BISHOP MUSEUM BULLETINS IN ENTOMOLOGY

Psocoptera of the Hawaiian Islands Part IV. The Endemic Genus *Palistreptus* (Elipsocidae): Systematics, Distribution, and Evolution

IAN W. B. THORNTON

Bishop Museum Bulletin in Entomology 4

Bishop Museum Press
Honolulu

The *Bulletin of the Bernice P. Bishop Museum* (ISSN 0005–9439) was begun in 1922 as a series of monographs presenting the results of research in many scientific fields throughout the Pacific. Beginning in 1987, the *Bulletins* continued with a slightly modified title as four new series: *Bishop Museum Bulletins in Anthropology* (ISSN 0893–3111), *Bishop Museum Bulletins in Botany* (ISSN 0893–3138), *Bishop Museum Bulletins in Entomology* (ISSN 0893–3146), and *Bishop Museum Bulletins in Zoology* (ISSN 0893–312X). Each series is sequentially numbered, beginning with number 1. *Bulletins* are issued irregularly.

For subscription information or guidelines on submission of manuscripts, please write:

The Editor
Bishop Museum Press
P.O. Box 19000-A
Honolulu, Hawai'i 96817

PSOCOPTERA OF THE HAWAIIAN ISLANDS

IAN W. B. THORNTON is Professor of Zoology, La Trobe University, Bundoora, Victoria, Australia, and a research associate in the Department of Entomology at the Bishop Museum.

Psocoptera of the Hawaiian Islands Part IV. The Endemic Genus *Palistreptus* (Elipsocidae): Systematics, Distribution, and Evolution

IAN W. B. THORNTON

Bishop Museum Bulletin in Entomology 4

Bishop Museum Press
Honolulu, 1990

PUBLISHED BY
Bishop Museum, Honolulu
W. Donald Duckworth, Director

The paper used in this publication meets the minimum requirements of American National Standards for Information Sciences–Permanence of Paper for Printed Library Materials
ANSI Z39.48–1984

ISBN 0–930897–48–X
ISSN 0893–3146
Library of Congress Catalog Card No. 90–081644

Contents

Abstract

A COMPLEX OF TWENTY psocopteran species of the endemic elipsocid genus *Palistreptus* is reported from the Hawaiian Islands. A generic diagnosis is provided, and the genus is allied with the propsocines rather than the elipsocines. The species *inconstans* (the type species) and *montanus* are redescribed, and 18 species are newly described. Following an analysis of 76 characters and the application of Hennigian principles to a species-character matrix using 9 characters, 2 subgenera (*Palistreptus* and *Strepilaptus*) comprising 6 species groups are recognized on characteristics of female genitalia. Keys are given for the identification of species and species groups, and a cladogram based on apomorphies of species groups is constructed. Analysis of the distribution of the complex shows that, as with the genus *Ptycta,* the Kaua'i–O'ahu strait has been the greatest barrier to distribution of *Palistreptus* species. Two species groups are confined to Kaua'i, which, as in the case of *Ptycta* species, has 100% endemicity. In contrast to the *Ptycta* situation, however, there is no evidence that either the Maui complex of islands or the island of Hawai'i has been an important center of endemism. It is suggested that since species of *Palistreptus* are in general more strictly mountain insects than are those of *Ptycta,* they have narrower ecological tolerances as a group. This may have impeded dispersal of the genus along the island chain from the west so that the younger islands east of O'ahu have not been dynamic settings for evolution, as they have been for *Ptycta.*

Introduction

THIS PAPER IS PART OF A SERIES treating the Psocoptera of the Hawaiian Islands (see Thornton 1981, 1984) and deals with species of the endemic elipsocid genus *Palistreptus* Enderlein. The material includes my own preliminary collections on O'ahu and Hawai'i in 1961; extensive collections on Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i that I made throughout 1963; the considerable collections of the other workers and institutions listed in Thornton (1981); and those of the Department of Entomology, University of Hawai'i, which were recently made available. My collecting coverage of the islands and the ecological role of psocopterans are discussed in the earlier papers of this series. I have also recently made a general review of the ecological and biogeographical distribution of arboreal Psocoptera (Thornton 1985).

Holotypes, allotypes, and paratypes are placed in the Bishop Museum, Honolulu (BPBM). The names of the main Hawaiian Islands are spelled with diacritical marks (glottal and macron) in accord with current orthography. Other Hawaiian place names, all of which cite label data, are spelled as on specimen labels, i.e., without diacriticals inserted.

The Genus *Palistreptus*

THE GENUS *Palistreptus* was erected by Enderlein (1920:457) to contain the Hawaiian species *Elipsocus inconstans* Perkins, 1899 (the type species) and *Elipsocus montanus* Perkins, 1899, both of which Enderlein (1913:357) had previously transferred to the endemic genus *Kilauella* Enderlein along with the 8 other Hawaiian species described by Perkins (1899) under *Elipsocus* Westwood. In erecting *Palistreptus,* Enderlein reduced *montanus* to a variety of *inconstans,* and the remaining 8 species of Perkins to a single species. Zimmerman (1948:244) could not distinguish between male genitalia of *montanus* and *inconstans* but was able to separate the species readily on forewing pattern, fine morphology of the postclypeus, and frons morphology (Zimmerman 1948:242–43). Thus, Zimmerman regarded Perkins's taxa as species.

As pointed out by Zimmerman (op. cit.), the genus is closely similar to *Kilauella,* which comprises a very large complex of species. Roesler (1944) regarded *Palistreptus* as a subgenus of *Kilauella.* The form of junction of veins *rs* and *m* in the forewing, which Enderlein (1920) cites as a character distinguishing *Palistreptus* (fusion) from *Kilauella* (crossvein), cannot be used to distinguish the genera as now known. However, species of *Palistreptus* are usually larger than species of *Kilauella,* the forewing is generally more spear-shaped, and there are genitalic differences. The two genera may be distinguished on genitalia as follows:

Phallosome lacking internal sclerites; hypandrium simple or bilobed, setae of uniform length; subgenital plate not bilobed, marginal setae not in 2 distinct groups ..... *Palistreptus*

Phallosome with internal sclerites associated with penial bulb; hypandrium with distinctly separate median lobe, at least 2 longer stouter setae each side on median lobe; subgenital plate bilobed, or at least marginal setae in 2 distinct groups ..... *Kilauella*

As a result of examination of the species before me, I provide below a generic diagnosis for *Palistreptus.* That of Enderlein (1920:457) lacked reference to genitalic features, and Smithers's (1964:219) description was based on only a few species.

Genus *Palistreptus* Enderlein

Diagnosis. FEMALE. Gonapophyses: ventral valve narrow, gradually tapering to point, with basal hook-shaped skeletal support for basal lobe and longitudinal sclerotized rod; dorsal valve with strong subapical tine; outer valve usually tapering mesially to bluntly rounded prolongation. Subgenital plate apical lobe variable in shape, sometimes absent, never clearly bilobed, bearing mesially usually 4 setae, these never clearly arranged in 2 pairs.

MALE. Hypandrium simple, posterior margin simple or, if incipiently bilobed, lobes broad and shallow, ciliation uniform, lacking lateral lobes; phallosome a simple frame without penial bulb sclerotizations.

Smithers (1964) recognized a subfamily of elipsocids, the Propsocinae, comprising the following southern hemisphere genera: *Propsocus* McLachlan (Australia, Tasmania, South Africa, Chile, Hawaiian Islands), *Pentacladus* Enderlein (Australia), *Antarctopsocus* Smithers (Marion Island, Crozet Islands) and *Spilopsocus* Smithers (Australia, Lord Howe Island, New Zealand, Campbell Island, Auckland Island). *Kilauella* and *Palistreptus* were linked, not with this subfamily, but with the Elipsocinae on the basis of 2 characteristics: (1) a reduction of the more pointed part of the dorsal valve of the female gonapophyses and (2) a less markedly bilobed form of the female subgenital plate. On examining a large number of species of *Kilauella* and *Palistreptus,* I consider the latter characteristic to hold for *Palistreptus* but not to hold generally for *Kilauella,* and the former to hold for neither. The 2 Hawaiian genera (and *Antarctopsocus*) share a simple hypandrium, lacking distinct lateral lobes, which is elipsocine-like rather than propsocine-like. However, this is a plesiomorphous condition. Both *Kilauella* and *Palistreptus* share a small but highly apomorphic character of the hind wing, first noticed in *Palistreptus* by Enderlein (1920:457): vein *cu* is reflected marginally. This character also occurs in the other propsocines, *Propsocus, Pentacladus,* and *Spilopsocus* (*Antarctopsocus* is brachypterous and the hind wing is reduced to a small lobe). However, it does not occur in other genera of the family. *Palistreptus* is closest to *Spilopsocus,* differing in lacking lateral lobes of the hypandrium and penial bulb sclerites (the latter lacking also in *Spilopsocus avius* Smithers). The wing pattern of the Australian *Spilopsocus ruidus* Smithers is remarkably like *Palistreptus.* The two Hawaiian genera are thus regarded as being closer to the Propsocinae and having southern hemisphere, not Palaearctic, affinities. Such affinities are highly unusual in Hawaiian insects.

All 20 known species of *Palistreptus* are true high-mountain-forest insects; none has been collected in the lowlands, and no representative has been found on Lāna'i.

Formation of Species Groups

Numerical taxonomic analyses, as described by Thornton (1984), were performed on the 20 species of *Palistreptus*. Seventy-six characters (listed in Appendix 1) were used: 47 are descriptive; 6, metric; 9, meristic; and 14, ratios. Twenty-two are 2-state characters; 25, 3-state; 19, 4-state; 5, 5-state; and 5, 6-state. The characters were coded, standardized, and given equal weight. Two coefficients of resemblance (distance coefficient and correlation coefficient) were computed, and clustering was performed by the weighted pair-group method using arithmetical averages. Correlation and distance phenograms (Figs. 91, 92) were compared by computing the simple matching coefficient of association, which for *Palistreptus* was 0.65. The above procedure is described in detail in Chui and Thornton (1972).

Only 2 species groups maintained their exact composition in both correlation and distance phenograms: one consisting of 3 species (*heterothorax, cinctifrons,* and *pallithorax*), and one of 4 species (*montanus, hyalinus, microvalvus,* and *sextus*). In the latter group, *microvalvus,* n. sp., is less closely related to the other members than they are to one another, in both phenograms. This group—also in both phenograms and particularly in that based on correlation coefficients—is set well apart from other species of the genus, its members being more distantly related to other groups than they are to one another.

An analysis of character states enabled a species-character matrix to be constructed, from which 2 subgenera and 6 species groups could be recognized using Hennigian principles; the subgenera are based on characters of the female genitalia.

Subgenus ***Palistreptus*, new status**

Description. Dorsal valve of female gonapophyses tapering apically, with tine on mesial edge arising at least ⅓ valve length from apex; outer valve apical edge convex; subgenital plate apical lobe shallow, at least 2 × as broad as long. (The *inconstans, heterothorax, nigriceps,* and *swezeyi* groups.)

Within this assemblage, the *heterothorax* group is characterized by apomorphies of the thoracic nota and outer valve, the *nigriceps* group by wing shape and hypandrial structure, and the *swezeyi* group by the apomorphic condition of the dorsal valve of the female gonapophyses. The *inconstans* group has no clearly obvious unique synapomorphy.

***Strepilaptus*, new subgenus**

Description. Dorsal valve of female gonapophyses rectangular, not tapering apically, with stout tine on apical edge. (The *montanus* and *microvalvus* groups.)

The *montanus* group is characterized by the apical lobe of the subgenital plate being at least 3 × as long as broad with the subapical row of setae thereby distorted;

the apical edge of the outer valve of the female gonapophyses concave, emarginate, with a lobe at each apical corner; and by forewing pattern. The monotypic *microvalvus* group lacks these apomorphies, having its own distinctly apomorphic outer valve, and is somewhat intermediate between the subgenera.

Key to Subgenera and Species Groups of Palistreptus

1. Dorsal valve gonapophyses tapering apically, tine some distance from apex, on mesial face . . . (subgenus *Palistreptus,* **n. stat.**) 2
   Dorsal valve gonapophyses rectangular, tine on apical edge . . . (subgenus *Strepilaptus,* **n. subgen.**) 5
2. Thoracic terga brown, outer margin outer valve gonapophyses not emarginate 3
   At least mesothoracic nota pale over anterior ½; outer margin outer valve gonapophyses emarginate, valve appearing curved ..... *heterothorax* group
3. Forewing length <3.05 greatest breadth; hypandrium margin unsclerotized 4
   Forewing length >3.10 greatest breadth; hypandrium margin sclerotized laterally ..... *nigriceps* group
4. Dorsal valve narrows gradually to apex, extends beyond tine for a distance 2× width of valve at tine; forewing transverse fascia continuous; hypandrium clearly shallowly bilobed ..... *inconstans* group
   Dorsal valve large, not gradually tapering to apex, bluntly rounded apically, extending beyond tine less than 1.5× width of valve at tine; forewing fascia absent or interrupted; hypandrium not bilobed .... *swezeyi* group
5. Apical lobe of subgenital plate at least 3× as long as broad, subapical row of setae distorted; outer valve emarginate on apical edge; pigment spots in marginal cells of forewing discrete ..... *montanus* group
   Apical lobe of subgenital plate trapezoid, as long as width at base, subapical row of setae not distorted; outer valve not emarginate on apical edge; pigment spots in marginal cells of forewing merge with pigment along veins ..... *microvalvus* group

The following key to species ignores subgeneric divisions and species groups.

Key to Species of Palistreptus

1. Female forewing length < 2.2 mm; distinct wide pale band across front of head ..... *fuscicosta,* **n. sp.**

Female forewing length > 2.5 mm; head pattern not as above 2

2. Female forewing with transverse fascia over junction of veins *cu* and *m* broad, continuous 3

Female forewing fascia absent or broken by hyaline areas, or if continuous narrow, not passing over junction of *m* and *cu* 4

3. Frons and clypeus brown; female forewing length <2.8 mm .... *brevipennis*, n. sp.

Frons buff, brown median patch and lateral brown marks, clypeus ground color creamy buff; female forewing length >3.1 mm ..... *inconstans*

4. Genae, frons, clypeus, and vertex brown ..... *nigriceps*, n. sp.

At least vertex with buff ground color and brown markings 5

5. Frons brown 6

Frons creamy buff with median brown patch and lateral markings 7

6. Head and thoracic terga waxy; gena with single brown band; outer valve of gonapophyses not ⅔ length of dorsal valve, round posteriorly; dorsal valve wide, blunt-tipped, spinose at base of short apophysis .... *swezeyi*, n. sp.

Head and thoracic terga dull; gena with 2 brown bands; outer valve of gonapophyses almost as long as dorsal valve, rounded trianguloid; dorsal valve narrowing gradually to apex, apophysis long, no spines .... *fuscifrons*, n. sp.

7. Female forewing with brown cloud covering area posterior to junction of *m* and *cu* 8

Female forewing hyaline or with very faint pigment posterior to junction of veins *m* and *cu* 11

8. Head and thoracic sclerites glossy, shining; clypeus ground color creamy buff, not darkening in apical ½ ..... *longipennis*, n. sp.

Head and thoracic sclerites dull; clypeus ground color brown, at least in anterior ½ 9

9. Clypeus ground color buff in posterior ½, brown anteriorly; genae with 2 brown bands ..... *oahuensis*, n. sp.

Clypeus ground color wholly brown; genae brown 10

10. Vertex dark brown from front, with 4 paler circular areas .. *lobatus*, n. sp.

Vertex buff with brown markings, not patterned as above ... *setosus*, n. sp.

11. Genae brown; clypeus uniform 12

Genae buff with 2 brown bands; clypeus with transverse brown band anteriorly, or anterior ½ brown 15

12. Clypeus ground color cream to buff 13

Clypeus ground color brown to dark brown 14

13. Frons with median brown patch; thoracic terga dull, brown; dorsal valve of gonapophyses massive, rounded apically, tine short ..... *valvulus*, n. sp.
Frons without median brown patch; thoracic terga waxy, very pale brown; dorsal valve of gonapophyses gradually tapering apically, tine long, almost reaching apex of valve ..... *pallithorax*, n. sp.
14. Forewing length >3.5 mm; 2nd flagellar segment brown; frons without lateral brown marks ..... *oligotarsus*, n. sp.
Forewing length <3.1 mm; proximal ⅓ of 2nd flagellar segment pale buff; frons with median brown patch continued laterally as diffuse brown marks curving posterolaterally ..... *pictifrons*, n. sp.
15. Hind tibia with 2 brown bands 15
Hind tibia with subapical brown band only, or without bands 17
16. Thoracic terga waxy; mesothoracic terga very pale brown, metathoracic terga brown; outer valve of gonapophyses large, tapering; dorsal valve tapering ..... *heterothorax*, n. sp.
Thoracic terga dull; meso- and metathoracic terga brown; outer valve of gonapophyses small, squarish; dorsal valve massive, rectangular ..... *microvalvus*, n. sp.
17. Outer valve of female gonapophyses curved, rounded at apex; dorsal valve tapering to rounded apex, long subapical tine; forewing with subapical posterior lobe very shallow; subgenital plate apical lobe short, broad; anterior ½ of mesothoracic dorsal lobes pale cream ... *cinctifrons*, n. sp.
Outer valve of gonapophyses large, bilobed, dorsal valve massive, short apical tine; forewing with obvious subapical lobe on posterior edge; subgenital plate apical lobe long, narrow; anterior ½ of mesothoracic lobes brown 18
18. Clypeus with anterior brown transverse band; thoracic terga shining ..... *montanus*
Clypeus brown on anterior ½; thoracic terga waxy or dull 19
19. Thoracic terga waxy; hind tibia without brown band; 6 apical setae on apex of subgenital plate ..... *sextus*, n. sp.
Thoracic terga dull; hind tibia with faint brown subapical band; 4 setae on apex of subgenital plate ..... *hyalinus*, n. sp.

Subgenus *Palistreptus*

In the following diagnoses of species groups, synapomorphies are indicated by an asterisk.

The inconstans Group

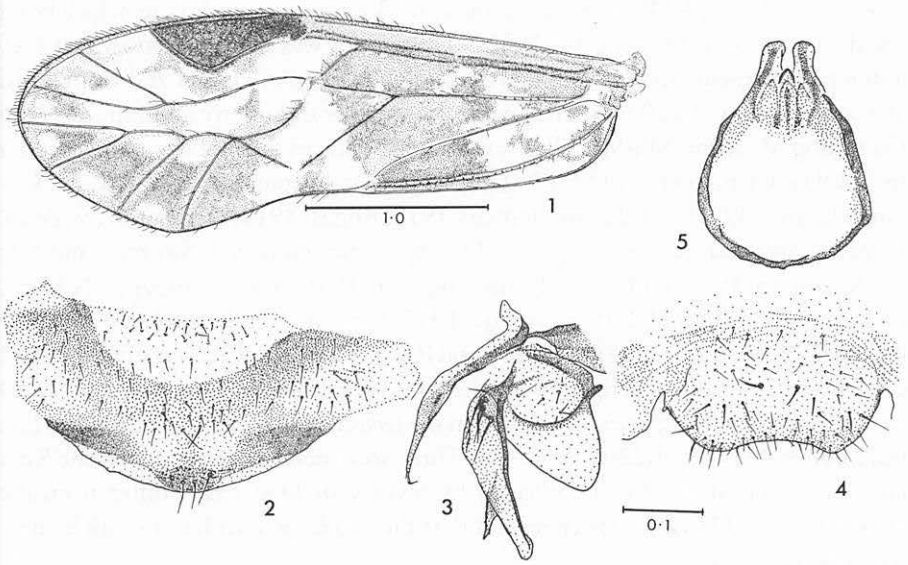
Thoracic terga dull; transverse fascia in forewing distinct, continuous*; spots in outer cells of forewing fused with pigment along vein margins*; subgenital plate with very shallow tapering rounded prominence posteriorly, bearing 3–4 setae apically; outer valve of gonapophyses tapering to rounded apex, more than ½ as broad as long; hypandrium just perceptibly incipiently bilobed. Species: *inconstans, brevipennis, oligotarsus, pictifrons.*

This group is represented on all islands except Kaua'i and Lāna'i. Two species, *brevipennis* (O'ahu, Moloka'i) and *inconstans* (Maui, Hawai'i), occur on 2 islands. The 4 species form a cluster with *setosus* in the phenogram based on correlation coefficients. Based on distance coefficients *brevipennis* and *inconstans* form one cluster in the phenogram, and the other 3 species (*oligotarsus, pictifrons,* and *setosus*) form another. On the basis of characteristics of the female gonapophyses, however, *setosus* is associated below with the *swezeyi* group.

Palistreptus (Palistreptus) inconstans (Perkins)

Elipsocus inconstans Perkins, 1899:84. [Holotype female, Hawai'i I, Kona (BPBM) examined.]
Kilauella inconstans (Perkins): Enderlein 1913:357.
Palistreptus inconstans (Perkins): Enderlein 1920:457, Figs. 14–15.

Redescription. FEMALE. *Coloration* (freshly killed, in alcohol). Head generally whitish cream, markings brown. Posterior ocelli surrounded by brown. Frons with median rhomboid brown patch, vague brown clouds either side extend across frons-vertex suture; anterior lobe of frons white. Clypeus with ca. 10 distinct brown striae, merging anteriorly. Gena brown, except white margin to orbit and in posterodistal corner. Eyes black. Maxillary palp brown. Antenna brown except basal flagellar segment pale brown, brown distally. Thoracic terga brown except cream-buff along sutures and posterior margins of dorsal lobes, scutella cream. Pleura brown. Legs: coxa, trochanter, and femur brown; tibia cream with 2 broad brown bands; tarsus brown. Forewing (Fig. 1) heavily pigmented, spots in posterior marginal cells fused, broad transverse fascia midway along wing, areola postica largely clouded, pterostigma setae on dark spots. Hind wing clouded. Abdomen buff, diffuse granulated gray-brown pigment dorsally, denser anteriorly; wide gray-brown transverse bands ventrally. *Morphology.* I.O.:D. = 4.5:1. Clypeus dull. Forewing length 3.3 mm. Areola postica sometimes touching media, sometimes free. Hind wing with 27 marginal setae. Number of ctenidia on hind tarsal segments: 18; 0; 1 + 1. Thoracic terga dull. Subgenital plate (Fig. 2) with apical lobe short, 4 stout setae along apical margin, subapical row of setae with pair of long stout setae medially. Field of 26 trichobothria



Figs. 1–5. *Palistreptus inconstans:* 1, ♀ forewing; 2, ♀ subgenital plate; 3, ♀ gonapophyses; 4, ♂ hypandrium; 5, ♂ phallosome. Figs. 2–5 to common scale. Scales in these and subsequent figures in mm.

on each paraproct. Gonapophyses (Fig. 3): dorsal valve with short pointed apophysis some distance from tip, outer valve subtriangular, long stout setae on posterior margin basally. Gonopore plate sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female, except gray-brown transverse stripes on dorsal abdomen more clearly defined. *Morphology.* I.O.:D. = 4.5:1. Flagellum not perceptibly thicker than that of female. Hind wing with 25 marginal setae. Number of ctenidia on hind tarsal segments: 20; 1; 1 + 1. Forewing venation variable at areola postica as in female. Genitalia: hypandrium (Fig. 4) incipiently bilobed, with large stout setae admedially, group of 3 fairly long setae more admedially. Phallosome apex pointed (Fig. 5). Field of 25 trichobothria on each paraproct.

NYMPH. Pale, with dark spots at base of short spines. Clypeus pale except dark band anteriorly, legs banded as adult. Clypeus with capitate hairs. Three short truncate hairs on frontal lobe, 2 more posteriorly, each on a small lobe. Abdominal terga beset with very short sharp spines.

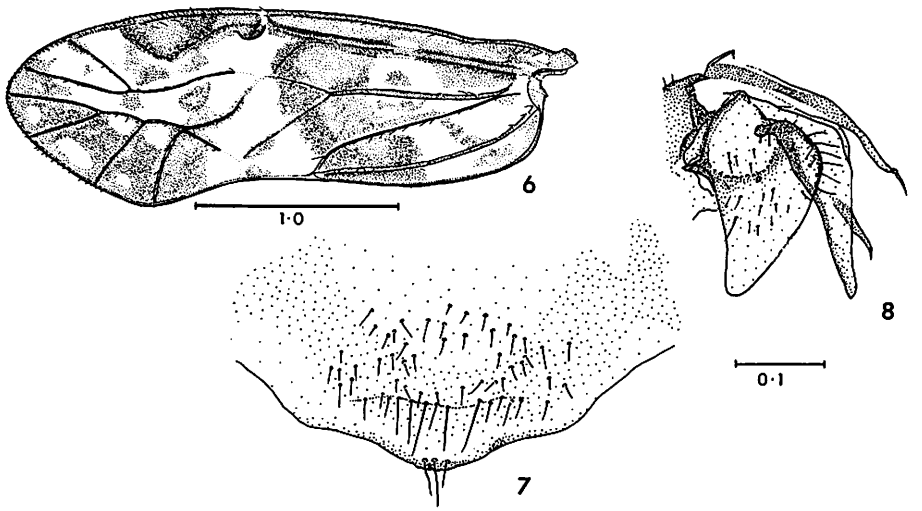
Redescription based on ♂♀, HAWAI'I, Volcano, Kipuka-ki, *Sheenobia*, 30.I.1963 (I.W.B. Thornton).

Other records. HAWAI'I. I have examined and dissected Perkins's type, which bears the data "Kona, 4,000 feet, VII.1892." The species was collected on *Acacia koa, Sophora, Charpentiera obovata,* and *Sheenobia* in Kipuka Puaulu and Kupuka Ki at about 4,000 ft (1,220 m) on Kilauea volcano, in both January and June 1963. In the Bishop Museum (BPBM) collection are 32 specimens attributable to this species from Olaa, Glenwood 2,300 ft (700 m), August and September 1917 (W. M. Giffard); Kilauea 4,000 ft (1,220 m), January 1917, August 1919, October 1929 *(Pelea, Gouldia, Suttonia, Straussia),* July 1934 *(Coprosma, Pipturus)* (Swezey), and July 1918, January 1917 (Giffard); S Kona, August 1919 *(Straussia)* (Swezey); N Kona, Puuwaawaa 3,700 ft (1,130 m), August 1917 (Giffard); and Kona 4,000 ft (1,220 m), 1892 (Perkins—*Fauna Hawaiiensis* and R.C.L. Perkins collections). In the BPBM collection is 1 female which, although the wings are rather extensively pigmented, I have assigned to this species. It was taken on Jerusalem Cherry on the Mauna Loa trail, above 4,000 ft (1,220 m). MAUI. Three specimens from *Rubus* on the Kula Pipe Line, Haleakala, Maui, collected by Swezey in June 1927, differ from the majority of the Hawaiian specimens in that the areola postica has a small hyaline window near its apex.

Distribution. Hawai'i, Maui, endemic. Frequent.

Palistreptus (Palistreptus) brevipennis Thornton, new species Figs. 6–8

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head buff, markings extensive, brown. Frons brown, a median darker mark visible. Clypeus brown, darker striae just discernible. Gena brown, except cream along margin of orbit and posterodistal corner, very small cream spot posterior to antennal socket. Eyes black. Maxillary palp dark brown. Antenna brown except basal flagellar segment paler extremely basally. Thoracic terga dark brown, median line cream. Pleura dark brown. Legs: coxa, trochanter, femur dark brown; tibia buff, wide dark brown band subbasally, narrower dark brown band subapically; tarsus dark brown. Forewing (Fig. 6) extensively pigmented, broad transverse fascia, areola postica ⅔ pigmented; spots in posterior outer cells fused; a circular hyaline window near margin of apical cells; apical ⅔ of pterostigma with wide pigmented margin, a few setae on dark spots, proximal ⅓ unpigmented, white by reflected light. Hind wing faintly clouded. Abdomen with granular gray-brown pigment, often as transverse bands. *Morphology.* I.O.:D. = 5.5:1. Clypeus dull. Forewing length 2.6 mm, areola postica usually touching media or joined by a short crossvein; stigmasac long, rectangular. Hind wing with 25 marginal setae. Number of ctenidia on hind tarsal segments: 17; 1; 1 + 1. Thoracic terga dull. Antennae short, forewings short and broad. Subgenital plate (Fig. 7) with very shallow apical lobe; 3 stout setae on apical margin; very long seta on subapical row each side of a median small seta, a fairly long seta some distance



Figs. 6–8. *Palistreptus brevipennis:* 6, ♀ forewing; 7, ♀ subgenital plate; 8, ♀ gonapophyses. Figs. 7–8 to common scale.

lateral to this along row. A field of 28 trichobothria on each paraproct. Gonapophyses (Fig. 8): dorsal valve with pointed apophyses not extending to tip of valve; outer valve somewhat elongate, 2 long stout setae on face, a group of 6 long setae on posterior margin. Gonopore plate sclerotized. Antennae and wings short.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 5.0:1. Flagellum no thicker than that of female. Hind wing with 23 marginal setae. Number of ctenidia on hind tarsal segments: 17; 1; 1 + 1. Genitalia: hypandrium similar to that of *P. inconstans,* with very long seta each side of midline on disc, several fairly long setae lateral to this. Phallosome similar to that of *P. inconstans.* A field of 31 trichobothria on each paraproct and a long seta set in a basal field at one end of group of trichobothria.

Type data. Holotype ♀ (BPBM 13924, 13924A), allotype ♂: O'AHU, E Koolau Mts, Pali Kea, ridge above Kaau Crater, 1,900 ft (580 m), *Metrosideros,* 12.IX.1963 (I.W.B. Thornton).

Other records. O'AHU. A male of this distinctive species was also collected at 1,500 ft (450 m) on Mt Tantalus, E Koolau Mts, in October 1963, in a Malaise trap near a bamboo thicket, by C. Yoshimoto. Two specimens collected by Swezey—1 in April 1933 on *Urera* at Kamokuiki Valley, NW Koolaus, and 1 from Pacific Heights, near Honolulu, on *Bobea* (no date)—are in the BPBM collection.

Distribution. O'ahu, Moloka'i, endemic. Occasional.

Palistreptus (Palistreptus) oligotarsus Thornton, **new species** Figs. 9–12

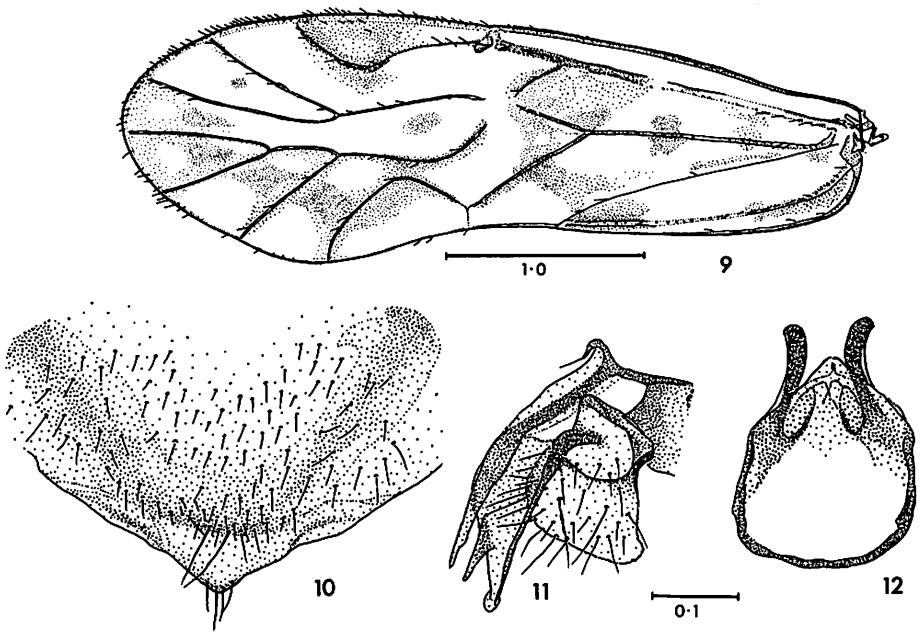
Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head generally cream, markings light brown except on frons and clypeus, sutures dark. Frons with median dark brown patch. Clypeus dark brown, darker striae just discernible. Gena brown, cream margin to orbit and posterior edge of gena. Eyes black. Maxillary palp brown. Antenna brown, basal flagellar segment rather paler. Thoracic terga brown, whitish cream scutella along sutures and posterior margins of dorsal lobes. Pleura brown. Legs: coxa, trochanter, and femur brown; tibia buff, a short brown band subapically; tarsus brown. Forewing (Fig. 9) fairly sparsely pigmented; transverse fascia narrow, indistinct; areola postica clouded distally, posterior marginal cell-spots fusing with paler marginal vein pigment; pterostigma setae not on dark spots. Hind wing faintly clouded. Abdomen with gray-brown granulated pigment. *Morphology.* I.O.:D. = 4.5:1. Clypeus dull. Hind wing with 22 marginal setae. Number of ctenidia on hind tarsal segment: 14–16 (type 14); 0; 0 + 1. Thoracic terga dull. Stigmasac long, rectangular. Pterostigma rather angular at vertex. Subgenital plate (Fig. 10) apical lobe short, 4 stout setae on apical margin, subapical row of setae with single long stout seta each side of midline, median short seta just posterior to these. A field of 26–27 trichobothria on each paraproct. Gonapophyses (Fig. 11): dorsal valve with pointed apophyses not extending to tip of valve; outer valve rounded, 2 long setae on face of valve and mesial group of stout setae. Gonopore plate sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female, with following exceptions: dark vertex markings very extensive, leaving only 2 small cream patches; frons dark; antenna brown; areola postica in forewing almost clear, or with pigment confined to apex. *Morphology.* I.O.:D. = 4.2:1. Flagellum decidedly thicker than that of female. Forewing length 3.7 mm. Hind wing with 21 marginal setae. Number of ctenidia on hind tarsal segments: 14; 1; 1 + 1. Genitalia: hypandrium as in that of *P. inconstans* with single long seta each side of midline on main body of hypandrium. Phallosome (Fig. 12) with apex pointed. A field of 32 trichobothria on each paraproct.

NYMPH. Recognizable by dark clypeus and antennae. Clypeus with capitate setae. Abdomen with fairly long truncate setae.

Type data. Holotype ♀ (BPBM 13925, 13925A), allotype ♂, 10♀, 10♂ paratypes: MAUI, Haleakala, near Puu Niauniau, *Pinus ponderosa,* 6,500 ft (2,000 m), 15.V.1963 (I.W.B. Thornton).

Other records. MAUI. Collected at 6,500 ft (1,990 m) on the western slopes of Haleakala from *Sophora* and *Pinus ponderosa* in May 1963. Two specimens of this species from near Puu Luau (Haleakala, 5,500 ft [1,680 m]) on *Myrsine* and *Copros-*



Figs. 9–12. *Palistreptus oligotarsus:* 9, ♀ forewing; 10, ♀ subgenital plate; 11, ♀ gonapophyses; 12, ♂ phallosome. Figs. 10–12 to common scale.

ma in April 1945, and 3 from the adjacent Puu Niauniau in the same month, all collected by Zimmerman, and a female collected at 5,000 ft (1,520 m) on Haleakala in May 1896 by Perkins (R.C.L. Perkins collection) are in the Bishop Museum. I have dissected the last-mentioned specimen.

Distribution. Maui, endemic. Locally common.

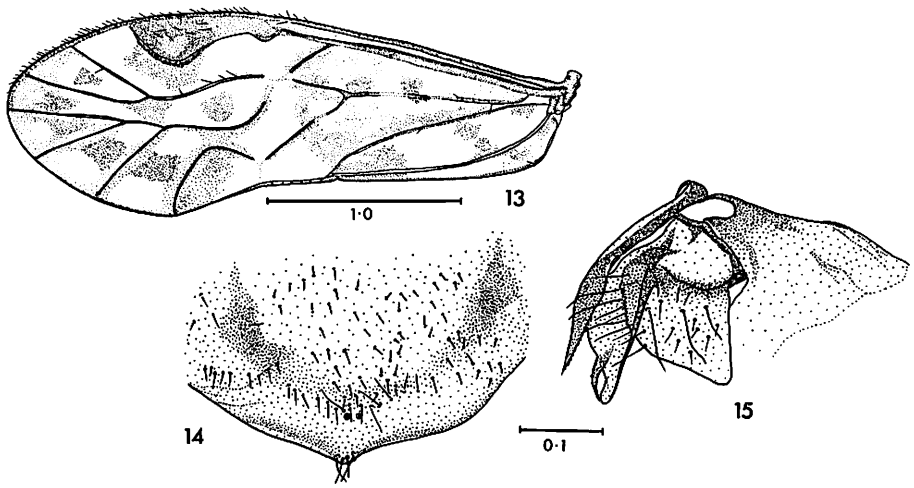
Comments. This rather large species shows considerable sexual dimorphism in color pattern of the head and wings and in thickness of the antennae.

It seems that this endemic form "prefers" recently introduced conifers to the native *Sophora.* The same amount of beating produced 2 adults on *Sophora* as against 50 on contiguous pine. Dead and living branches of the pine showed no particular difference as far as the distribution of this species was concerned.

The reduction of ctenidia in this high-mountain form is noteworthy. There is no evidence of reduction of wings, ocelli, or trichobothria.

Palistreptus (Palistreptus) pictifrons Thornton, new species Figs. 13–15

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head generally cream-



Figs. 13–15. *Palistreptus pictifrons:* 13, ♀ forewing; 14, ♀ subgenital plate; 15, ♀ gonapophyses. Figs. 14–15 to common scale.

buff, markings brown. Frons with median dark patch continued anteriorly each side as diffuse brown mark curving posteriorly laterally. Clypeus brown, darker striae discernible. Gena pale cream below orbit and posterodistally, circular patch posterior to antennal socket pale cream, otherwise brown. Eyes black. Maxillary palp brown. Antenna brown, except proximal ⅔ of basal flagellar segment and proximal ⅓ of 2nd flagellar segment pale buff. Thoracic terga brown, median line cream. Pleura brown. Legs: coxa, trochanter, femur brown; tibia pale brown, vague darker band towards apex and in some specimens proximal band just discernible, tarsus brown. Forewing (Fig. 13) fairly extensively pigmented, areola postica clouded over distal ½ with broad pigmented margin, proximal ½ unpigmented, white by reflected light. Spots fused in posterior outer cells. Hind wing hyaline except faintly clouded in proximal and distal angles of anal cell, and proximal ½ of costal cell. Abdomen with very sparse gray-brown granulated pigment, denser laterally. *Morphology.* I.O.:D. = 5.8:1. Clypeus dull. Hind wing with 20 marginal setae. Forewing length 2.9 mm, stigmasac fairly long, flat. Areola postica smoothly rounded. Number of ctenidia on hind tarsal segments: 17; 1; 1 + 1. Thoracic terga dull. Subgenital plate (Fig. 14) apical lobe very shallow, 4 setae on apical margin, subapical row of long setae with very long seta each side of midline just posterior to this row. A field of 28 trichobothria on each paraproct. Gonapophyses (Fig. 15): dorsal valve with fairly short pointed apophysis that extends as far as apex of valve; outer valve fairly smoothly rounded, 3 long setae on face, group of long setae on posterior edge. Gonopore plate sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female; pigmentation rather darker. *Morphology.* I.O.:D. = 5.5:1. Flagellum thicker than that of female. Hind wing with 18 marginal setae. Number of ctenidia on hind tarsal segments: 16; 1; 1 + 1. Genitalia: hypandrium as *inconstans* with pair of long setae each side of midline on disc, group of 3 fairly long setae near margin laterally. Phallosome with apex pointed, much as in *P. oligotarsus*. A field of 35 trichobothria on each paraproct.

Type data. Holotype ♀ (BPBM 13926, 13926A), allotype ♂, 6♀ paratypes: MOLOKA'I, summit Puu Kole Kole, 3,950 ft (1,200 m), *Juniperus,* 18.VII.1963 (I.W.B. Thornton).

Other records. MOLOKA'I. This species was collected in 1963 at around 4,000 ft (1,220 m) at the following locations in the central mountains: S of Hanalilolilo (July, on *Metrosideros*); Hipuapua Falls (July, on *Metrosideros*); N of Puu Kole Kole (July, on *Juniperus, Metrosideros*); between Puu Kole Kole and Lehuula (April, on *Metrosideros*). It was also collected in 1963 at about 3,000 ft (910 m) on the slope below Kamoku Flats in July on *Metrosideros,* and on the north ridge of Halawa Valley, in July, on *Pelea.* Four specimens in the Bishop Museum collection, collected at 4,400 ft (1,340 m) above Waikolu Valley in April and May 1955 by Gressitt, are also of this species.

Distribution. Moloka'i, endemic. Frequent.

Comments. In wing pattern, this species resembles *P. oligotarsus,* found on Maui, but the wings are smaller and the pigmentation is more extensive.

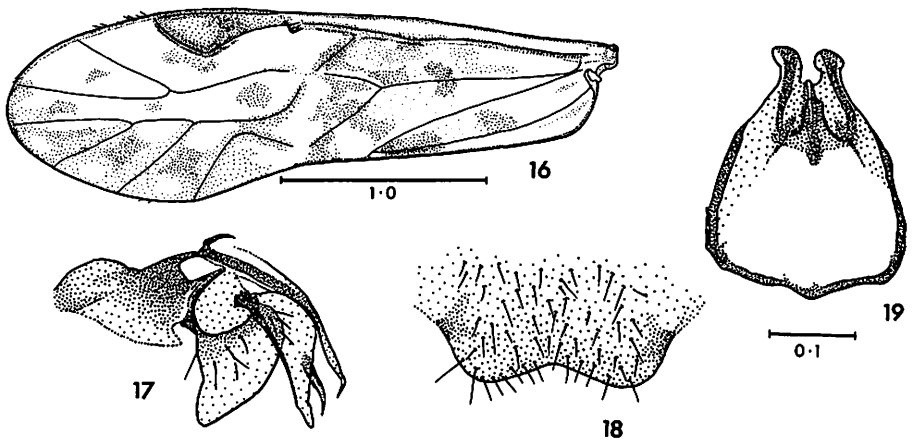
The heterothorax Group

Thoracic terga and head waxy*; mesothoracic nota pale, at least anteriorly*; forewing transverse fascia narrow, indistinct, discontinuous, spots in outer cells of forewing fused with vein pigment* (except *cinctifrons*); subgenital plate apical lobe short, broad, with 4 marginal setae; outer margin of outer valve emarginate, valve appearing curled*; hypandrium distinctly but shallowly bilobed.* Species: *heterothorax, cinctifrons, pallithorax.*

This group of 3 species is confined to Kaua'i. It is a strong group in the sense that it forms an identical cluster in both phenograms.

Palistreptus (Palistreptus) heterothorax Thornton, new species Figs. 16–19

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head buff, vertex markings pale brown, except brown transverse mark extending from just mesial to orbit to ocellar protuberance. Epicranial suture dark, obvious. Frons buff, brown median patch with dark brown transverse line each side, angled anteriorly. Clypeus



Figs. 16–19. *Palistreptus heterothorax:* 16, ♀ forewing; 17, ♀ gonapophyses; 18, ♂ hypandrium; 19, ♂ phallosome. Figs. 17–19 to common scale.

with distinct striae posteriorly, dark brown anteriorly. Gena with upper brown band not reaching anterior edge of sclerite, dark brown band below this not reaching posterior edge of sclerite. Eyes black. Ocelli pale, centripetally black. Frons-vertex sutures dark, obvious. Maxillary palp brown, apical segment pale at apex. Antenna brown, basal flagellar segment paler, except distally. Terga of mesothorax very pale brown, those of metathorax brown, cream band between dorsal lobes medially and along posterior margins. Pleura brown. Hind leg: coxa brown; trochanter pale brown; femur brown; tibia with wide subbasal brown band almost fusing with narrow subapical brown band; tarsus brown. Forewing (Fig. 16) without definite transverse fascia; spots in posterior outer cells angular, fused with paler marginal pigment along veins; areola postica clouded over distal ⅔; pterostigma with short, pigmented band ⅓ length from stigmasac, but whole area of pterostigma appearing dark by transmitted light. Hind wing subhyaline, faint fuscous clouds in angles of anal cell. Abdomen with granular gray-brown markings. *Morphology.* I.O.:D. = 5.0:1. Head and thoracic terga waxy. Forewing length 2.9 mm, stigmasac normal, smoothly pointed. Hind wing with 23 marginal setae. Number of ctenidiobothria on hind tarsal segments: 18; 1; 1 + 1. Subgenital plate with apical lobe shallow, broad; 4 long stout apical setae; subapical row with 1 very long stout seta each side of midline, 3 progressively shorter and finer setae, as well as other short setae more laterally. Field of 25 trichobothria on each paraproct. Gonapophyses (Fig. 17): dorsal valve with pointed apophysis extending almost to tip of valve, beset with recurved setae; outer valve with 3 long setae on face, wide group of 3 or 4 setae on posterior margin. Gonopore plate sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female with following exceptions: transverse marks on vertex darker than those on frons, genae brown except upper margin, mesothoracic terga almost cream, tibial pigment less extensive. *Morphology.* I.O.:D. = 5.0:1. Flagellum very little thicker than that of female. Head and thoracic terga waxy. Hind wing with 23 marginal setae. Number of ctenidiobothria on hind tarsal segments: 18; 1; 1 + 1. Genitalia: hypandrium (Fig. 18) shallowly bilobed, sclerotized marginally, particularly laterally, longer setae distributed fairly uniformly. Phallosome (Fig. 19) apex not obviously pointed. Field of 30 trichobothria on each paraproct.

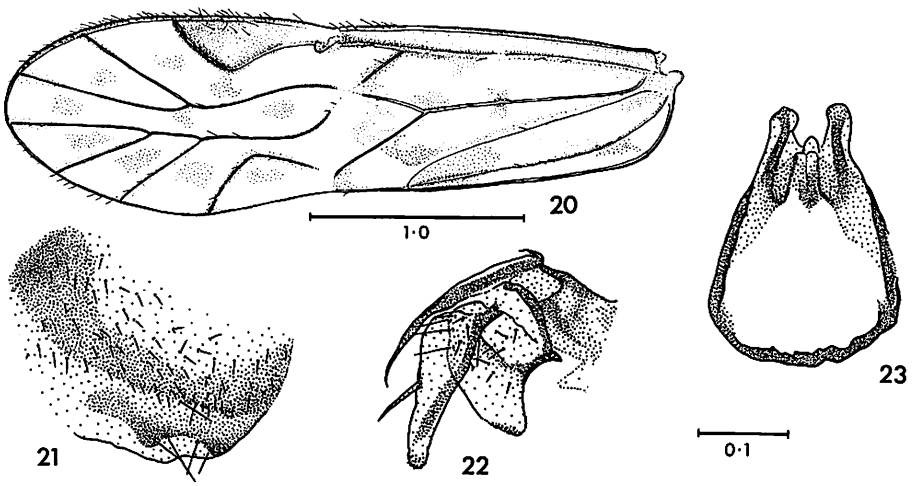
Type data. Holotype ♀ (BPBM 13927): KAUA'I, Kokee area, 3,600 ft (1,100 m), 10–13.IX.1957 (A. M. Nadler). Allotype ♂: KAUA'I, N end Alakai Swamp near Bench Mark 3698, 4,000 ft (1,220 m), *Cheirodendron,* 28.VII.1963 (I.W.B. Thornton).

Distribution. Kaua'i, endemic. Rare.

Comments. The species is distinguishable at low magnifications by the differential coloration of the thoracic terga.

Palistreptus (Palistreptus) cinctifrons Thornton, new species Figs. 20–23

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head very pale cream, with following exceptions: pale brown circular spot on dorsal surface of vertex each side epicranial suture; transverse brown band of marks between orbit and ocellar protuberance; frons-vertex suture dark brown; median brown patch on frons, dark brown slanting transverse line each side of this; clypeus with narrow transverse very dark brown band anteriorly; anteclypeus brown; gena with very faint short transverse pale brown mark in upper ½, dark brown transverse band in lower ½, not extending to posterior margin of gena (this band a continuation of clypeal stripe); maxillary palp light brown, apical segment brown, buff at apex; antennal flagellum brown except 1st segment pale buff. Eyes black; ocelli pale, black centripetally. Mesothorax with antedorsum and anterior ½ of dorsal lobes pale cream, rest of lobes brown with cream posterior margin; metathoracic dorsal lobes brown, cream patch posteromesally; median pale cream band between both pairs of dorsal lobes; scutella cream, sutures dark. Thoracic pleura dark brown. Hind leg: coxa pale brown; trochanter pale cream; femur pale cream, small black mark on posterior surface subapically; tibia pale buff, narrow faint brown subapical band (this darker on other legs); tarsus brown. Forewing (Fig. 20) length 3.2 mm, with discrete spots within each marginal cell including areola postica; pterostigma white by reflected light in basal ½, apical ½ with narrow dark brown posterior margin. Hind wing



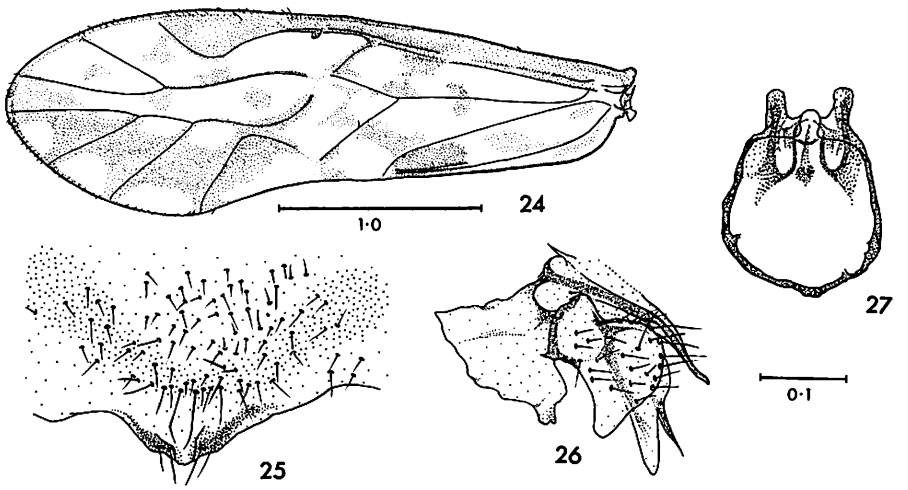
Figs. 20–23. *Palistreptus cinctifrons:* 20, ♀ forewing; 21, ♀ subgenital plate; 22, ♀ gonapophyses; 23, ♂ phallosome. Figs. 21–23 to common scale.

hyaline, fuscous at angles of anal cell and in costal cell. Abdomen dorsally with granular gray-brown markings, broad dark brown longitudinal band laterally, creamy-white ventrally. *Morphology.* I.O.:D. = 5.5:1. Eyes situated at angles of head. Metathoracic terga waxy, alutaceous. Stigmasac normal, rounded. Hind wing with 16 marginal setae. Number of ctenidiobothria on hind tarsal segments: 20; 1; 1 + 1. Subgenital plate (Fig. 21) with apical lobe short, 4 stout apical setae; subapical row of setae with a single long stout seta each side of midline. Field of 26 trichobothria on each paraproct. Gonapophyses (Fig. 22): dorsal valve with narrow, offstanding pointed apophysis, not as long as apical portion of valve; outer valve large, bluntly pointed, with 2 long setae on face, group of 5–6 long setae on posterior margin. Gonopore plate distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 4.5:1. Flagellum no thicker than that of female. Metathoracic terga waxy, alutaceous. Hind wing with 20 marginal setae. Number of ctenidiobothria on hind tarsal segments: 20; 1; 1 + 1. Genitalia: hypandrium similar to that of *P. heterothorax,* with long setae evenly distributed. Phallosome (Fig. 23) with incurved outer parameres little sclerotized.

Type data. Holotype ♀ (BPBM 13928, 13928A), allotype ♂, 1 ♀ paratype: KAUA'I, Kokee area, near Camp Slogget, 3,600 ft (1,100 m), dead lichen-covered branches *Acacia koa,* without *Pleurococcus,* 1.VIII.1963 (I.W.B. Thornton).

Other records. KAUA'I. This species was also taken at Kokee in August 1957 by



Figs. 24–27. *Palistreptus pallithorax:* 24, ♀ forewing; 25, ♀ subgenital plate; 26, ♀ gonapophyses; 27, ♂ phallosome. Figs. 25–27 to common scale.

Mockford, at the same locality in September 1957 by Nadler, and on *Acacia koa* near Kawaikoi Stream in July 1963.

Distribution. Kaua'i, endemic. Occasional.

Palistreptus (Palistreptus) pallithorax Thornton, **new species** Figs. 24–27

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head pale buff with following exceptions: transverse band of light brown vertex marks between orbit and ocellar protuberance; frons largely light brown, distinct median patch not discernible; anterior margin of clypeus dark brown; anteclypeus dark brown; gena dark brown except upper margin bordering orbit; maxillary palp brown; flagellum brown, except basal segment basally buff. Eyes black; ocelli pale, gray centripetally. Thoracic terga pale buff except dorsal lobes darkening to light brown posteromedially. Pleura brown. Hind leg: coxa dark brown; trochanter pale buff; femur brown; tibia pale buff, subbasal band absent, subapical band very pale brown, hardly discernible. Tarsus brown. Forewing (Fig. 24) pigment extensive; spots in posterior outer cells large, fused; areola postica clouded over distal ½; pterostigma white by reflected light for proximal ⅓, brown pigment surrounding distal ⅔ except posteriorly. Hind wing faintly fuscous, darker at angles of anal cell. Abdomen with granular gray-brown markings. *Morphology.* I.O.:D. = 5.5:1. Head and thoracic terga waxy, alutaceous. Forewing length 3.0 mm, stigmasac small, rounded. Hind wing with 21 marginal setae. Number of ctenidiobothria on hind tarsal segments: 19; 1; 1 + 1.

Subgenital plate (Fig. 25) with apical lobe short, 4 long stout apical setae, subapical row with 1 very long and 2 long setae each side of midline. Field of 24 trichobothria on each paraproct. Gonapophyses (Fig. 26): dorsal valve with pointed apophysis extending almost as far as apex of valve; outer valve with elongate posterior corner, 3 longer setae on face, group of ca. 6 longer setae on posterior margin. Gonopore plate sclerotized, distinct.

MALE. *Coloration* (freshly killed, in alcohol). As female, except flagellum wholly brown, thoracic terga with paler brown pigment. *Morphology.* I.O.:D. = 5.0:1. Flagellum decidedly thicker than that of female. Metathoracic terga waxy, alutaceous. Hind wing with 17 marginal setae. Number of ctenidiobothria on hind tarsal segments: 20; 1; 1 + 1. Genitalia: hypandrium as in *P. heterothorax* with narrow sclerotized margin laterally, setae fairly uniformly distributed. Phallosome as in Fig. 27. Field of 28 trichobothria on each paraproct.

Type data. Holotype ♀ (BPBM 13929, 13929A), allotype ♂: KAUA'I, N end Alakai Swamp, near Bench Mark 3698, 4,000 ft (1,220 m), *Cheirodendron,* 28.VII.1963 (I.W.B. Thornton).

Other records. KAUA'I. This species was also taken in July 1963, near Wainiha Ridge, north of Kawaikoi Stream. The types were collected together with a male of *heterothorax.*

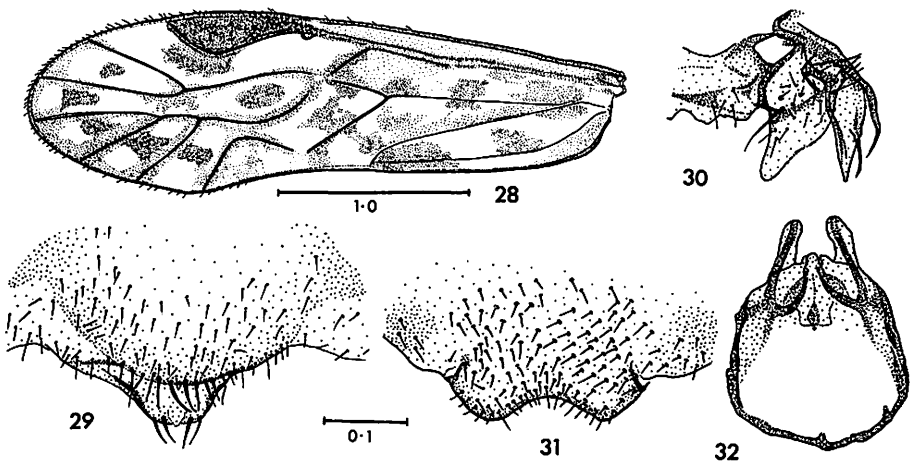
Distribution. Kaua'i, endemic. Rare.

Comments. The pale thorax distinguishes this species at low magnifications.

The nigriceps Group

Metathoracic terga dull (except waxy in *fuscifrons* and *longipennis*); forewing transverse fascia indistinct, broken; outer cell spots in forewing fused with pigment along vein margins*; female subgenital plate with short, broad apical lobe bearing 4 marginal setae; outer valve of gonapophyses narrow, no more than ½ as broad as long; hypandrium clearly bilobed, lateral margin sclerotized*; forewing length 3.1 × or more greatest breadth, subapical lobe on posterior margin shallow.* Species: *nigriceps, fuscicosta, fuscifrons, longipennis, oahuensis.*

Of the 5 species of this group, *nigriceps* and *fuscifrons* are confined to Kaua'i and *fuscicosta, longipennis,* and *oahuensis* to O'ahu. The species *fuscifrons, nigriceps,* and *oahuensis* cluster together in the correlation coefficient phenogram, and *nigriceps* and *oahuensis* form a cluster also in the distance phenogram. The inclusion of *fuscicosta* is tentative, only the female being known, and *longipennis* is included on the basis of forewing shape and hypandrial characteristics. The group is characterized by the narrow forewing, the ratio of length to greatest width being the greatest of any group, and the distinctly bilobed, marginally sclerotizd hypandrium.



Figs. 28–32. *Palistreptus nigriceps:* 28, ♀ forewing; 29, ♀ subgenital plate; 30, ♀ gonapophyses; 31, ♂ hypandrium; 32, ♂ phallosome. Figs. 29–32 to common scale.

Palistreptus (Palistreptus) nigriceps Thornton, **new species** Figs. 28–32

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head dark, pale cream area on vertex laterally. Frons dark brown except apices of anterior lateral lobes white. Clypeus dark brown. Gena brown, except margin below orbit white. Eyes gray; ocelli pale. Maxillary palp brown, apical segment pale at apex. Antenna brown, proximal ⅔ basal flagellar segment paler. Thoracic terga brown; extreme lateral corners of dorsal lobes cream; median band cream, very narrow on metathorax; scutella brown. Pleura brown. Hind leg dark brown except tibia pale buff, vague wide brown band subbasally (this absent on foreleg), distinct narrower dark brown band subapically. Forewing (Fig. 28) with distal ¾ of areola postica having vague brown pigment marginally, fairly large hyaline area within this; pigment spots in posterior marginal cells angular, fused with paler pigment bands along veins; pterostigma with fairly broad pigmented margin for distal ⅔, basal ⅓ white by reflected light. Hind wing uniformly suffused faint brown, darker in costal cell. Abdomen dorsally with granular gray-brown pigment, sometimes forming broad transverse bands, ventrally whitish cream. *Morphology.* I.O.:D. = 4.0:1. Forewing length 3.1 mm, stigmasac small, rounded; pterostigma vertex evenly rounded. Hind wing with 20 marginal setae. Number of ctenidia on hind tarsal segments: 18; 1; 1 + 1. Subgenital plate (Fig. 29) with short trapezoid apical lobe, 4 stout apical setae, subapical row of 8 long setae, central 4 very long. A field of 26 trichobothria and 1 long seta in smooth separate field on each paraproct. Gonapophyses (Fig. 30): dorsal valve with long pointed apophysis extending as far as apex of valve; outer valve long,

smoothly rounded, with 2 long setae on face, group of 4–6 long setae on posterior angle. Gonopore plate distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 3.0:1, eyes large for this genus. Flagellum no thicker than that of female. Hind wing with 22 marginal setae, wing longer than in female. Number of ctenidiobothria on hind tarsal segments: 19; 1; 1 + 1. Genitalia: hypandrium (Fig. 31) with distinct lobes, setae subequal in length. Phallosome as in Fig. 32. Field of 24 trichobothria on each paraproct, an adjacent apical field of 4 short setae and 1 very long seta.

Type data. Holotype ♀ (BPBM 13930, 13930A), allotype ♂, 1♀, 3♂ paratypes: KAUA'I, Kokee area, near Camp Slogget, 3,600 ft (1,100 m), dead branches *Acacia koa* with lichen, 1.VIII.1963 (I.W.B. Thornton).

Other records. KAUA'I. A single male was collected by Swezey at Kumuwela, from *Pipturus,* in June 1932, and another in July of the same year at Halemanau from *Acacia koa.* These specimens are in the BPBM collection.

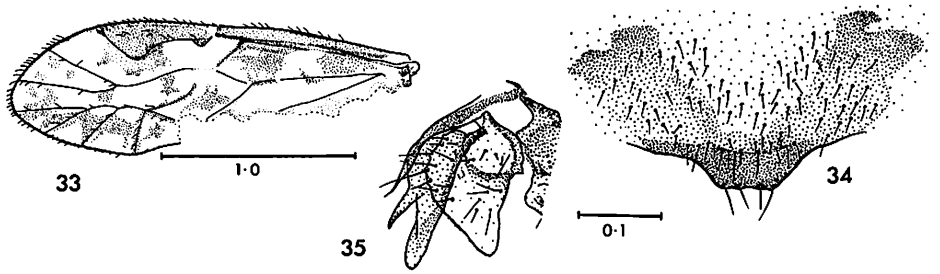
Distribution. Kaua'i, endemic. Rare.

Comments. No specimen of this species was collected from live branches of the trees on which the type series was collected, suggesting that the species is a lichen-feeder.

Features of the genitalia distinguish the species from *P. setosus,* which it resembles in general coloration; the forewing shape and width of the transverse fascia also serve to separate these two species.

Palistreptus (Palistreptus) fuscicosta Thornton, new species Figs. 33–35

Description. FEMALE. *Coloration* (after 30 years' dry storage). Head cream, vertex markings brown. Frons brown posteriorly with median darker brown patch, pale buff anterolaterally. Clypeus pale posteriorly with faint striae, dark brown band anteriorly; between brown pigment of frons and dark brown clypeal band, a wide paler band across front of head. Gena pale buff along orbital margin and at posterodistal corner, otherwise brown. Eyes black, ocelli pale. Maxillary palp brown, apical segment paler at tip. Antenna brown; basal 3 and most of 4th segment paler. Thoracic terga brown, median cream band extending from mesothoracic antedorsum to metathoracic scutellum, dorsal lobes with lateral margins cream. Pleura brown. Hind leg: coxa, trochanter, and femur brown; tibia buff, subbasal brown band (lacking in more anterior legs), a narrower darker brown subapical band; tarsus brown. Forewing (Fig. 33) markings not extensive but costal cell brown; areola postica with isolated light brown cloud distally; posterior marginal cell spots brown, fusing with marginal cloudiness along veins; pterostigma narrowly bordered with brown in apical ½. Hind wing hyaline except costal cell fuscous. Abdomen with gray-brown



Figs. 33–35. *Palistreptus fuscicosta:* 33, ♀ forewing; 34, ♀ subgenital plate; 35, ♀ gonapophyses. Figs. 34–35 to common scale.

granulations. *Morphology.* I.O.:D. = 5.0:1. Head and thoracic terga dull. Forewing length 2.0 mm, pterostigma widening abruptly in apical ½, stigmasac angular, fairly long. Hind wing with 21 marginal setae. Number of ctenidia on hind tarsal segments: 15; 0; 0 + 1. Subgenital plate (Fig. 34) with apical lobe short, trapezoidal, 4 stout apical setae, subapical row with 9 longer setae, not symmetrically distributed. Field of 28 trichobothria on each paraproct. Gonapophyses (Fig. 35): dorsal valve with fairly long pointed apophysis; outer valve pyriform, with 4 longer setae on face, group of 4 long setae on posterior margin. Gonopore plate sclerotized.

MALE. Unknown.

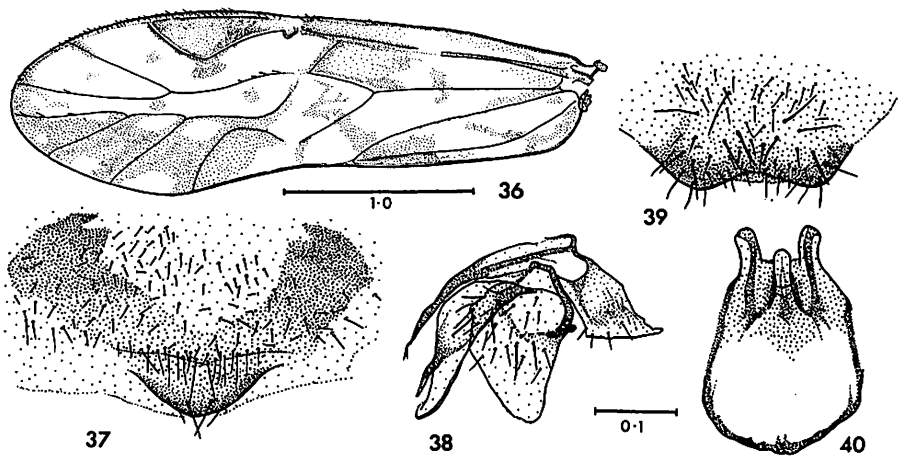
Type data. Holotype ♀ (BPBM 13931): O'AHU, E Koolau Mts, Mt Tantalus, *Acacia koa,* V.1934 (O. W. Swezey).

Distribution. O'ahu, endemic. Rare.

Comments. This remarkably small species is described from a single specimen. Its distinctness in head markings and wing pattern preclude confusion with any other species.

Palistreptus (Palistreptus) fuscifrons Thornton, new species Figs. 36–40

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head pale cream, vertex markings pale brown except brown anteriorly and merging with brown frons. Epicranial and frons-vertex sutures dark. Darker brown median patch on frons and small spot each side of this discernible. Clypeus pale posteriorly, striae just discernible, dark brown transverse band anteriorly. Gena brown, pale cream border to orbit and in posterodistal angle, dark brown band (continuation of clypeal band) not reaching posterior margin of gena. Eyes black; ocelli pale, black centripetally. Maxillary palp brown, apical segment paler at tip. Antenna with scape, pedicel, basal ¾ of basal flagellar segment pale cream, otherwise brown. Thoracic terga brown,



Figs. 36–40. *Palistreptus fuscifrons:* 36, ♀ forewing; 37, ♀ subgenital plate; 38, ♀ gonapophyses; 39, ♂ hypandrium; 40, ♂ phallosome. Figs. 37–40 to common scale.

median cream band, scutella cream. Pleura brown. Hind leg: coxa brown; trochanter pale cream; femur brown; tibia pale cream with short subapical brown band; tarsus brown. Forewing (Fig. 36): areola postica with brown pigment covering distal ¾; pigment in posterior marginal cells extensive, fusing; spots in other cells small, discrete; pterostigma white by reflected light in basal ⅓, apical ⅔ with narrow brown posterior margin. Hind wing with faint brown infuscation at angles of anal cell, in costal and axillary cells. Abdomen with sparse granular gray-brown markings, a very broad gray-brown longitudinal band extremely laterally for basal ⅓. *Morphology.* I.O.:D. = 4.2:1. Metathoracic terga waxy, alutaceous. Forewing length 3.0 mm, stigmasac in forewing fairly large, smoothly rounded. Hind wing with 22–26 marginal setae. Number of ctenidia on hind tarsal segments: 19–21; 1; 1 + 1. Subgenital plate (Fig. 37) with apical lobe short, 4 stout apical setae, subapical row consisting of 12 long stout setae, central pair longest and stoutest, grading laterally. Field of 24–28 trichobothria on each paraproct. Gonapophyses (Fig. 38): dorsal valve with pointed apophysis not extending as far as apex of valve; outer valve with 3 longer setae on face, a group of ca. 4 setae on posterior margin. Gonopore plate distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 4.0:1. Flagellum slightly thicker than that of female. Metathoracic terga waxy, alutaceous. Hind wing with 25 marginal setae. Number of ctenidia on hind tarsal segments: 22; 1; 1 + 1. Genitalia: hypandrium (Fig. 39) margin with narrow sclerotized border laterally, a group of 4 longer setae in center of disc, pair each side

posterolaterally, group of 3 each side anterolaterally. Phallosome (Fig. 40) with apex blunt. Field of 30 trichobothria on each paraproct.

Type data. Holotype ♀ (BPBM 13932, 13932A), allotype ♂, 1 ♂ paratype: KAUA'I, Kokee area, near Camp Slogget, 3,600 ft (1,100 m), dead lichen-covered branches of *Acacia koa,* 1.VIII.1963 (I.W.B. Thornton).

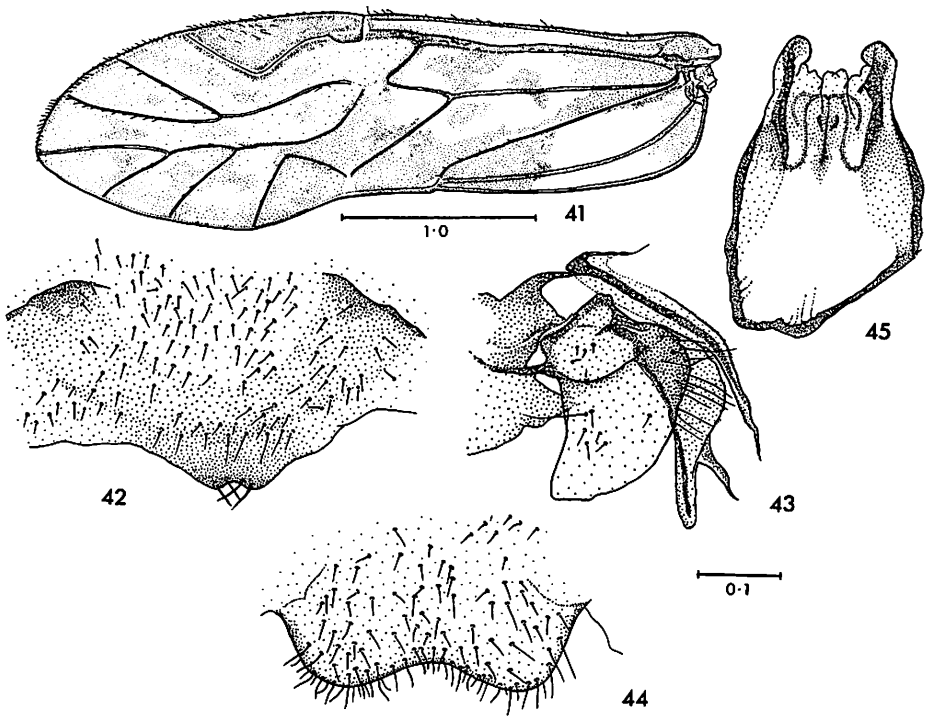
Other records. KAUA'I. A female was also collected from live branches of the same trees, and a female was swept from the trunks of *Acacia koa* at Kokee in July 1963. The type series was collected with *Palistreptus microvalvus, cinctifrons, setosus,* and *nigriceps.*

Distribution. Kaua'i, endemic. Rare.

Comments. The wing markings of *fuscifrons* are quite distinctive.

Palistreptus (Palistreptus) longipennis Thornton, new species Figs. 41–45

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head cream, vertex markings fairly sparse, brown. Frons pale brown, with median dark brown mark, vague small brown lateral marks towards anterior margin. Clypeus cream, with well-marked brown striae. Gena cream with 2 oblique brown bands, fusing anteriorly but leaving a cream circular area posterior to antennal socket. Eyes black. Ocelli pale, black centripetally. Maxillary palp brown. Antenna brown, basal flagellar segment a little paler. Thoracic terga brown, median cream band between mesothoracic dorsal lobes and along posterior margin of meso- and metathoracic dorsal lobes. Pleura brown. Legs: coxa brown; trochanter and femur pale brown; tibia pale buff with vague barely discernible darker band subapically; tarsus brown. Forewing (Fig. 41) with pale brown markings; areola postica with small markings at apex and along posterior margin; spots in outer cells discrete; pterostigma with vague reddish brown pigment about ⅓ its length from stigmasac, definite reddish brown margin each side of posterior boundary vein, otherwise granulated white by reflected light. Stigmasac dark reddish brown. Hind wing with faint brown infuscation. Abdomen with sparse granular gray-brown markings. *Morphology.* I.O.:D. = 5.8:1. Clypeus, front of head, thoracic terga shining. Forewing long (3.5 mm), spear-shaped apically, stigmasac long, rectangular. Hind wing long, bluntly rounded apically, with 34 marginal setae. Number of ctenidia on hind tarsal segments: 18; 1; 1 + 1. Subgenital plate (Fig. 42) apical lobe short, 4 stout setae on apical margin; subapical row with a long stout seta each side of midline, pair of fairly long setae to left of this pair, no corresponding pair to right. Field of 26 trichobothria on each paraproct. Gonapophyses (Fig. 43): dorsal valve with pointed apophysis not extending to tip of valve;



Figs. 41–45. *Palistreptus longipennis:* 41, ♀ forewing; 42, ♀ subgenital plate; 43, ♀ gonapophyses; 44, ♂ hypandrium; 45, ♂ phallosome. Figs. 42–45 to common scale.

outer valve somewhat elongate, 2 very long and 1 fairly long setae on face of valve, a group of long setae on its posterior margin. Gonopore plate sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 5.8:1. Flagellum decidedly thicker than that of female. Clypeus, front of head, thoracic terga shining. Hind wing with 30 marginal setae, shape as female. Forewing somewhat blunter than that of female apically. Number of ctenidia on hind tarsal segments: 18; 1; 1 + 1. Genitalia: hypandrium (Fig. 44) with margin sclerotized laterally, setae fairly evenly distributed over the 2 lobes. Phallosome (Fig. 45), apex not pointed. Field of 31 trichobothria on each paraproct.

Type data. Holotype ♀ (BPBM 13933, 13933A), allotype ♂, 1 ♂ paratype: O'AHU, E Koolau Mts, Mt Tantalus, 2,000 ft (610 m), *Acacia koa,* 22.II.1963 (I.W.B. Thornton).

Other records. O'AHU: central Koolau Mts, Poamoho Trail, *Metrosideros,* 2.XI.1963, 1 ♂; E Koolau Mts, Mt Tantalus, *Acacia koa,* 20.VI.1963, 3 ♀.

Distribution. O'ahu, endemic. Occasional.

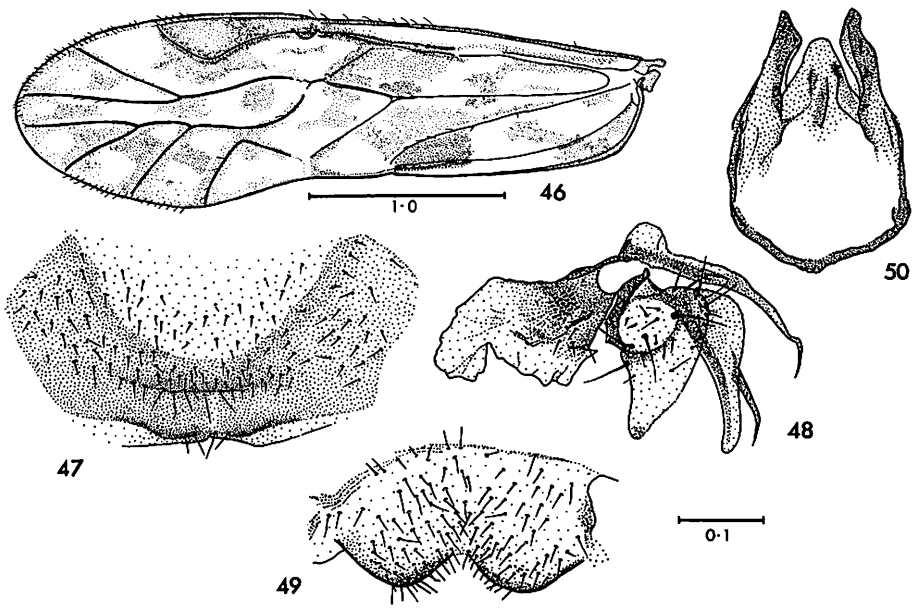
Palistreptus (Palistreptus) oahuensis Thornton, **new species** Figs. 46–50

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head cream, with brown markings, those on posterior of vertex faint, sparse, those medially and mesial to orbits darker, denser. Frons with brown medial patch, vague brown patches contiguous with this laterally. Clypeus with striae posteriorly, dark brown anteriorly. Gena with 2 brown bands: an upper band diagonally across gena below orbit; lower darker band below antennal socket not extending to posterior margin of gena. Eyes black, ocelli pale. Maxillary palp brown. Antenna brown, basal flagellar segment paler except distally. Thoracic terga brown, median cream band between mesothoracic dorsal lobes, cream patch at lateral corners of dorsal lobes of meso- and metathorax. Pleura brown. Hind leg: coxa brown; trochanter pale buff; femur brown; tibia pale cream with wide subbasal brown band and rather narrower subapical brown band; tarsus brown. Forewing (Fig. 46) markings very similar to *Palistreptus longipennis,* except spots in posterior outer cells fusing with marginal pigment along veins; circular hyaline patch submarginally in both distal cells. Hind wings faintly infuscated. Abdomen with sparse granular gray-brown markings. *Morphology.* I.O.:D. = 5.0:1. Head and thorax dull. Forewing length 3.2 mm, smoothly rounded apically, stigmasac normal, smoothly rounded. Hind wing with 19 marginal setae. Number of ctenidia on hind tarsal segments: 21; 1; 1 + 1. Subgenital plate (Fig. 47) apical lobe short, 4 stout apical setae, subapical row with longer setae not arranged symmetrically. Field of 23 trichobothria on each paraproct. Gonapophyses (Fig. 48): dorsal valve with tine long, extending as far as apex of valve; outer valve pyriform, with 4 longer setae on face, group of long setae on posterior margin. Gonopore plate sclerotized, very distinct.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 4.3:1, otherwise as female. Genitalia: hypandrium (Fig. 49) with prominent rounded trianguloid lobes; phallosome (Fig. 50) outer parameres angular apically.

Type data. Holotype ♀ (BPBM 13934, 13934A), allotype ♂: O'AHU, E Koolau Mts, Mt Tantalus, 1,800 ft (550 m), dead branches *Acacia koa,* 22.II.1963 (I.W.B. Thornton).

Other records. O'AHU. Three females of this species in the BPBM collection were collected by Swezey, in January and March 1933 on *Pipturus* in Haleauau Valley, and in September 1932, also on *Pipturus,* in the Makua Valley of the Waianae Range. Two females in the Bishop Museum collection were collected in April 1933 from *Urera,* Kanookuiki Valley, NW Koolau Mts, with *P. montanus* and *P. sextus,* also



Figs. 46–50. *Palistreptus oahuensis:* 46, ♀ forewing; 47, ♀ subgenital plate; 48, ♀ gonapophyses; 49, ♂ hypandrium; 50, ♂ phallosome. Figs. 47–50 to common scale.

by Swezey. C. P. Hoyt collected 2 specimens, which now lack abdomens, at 1,500 ft (460 m) at Kuliouou in February 1953; these are in the Bishop Museum.

Distribution. O'ahu, endemic. Rare.

Comments. Superficially similar to *P. longipennis, P. oahuensis* differs in the lack of shine on head and thorax, in the density of marginal setae of the hind wing, in forewing shape, and in a number of details of coloration. It was collected together with specimens of *Palistreptus sextus,* to which it is less closely related than to *P. longipennis.*

The swezeyi Group

Thoracic terga dull; forewing transverse fascia may or may not be evident, never unbroken; spots in outer cells merging with vein pigment*; apical process of subgenital plate trapezoid, broader than long, 4 marginal setae; dorsal valve of gonapophyses large, bluntly rounded apically,* apophysis on outer margin short; lobes of hypandrium almost imperceptible.* Species: *swezeyi, lobatus, setosus, valvulus.*

This group of 4 species has representatives on Kaua'i, O'ahu, and Maui. This grouping cannot be justified on the numerical analyses; only *swezeyi* and *valvulus*

form a cluster in the correlation coefficient phenogram. The males of *swezeyi* and *valvulus* are unknown. The group is justified on the basis of characteristics of the dorsal valve of the female gonapophyses and of the hypandrium.

Palistreptus (Palistreptus) swezeyi Thornton, new species Figs. 51–53

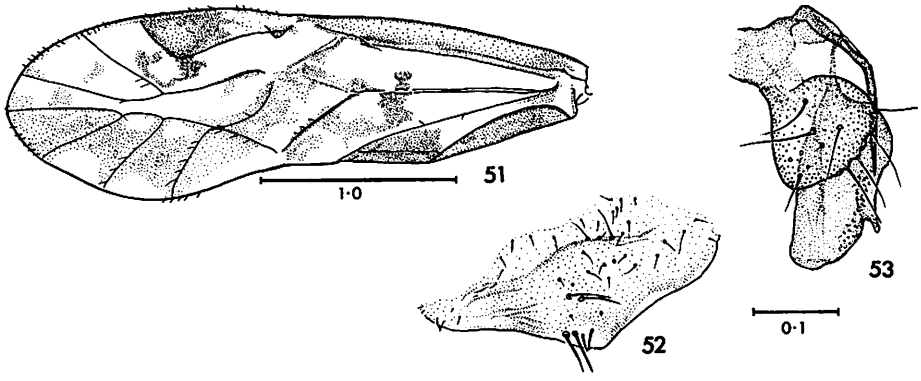
Description. FEMALE. *Coloration* (after some decades' dry storage). Head buff, vertex markings brown, well-marked brown band from orbit to ocellar protuberance along and posterior to frons-vertex suture. Frons dark brown, except anterolaterally. Clypeus pale posteriorly, dark brown transverse band anteriorly. Gena brown, pale buff along orbital margin, in posterodistal corner, and circular pale patch posterior to antennal socket. Eyes black, ocelli pale. Maxillary palp brown. Antenna brown except basal 3 segments pale buff. Thoracic terga color not discernible. Pleura brown. Hind legs brown except trochanter pale buff, tibia pale buff, narrow brown subapical band (darker on more anterior legs). Forewing (Fig. 51): areola postica pigmented over anterodistal ⅘, posterior outer cells extensively covered with merging pigment; cells M_2 and M_3 with fairly large crescent-shaped hyaline areas on margin; cell M_1 almost completely filled with pigment; middle spot of cell R_5 extending from anterior to posterior of cell; pterostigma with fairly broad pigmented margin in distal ½; posterior to pterostigma an irregular hyaline area surrounded by band of pigment. Hind wing faintly infuscate at distal and basal angles of anal cell. Abdominal color not discernible. *Morphology.* I.O.:D. = 3.5:1. Head and thoracic terga dull. Forewing length 2.9 mm, stigmasac rounded, pterostigma fairly evenly rounded. Areola postica almost touching media in one wing, fused with it in other. Hind wing with 19 marginal setae. Number of ctenidia on hind tarsal segments: 24; 1; 1 + 1. Subgenital plate (Fig. 52) with apical lobe short; 4 stout apical setae; only 2 very long stout setae centrally placed make up subapical "row" present in most other species. Field of 24 trichobothria on each paraproct. Gonapophyses (Fig. 53): dorsal valve wide, relatively massive, blunt-tipped, with very short apophysis located halfway between base and apex, row of short sharp spines enclosing base of this apophysis on lateral surface of valve, field of minute tubercles near base on mesial surface; outer valve short, rounded posteriorly, 4 long stout setae on face, 7 such setae along posterior edge. Gonopore with surrounding sclerotized ring.

MALE. Unknown.

Type data. Holotype ♀ (BPBM 13935): O'AHU, Halawa, *Euphorbia,* no date (O. W. Swezey) (BPBM collection).

Distribution. O'ahu, endemic. Rare.

Comments. The species is based on this single specimen because of the unusual nature

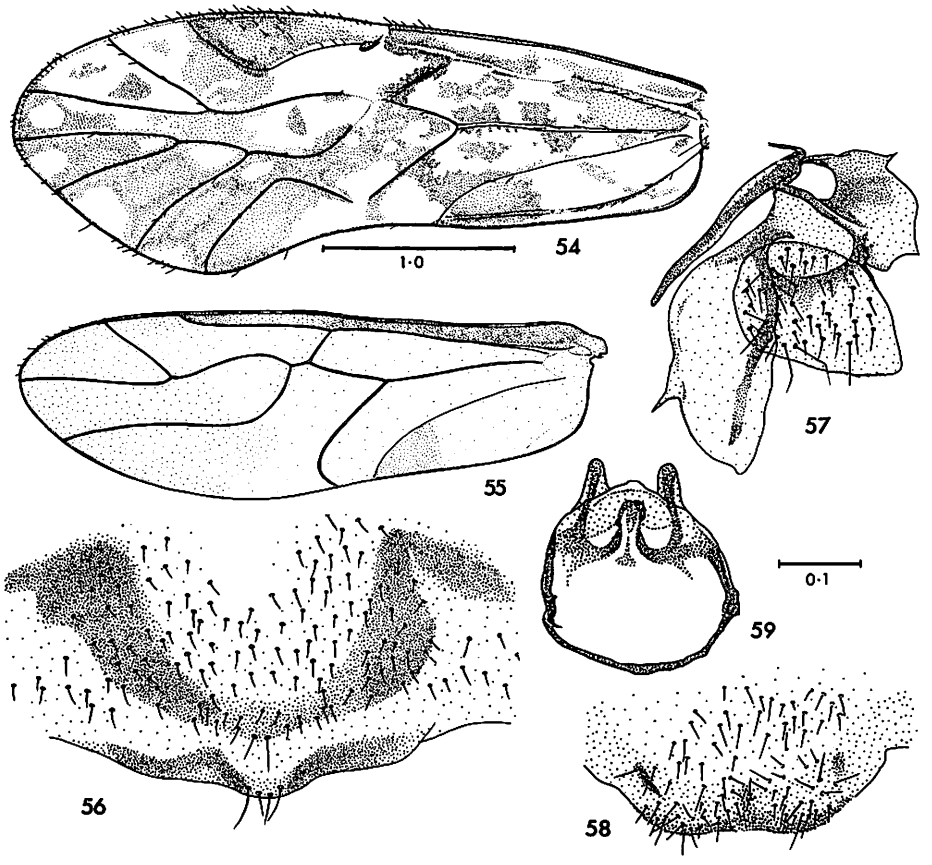


Figs. 51–53. *Palistreptus swezeyi:* 51, ♀ forewing; 52, ♀ subgenital plate; 53, ♀ gonapophyses. Figs. 52–53 to common scale.

of the genitalia, which resemble in a general way those of *Palistreptus lobatus.* In head markings the species resembles *P. fuscifrons,* which otherwise is quite distinct.

Palistreptus (Palistreptus) lobatus Thornton, new species Figs. 54–59

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Vertex buff, lateral markings absent dorsally, brown patch midway between orbit and epicranial suture, usual markings adjacent to epicranial suture, vertex anteriorly dark brown, cream circular area extremely laterally, another cream circle, like an ocellus but surrounding a brown seta, between ocellar protuberance and lateral margin—thus 7 pale circular areas of about equal size (3 of them ocelli) seen from front, on a dark brown background. Frons dark brown, anterolaterally cream. Clypeus dark brown except posteriorly in middle paler with discernible striae. Gena brown, cream margin to orbit, cream circular area behind antennal socket. Eyes dark gray, ocelli pale cream. Maxillary palp brown. Antenna brown except 3 basal segments pale buff. Thoracic terga brown, mesothoracic antedorsum dark brown, dorsal lobes fading to cream on outer margins; median cream band, very narrow on metathorax; scutella cream. Pleura brown. Hind leg: brown, except tibia pale buff, wide subbasal brown band (absent in anterior legs) and narrow subapical dark brown band, apex of basal tarsal segment pale. Forewing (Fig. 54): areola postica with brown pigment over distal ⅘; posterior outer cells very extensively covered with pigment; cell M_3 dark to margin or only a very narrow crescent-shaped paler or hyaline area; middle spot of cell R_5 extending from anterior to posterior of cell; pterostigma in basal ½ white by reflected light, dark brown margin in distal ½, setae sited on dark brown spots, these often fused. Hind wing (Fig. 55) infuscate, costal cell brown, distal angle of anal cell faint brown. Abdomen buff above, gray-brown granular pigment below. *Morphology.*



Figs. 54–59. *Palistreptus lobatus:* 54, ♀ forewing; 55, ♀ hind wing; 56, ♀ subgenital plate; 57, ♀ gonapophyses; 58, ♂ hypandrium; 59, ♂ phallosome. Figs. 54–55, 56–59 to common scales.

I.O.:D. = 3.8:1. Head and thoracic terga dull. Forewing long (3.6 mm); stigmasac rounded, areola postica asymmetrical, descending limb relatively long. Hind wing with 20 marginal setae. Number of ctenidia on hind tarsal segments: 22; 1; 1 + 1. Subgenital plate (Fig. 56) with very shallow wide apical lobe; 4 stout apical setae; stout long seta each side of midline in position of subapical row of other species. Field of 29 trichobothria on each paraproct. Gonapophyses (Fig. 57): dorsal valve somewhat pyriform, wide, bluntly rounded at tip, bearing extremely short pointed apophysis halfway along posterior edge, apex 4 or 5 × its length from apex of valve; outer valve large, with setose lobe projecting outwards posteriorly. Gonopore plate distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. =

3.5:1. Flagellum distinctly thicker than that of female. Head sclerites dull. Hind wing with 24 marginal setae. Forewing shorter than that of female. Ctenidiobothria on hind tarsal segments: 22; 1; 1 + 1. Genitalia: hypandrium (Fig. 58) with lobes widely separated, shallow, bearing numerous long setae, posterocentral area with fine-pointed tubercles, not set in sockets. Phallosome (Fig. 59) blunt apically, outer parameres without hyaline tubercles apically. Field of 27 trichobothria on each paraproct.

Type data. Holotype ♀ (BPBM 13936, 13936A), allotype ♂: KAUA'I, Mohihi Stream, 2.5 km E of junction with Poomau Stream, 3,900 ft (1,190 m), *Metrosideros,* 30.VII.1963 (I.W.B. Thornton).

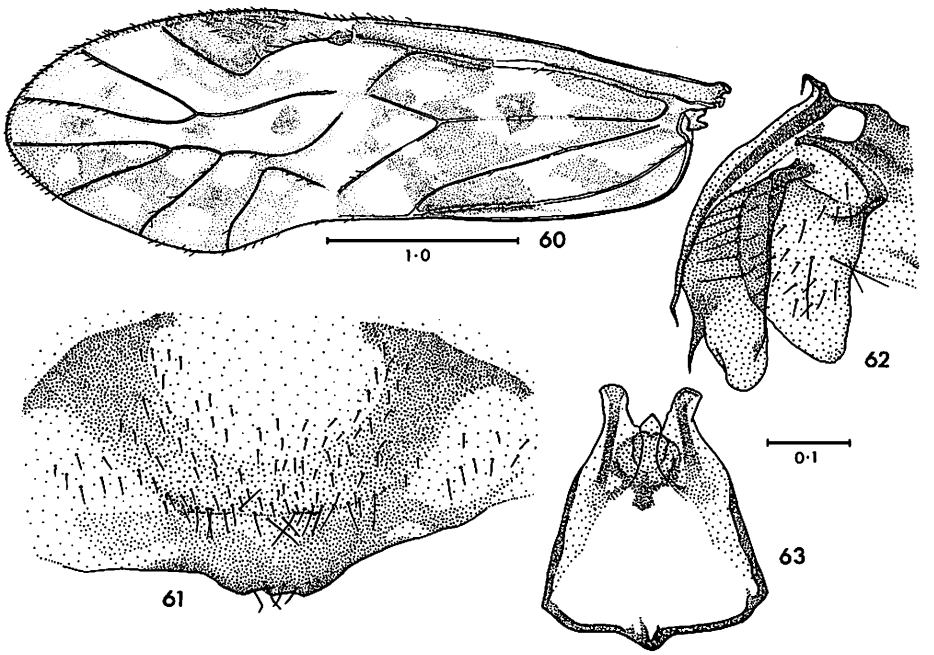
Other records. KAUA'I, trail N of Mohihi Stream, 3,900 ft (1,190 m), *Metrosideros,* 29.VII.1963, 2♂, 1♀.

Distribution. Kaua'i, endemic. Rare.

Comments. The female genitalia, wing, and head markings of *lobatus* are quite characteristic.

Palistreptus (Palistreptus) setosus Thornton, new species Figs. 60–63

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head buff, brown vertex markings extensive, sharply defined. Epicranial and frontal sutures dark. Frons light brown, darker brown median patch, small dark brown spot each side. Clypeus brown, darker striae. Gena brown, except cream margin below eye and cream in posterodistal angle. Eyes black, ocelli pale, narrowly brown centripetally. Maxillary palp brown, apical segment paler at tip. Antenna with scape, pedicel, basal ¾ of basal flagellar segment pale brown, otherwise brown. Thoracic terga, including scutella, brown; median cream band on mesothorax only. Pleura brown. Hind leg: coxa, trochanter, femur brown; tibia pale buff, wide subbasal and darker narrower subdistal brown band; tarsus brown. Forewing (Fig. 60) very extensively pigmented, with areola postica distal ¾ clouded brown, a small hyaline window near apex; brown spots in posterior marginal cells angular, fused with paler pigment along vein margins; pterostigma with wide cloudy brown margin in distal ⅔, white by reflected light in proximal ⅓; extensive dark brown patch in distal angle of anal and axillary cells. Hind wing uniformly suffused with brown, somewhat darker in angles of anal cell. Abdomen with granular gray-brown pigment. *Morphology.* I.O.:D. = 5.5:1. Head and thoracic terga dull. Forewing long (3.6 mm); stigmasac fairly large, squarish; pterostigma sharply angled at vertex; areola postica not symmetrical, with slight bend on distal arm near apex of areola postica. Hind wing with 25 marginal setae. Number of ctenidia on hind tarsal segments: 19; 1; 1 + 1. Subgenital plate



Figs. 60–63. *Palistreptus setosus:* 60, ♀ forewing; 61, ♀ subgenital plate; 62, ♀ gonapophyses; 63, ♂ phallosome. Figs. 61–63 to common scale.

(Fig. 61) with apical lobe short, wide, 4 stout apical setae, subapical row with 14 longer setae, short ones only extremely laterally. Field of 27 trichobothria on each paraproct. Gonapophyses (Fig. 62): dorsal valve wide, with short pointed apophysis never extending as far as valve apex; outer valve bluntly rounded, 3 long setae on face, group of 6 long setae on posterior margin. Gonopore plate distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 4.0:1. Flagellum no thicker than that of female. Hind wing with 26 marginal setae. Ctenidia on hind tarsal segments: 22; 1; 1 + 1. Genitalia: hypandrium shallowly bilobed, with long setae fairly uniformly distributed. Phallosome as in Fig. 63. Field of 34 trichobothria on each paraproct and an adjacent distal field of 5 setae, one longer than others.

NYMPH. Clypeus dark anteriorly, dark pigment extending on to genae, otherwise pale. Legs clearly banded. Covered with long capitate hairs, these arranged in transverse rows on abdomen.

Type data. Holotype ♀ (BPBM 13937, 13937A), allotype ♂, 4 ♂ paratypes: KAUA'I, Alakai Swamp, NW of Kawaikoi Stream, *Metrosideros,* 28.VII.1963 (I.W.B. Thornton).

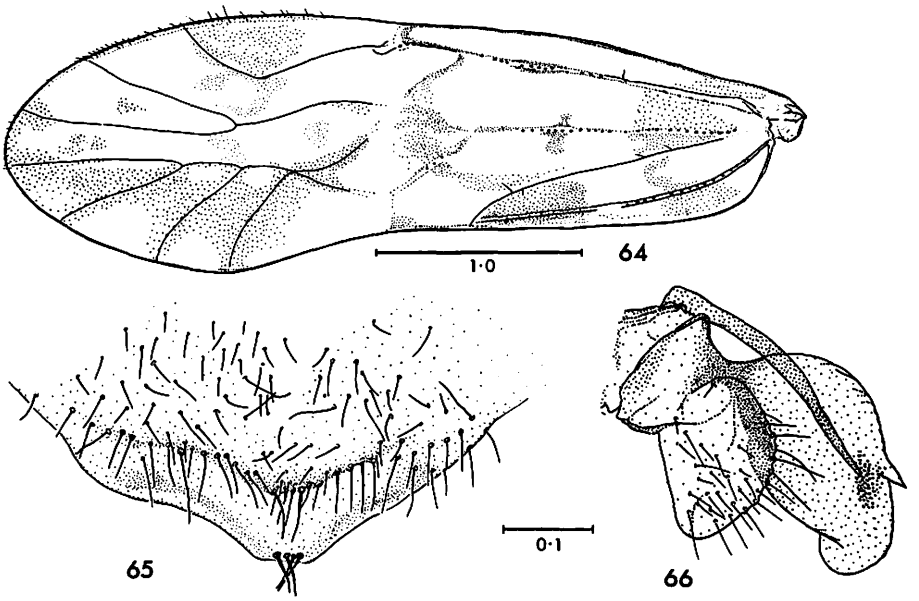
Other records. KAUA'I. One of the commonest Kaua'i species of *Palistreptus, P. setosus* has been taken at around 4,000 ft (1,220 m) at the following localities: edge of Alakai Swamp, August 1957 (Mockford), *Metrosideros, Styphelia,* July 1963; Mohihi Stream, July 1963; Camp Slogget, *Acacia koa* dead lichen-covered branches and live branches, August 1963; Kalalau-Waimea divide, *A. koa,* November 1963; SE corner Kalalau Valley, November 1963; Kokee area, August 1957 (Mockford), September 1957 (Nadler), November 1963, *A. koa;* Na Pali Kona Forest Reserve, August 1957 (Mockford); Alakai Swamp 1 mile (1.6 km) SW of Kilohana Peak, July 1963. A single female from Kaholuananu, collected by I. A. Kusche in April 1920, is in the BPBM collection.

Distribution. Kaua'i, endemic. Common.

Comments. The dark frons marks resemble those of *P. fuscifrons,* from which this species can be distinguished by wing pattern and by the uniform and darkly pigmented clypeus.

Palistreptus (Palistreptus) valvulus Thornton, new species Figs. 64–66

Description. FEMALE. *Coloration* (after more than 30 years' dry storage). Head buff, vertex markings brown, brown streak anteriorly from orbit to ocellar protuberance. Frons with brown median patch, extensive brown lateral markings, cream anterolaterally. Clypeus pale, no darker anterior band discernible. Genal coloration not discernible. Eyes black, ocelli pale. Maxillary palp brown. Antennal and thoracic terga color not discernible. Thoracic pleura brown. Hind leg: faded; but coxa, femur, and tarsus brown, faint suggestion of subbasal and subapical bands on tibia. Forewing (Fig. 64) with spots in posterior marginal cells fused with marginal pigmentation of veins; areola postica pigmented over anterodistal ⅓; pterostigma with pigmented margin in apical ½, some of setae on pale brown spots; basal markings sparse, faint, except dark at distal end of anal vein. Hind wing infuscate in distal angle of anal cell and proximal end of costal cell. Abdominal color not discernible. *Morphology.* I.O.:D. = 5.0:1. Head and thoracic terga dull. Forewing long (3.7 mm); stigmasac and pterostigma posterior margin fairly smoothly rounded; areola postica vertex just touches media in both wings. Hind wing with 26 marginal setae. Number of ctenidia on hind tarsal segments: 20; 1; 1 + 1. Subgenital plate (Fig. 65) with apical lobe broad, trapezoidal, 4 stout apical setae; subapical row consisting of long and short setae with 2 central long stout setae. Field of 30 trichobothria on each paraproct. Gonapophyses (Fig. 66): dorsal valve wide, massive, with lobate bluntly rounded apex, very short pointed apophysis located halfway between base and apex, row of fairly long sharp spines enclosing base of apophysis on lateral surface, sparse and fairly large field of small hairlike tubercles near base on mesial surface; outer



Figs. 64–66. *Palistreptus valvulus:* 64, ♀ forewing; 65, ♀ subgenital plate; 66, ♀ gonapophyses. Figs. 65–66 to common scale.

valve somewhat lobate, long stout setae on face, 9 such setae on posterior edge. Gonopore with surrounding sclerotized ring.

MALE. Unknown.

Type data. Holotype ♀ (BPBM 13938): MAUI, Haleakala, Kula Pipe Line, 4,500 ft (1,370 m), IV.1932 (Bryant) (BPBM collection).

Distribution. Maui, endemic. Rare.

Comments. A specific description is provided for this unique specimen on the grounds of its close similarity to *P. swezeyi* in features of genitalia, which are somewhat unusual for the genus. It differs from that species in the chaetotaxy of the subgenital plate, in the detailed ornamentation near the base of the pointed apophysis of the dorsal valve of the female gonapophyses, in size, and in forewing and clypeal pattern.

Strepilaptus, new subgenus

This subgenus is proposed for the following two groups, which cluster together in both phenograms. When considered in relation to the differences between *Pali-*

streptus and *Spilopsocus* Smithers, the group is seen to be of at least subgeneric rank. The subgenus, like the subgenus *Palistreptus,* is represented on all islands.

The montanus Group

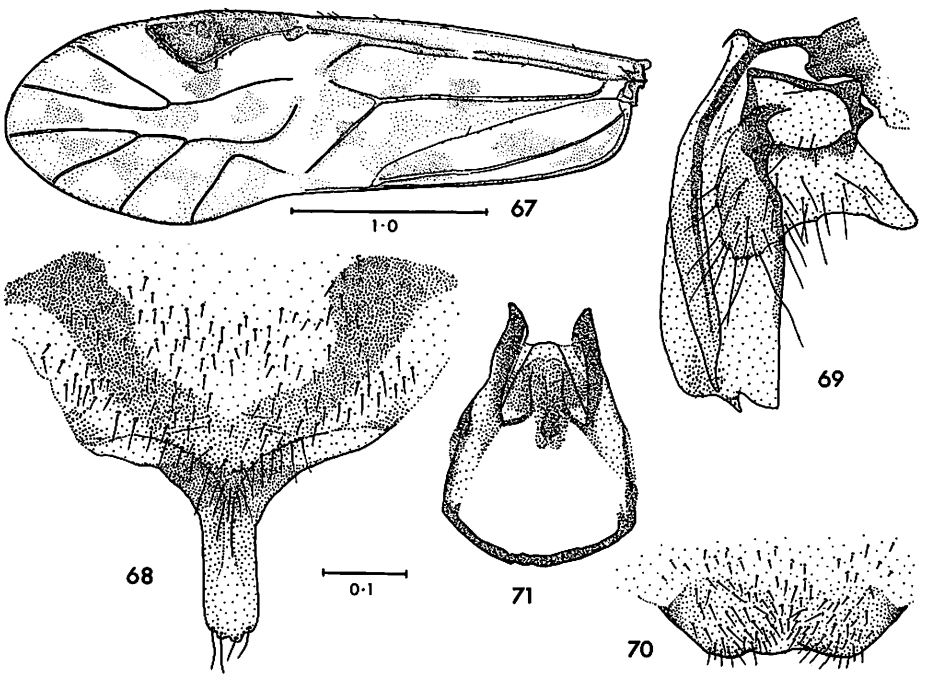
Thoracic terga dull (except *montanus* shining); forewing transverse fascia absent or indistinct, spots in outer cells of forewing discrete; apical process of female subgenital plate long, usually at least 2 × width of process,* subapical row of setae distorted posteriorly in midline into base of process*; outer valve of gonapophyses broader than long, posterior margin emarginate, valve appearing bilobed*; dorsal valve massive, angular, apophysis on posterior margin*; hypandrium distinctly but shallowly bilobed.* Species: *montanus, hyalinus, sextus.*

A highly distinctive group of 3 species that cluster together in both phenograms. The group is represented on all islands but Kaua'i and Lāna'i.

Palistreptus (Strepilaptus) montanus (Perkins) Figs. 67–71

Elipsocus montanus Perkins, 1899:83. Holotype male, Maui, Haleakala (BMNH), examined.
Kilauella montanus (Perkins): Enderlein 1913:357.
Palistreptus inconstans var. *montanus* (Perkins): Enderlein 1920:458, Fig. 16.

Redescription. FEMALE. *Coloration* (freshly killed, in alcohol). Vertex buff, usual brown markings. Frons with median brown patch, long lateral brown patches each side contiguous with median patch, anterior lobes cream. Clypeus posteriorly buff with brown striae, anteriorly dark brown transverse band. Gena cream, upper transverse brown band to antennal socket, lower dark brown band not reaching posterior margin (continuation of clypeal band). Eyes black; ocelli pale, dark brown centripetally. Maxillary palp brown. Antenna with scape, pedicel, basal flagellar segment brown, distal end pale brown. Thoracic terga brown; mesothoracic antedorsum dark brown anteriorly, cream on upper surface; dorsal lobes with narrow cream bands along posterior margins; cream median band along thorax; scutella brown, traversed by median cream band. Pleura brown. Hind legs: coxa, trochanter, and femur faint brown, femur with dark brown patch subdistally on posterior surface; tibia pale buff, brown subdistal band; tarsus brown. Forewing (Fig. 67): areola postica with faint brown cloudiness; marginal cell brown spots just merging with faint brown pigment along veins; pterostigma with brown margin in distal ½. Hind wing faintly fuscous in costal cell and angles of anal cell. Abdomen with gray-brown granular pigment. *Morphology.* I.O.:D. = 4.5:1. Head sclerites faintly shining; anterior of mesothoracic antedorsum polished, metathoracic terga waxy. Forewing length 3.3 mm; stigmasac fairly large; vertex of pterostigma smoothly rounded. Hind wing with 18 marginal setae. Number of ctenidia on hind tarsal segments: 22; 1; 1 + 1. Subgenital plate (Fig. 68) with elongate apical lobe, rounded at apex; 4 short



Figs. 67–71. *Palistreptus montanus:* 67, ♀ forewing; 68, ♀ subgenital plate; 69, ♀ gonapophyses; 70, ♂ hypandrium; 71, ♂ phallosome. Figs. 68–71 to common scale.

apical setae; subapical row distorted towards apex medially, pair of very long stout setae medially, 3 or 4 long setae in row each side of these. Field of 42 trichobothria on each paraproct. Gonapophyses (Fig. 69) very similar to those of *P. sextus,* 3 long setae on face of outer valve. Gonopore rim distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* Smaller than female. I.O.:D. = 3.5:1. Flagellum decidedly thicker than that of female. Head sclerites waxy. Mesothoracic antedorsum anteriorly polished, metathoracic terga waxy. Stigmasac rounded, pterostigma as female. Hind wing with 16 marginal setae. Number of ctenidia on hind tarsal segments: 17; 1; 1 + 1. Genitalia: hypandrium (Fig. 70) margin well sclerotized laterally, with very distinct lobes, without any distinctly longer setae. Phallosome as in Fig. 71. Field of 32 trichobothria on each paraproct.

Redescription based on ♀♂, MOLOKA'I, Hipuapua Falls, *Metrosideros* and *Cheirodendron,* 15.VII.1963 (I.W.B. Thornton).

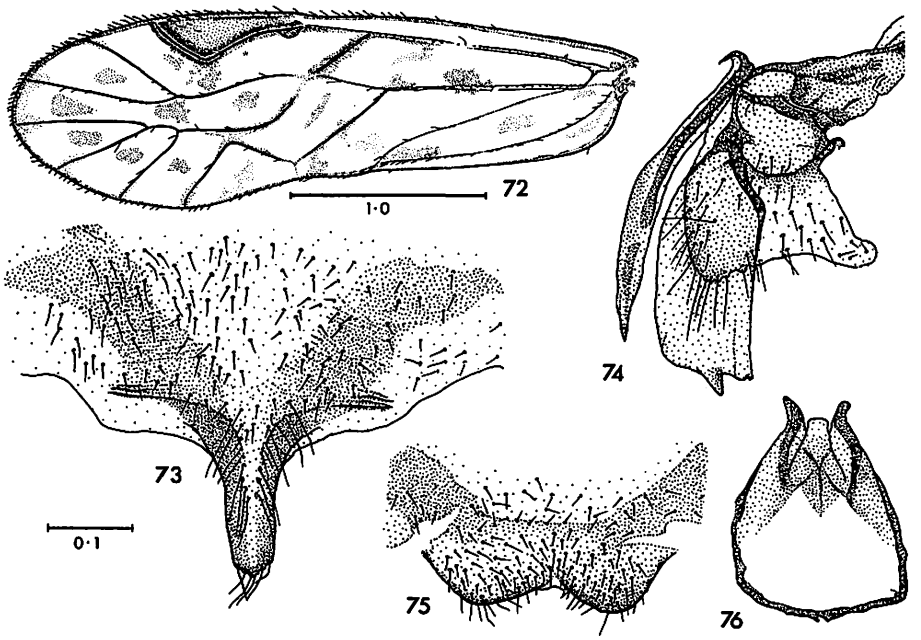
Other records. Described by Perkins from 5,000 ft (1,520 m) on Haleakala, E MAUI, this species was taken at 2,500 ft (760 m) in Iao Valley, W MAUI, in September

1963, and at about 1,500 ft (460 m) near the Hipuapua Falls, E MOLOKA'I, in July 1963 on *Metrosideros* and *Cheirodendron*. MAUI. I have examined and dissected the male holotype in the British Museum, which was collected in May 1896, and have examined 7 males and 6 females taken at 5,000 ft (1,520 m) on Haleakala in May and October 1896 in the *Fauna Hawaiiensis* and R.C.L. Perkins collections of the Bishop Museum. Also in these collections are various other specimens from E Maui: 3 specimens, Kula Pipe Line, August 1929, 2 on *Straussia,* 1 on *Pipturus;* 1 female, Haelaau, December 1928, *Gouldia;* 1 female, Olinda, January 1926, *Acacia koa,* all collected by Swezey; 2 specimens from 4,500 ft (1,370 m), Kula Pipe Line, collected by O. Bryant. From W Maui is a single specimen from the Iao Valley, August 1929, on *Straussia,* collected by Swezey. HAWAI'I. Swezey collected a female on the Upper Hamakua Ditch Trail, Kohala Mountains, which appears to be of this species and not the related *Palistreptus hyalinus* endemic to the island of Hawai'i.

Distribution. Hawai'i, Maui, Moloka'i, endemic. Rare.

Palistreptus (Strepilaptus) sextus Thornton, new species Figs. 72–76

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head cream, usual vertex marks brown, except small dark brown area each side posterior to ocellar protuberance, dark brown streak from anterior of orbit extending along frons-vertex suture. Frons cream, brown median patch, dark brown transverse line each side touching middle of median patch each side. Clypeus posteriorly buff, discernible brown striae; anteriorly brown, striae not discernible. Gena whitish cream, brown band some distance below orbit traversing gena to antennal socket, a lower transverse dark brown streak below this from anterior edge of gena to about midway across it. Eyes black, ocelli pale, dark brown centripetally. Maxillary palp brown. Antenna with scape and pedicel brown, basal flagellar segment pale brown, darkening distally, rest of flagellum dark brown. Thoracic terga brown, except mesothoracic antedorsum dark brown anteriorly, cream on upper surface, lateral margins of dorsal lobes cream. Cream median band along thorax, scutella cream. Pleura brown. Hind legs: coxa pale brown; trochanter and femur very pale cream, dark brown patch subapically on posterior surface of femur; tibia pale buff (subapical brown band on foreleg); tarsus pale brown. Forewing (Fig. 72) sparsely pigmented; areola postica almost free of pigment; all marginal cell spots discrete; pterostigma with dark brown posterior margin. Hind wing hyaline, faint infuscation in costal cell. Abdomen with granular gray-brown pigment dorsally and ventrally, this lacking in longitudinal ventrolateral band each side. *Morphology.* I.O.:D. = 5.0:1. Head and thoracic terga waxy. Forewing length 3.1 mm; pterostigma vertex rather angular, areola postica symmetrical, apex fairly sharply angled. Hind wing narrow, with 24 marginal setae. Number of ctenidia on hind tarsal segments: 16; 1; 1 + 1. Subgenital plate (Fig. 73) with apical



Figs. 72–76. *Palistreptus sextus:* 72, ♀ forewing; 73, ♀ subgenital plate; 74, ♀ gonapophyses; 75, ♂ hypandrium; 76, ♂ phallosome. Figs. 73–76 to common scale.

lobe elongate, rounded at tip, 4 or 6 stout apical setae; subapical row of setae distorted towards apex medially. Field of 28 trichobothria on each paraproct. Gonapophyses (Fig. 74): ventral valve fairly broad, narrowing sharply a short distance from apex; dorsal valve large, rectangular, wide pointed apophysis about halfway along margin; outer valve of characteristic shape, 2 long setae on face of valve, a group of ca. 7 long setae on posterior margin. Gonopore rim distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female, except ground color of frons often brown. *Morphology.* Smaller than female. I.O.:D. = 4.5:1. Flagellum decidedly thicker than that of female. Head sclerites faintly shining. Metathoracic terga waxy. Hind wing with 19–24 marginal setae. Number of ctenidia on hind tarsal segments: 16–19; 1; 1 + 1. Genitalia: hypandrium (Fig. 75) margin sclerotized laterally, with very distinct lobes, bearing long and short setae. Phallosome (Fig. 76) with flat apex, outer parameres narrowing distally, twisted. Field of 34–37 trichobothria on each paraproct.

NYMPH. Recognizable by postocellar markings, lateral frons marks, and anterior lateral vertex marks along frons-vertex suture. Anteriorly clypeus bears a dark transverse stripe. Long capitate hairs.

Type data. Holotype ♀ (BPBM 13939, 13939A), allotype ♂, 7♀, 8♂ paratypes: O'AHU, E Koolau Mts, Mt Tantalus, 2,000 ft (610 m), dead branches *Acacia koa,* 22.II.1963 (I.W.B. Thornton).

Other records. O'AHU: E Koolau Mts, near Kaau Crater, 1,300 ft (400 m), *Acacia koa,* 1♀; E Koolau Mts, Moana Loa, 30.XI.1930, 1♀; NW Koolau Mts, Kamokuiki Valley, *Urera,* 2.IV.1933, 3♂, 3♀; same locality, *Abortopetalum,* 13.IV.1933, 1♀; E Central Koolau Mts, Kahauiki Valley, 29.I.1933, 1 specimen, damaged; all collected by Swezey.

Distribution. O'ahu, endemic. Frequent.

Palistreptus (Strepilaptus) hyalinus Thornton, new species Figs. 77–81

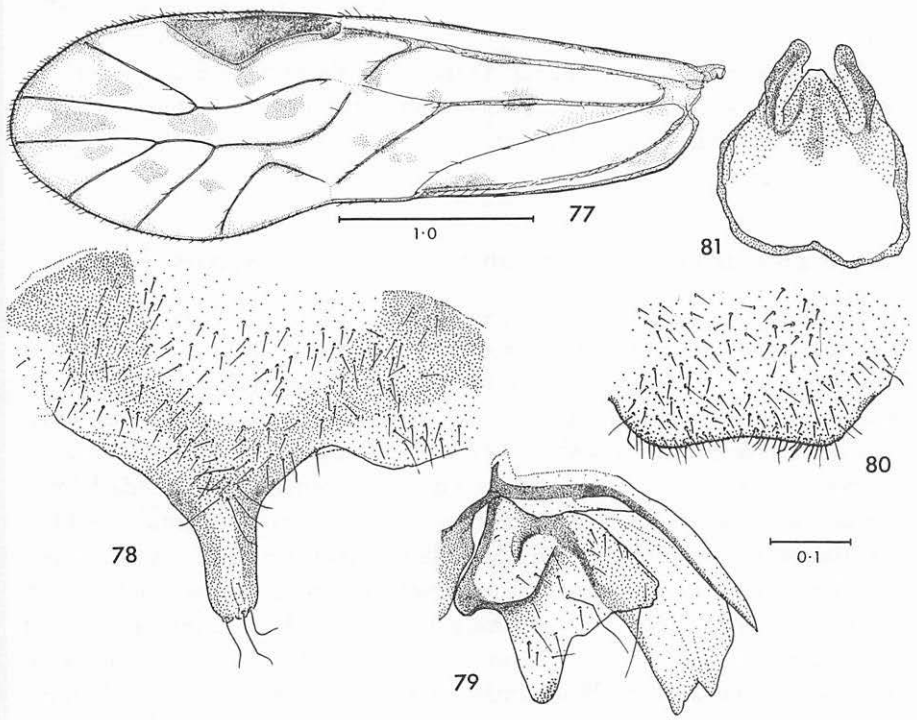
Description. FEMALE. *Coloration* (freshly killed, in alcohol). As *P. sextus,* except faint brown subapical band on tibia, forewing (Fig. 77) with fewer pigment patches, areola postica hyaline. Eyes gray. *Morphology.* I.O.:D. = 5.0:1. Head and thoracic terga dull. Forewing long (3.6 mm); pterostigma vertex rather angular, vertex of areola postica smoothly rounded. Hind wing with 24 marginal setae. Ctenidia on hind tarsal segments: 20; 0; 1 + 1. Subgenital plate (Fig. 78) similar to that of *P. sextus,* but only 4 apical setae, subapical row of setae not so distorted. Field of 35 trichobothria on paraproct. Gonapophyses (Fig. 79) similar to *P. sextus.* Rim of spermapore distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female except head pattern and anterior of vertex and basal ½ of frons brown, usual pattern hardly discernible; legs uniform brown; eyes gray. *Morphology.* I.O.:D. = 4.5:1. Flagellum thicker than that of female. Head and metathoracic terga waxy. Hind wing with 18 marginal setae. Ctenidia on hind tarsal segments: 17–20; 0; 1 + 1. Hypandrium (Fig. 80) lobes indistinct, apical margin somewhat sclerotized with long and short setae. Phallosome (Fig. 81) with rectangular apex, outer parameres broad distally. Field of 3 trichobothria on paraproct.

NYMPH. Similar to that of *P. inconstans* but easily distinguished by short transverse dark brown bar each side at base of clypeus and central mushroom-shaped dark brown mark on frons; these markings absent from nymphs of *P. inconstans.*

Type data. Holotype ♀ (BPBM 13940, 13940A), allotype ♂, 1♀, 1♂ paratypes: HAWAI'I, Kilauea area, Kipuka Ki, 4,000 ft (1,220 m), *Scheenobia,* 30.I.1963 (I.W.B. Thornton).

Other records. HAWAI'I. Same date and locality as holotype, *Acacia koa* (1♀), *Sophora* (2♀), dead branches of *Pipturus* (2♀); Kilauea area, Kipuka Puaulu, *Sophora* (2 N), *Charpentiera obovata* (1♀), dead branches *Pipturus* (1♀), living



Figs. 77–81. *Palistreptus hyalinus:* 77, ♀ forewing; 78, ♀ subgenital plate; 79, ♀ gonapophyses; 80, ♂ hypandrium; 81, ♂ phallosome. Figs. 78–81 to common scale.

branches *Urea sandwicensis* (2♂), *Osmanthus sandwicensis* (1♀), *Acacia koa* (1♀, 1♂), 24/25.VI.1963; Kilauea, 20 mi (32 km), *Cibotium,* 28.I.1963, 1♂; Waimea, 2,700 ft (820 m), *Datura,* 26.VI.1963 (2♀); 1,200 ft (370 m) above Captain Cook, living fronds of 11 m tall *Cibotium,* 28.VI.1963 (1♂); Kona, 4,000 ft (1,220 m), 1892 (R.C.L. Perkins) (in *Fauna Hawaiiensis* collection, Bishop Museum, labeled "Elipsocus vinosus") (1♀).

Distribution. Hawai'i, endemic. Frequent.

Comments. This species is very similar to *P. sextus,* known from O'ahu. The species differs from *sextus* in male head pattern and female subgenital plate.

The microvalvus Group (microvalvus)

Thoracic terga dull; forewing transverse fascia indistinct; spots in outer cells of forewing merge with pigment along veins*; subgenital plate apical lobe trapezoid, as long as broad, bearing 4 marginal setae; outer valve of gonapophyses very small,

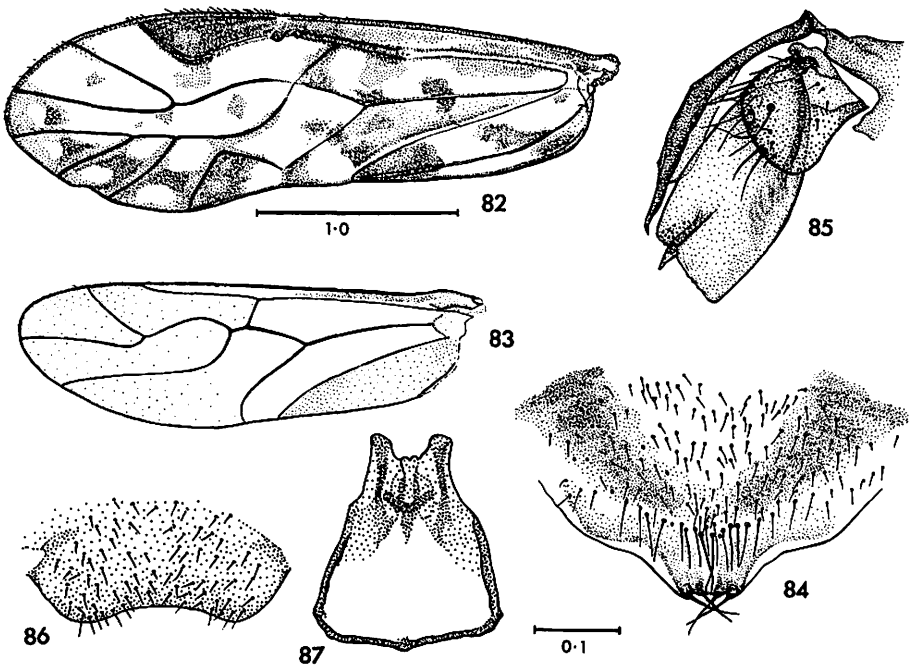
squarish*; dorsal valve massive, angular, short tine on posterior margin*; hypandrium perceptibly bilobed.

This group consists of a single Kaua'i species. In the numerical analyses it forms a cluster with the preceding group, but on both phenograms it is the most distant member. It is here given a separate group on the basis of differences in subgenital plate.

Palistreptus (Strepilaptus) microvalvus Thornton, new species Figs. 82–87

Description. FEMALE. *Coloration* (freshly killed, in alcohol). Head pale buff, vertex markings brown, anterior part of vertex round ocellar protuberance light brown. Frons light brown, median patch brown, each side with angled dark brown line sloping forwards to front of median patch. Clypeus pale posteriorly, faint brown striae discernible, anteriorly with transverse dark brown band. Gena cream with 2 brown bands, upper brown, not reaching anterior margin of gena, lower dark brown (continuation of clypeal band), not reaching posterior margin of gena. Eyes black; ocelli pale, dark brown centripetally. Maxillary palp brown, apical segment pale at tip. Antenna with basal 3 segments pale buff, remainder brown. Thoracic terga brown; mesothoracic terga with cream margins; metathoracic dorsal lobes with short cream band along posterior margins, median band cream, narrower on metathorax; scutella cream. Pleura brown. Hind leg: brown, except tibia buff with vague brown subbasal band (absent in foreleg), distinct dark brown subapical band. Forewing (Fig. 82): areola postica with distal ½ more or less pigmented, paler or hyaline area within apical angle; pigment spots in posterior cells angular, fused with paler pigment bands along vein margins; pterostigma in many specimens wholly dark gray-brown, in others paler, narrow brown margin around distal ½. Hind wing (Fig. 83) faintly infuscated, darker brown clouds in angles of anal cell and in costal cell. Abdomen with broad gray-brown transverse bands along terga and sterna. *Morphology.* I.O.:D. = 4.2:1. Head and thoracic terga dull. Forewing long (3.7 mm); stigmasac small, smoothly rounded. Hind wing with 24 marginal setae. Number of ctenidia on hind tarsal segments: 18; 1; 1 + 1. Thoracic terga dull. Subgenital plate (Fig. 84) with apical lobe short, trapezoid, 4 stout apical setae; subapical row consisting of approximately 18 longer setae, medial pair the longest and stoutest. Field of 27 trichobothria on each paraproct. Gonapophyses (Fig. 85): dorsal valve long, rectangular, with short sharp spine on distal margin close to posterior corner, short sclerotized bar in line with this in body of valve; outer valve small, with 2 long setae on face of valve, group of setae on posterior margin; ventral valve with lobe some distance from apex. Gonopore plate distinct, sclerotized.

MALE. *Coloration* (freshly killed, in alcohol). As female. *Morphology.* I.O.:D. = 3.6:1. Flagellum not thicker than that of female. Forewing shorter than that of



Figs. 82–87. *Palistreptus microvalvus:* 82, ♀ forewing; 83, ♀ hind wing; 84, ♀ subgenital plate; 85, ♀ gonapophyses; 86, ♂ hypandrium; 87, ♂ phallosome. Figs. 82–83, 84–87 to common scales.

female. Stigmasac small, rounded. Hind wing with 25 marginal setae. Ctenidia on hind tarsal segments: 19; 1; 1 + 1. Genitalia: hypandrium (Fig. 86) with lobes widely separated, sclerotized on lateral margins, long setae distributed fairly uniformly but lacking in posterocentral area. Phallosome (Fig. 87) without pointed apex. Field of 31 trichobothria on each paraproct.

Type data. Holotype ♀ (BPBM 13941): KAUA'I, Kokee area, telephone track, 2,620 ft (800 m), *A. koa,* 29.VII.1963 (I.W.B. Thornton). Allotype ♂, 14 ♀, 10 ♂ paratypes: KAUA'I, Kokee area, near Camp Slogget, 4,000 ft (1,220 m), *Acacia koa,* 1.VIII.1963 (I.W.B. Thornton).

Other records. KAUA'I. One of the common species of *Palistreptus, microvalvus* is the only one to occur at lower elevations, having been taken as low as 2,600 ft (790 m), on *Acacia koa* on the Kokee Road, in July 1963. It has been collected on *A. koa* also at 2,850 ft (870 m), July 1963; near Puu Ka Pele at 3,500 ft (1,070 m), July 1963; and on dead twigs bearing *Pleurococcus* and on the trunks of *A. koa* at Kokee

in September 1957 (Nadler) and in July, August, and November 1963. At Kokee it also occurs on *Araucaria*. It has been taken at the edge of the Alakai Swamp in August 1957 (Mockford) and in November 1963; on *Metrosideros* in the Mohihi area in July 1963; and on both living and dead lichen-bearing twigs of *A. koa* near Kawaikoi Stream and near Camp Slogget at 4,000 ft (1,220 m) in July and August 1963. It also occurs on *Metrosideros* near Kalalau Lookout, where it was collected in August 1957 (Mockford) and July 1963. In the Kumuwela Valley, Swezey took a male and a female from *Scaevola* and a female from *Cryptocarya* in June 1932. These 3 specimens are in the BPBM collection. A single female, collected by J. A. Kusche at the headwaters of the Waialae River, Kaua'i, in April 1920, is also in the BPBM collection.

Three female specimens in the BPBM *Fauna Hawaiiensis* collection are labeled simply "Lanai." Specimen labels in this collection, other than those of types, are suspect (see Zimmerman 1948:245). It is possible that these specimens were in reality collected on Kaua'i.

Distribution. Kaua'i, ?Lāna'i, endemic. Common.

Comments. The combination of short subgenital plate lobe and long rectangular dorsal valve with short outer valve, which can clearly be seen in the intact female, is unique for this genus.

Discussion

THE DISTRIBUTION OF *Palistreptus* species on the main Hawaiian Islands is shown in Table 1. Lāna'i (Fig. 88) is not shown, since no *Palistreptus* species is known from that island. Of the 20 *Palistreptus* species, 17 occur on only a single island, 2 occur on 2 islands, and 1 occurs on 3 islands. Table 2 shows the percentage of endemicity for each of the 5 islands, both for *Palistreptus* species and for *Ptycta* Enderlein species (and subspecies). Only Kaua'i, the oldest and most isolated island, has 100% endemicity (in the case of both genera). It is also the only island to have endemic species groups of *Palistreptus* (it has 2). The strait between Kaua'i and O'ahu is a boundary for 4 species groups of *Palistreptus* (Fig. 89); that between O'ahu and Moloka'i and that between Maui and Hawai'i for 1 each. Interisland straits within the Maui complex of islands (Moloka'i, Lāna'i, Maui, and Kaho'olawe) are represented in this study only by that between Moloka'i and Maui, the only 2 islands of the complex from which *Palistreptus* species are known. This strait does not form a boundary for any species group of *Palistreptus*.

A cladogram of species groups is provided in Fig. 90. The group with the most striking synapomorphies, the *montanus* group, is absent from Kaua'i, but is related to the *microvalvus* group—which occurs only on Kaua'i—by the unusually massive angular dorsal valve of the female gonapophyses. Together these groups form an assemblage of at least subgeneric rank (for which the name *Strepilaptus* is proposed) when considered in relation to the differences between *Palistreptus, Spilopsocus,* and *Kilauella*. I suggest that the *Strepilaptus* line, with apomorphic outer valve and subgenital plate in the female, dispersed from Kaua'i to the eastern islands, where the condition of the female subgenital plate became even more apomorphic, and that the barrier of the Kaua'i–O'ahu strait prevented a reinvasion of Kaua'i by the *montanus* group.

Within the other section of the genus (subgenus *Palistreptus*) (Fig. 90), the *heterothorax* group, with a number of apomorphies, is confined to Kaua'i, while its sister-group, the *nigriceps* group, occurs on both of the older, western islands, Kaua'i and O'ahu. Evidently, neither group has colonized the Maui complex or the young island of Hawai'i. These groups form a weak assemblage, having no unique synapomorphy. The sister-groups of this pair are the *swezeyi* and *inconstans* groups. Both occur on O'ahu and the Maui complex; the *swezeyi* group also occurs on Kaua'i, and the *inconstans* group also occurs on Hawai'i.

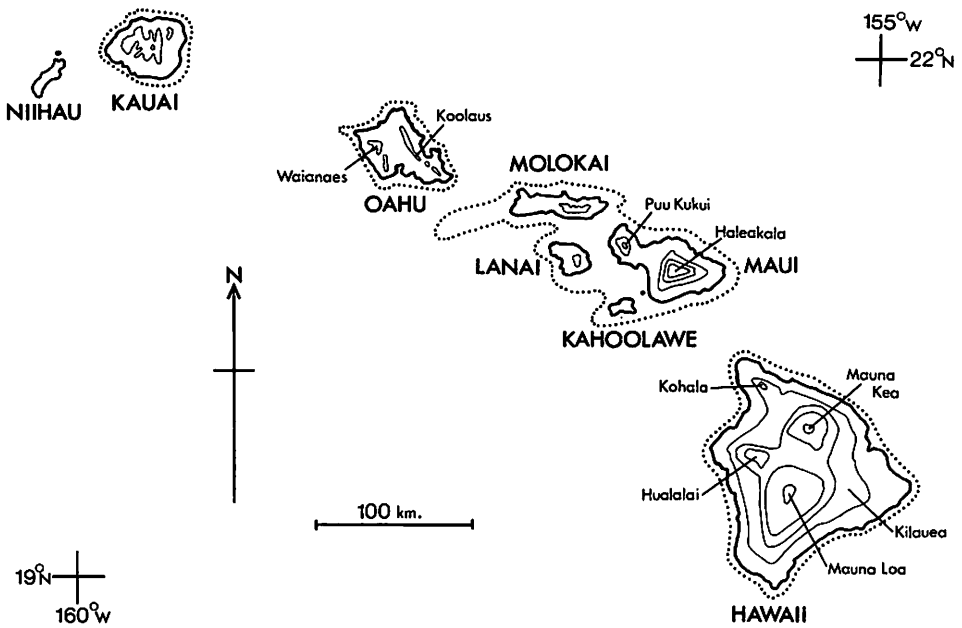


Fig. 88. Hawaiian Islands (main, or windward, group), showing main volcanoes. Contours at 300 m below sea level (dotted), 500 m, 1,600 m, 2,000 m, and 4,000 m elevation.

When one considers the general pattern of distribution and affinities of the genus *Palistreptus*, a parallel with the situation in the endemic *Ptycta* complex (Thornton 1984) can be seen (Fig. 89). The Kaua'i–O'ahu strait, the widest and deepest of the interisland channels, which was not exposed in Pleistocene glaciations, forms the major disjunction in archipelagic distributions of the species groups of both genera. However, there is a notable difference. Of the Hawaiian *Ptycta* taxa, Kaua'i carries only about one-sixth (11 spp.) and the Maui complex carries nearly half (27 spp.). In contrast, more than one-third of the *Palistreptus* species (8 of 20) occur on Kaua'i and less than one-third (6) on the Maui complex (Tables 1, 2). Only 3 species within 2 *Palistreptus* species groups have been found on Hawai'i, and one of these is confined to the oldest part of the island, the Kohala mountain massif (Fig. 88). Thus, the Maui complex does not appear to have been the site of a major burst of speciation for *Palistreptus* as it was for *Ptycta;* only 3 of the 20 *Palistreptus* species are endemic to the complex, whereas 15 species—23 taxa including subspecies—of *Ptycta* are endemic, more than one-third of the Hawaiian *Ptycta* species-group taxa. Nor does the island of Hawai'i appear to have been a center of endemism for *Palistreptus* (it carries only a single endemic species), as it was for *Ptycta* (7 endemic species, 11 endemic taxa including subspecies).

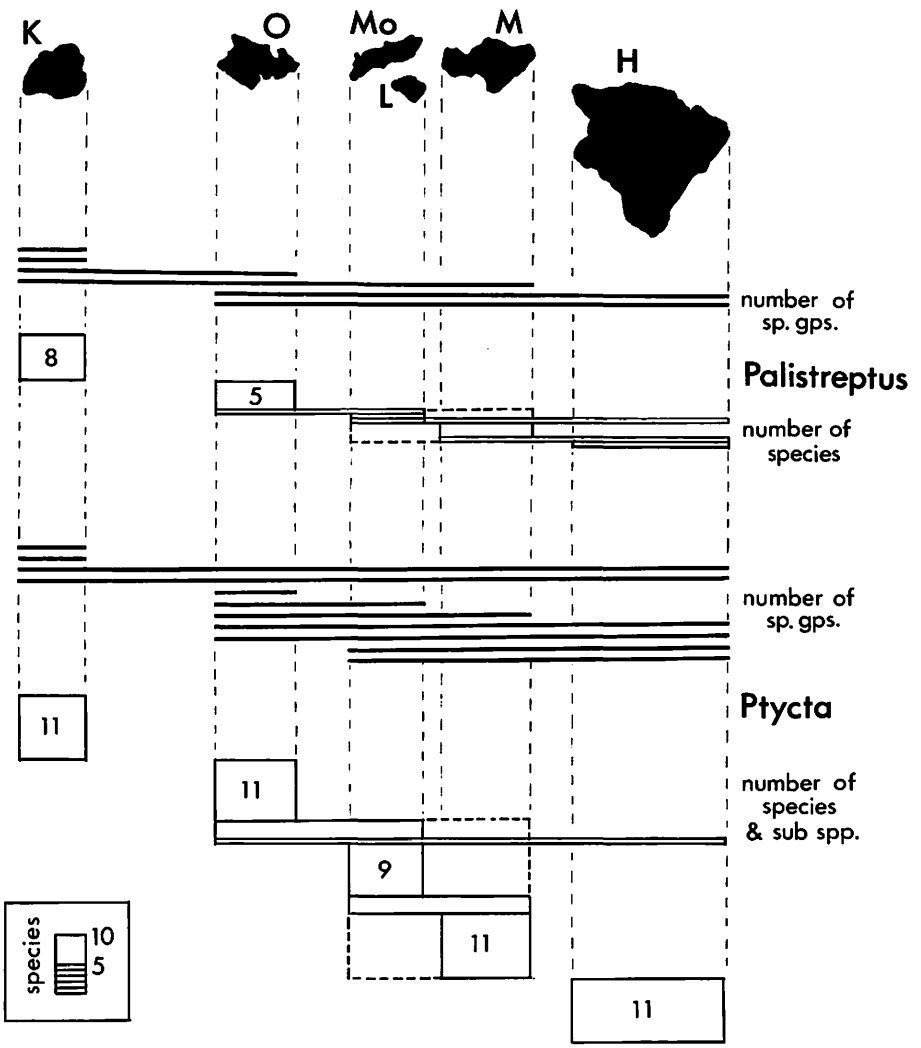


Fig. 89. Island distribution of species groups (each bold horizontal line represents one species group), and species and subspecies (height of rectangle represents number of species and subspecies, see inset), of *Palistreptus* and *Ptycta*. Bold dashed outline of rectangles indicates Maui complex of islands treated as a single island. K = Kaua'i; O = O'ahu; Mo = Moloka'i; L = Lāna'i; M = Maui; H = Hawai'i.

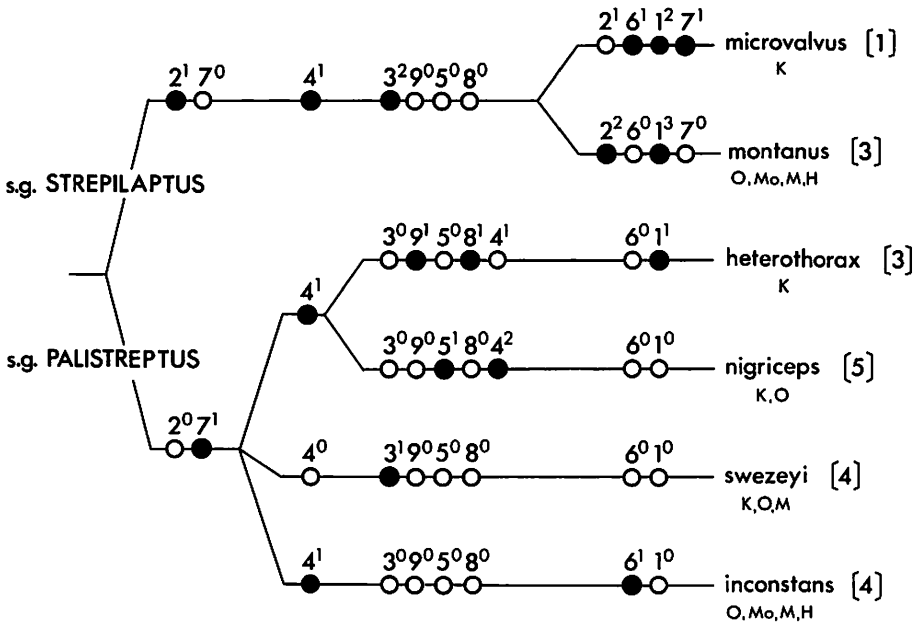


Fig. 90. Cladogram of 6 species groups comprising 20 species of *Palistreptus*, based on states of 9 characters. Character states as follows (plesiomorphic^0 to apomorphic): 1. ♀ outer valve fusiform (1^0); curved, outer edge emarginate (1^1); small, rounded (1^2); outer and posterior edges emarginate (1^3). 2. ♀ subgenital plate apical lobe short, broader than long, pointed (2^0); as broad as long (2^1); longer than broad (2^2). 3. ♀ dorsal valve long, narrow, apically rounded, tine on inner edge (3^0); massive, fleshy, tine on inner edge (3^1); massive, rectangular, tine on apical edge (3^2). 4. hypandrium not bilobed (4^0); shallowly bilobed (4^1); clearly bilobed, margin sclerotized (4^2). 5. forewing shape normal (5^0); forewing length: greatest width ≥ 3.10 (5^1). 6. transverse fascia in forewing absent or discontinuous (6^0); continuous (6^1). 7. outer cell spots in forewing discrete (7^0); spots merge with pigment lining veins (7^1). 8. thoracic terga dull (8^0); glossy (8^1). 9. Mesothoracic nota brown (9^0); pale (9^1).

Species of *Palistreptus* are much more strictly mountain insects than are those of *Ptycta*, a few of which occur also in the lowlands. This suggests that the different distribution patterns of the 2 endemic complexes may be the result of differing colonizing abilities, *Palistreptus* species generally having narrower ecological tolerances that may impede establishment. If colonization of *Palistreptus* has been retarded because of this, the younger islands east of O'ahu may not have been able to act as dynamic settings for evolution, as they did for *Ptycta*. The different patterns may also, of course, simply reflect a shorter history on the island group for *Palistrep-*

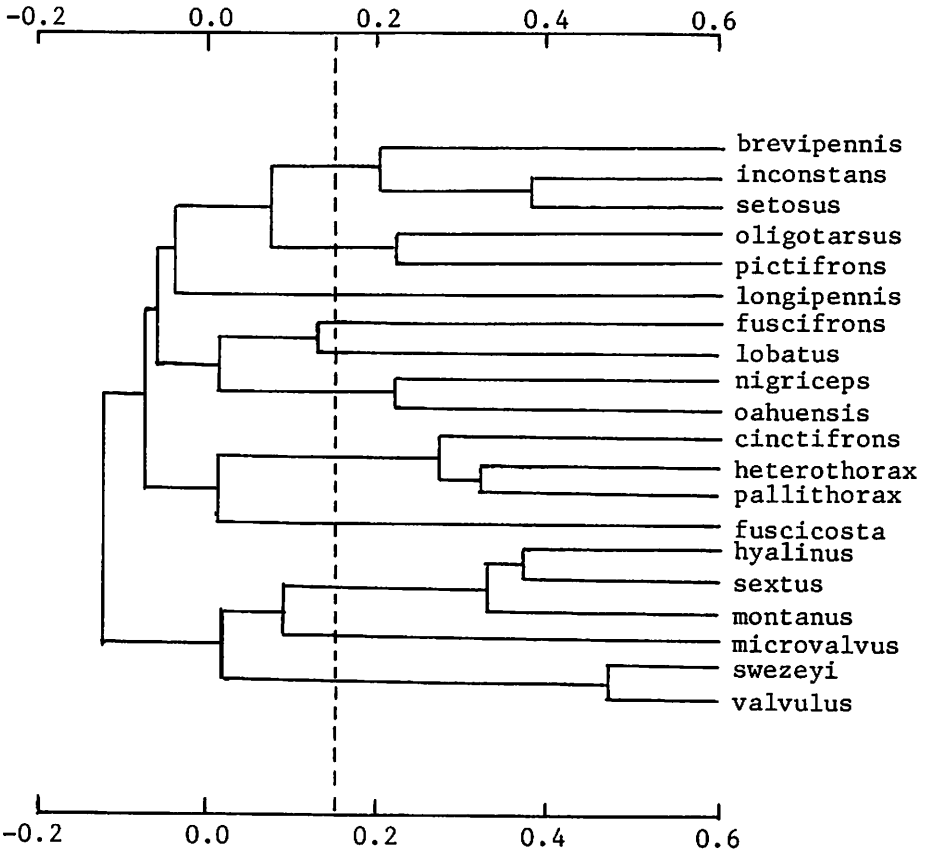


Fig. 91. Correlation phenogram of *Palistreptus* species (correlation coefficient, 76 characters, clustering by WPG, arithmetic averages).

tus, in spite of the fact that whereas *Ptycta* is not confined to the Hawaiian Islands, *Palistreptus* is an endemic genus.

A study of the 3rd and largest Hawaiian endemic complex of psocopterans, the endemic genus *Kilauella,* which is closely related to *Palistreptus,* is proceeding. This may have some bearing on the above hypothesis.

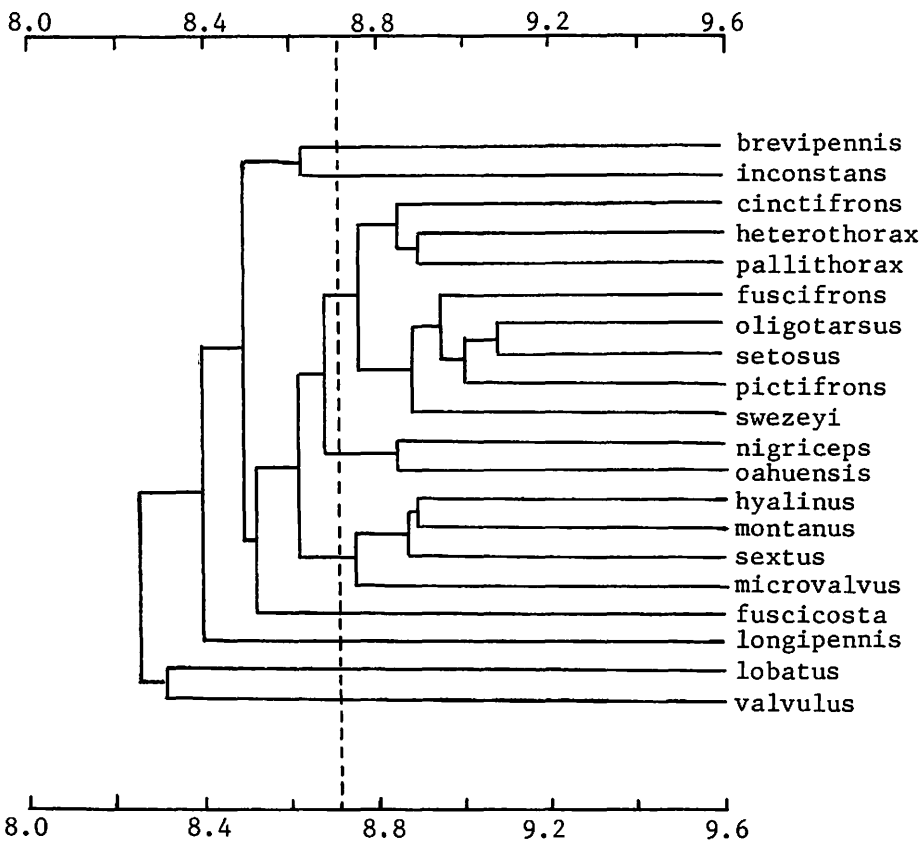


Fig. 92. Distance phenogram of *Palistreptus* species (distance coefficient, 76 characters, clustering by WPG, arithmetic averages).

Table 1. Distribution of *Palistreptus* species on the main Hawaiian Islands.

	Kaua'i	O'ahu	Moloka'i	Maui	Hawai'i
heterothorax group					
heterothorax	x				
cinctifrons	x				
pallithorax	x				
inconstans group					
inconstans				x(E)	x
brevipennis		x	x		
oligotarsus				x(E)	
pictifrons			x		
nigriceps group					
nigriceps	x				
fuscicosta		x			
fuscifrons	x				
longipennis		x			
oahuensis		x			
swezeyi group					
swezeyi		x			
lobatus	x				
setosus	x				
valvulus				x(E)	
microvalvus group					
microvalvus	x				
montanus group					
montanus			x	x(EW)	x(K)
hyalinus					x
sextus		x			

Note: E = East Maui; W = West Maui; K = Kohala massif of Hawai'i.

Table 2. Percentage endemicity of Hawaiian Islands for species (and subspecies) of *Palistreptus* and *Ptycta*.

	Kaua'i	O'ahu	Moloka'i	Lāna'i	Maui [Maui complex]	Hawai'i
Palistreptus						
Total species	8	6	3	0	4 [6]	3
Endemic species	8	5	1	0	2 [3]	1
% endemicity	100	83	33	0	50 [50]	33
Ptycta						
Total species	11	15	12(13)	6	16 [22(28)]	11(12)
Endemic species	11	10(11)	3(6)	0(2)	6(11) [15(23)]	8(11)
% endemicity	100	67(73)	25(46)	0(33)	38(69) [68(82)]	73(92)

Note: Figures in parentheses include subspecies where this increases the number of taxa.

Literature Cited

Chui, W. D. 1969. A study of the distribution and relationships of endemic complexes of Psocoptera in the Hawaiian Islands. Ph.D. thesis, University of Hong Kong.

Chui, W. D. & I.W.B. Thornton. 1972. A numerical taxonomic study of the endemic *Ptycta* species of the Hawaiian Islands (Psocoptera: Psocidae). Syst. Zool. 1:7–22.

Enderlein, G. 1913. Beiträge zur Kenntnis der Copeognathen. I. Zur Kenntnis der Copeognathen Hawaii. Zool. Anz. 41:354–58.

——. 1920. Die Copeognathen der Hawaii-Inseln. Zool. Jahrb. Abt. Syst. Geogr. Tiere 43:449–60.

Perkins, R.C.L. 1899. Neuroptera. p. 31–89. Fauna Hawaiiensis. Vol. 2 (2). Cambridge Univ. Press, Cambridge.

Roesler, R. 1944. Die Gattungen der Copeognathen. Stett. Entomol. Ztg. 105:117–66.

Smithers, C. N. 1964. Notes on the relationships of the genera of Elipsocidae (Psocoptera). Trans. R. Entomol. Soc. Lond. 116:211–24.

Thornton, I.W.B. 1981. The Psocoptera of the Hawaiian Islands. Parts I and II. Introduction and the nonendemic fauna. Pac. Insects 23:1–49.

——. 1984. Psocoptera of the Hawaiian Islands. Part III. The endemic *Ptycta* complex (Psocidae): Systematics, distribution, and evolution. Int. J. Entomol. 26:1–128.

——. 1985. The geographical and ecological distribution of arboreal Psocoptera. Ann. Rev. Entomol. 30:175–96.

Zimmerman, E. C. 1948. Corrodentia, p. 217–52. Insects of Hawaii. Vol. 6. Univ. of Hawaii Press, Honolulu.

APPENDIX I

Characters Used in Numerical Analysis, with Descriptions of State Codes

1. Coloration of 1 antennal segment, f_1: 1 = uniformly colored; 2 = darker at tip.
2. Color of f_1: 1 = pale brown; 2 = light brown; 3 = brown; 4 = dark brown.
3. Coloration of scape compared to basal portion of f_2: 1 = lighter; 2 = same color; 3 = darker.
4. Coloration of pedicel compared to basal portion of f_1: 1 = lighter; 2 = same color; 3 = darker.
5. Length of f_1 : length of f_2: 1 = 0.75–1.04; 2 = 1.05–1.32; 3 = 1.33–1.61.
6. Flagellum thickness of male compared to that of female: 1 = about the same; 2 = thicker.
7. Length of flagellum : length of hind tibia: 1 = 1.51–2.00; 2 = 2.01–2.50; 3 = 2.51–3.00; 4 = 3.01–3.50.
8. Color of maxillary palp: 1 = light brown; 2 = brown; 3 = dark brown.
9. I.O.:D of male: 1 = 2.60–3.00; 2 = 3.10–3.50; 3 = 3.60–4.00; 4 = 4.10–4.50; 5 = 4.60–5.00; 6 = 5.10–5.50.
10. I.O.:D of female: 1 = 2.60–3.00; 2 = 3.10–3.50; 3 = 3.60–4.00; 4 = 4.10–4.50; 5 = 4.60–5.00; 6 = 5.10–5.50.
11. Color of frons-vertex suture: 1 = pale brown; 2 = light brown; 3 = brown; 4 = dark brown.
12. Dark pigmentation posterior to frons-vertex suture: 1 = absent; 2 = present.
13. Transverse brown mark from eye to ocelli: 1 = absent; 2 = present.
14. Head surface: 1 = not shining; 2 = slightly shining; 3 = shining.
15. Ground color of head: 1 = cream; 2 = pale brown; 3 = light brown or brown; 4 = dark brown.
16. Frons median mark: 1 = absent; 2 = present.
17. Shape of lateral frons marks: 1 = indistinct; 2 = dot; 3 = streak; 4 = irregular.
18. Lateral frons marks distinct or fused with frons median mark: 1 = distinct; 2 = fused.
19. Lateral frons marks distinct or fused with vertex marks: 1 = distinct; 2 = fused.
20. Clypeal pattern: 1 = absent; 2 = present.
21. Type of clypeal pattern: 1 = striae only; 2 = anterior transverse band only; 3 = striae and anterior transverse band.
22. Genal pattern: 1 = absent; 2 = present.
23. Type of genal pattern: 1 = oblique stripe below eye; 2 = distal stripe below eye; 3 = both oblique and distal stripes.

24. Thoracic tergal surface: 1 = not shining; 2 = metathorax only faintly shining; 3 = metathorax and antedorsum of mesothorax slightly shining; 4 = both mesothorax and metathorax shining; 5 = all tergites polished.
25. Median cream band on thorax: 1 = same width on meso- and metathorax; 2 = narrower on metathorax; 3 = present only on mesothorax.
26. Color of antedorsum compared to lateral dorsal lobes of mesothorax: 1 = same; 2 = paler; 3 = antedorsum distinctly bicolored, darker anteriorly, paler posteriorly.
27. Coloration of dorsal lobes of mesothorax: 1 = uniform; 2 = lighter anteriorly.
28. Coloration of lateral dorsal lobes of metathorax: 1 = uniform; 2 = lighter anteriorly; 3 = lighter posteriorly.
29. General coloration of female: 1 = same as male; 2 = lighter than male; 3 = darker than male.
30. Forewing length of male : forewing length of female: 1 = below 0.90; 2 = above 0.90.
31. Forewing length : forewing width: 1 = 2.61–2.80; 2 = 2.81–3.00; 3 = 3.01–3.20.
32. Pterostigma length : pterostigma width: 1 = 2.61–2.90; 2 = 2.91–3.20; 3 = 3.21–3.50; 4 = 3.51–3.80.
33. In forewing, length of r_{2+3} : length of rs: 1 = 0.66–0.75; 2 = 0.76–0.85; 3 = 0.86–0.95; 4 = 0.96–1.00; 5 = 1.01–1.10.
34. Color of forewing costal cell: 1 = hyaline; 2 = pale brown basally; 3 = pale brown; 4 = light brown basally; 5 = light brown; 6 = brown.
35. Stigmasac of female: 1 = small and round; 2 = round; 3 = long and rectangular; 4 = angular.
36. Pigmented spots at base of setae within pterostigma: 1 = absent; 2 = present.
37. Pigment within pterostigma: 1 = absent; 2 = light orange; 3 = reddish brown.
38. Extent of pigmentation within pterostigma: 1 = fills cell; 2 = ⅔ fills; 3 = less than ⅔ fills.
39. Transverse fascia of forewing: 1 = much reduced; 2 = reduced; 3 = wide and broken; 4 = wide and complete.
40. Shape of pigmented spots of outer cells in forewing: 1 = rectangular; 2 = rectanguloid, rounded corners; 3 = oval or round.
41. Fusion of pigmented spots in outer cells of forewing: 1 = no fusion; 2 = in M_1, M_2, and M_3; 3 = in all M cells and R_5; 4 = in all M cells, R_5, and R_3.
42. Number of pigmented spots in R_1 of forewing: 1 = 1; 2 = 2; 3 = 2 fused; 4 = 3; 5 = 3 fused.
43. Two m + cu spots (forewing): 1 = distinct; 2 = touch; 3 = fused.
44. Extent of unpigmented boundary veins of areola postica of forewing: 1 = cu_{1b} only; 2 = cu_{1b} and part of cu_{1a}.
45. Number of pigmented spots in Ax of forewing: 1 = no pigmented spot; 2 = 1 proximal spot; 3 = 2 spots: 1 proximal, 1 distal; 4 = 3 spots: 1 proximal, 1 middle, 1 distal.

46. Coloration of hind wing M cell: 1 = hyaline or smoky; 2 = pale or light brown; 3 = brown.
47. Number of marginal setae of hind wing: 1 = 16–21; 2 = 22–27; 3 = 28–33.
48. Length of arc of R_3 : length of rs, in hind wing: 1 = 0.65–0.74; 2 = 0.75–0.84; 3 = 0.85–0.94.
49. Cell R_5 width in hind wing : width of hind wing: 1 = 0.20–0.23; 2 = 0.24–0.27.
50. Number of ctenidiobothria on t_1 of hind leg: 1 = 15–16; 2 = 17–18; 3 = 19–20; 4 = 21–22; 5 = 23–24.
51. Color pattern of hind tibia: 1 = 2 brown bands ill-defined; 2 = 1 subapical brown band; 3 = ill-defined subbasal, distinct subapical band; 4 = both bands distinct.
52. Abdominal pattern: 1 = no pattern, with dark brown granular pigment; 2 = with distinct pattern.
53. Presence of transverse bands in abdominal pattern: 1 = absent; 2 = present.
54. Transverse bands in abdominal pattern: 1 = dark brown dorsally, ventrally cream; 2 = dark brown both dorsally and ventrally.
55. Presence of longitudinal bands in abdominal pattern: 1 = absent; 2 = present.
56. Longitudinal bands in abdominal pattern: 1 = incomplete laterals; 2 = complete laterals; 3 = dorsal median and incomplete laterals; 4 = dorsal wide median and complete laterals.
57. Forewing length of female: 1 = 6.60–7.50; 2 = 7.60–8.50; 3 = 8.60–9.50; 4 = 9.60–10.50; 5 = 10.60–11.50; 6 = 11.60–12.50.
58. Length : width of male epiproct: 1 = 0.26–0.40; 2 = 0.41–0.55; 3 = 0.56–0.70; 4 = 0.71–0.85.
59. Number of trichobothria on paraproct of male: 1 = 24–28; 2 = 29–33; 3 = 34–38.
60. Ciliation of hypandrium: 1 = setae of similar length; 2 = with 1 pair longer; 3 = with 2 pairs longer; 4 = with in addition pointed tubercles.
61. Length : width of female epiproct: 1 = 0.44–0.55; 2 = 0.56–0.67; 3 = 0.68–0.79; 4 = 0.80–0.91.
62. Number of trichobothria on paraproct of female: 1 = 23–28; 2 = 29–34; 3 = 35–40; 4 = 41–46.
63. Sculpturing pattern of female 9th tergite: 1 = absent; 2 = ill-defined; 3 = quite well-defined; 4 = distinct.
64. Lobe of outer valve of female gonapophyses: 1 = absent; 2 = present.
65. Lateral lobe of outer valve (relative to rest of valve): 1 = small; 2 = large.
66. Shape of outer valve: 1 = small and round; 2 = large and lobate; 3 = elongate.
67. Number of mesial marginal setae of outer valve: 1 = 2–4; 2 = 4–6; 3 = 6–8; 4 = 8 or more.
68. Length : width of dorsal valve of female gonapophyses: 1 = 1.60–2.00; 2 = 2.10–2.50; 3 = 2.60–3.00; 4 = 3.10–3.50; 5 = 3.60–4.00.
69. Lobe of dorsal valve: 1 = absent; 2 = present.
70. Position of apophysis of dorsal valve: 1 = apical or slightly subapical; 2 = lateral.

71. Sclerotization (as rods or spines) above base of apophysis of dorsal valve: 1 = no sclerotization; 2 = as rods; 3 = as spines and tubercles.
72. Length of dorsal valve : length of apophysis of dorsal valve: 1 = 3.00–6.00; 2 = 7.00–10.00; 3 = 11.00–14.00.
73. Presence of distinct subapical lobe on ventral valve of female gonapophyses: 1 = absent, no widening; 2 = absent, some widening; 3 = present.
74. Shape of apical lobe of female subgenital plate: 1 = fairly flattened or rounded; 2 = bilobed slightly; 3 = narrow and elongate.
75. Number of apical setae of female subgenital plate: 1 = 2–4; 2 = 3; 3 = 4; 4 = 4–6.
76. Distribution of subapical row of long setae on female subgenital plate: 1 = long median pair only; 2 = long median pair, shorter ones each side; 3 = long median pair, mixed sizes each side; 4 = long median 4, shorter ones each side; 5 = long median 4, 2 longer ones on one side; 6 = 9 of even length.