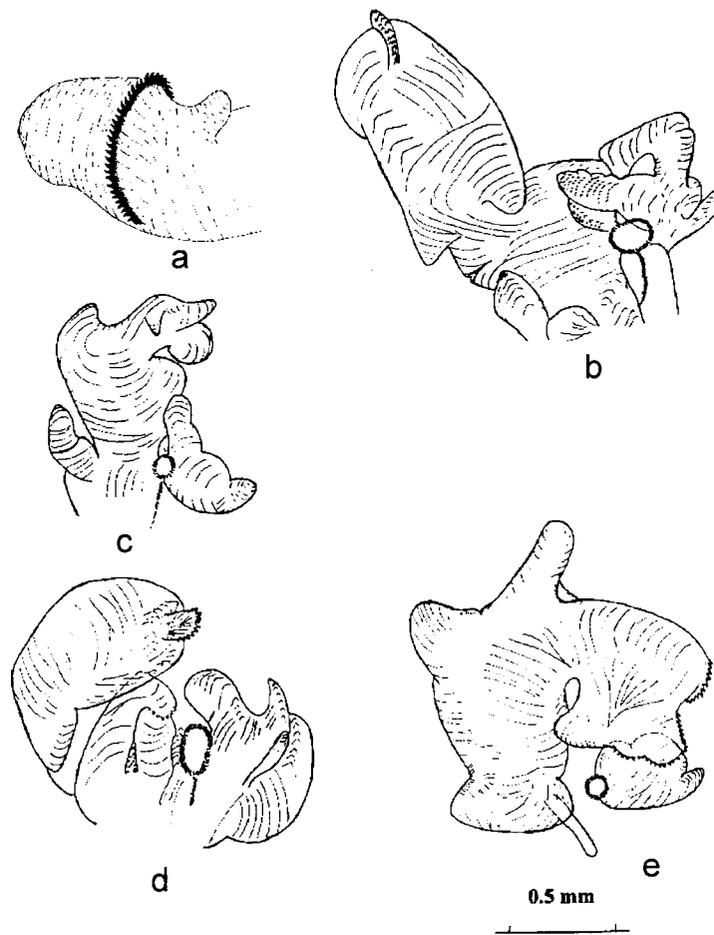


Fig. 23. Male vesica of *Platylagus* spp. a) *P. chamulans* (taken from Kelton and Knight, 1970), b) *P. chiapasensis*, c) *P. keltoni*, d) *alpinus* (= *chiapasensis*), e) *vanduzeei*.

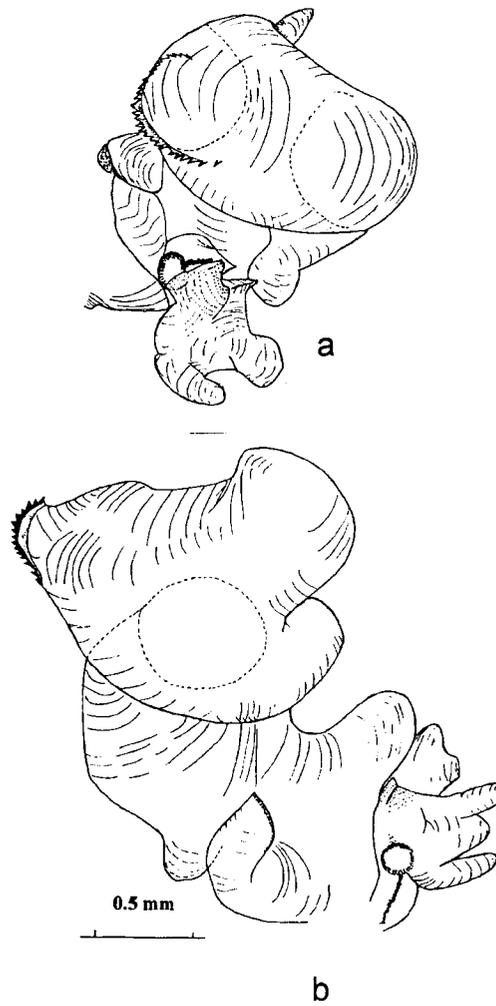


Fig. 24. Male vesica of *Platylagus* spp. a) *P. grandis*, b) *P. rolfsi*.

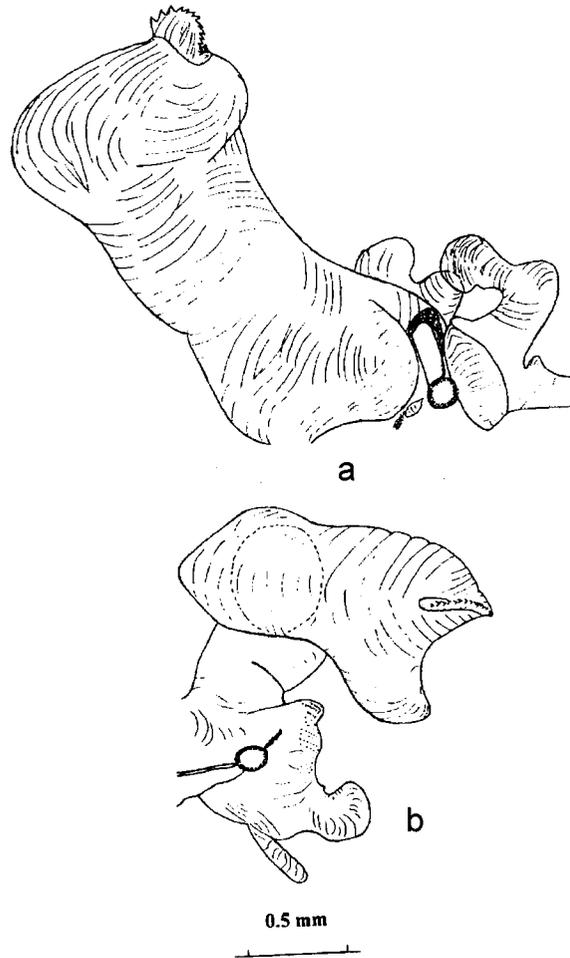


Fig. 25. Male vesica of *Platylagus* spp. a) *P. scutellatus*, b) *P. pilosipes*.

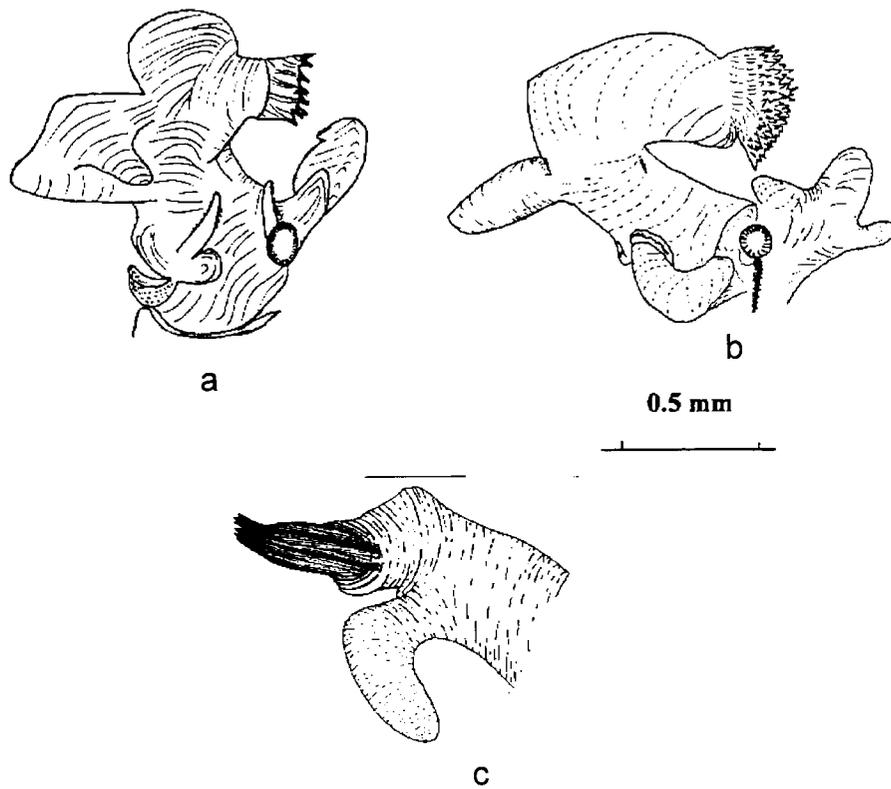


Fig. 26. Male vesica of *Platylagus* spp. a) *P. longirostris*, b) *P. usingeri*, c) *mexicanus* (taken from Kelton and Knight, 1970).

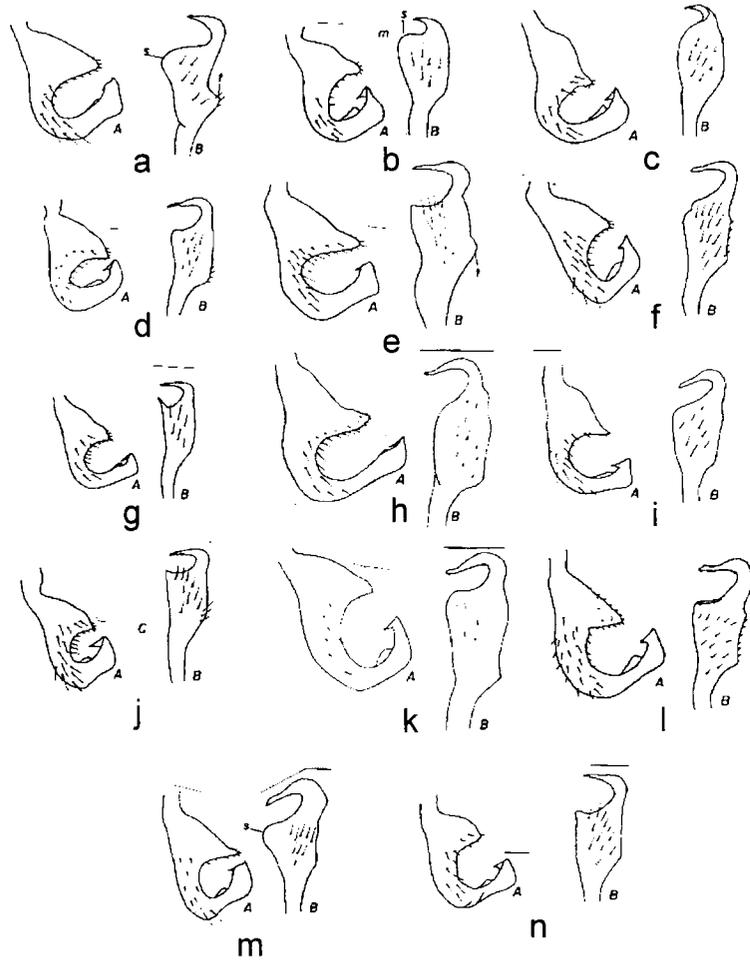


Fig. 27. Genital claspers of male *Platylagus* (figures taken from Kelton and Knight, 1970). a) *P. keltoni*, b) *P. usingeri*, c) *P. vanduzeei*, d) *P. andrei*, e) *P. angulatus*, f) *P. balli*, g) *P. brevirostris*, h) *P. chamulans*, i) *P. chiapasensis*, j) *P. crinitus*, k) *P. grandis*, l) *P. knighti*, m) *P. longirostris*, n) *P. luridus*.

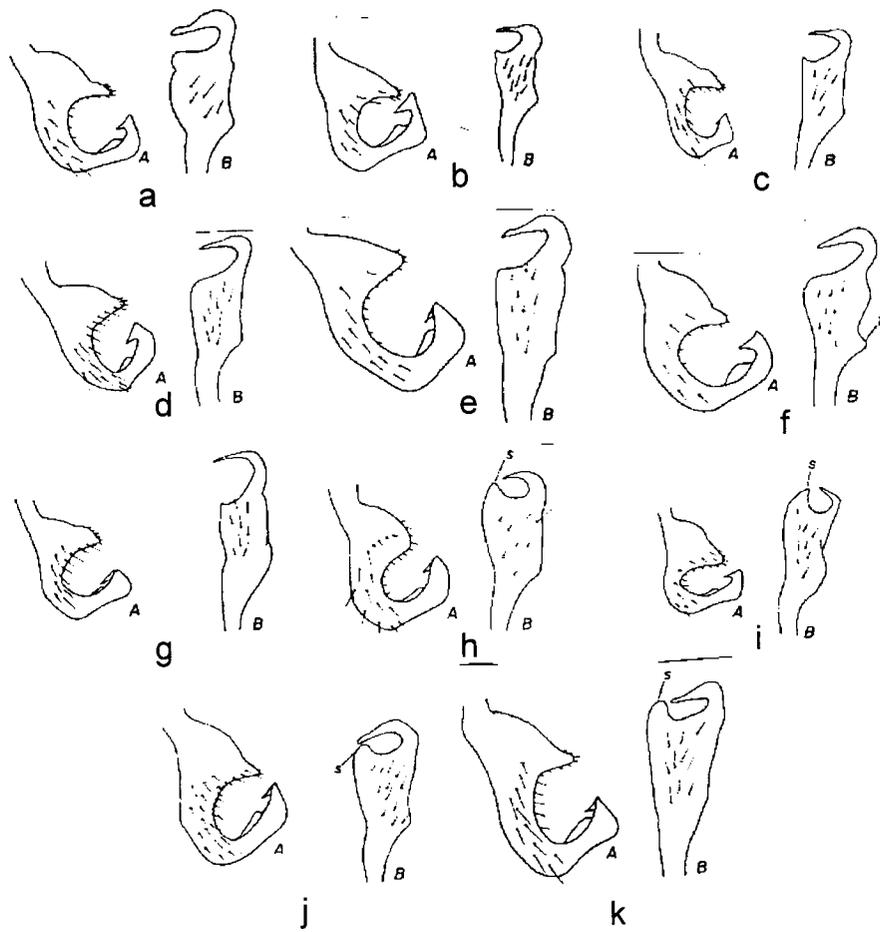


Fig. 28. Genital claspers of male *Platylagus* (figures taken from Kelton and Knight, 1970). a) *P. mexicanus*, b) *P. piceicola*, c) *P. pilosus*, d) *P. pseudotsugae*, e) *P. rolfsi*, f) *P. rubripes*, g) *P. teocotae*, h) *P. contortae*, i) *P. crassicornis*, j) *P. pilosipes*, k) *P. scutellatus*.

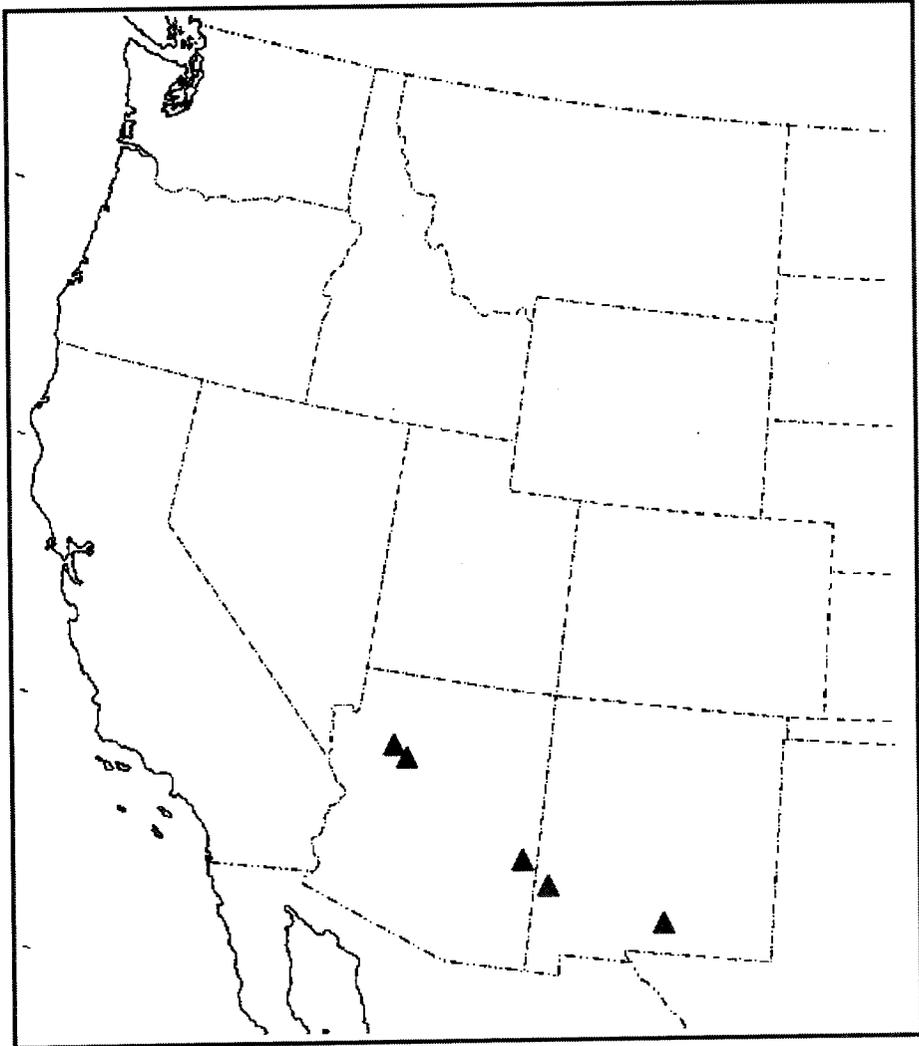


Fig. 29. Distribution of *Platylagus andrei*.

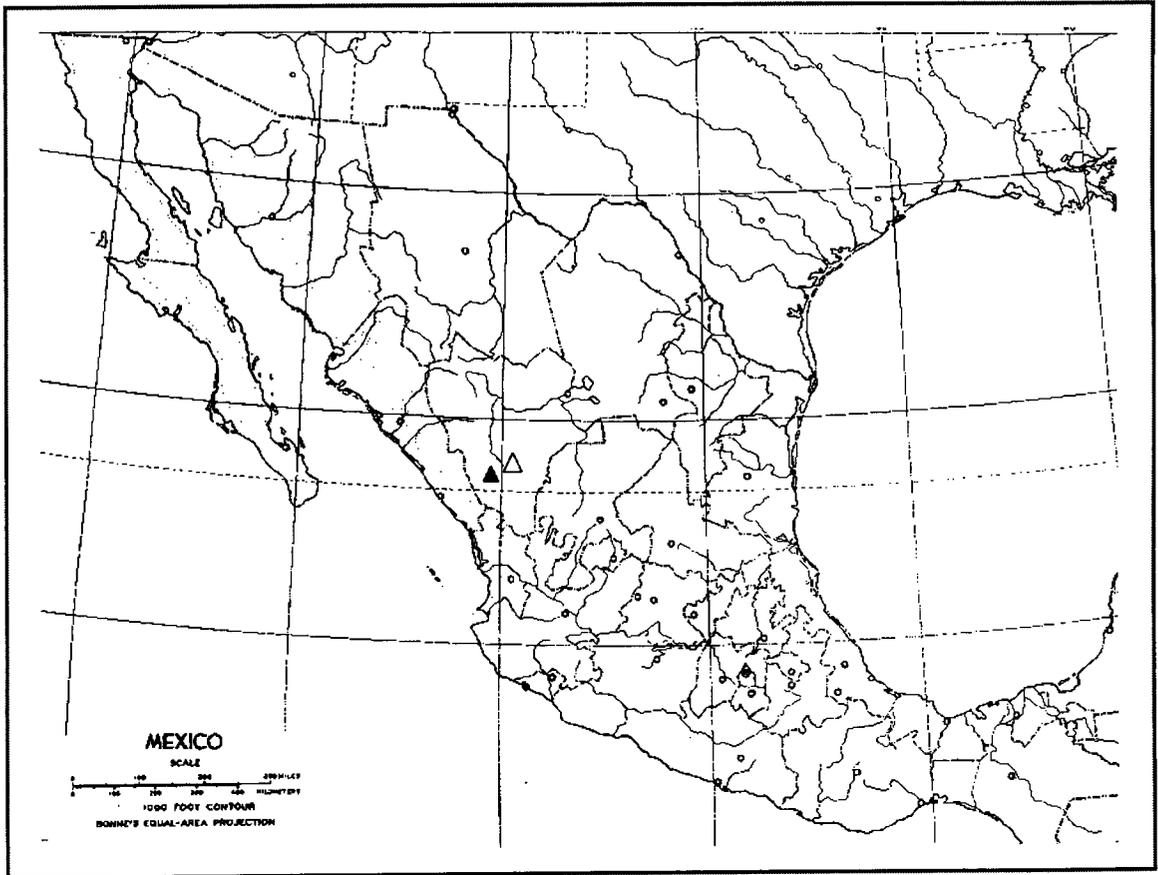


Fig. 30. Distribution of *Platylagus angulatus*, *P. keltoni*, *P. longirostris* (open triangle) and *Platylagus brevirostris* (solid triangle).

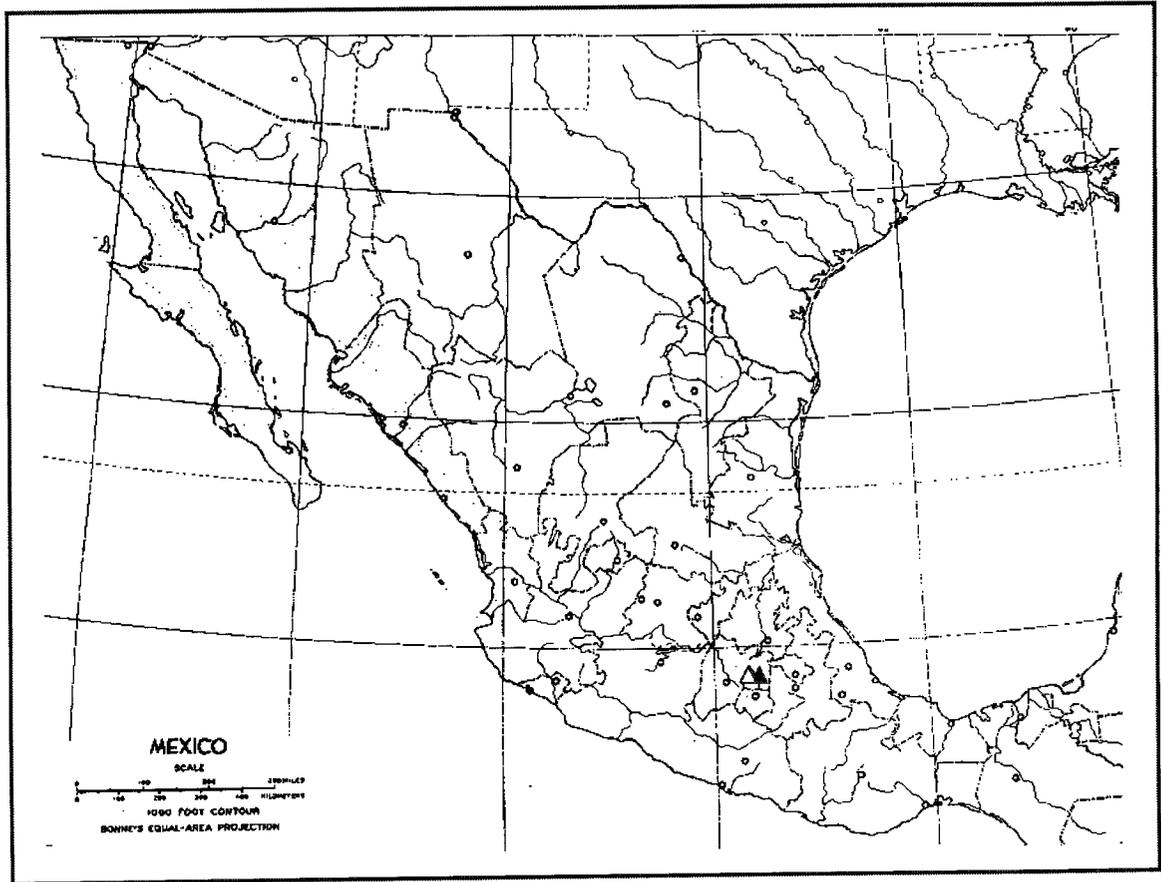


Fig. 31. Distribution of *Platylagus aztecus* (open triangles) and *Platylagus teocotae* (solid triangles).

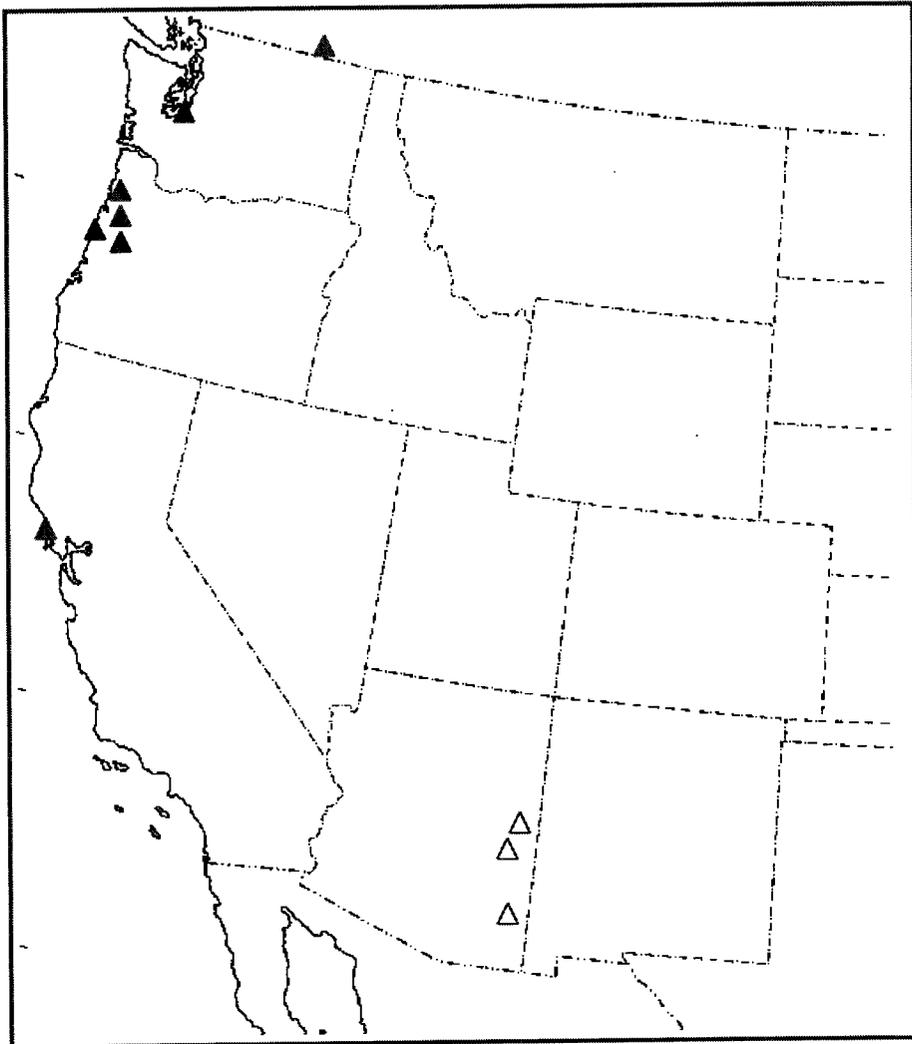


Fig. 32. Distribution of *Platylagus balli* (open triangles) and *Platylagus pseudotsugae* (solid triangles).

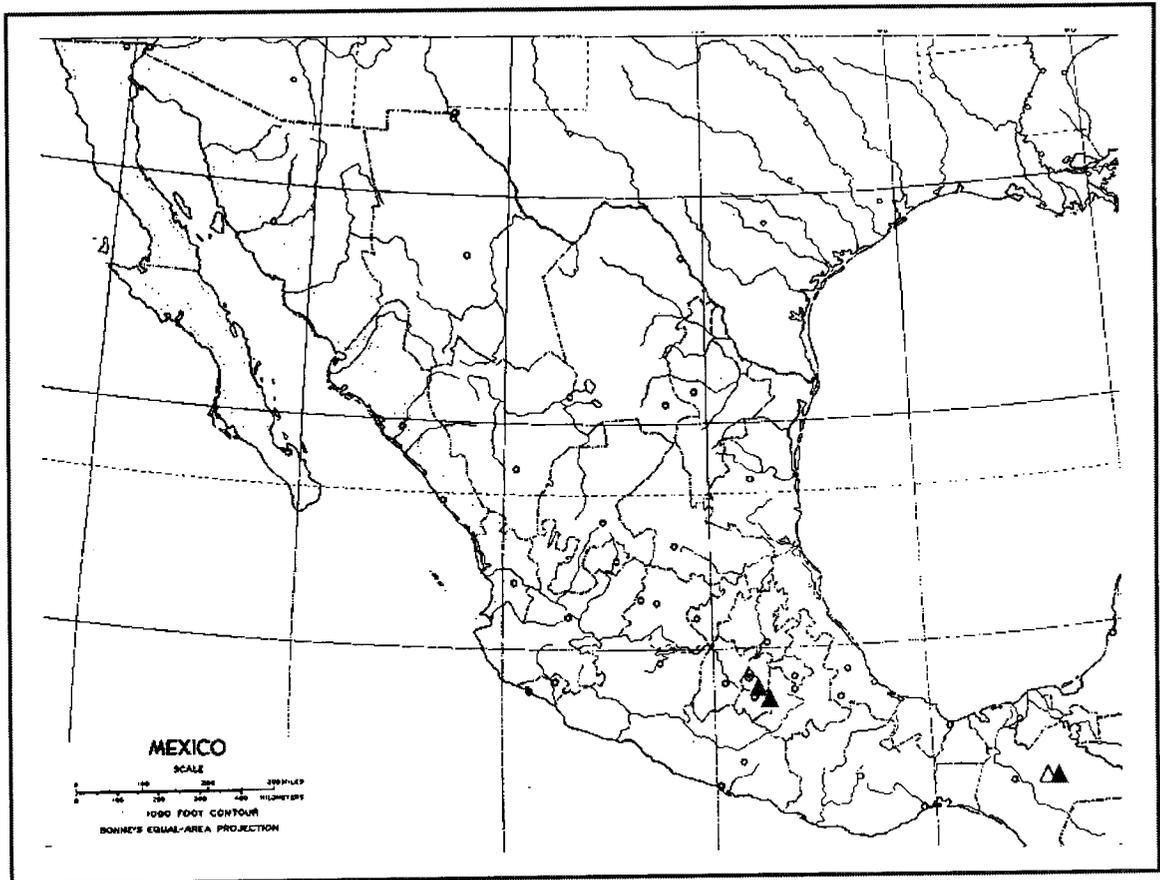


Fig. 33. Distribution of *Platylagus chamulans* (open triangles) and *Platylagus chiapasensis* (solid triangles).

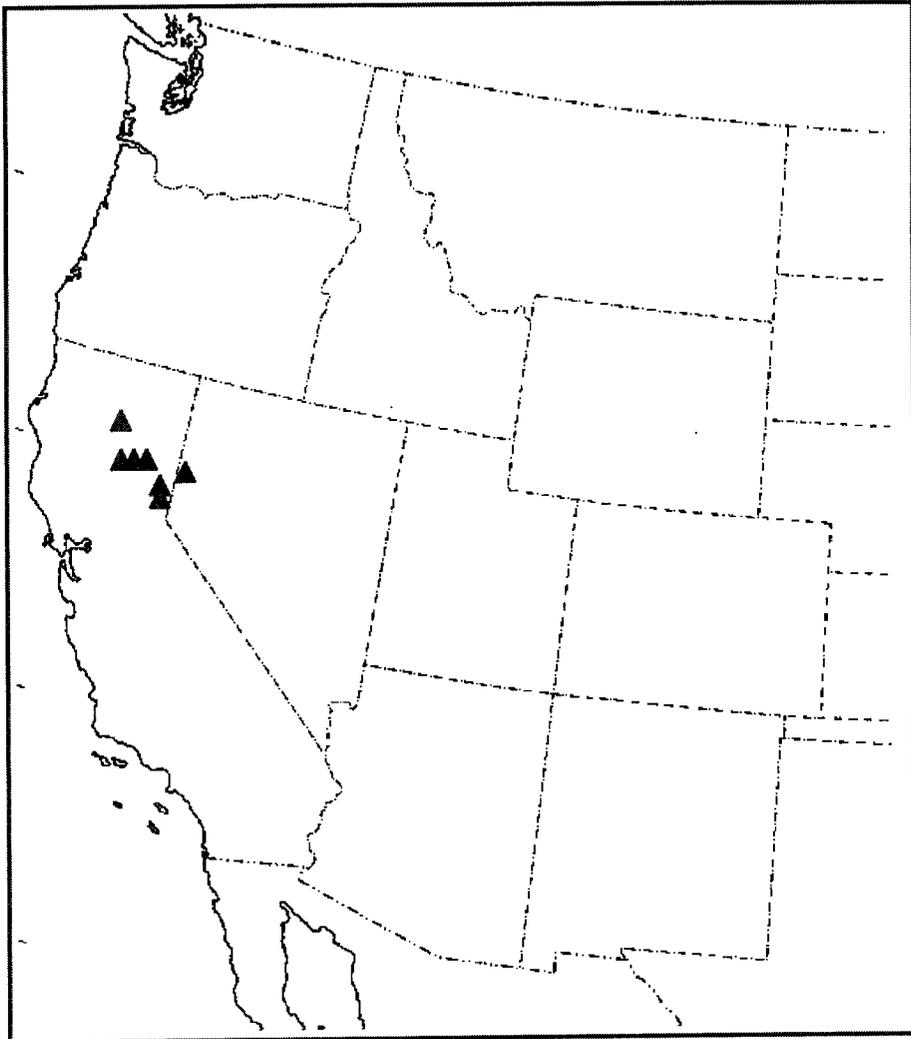


Fig. 34. Distribution of *Platylagus contortae*.

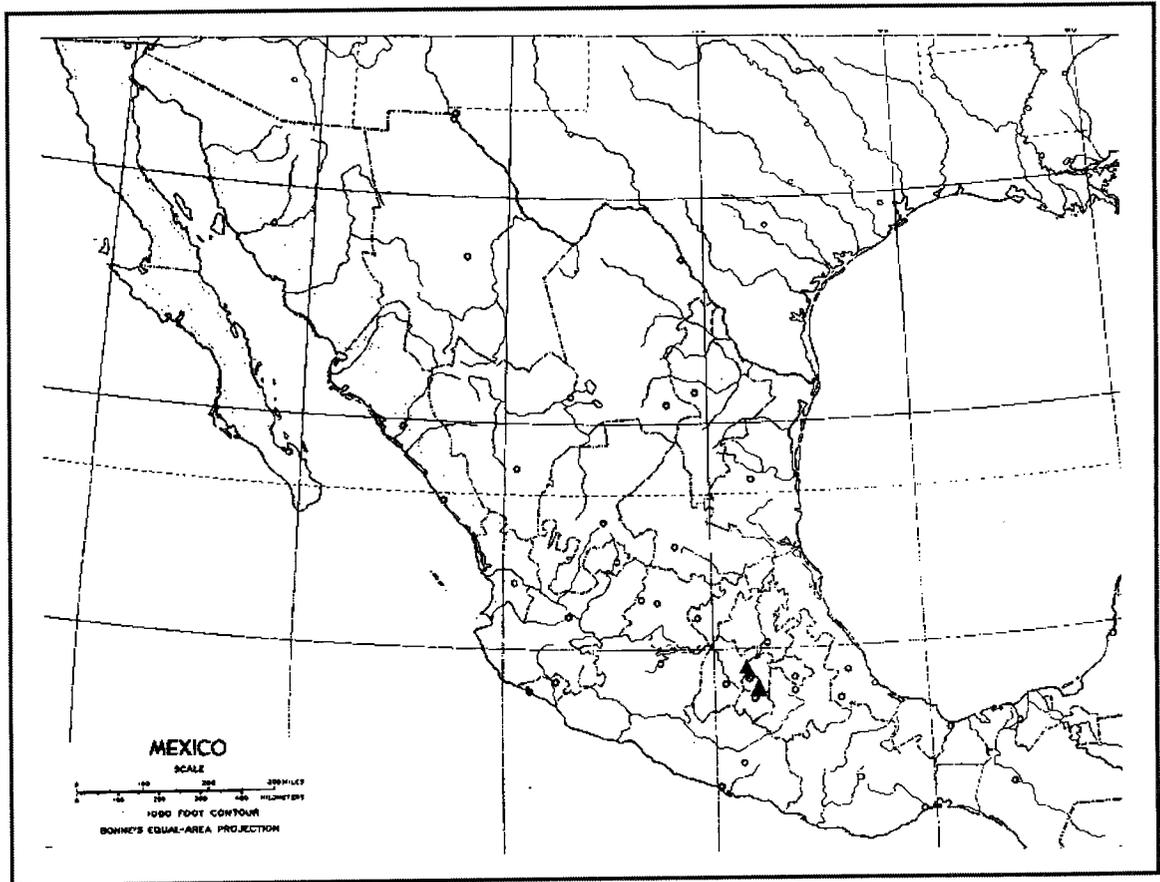


Fig. 35. Distribution of *Platylagus crassicornis*.

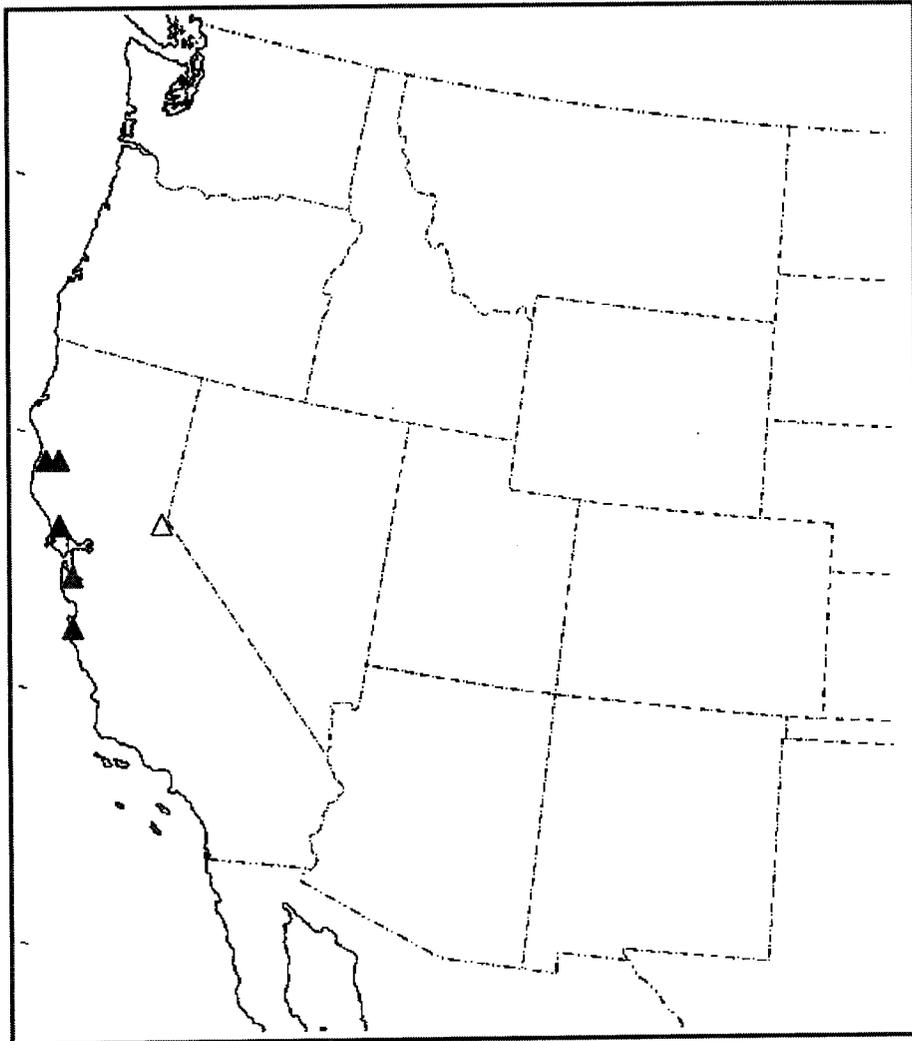


Fig. 36. Distribution of *Platylagus crinitus* (open triangles) and *Platylagus usingeri* (solid triangles).

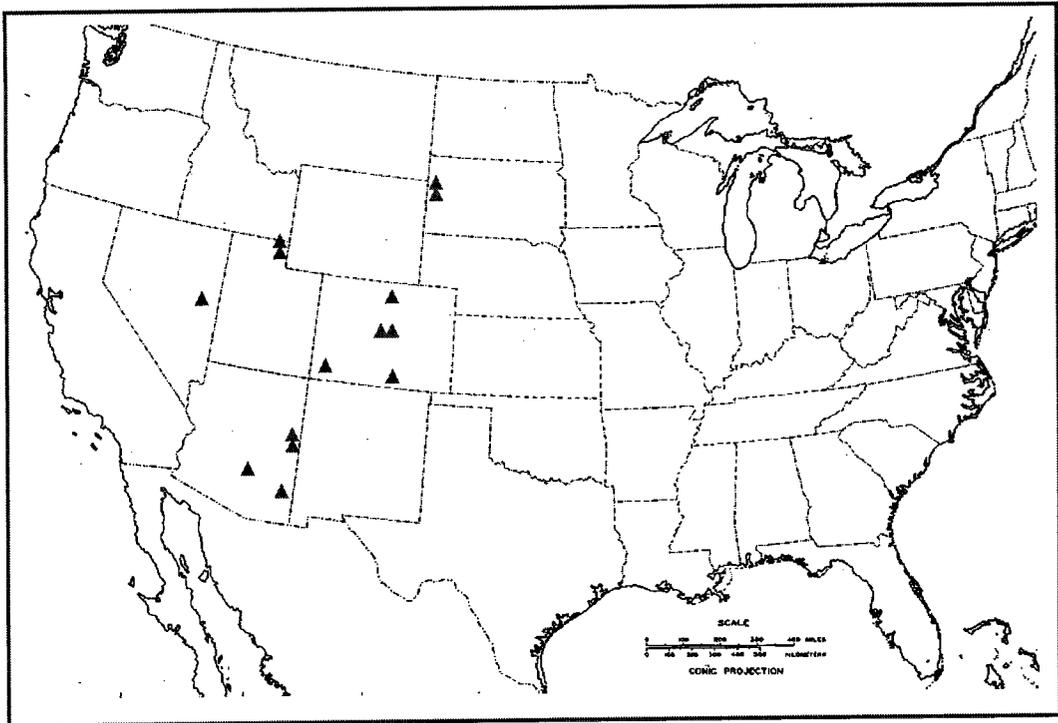


Fig. 37. Distribution of *Platylagus grandis*.

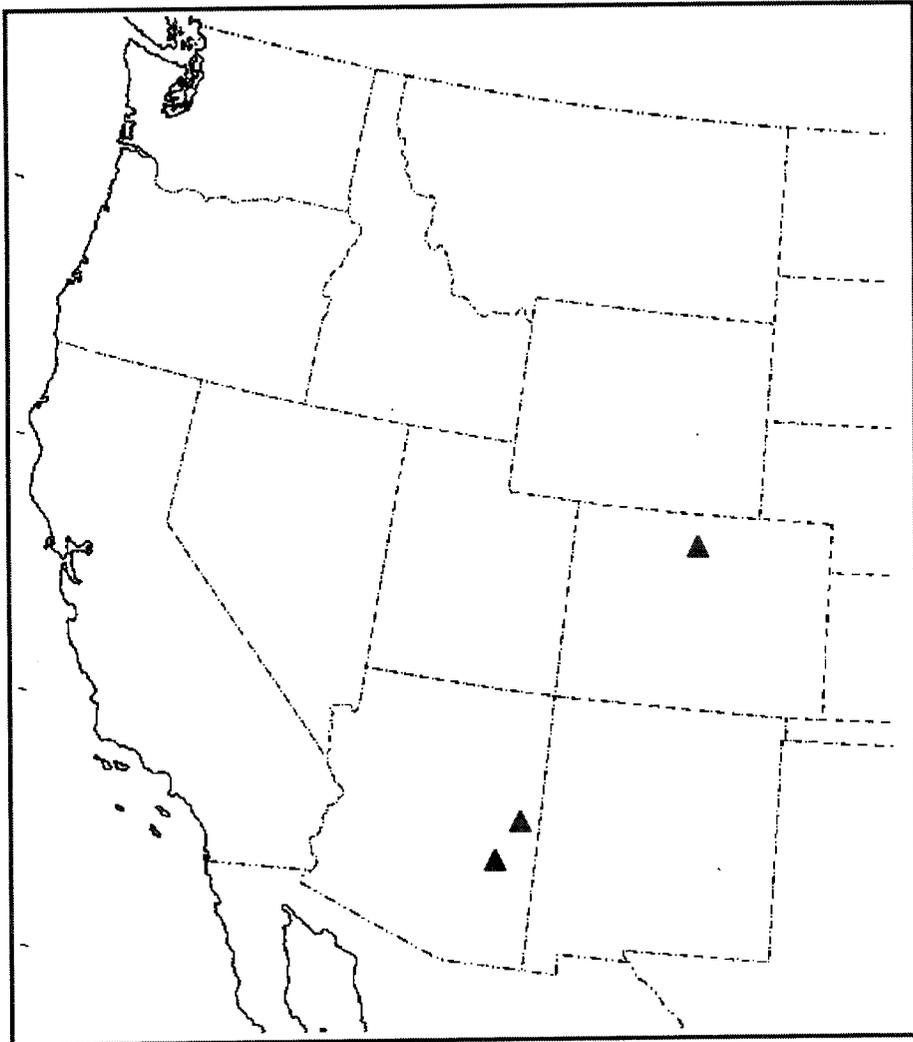


Fig. 38. Distribution of *Platylagus knighti*.

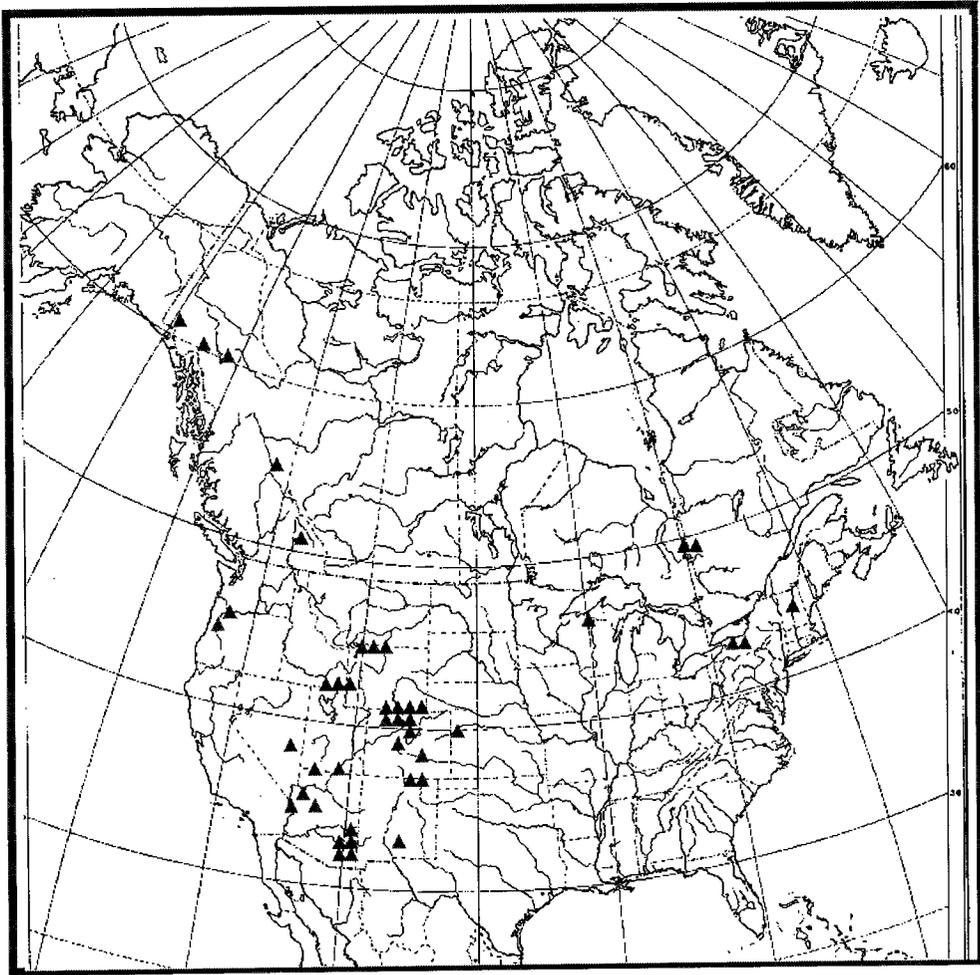


Fig. 39. Distribution of *Platylagus luridus*.

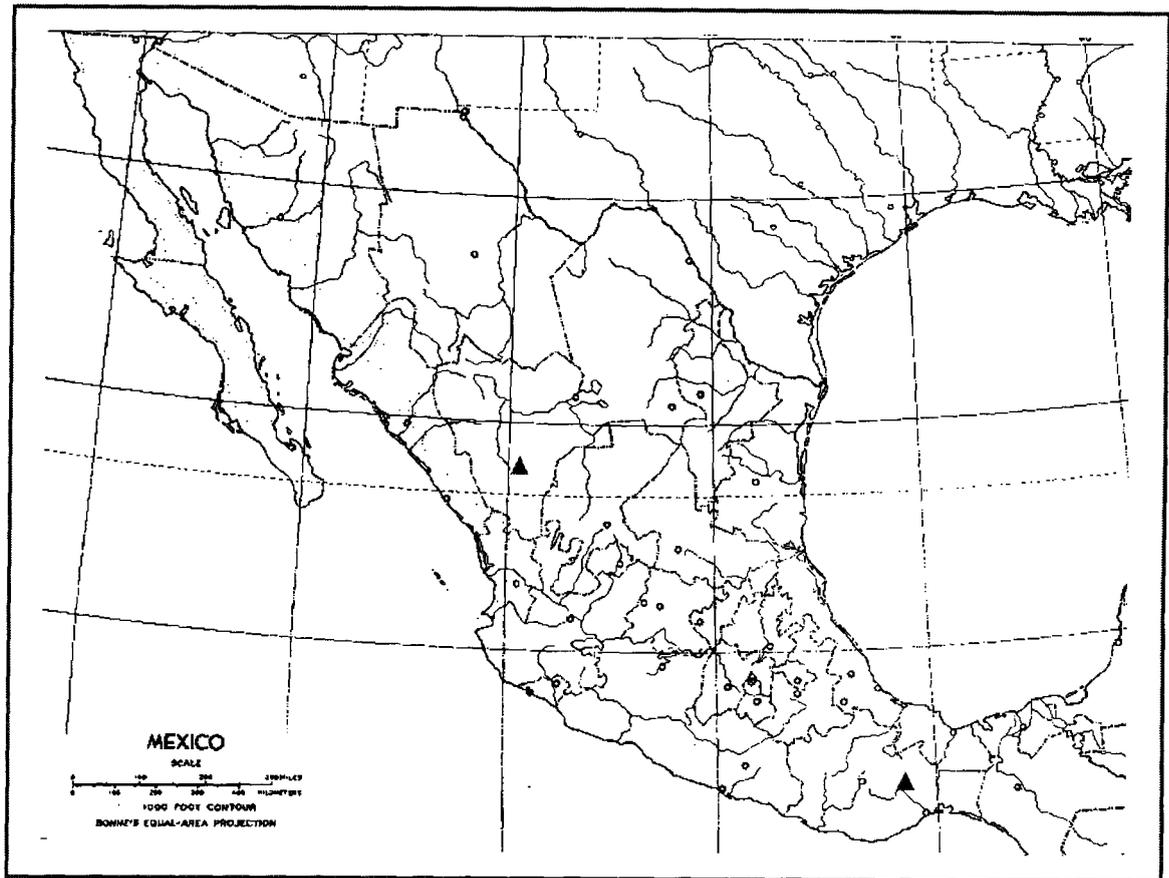


Fig. 40. Distribution of *Platylygus mexicanus*.

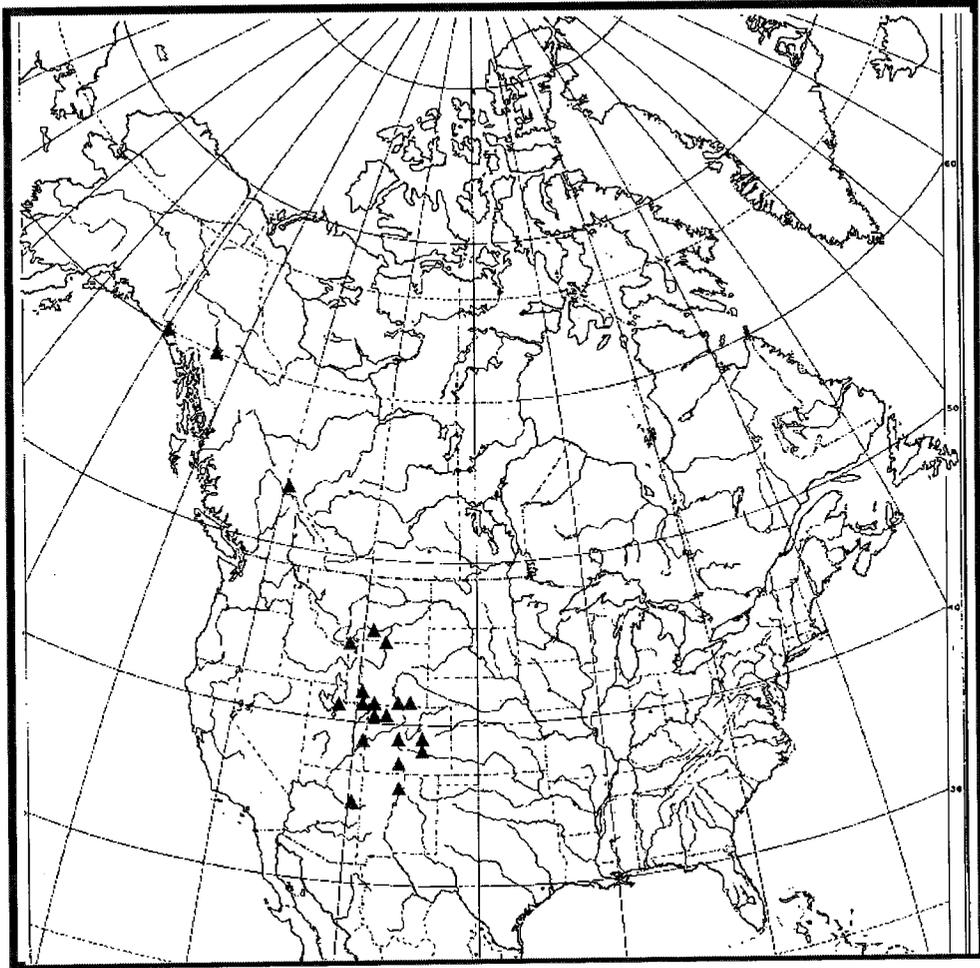


Fig. 41. Distribution of *Platylagus piceicola*.

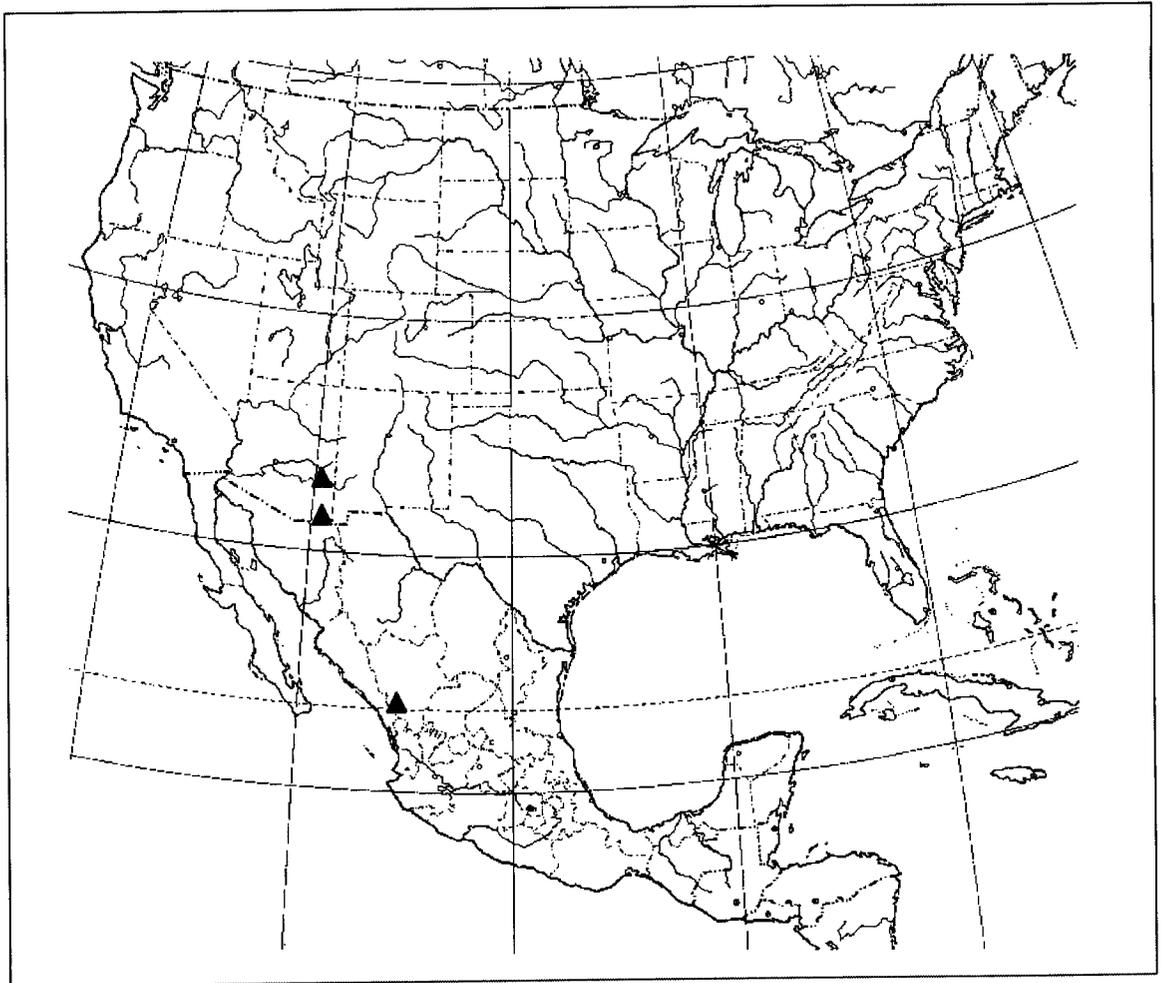


Fig. 42. Distribution of *Platylagus pilosipes*.

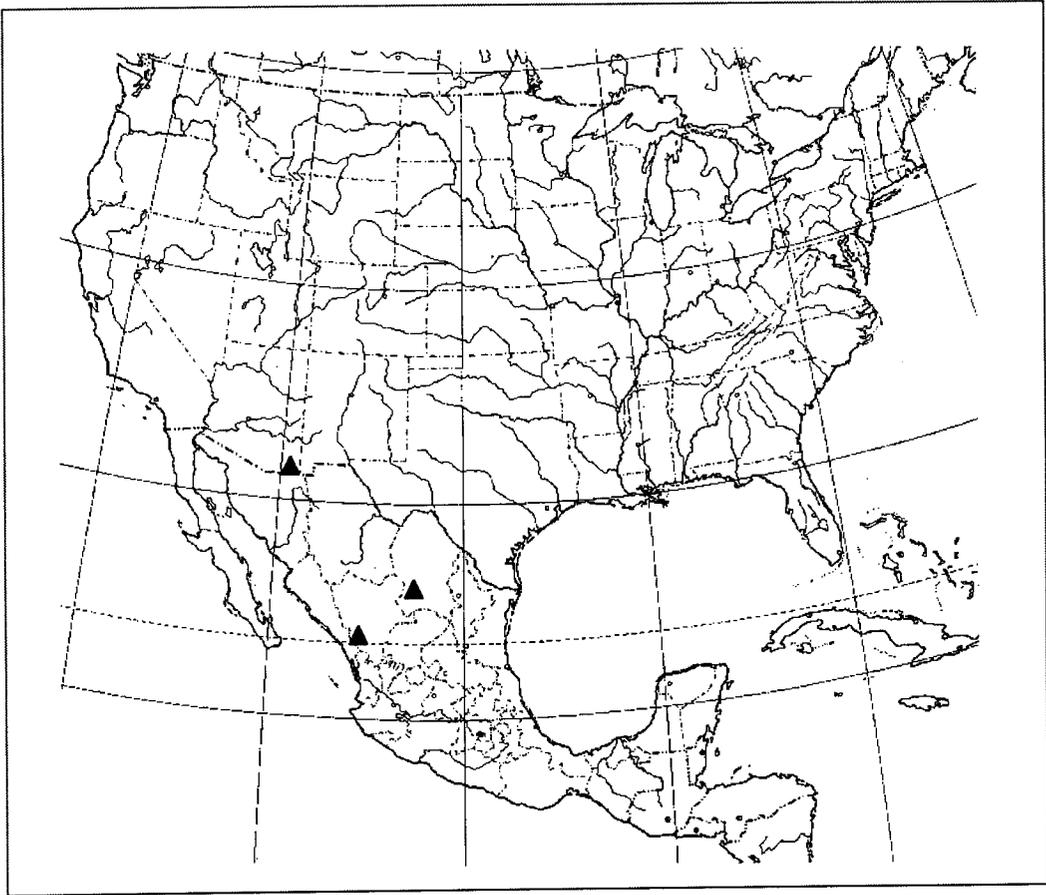


Fig. 43. Distribution of *Platylagus pilosus*.

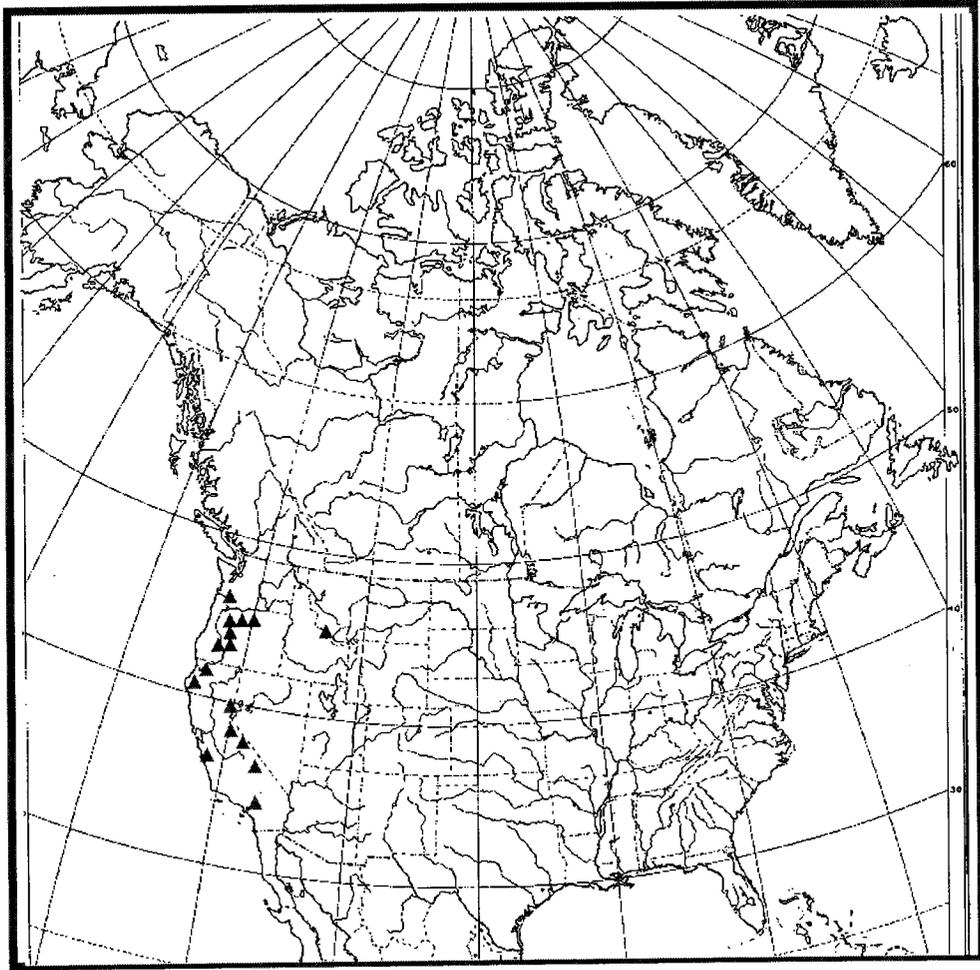


Fig. 44. Distribution of *Platylagus rolfsi*.

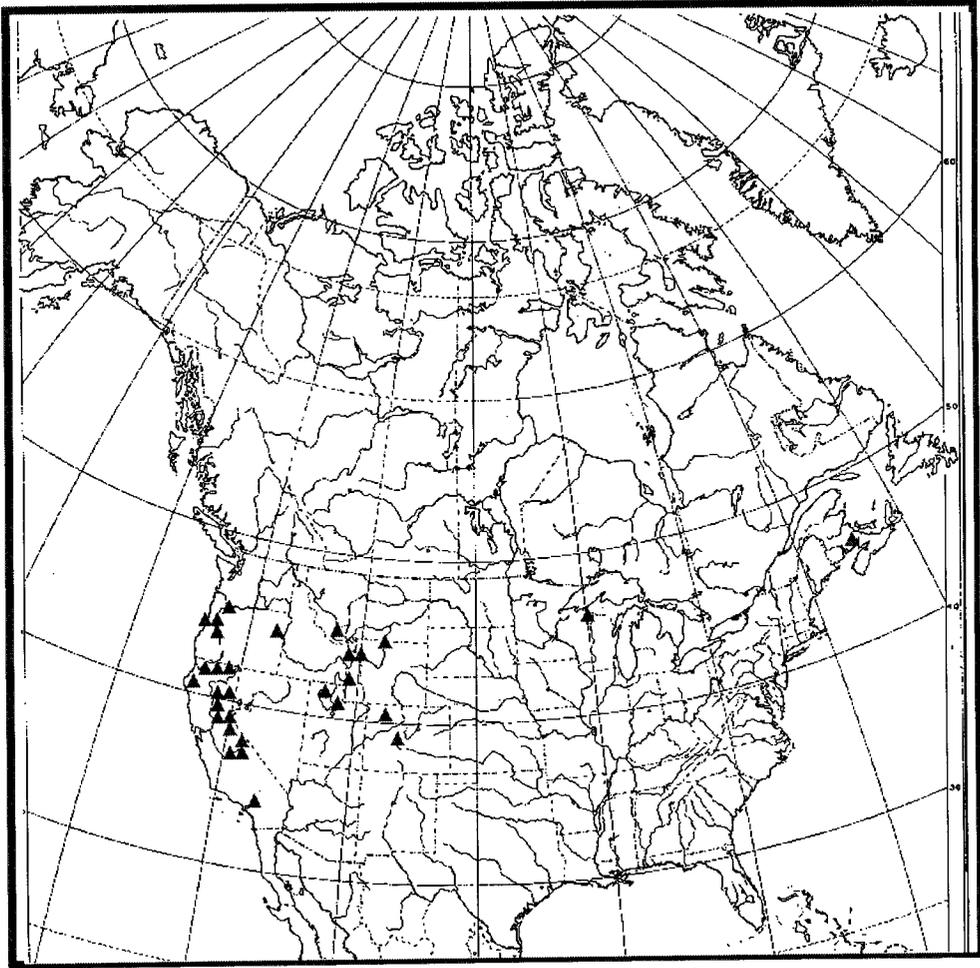


Fig. 45. Distribution of *Platylagus rubripes*.

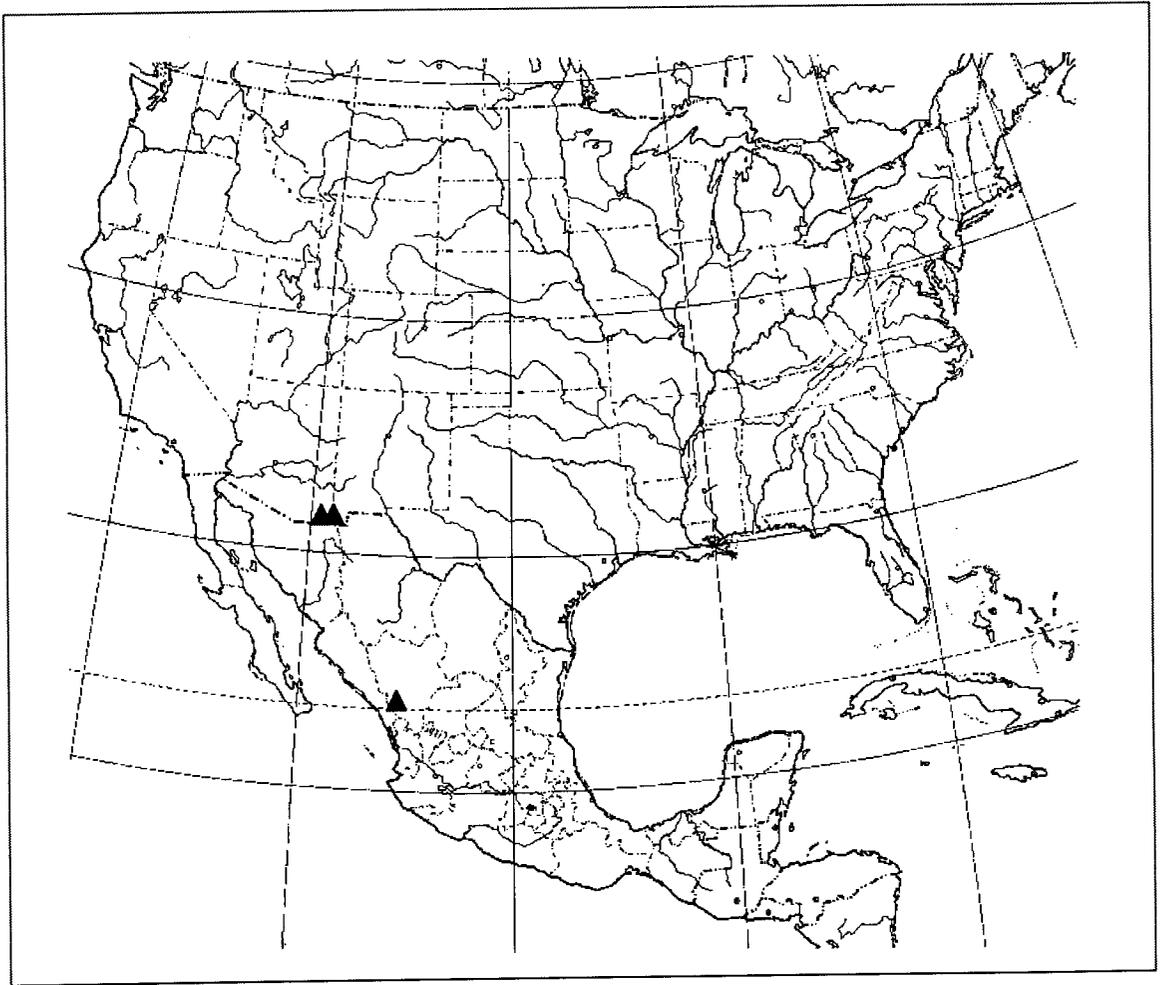


Fig. 46. Distribution of *Platylagus scutellatus*.

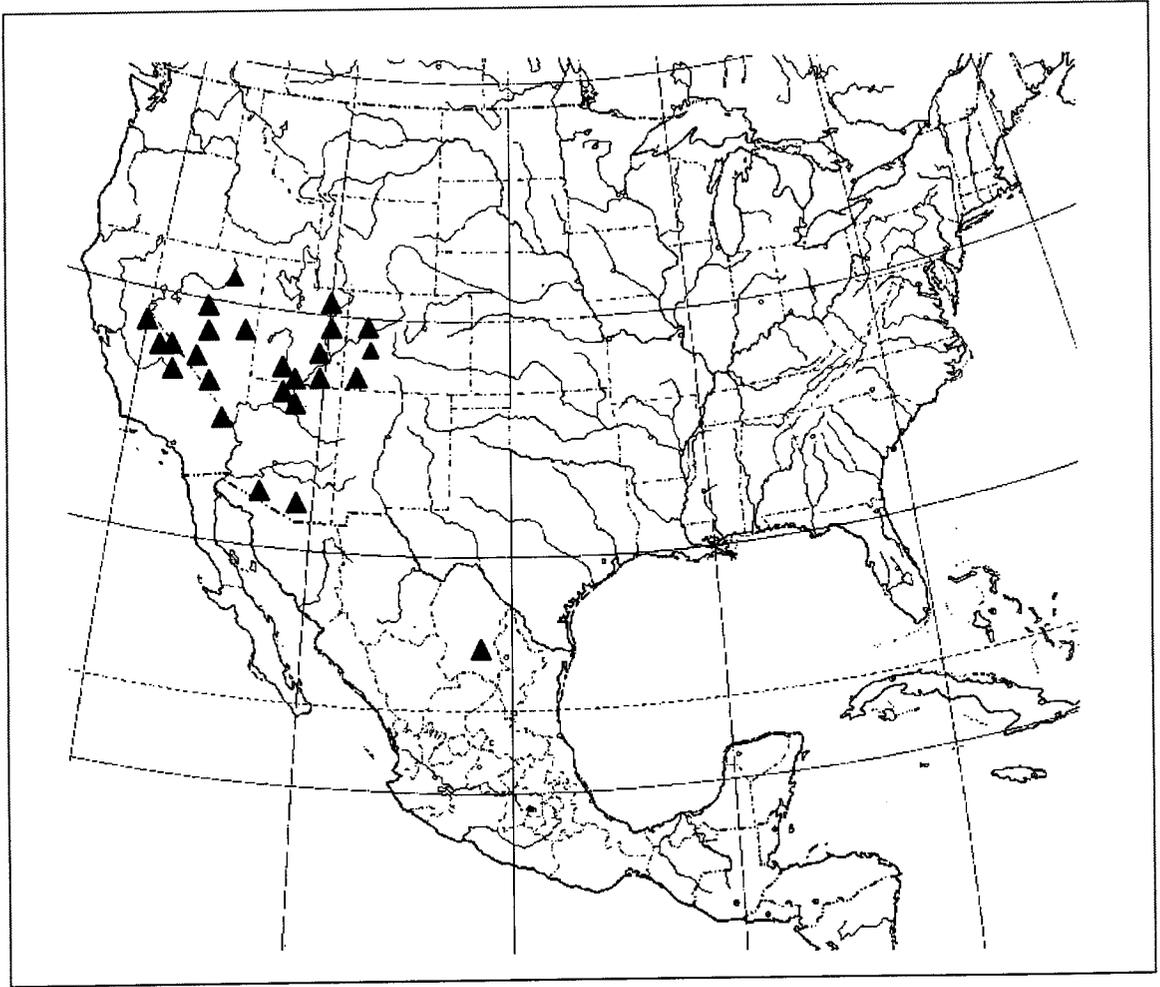


Fig. 47. Distribution of *Platylagus vanduzeei*.

