A New Genus of Hump-backed Psocids from Mexico and Southwestern United States (Psocoptera: Psocidae)[1]

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Resumen

El nuevo género *Camelopsocus* de la Familia Psocidae (Orden Psocoptera) se describe, con dos especies nuevas: *C. monticolus* y *C. similis.* Distintivo del género es una giba dorsal del abdomen, más grande en la hembra. Las dos especies tienen dimorfismo de las alas: las hembras con alas reducidas a escamas pequeñas, y los machos con alas largas. El género *Camelopsocus* está cerca de los géneros *Maheela, Ptycta* y *Oreopsocus.*

Un ejemplo de evolución convergente se muestra entre *Camelopsocus* y la forma africana *Mesopsocus dromedarius* Ball.

Abstract

The new forms described below were taken in the course of extensive collecting of Psocoptera in Mexico and southwestern United States. They belong to the family Psocidae, subfamily Psocinae, as defined by Badonnel (1943). Because of their unique features of body shape and male genitalia, they do not fit into any of the known genera of the subfamily; therefore, I regard the two species as representing a new genus.

Genus **Camelopsocus,** new genus

Female: micropterous; abdomen raised in middle segments into a conspicuous hump (fig. 1). Antenna longer than body, its flagellum slender throughout. Subgenital plate with a short distal process rounded apically; pigmented area Y —shaped, the arms directed antero— laterally. Genapophyses (fig. 11): external valve (lateral gonapophysis) with conspicuous distal lobe; dorsal and ventral valves both terminating in a long, slender process.

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Male: Macroptercus; abdomen more cylindrical than in female, the hump represented primarily by a tubercle (fig. 2). Antenna as in female. Wings with typical venation of the family (anterior wing, fig. 7). Pterostigma long, shallow, only slightly constricted basally, subtented nearly its entire length by a *stigmasaum*. Rs and M joined a short distance in forewing; medio-cubital segment of roof of areola postica long. Ciliation apparently lacking on wings. Hypandrium with a central sclerotized strap running from base to apex and bending leftward at apex. Phallosome with parameres fused into a long, anteriorly-directed rod, the rod longer than remainder of phallosome.

Type species: **Camelopsocus monticolus,** new species

Camelopsocus monticolus, new species

Diagnosis: Differing from *C. similis* n. sp. as follows: (1) shape of phallosome (fig. 3 vs. fig. 4), with apical process shorter and sides of frame not as heavily sclerotized; (2) shape and pigmentation of hypandrium (fig. 5 vs. fig. 6), this species having central strap joined directly to pigmented basal portion; (3) shape of sclerotized rim of epiproct (fig. 8 vs. fig. 9) it being longer and narrower in this species; (4) shape of pigmented area of female subgenital plate (fig. 12 vs. fig. 13), the arms being longer and somewhat back-curved apically in this species; (5) Internal valve (dorsal gonapophysis) with its apical process straight and acuminately pointed (fig. 10); the process curved and terminating in several tiny denticles in *C. similis* (fig. 11).

Female: Measurements: Table I.

Morphology: Median ocellus absent, laterals vestigial; epicranial suture ending, without branching, posterior to ocellar region. Compound eyes small (table I), set anteriorly. Terminal segment of maxillary palpus about 2.5 times as long as wide. Anterior winglets a pair of tiny scales, in length equal to about half width of mesonotum. Posterior winglets a pair of cuticular folds, much shorter than anteriors. Posterior first tarsal segment lacking ctenidia. Genitalia as described for the genus and in diagnosis above. Field of seven trichobothria on each paraproct.

Color (in alcohol one year): Ground color white, marked with chocolate brown. Compound eyes white, underlain by dark pigment. Antennae

brown except first three segments white blotched with brown. Maxillary palpi with first two segments white, third with brown basal ring, fourth brown but fading on anterior surface. Vertex white, marked with brown dashes and dots converging on compound eyes and paralleling posterior margin and epicranial suture. Clypeus with several parallel series of broken brown lines running dorso-ventrally. Each thoracic tergum with pair of large brown lateral spots. Pronotum with median transverse brown spot. Meso and metanotum each with pair of irregular brown blotches bordering mid-line. Winglets brown, bordered in white. Each winglet subtented by a brown blotch. A brown spot above, but separated from each coxal base. Coxae brown basally and laterally, white medially except at base. Femora brown above, white below, but ringed with brown basally and medially. Tibia pale gray with brown basal and brown subapical spot. Tarsi brown. Abdomen white ventrally, irregularly blotched with brown dorsally. The brown areas shagreened.

Male (described from single specimen):

Measurements: Table I.

Morphology: Head small; ocelli large and conspicuous. Compound eyes small but prominent (ratios, table I), placed anteriorly, as in female, and very slightly stalked. Antennae as in female. Terminal segment of maxillary palpus slightly more slender than in female. Wing venation as described for the genus. Posterior first tarsal segment with 15 and 17 ctenidia. Genitalia as described for the genus and in diagnosis. Epiproct (fig. 8) with sclerotized rim roughly diamond-shaped, bearing field of small tubercles on apex of dorsal lobe. Paraproct with field of 14 trichobothria.

Color (in alcohol one year): Comparable parts same as in female except thoracic pleura more extensively brown. Pterothoracic tergal lobes brown, outlined in white. Wings unmarked except for brown pterostigma with darker brown band running its length medially, brown *stigmasaum* for about basal three-fourths of its length, continuing in white to wing apex, and brown anal cell in forewing.

Variation: The females from Durango, Mexico, have a solidly brown terminal segment of the maxillary palpus, while those from Catron County, New Mexico have the brown fading to dirty white on the anterior (dorsal) surface. One of the Durango females has the entire inner surface of each

tibia brown, whereas this is principally pale gray on the New Mexican specimens; the other Durango female is intermediate in this character. In the Durango females, the apical tubercle of the hump is not as high as in the females from New Mexico.

Nymphs: These are essentially miniature adults in color and shape. Late instar male nymphs have the wing pads extensively brown, with the radial stem and pterostigma of the forewing white. Late instar female nymphs have the hump larger than in late instar males.

Type locality: Catron County, New Mexico, one mile northwest of junction of Highways 180 and 12, July 6, 1963, 1 ♂ (holotype, reared from nymph), 1 ♀ (allotype, reared from nymph), 1 ♀ (paratype), and 22 nymps, on small-leaved scrub oak; 7 nymphs on pines and junipers; coll.: E.L. Mockford and F. Hill. The types are in my collection.

Other records: UNITED STATES: Arizona: 44 miles north of Tucson on Highway 80, December 6, 1962, 2 nymphs, beating solanaceous herb bearing dead leaves, coll.: E.L. Mockford. Colorado: Pingree Park, August 20, 1924, 1 nymph, coll: C.R. Crosby. MEXICO: Durango: 24 miles west of Durango City on Highway 40, July 16, 1963, 2 ♀, 4 nymphs, beating pines, coll.: E.L. Mockford and F. Hill.

Camelopsocus similis, new species

Diagnosis: See diagnosis of *C. monticolus*.

Female: Measurements: Table I.

Morphology: Median ocellus absent, laterals represented by pair of tiny brown spots. Epicranial suture ending, without branching, immediately posterior to ocellar region. Compound eyes small (table I and fig. 1), set anteriorly. Terminal segment of maxillary palpus shorter and broader than in *C. monticolus*, about 2.3 times as long as wide. Winglets developed as in *C. monticolus*. Posterior tarsus lacking ctenidia. Genitalia as described for the genus and in diagnosis of preceding species. Field of 7 trichobothria on each paraproct.

Color (in alcohol one year): Essentially same as in *C. monticolus*, differing as follows: fourth antennal (second flagellar) segment white blotched with brown. Fourth segment of maxillary palpus with white spot on anterior (dorsal) surface. Regions of large muscle attachments

of vertex subtended by brown smudges. Brown lines of clypeus tending to converge somewhat toward mid-line. Pair of brown spots on metathoracic tergum paler centrally than peripherally. Mesothoracic winglets with one or two brown lines continuing, with or without breaks, to tip of winglet; otherwise white. Metathoracic winglet white. First tarsal segment mostly white dorsally.

Male: Measurements: Table I.

Morphology: Head essentially same as described for *C. monticolus*. Ratios for compound eyes in table I. Terminal segment of maxillary palpus somewhat more slender than in female. Wing venation as described for the genus. Posterior first tarsal segment with 16-17 ctenidia. Genitalia as described for the genus and in diagnosis. Sclerotized rim of epiproct (fig. 9) short and wide, widest anterior to its middle, with small tubercles along apical edge of its dorsal lobe. Paraproct with field of 23-25 trichobothria.

Color (in alcohol one year): Comparable parts similar to those of female, except compound eyes gray, antennae entirely brown, second and third segments of maxillary palpi largely brown, thoracic pleura more extensively brown, and first tarsal segments completely brown. Wings unmarked except for, in forewing, brown cloud covering most of costal cell, and extending below R_1 in region of branching of Rs; brown pterostigma, brown *stigmasaum* for about its basal two-thirds, then continuing in white nearly to wing margin, and brown anal cell.

Variation: Females from the State of Mexico show almost no brown marks on the clypeus and have gray eyes. The latter is probably a result of their having been in alcohol a year longer.

Nymphs: The remarks on nymphs of *C. monticolus* apply equally to this species. Nymphs of an early instar, probably second or third, are on hand and these show the abdominal hump, though represented mostly by the apical tubercle.

Type locality: Durango, Mexico: 24 miles west of Durango City on Highway 40, July 16, 1963, beating oaks and small ericaceous shrubs, 1 ♂ (holotype), 1 ♀ (allotype), 6 ♀ (paratypes), and 12 nymphs; coll.: E.L. Mockford and F. Hill. The types are in my collection.

Other records: MEXICO: Mexico State: approximately one mile west of Continental Divide on Highway 136 (el. approx. 10,000 feet),

July 3, 1962, beating broad-leaved shrubs, 2♂, 8♀, 18 nymphs, coll.: E.L. Mockford and F. Hill.

Discussion: In structure of male genitalia, *Camelopsocus* shows similarity with *Hyalopsocus* Roesler (1954), subgenus *Loensia* of the genus *Trichadenotecnum* Enderlein (as defined by Roesler, 1944), *Ptycta* Enderlein (1925), *Maheela* Enderlein (1931), *Oreopsocus* Roesler (1939), the *Psocus bisignatus* group, and *Psocus pollutus* Banks; all of these having the hypandrium with a central, incurved strap. It resembles *Hyalopsocus, Ptycta, Maheela, Oreopsocus, Psocidus badonneli* Roesler (=*Psocus multipunctatus* Badonnel, 1932), and *Psocidus tikalus* Mockford (1957) in having the parameres joined to form an extended piece at the anterior end of the phallic frame. It resembles *Maheela, Ptycta, Oreopsocus,* and *Psocidus badonneli* in that the parameres are extended into a point posteriorly. In female genitalia, *Camelopsocus* resembles most closely *Ptycta, Maheela, Oreopsocus, Clematostigma,* and subgenus *Loensia* in that the subgenital plate terminates in a broad, rounded process, the internal and ventral valves terminate in slender processes, and the principal setae of the external valve form more or less a row. The resemblance of the gonapophyses to those of *Oreopsocus* is striking, the internal valve being about identical in shape and spination, and the external valve bearing a long distal lobe in both genera. The pigmentation pattern of the subgenital plate strongly resembles those of *Ptycta, Maheela,* and the *Psocus bisignatus* group.

It would appear that *Camelopsocus, Maheela, Ptycta, Oreopsocus,* and the *Psocus bisignatus* group form a generic complex characterized by the genitalic features discussed above and by absence or near absence of markings on the wings. This complex stands close to *Psocus s. str.* and *Hyalopsocus,* which are specialized by enlargement of the external valve and having a longer, more slender distal process on the subgenital plate. Some character overlap with the subgenus *Loensia* relates this complex to the genus *Trichadenotecnum* (as defined by Roesler, 1944). *Clematostigma* probably stands close to this complex, although absence of knowledge of the male genitalia makes its relationships difficult to establish.

Dorsal abdominal processes are known in two families of Psocoptera-Psocidae and Mesopsocidae. In the Mesopsocidae, a high abdomen bearing one dorsal process is known in one species of *Mesopsocus, M. dromedarius* Ball (1937) of Morocco, while the unique species of the genus

Hexacyrtoma, H. capensis Enderlein (1908) of South Africa shows a series of six dorsal abdominal tubercles, one on each of the first six abdominal terga.

It seems likely that the high, tubercle-bearing abdomen has arisen three separate times-once in *Camelopsocus,* once in *Mesopsocus,* and once in *Hexacyrtoma,* yet the three forms show a number of features in common. The females of all are nearly or completely wingless. Coloration is similar, and the compound eyes are small.

In addition to the resemblances shown by all three forms, *Camelopsocus* and *Mesopsocus dromedarius* show a number of other similarities. Shape of the abdomen is about the same with the apical tubercle of the hump in the same position and the hump being developed to a considerably greater extent in the female than in the male. The wing dimorphism is almost exactly the same in *Camelopsocus* as in *M. dromedarius* and the majority of *Mesopsocus* species. The pterostigma of the male forewing is of about the same shape, indicating a rather marked departure for *Camelopsocus* from the usual rather deep pterostigma of the Psocidae. The bend of the medial vein before joining Cu_{1a} in the forewing of *Camelopsocus* is reminiscent of that of the same position in *Mesopsocus.*

The shape and color of females of both *Camelopsocus* and of *Mesopsocus dromedarius* probably give them the appearance of small thorns or the swellings below leaf scars on the shrubs on which they live. Most of the similarities between females of *Camelopsocus* and *M. dromedarius* probably are related to this resemblance within the ecological niche occupied. The presence of well-developed wings would doubtless detract from such a resemblance. The similarities between males, as far as color is concerned probably represent a protective resemblance to the surrounding environment. The presence of a small hump in the males, covered by the wings, may be only a matter of its being genetically carried along in this sex. The wing venational similarities between *Camelopsocus* and *M. dromedarius* are much more difficult to explain, and at present I have no solution to suggest.

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TABLE I

[1] For measurements greater than 3 mm, micrometer unit = 0.0093 mm; for measurements from 0.49 — 1.5 mm, micrometer unit = 0.0058 mm; for measurements less than 0.49 mm, and for measurements used to calculate I0/D and P0, micrometer unit = 0.0037 mm.

[2] N.M. = New Mexico locality; D = Durango locality; M = Mexico State locality.

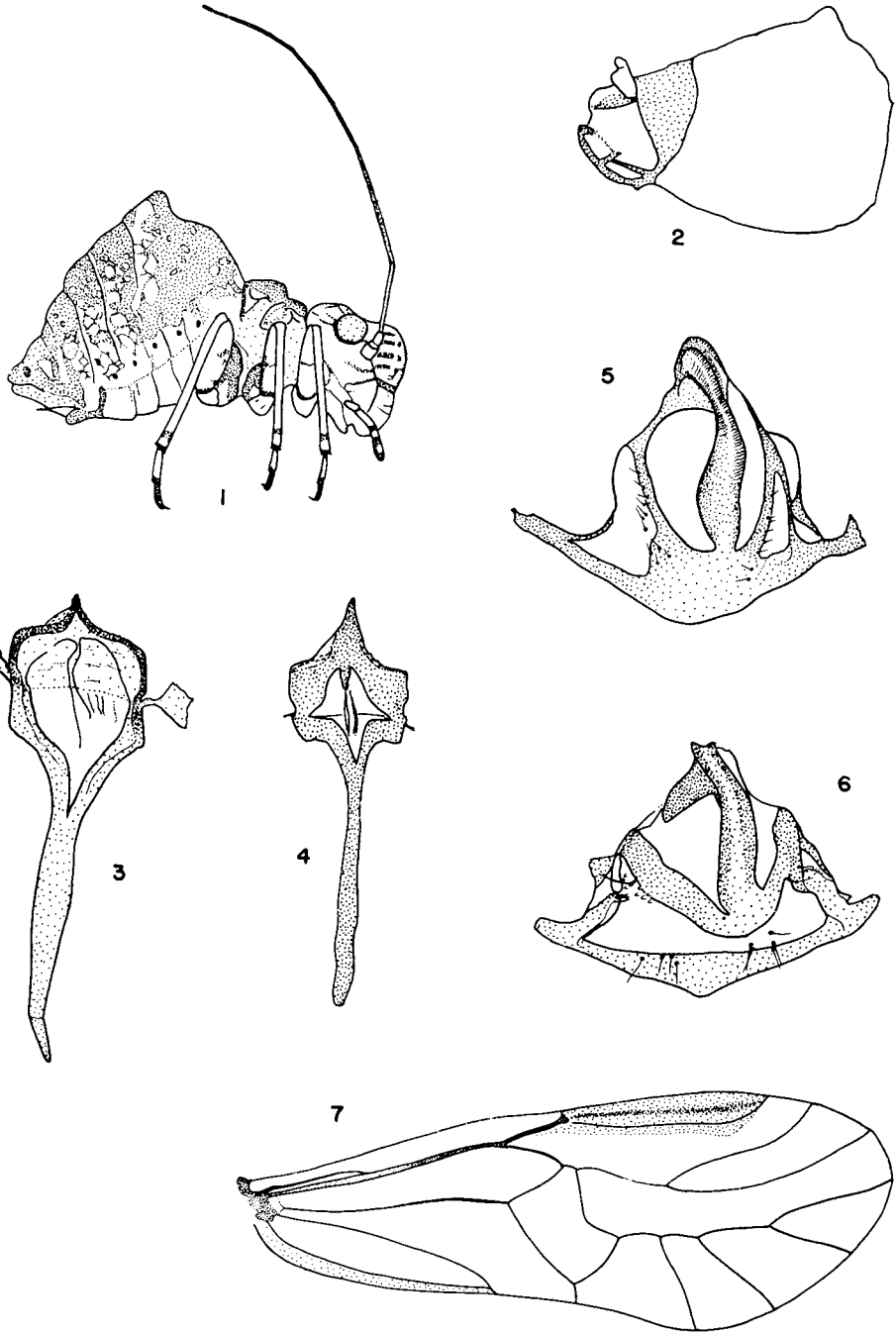
[3] I0/D = distance between compound eyes at their anterior end divided by antero-posterior diameter of compound eye; P0 = transverse width of compound eye divided by antero-posterior diameter of compound eye.

TABLE 1

MEASUREMENTS [1] (IN MILLIMETERS) AND RATIOS FOR TWO SPECIES OF *CAMELOPSOCUS*

	Forewing length	Hindwing length	Hind Tibial length	Hind Tarsal Segment 1	Hind Tarsal Segment 2	Antennal length	Flagellar Segment 1	Flagellar Segment 2	I0/D3	PO
C. monticolus ♂	4.111	3.088	1.247	0.312	0.144	3.869	0.626	0.702	1.96	0.78
♀ N.M.[2]	0.226	——	1.334	0.396	0.185	3.543	0.632	0.597	2.44	0.68
♀ N.M.	0.263	——	1.485	0.440	0.192	4.092	0.713	0.679	2.46	0.82
♀ D.	0.266	——	1.351	0.426	0.178	3.934	0.673	0.632	2.34	0.69
♀ D.	0.278	——	1.363	0.433	0.170	3.971	0.702	0.632	2.22	0.73
C. similis ♂ *D.*	4.111	2.976	1.224	0.337	0.155	3.664	0.563	0.580	2.00	0.72
♂ M.	4.762	3.506	1.212	0.352	0.178	3.841	0.667	0.626	2.05	0.71
♂ M.	4.697	3.506	1.293	0.366	0.174	3.887	0.673	0.638	2.00	0.71
♀ M.:										
No. Measured	8	——	8	8	8	8	8	8	8	8
Minimum	0.285	——	1.067	0.281	0.159	3.134	0.522	0.493	2.23	0.65
Maximum	0.355	——	1.137	0.300	0.181	3.571	0.592	0.551	2.52	0.77
Mean	0.317	——	1.106	0.290	0.173	3.296	0.567	0.529	2.36	0.68
Standard Dev.	0.021	——	0.025	0.007	0.007	0.141	0.026	0.021	——	——
♀ D.:										
No. Measured	7	——	7	7	7	7	7	7	7	7
Minimum	0.237	——	1.015	0.278	0.155	3.274	0.493	0.522	2.27	0.64
Maximum	0.301	——	1.143	0.307	0.174	3.683	0.609	0.603	2.50	0.77
Mean	0.268	——	1.098	0.294	0.167	3.449	0.546	0.552	2.35	0.69
Standard Dev.	0.025	——	0.042	0.011	0.006	0.153	0.035	0.030	——	——

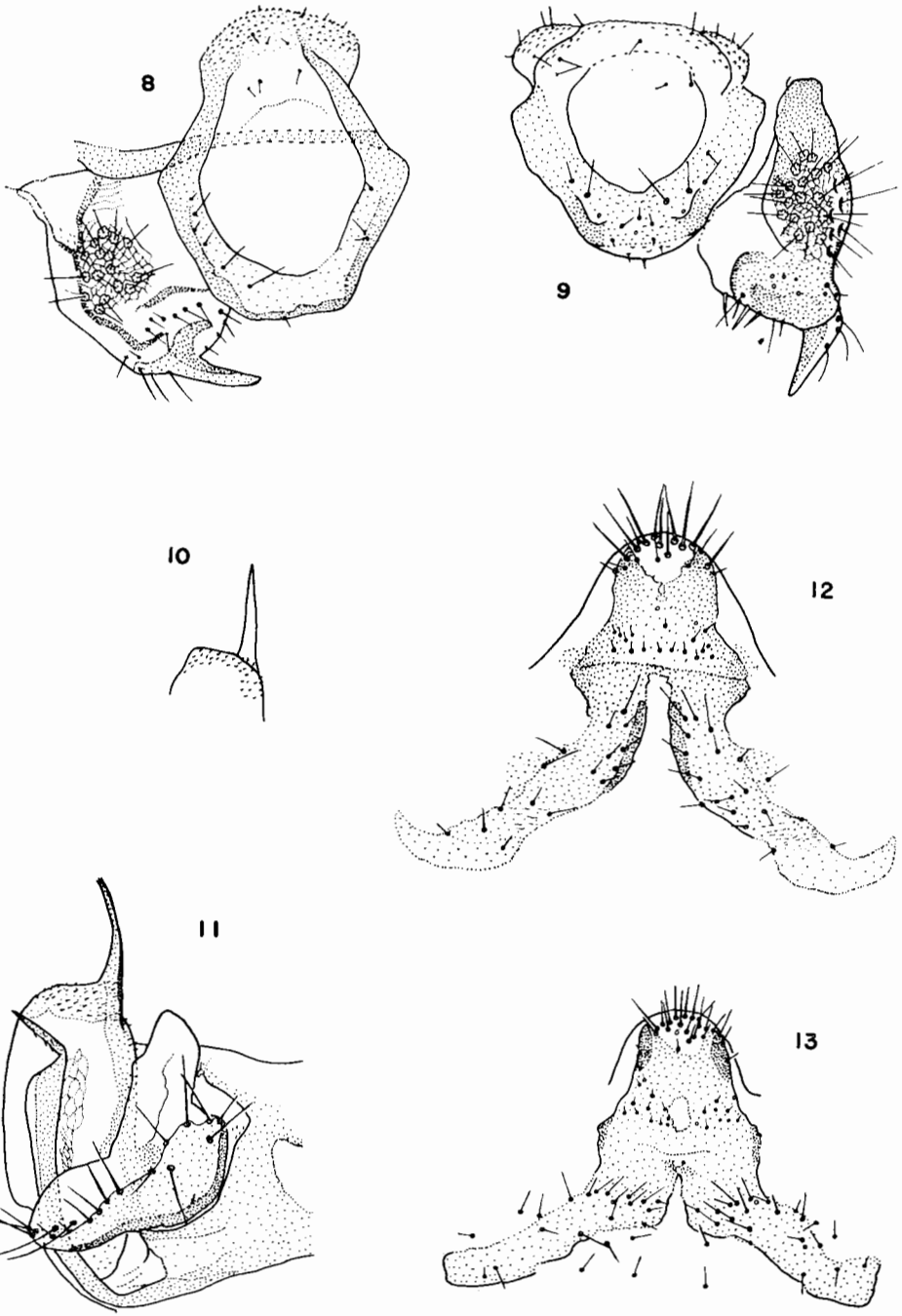
Plate I.



Camelopsocus similis n. sp., Fig. 1. Female, lateral view, Fig. 2. male abdomen, lateral view, Fig. 4. Phallosome, Fig. 6. Hypandrium, Fig. 7. male forewing.

Camelopsocus monticolus n. sp., Fig. 3. Phallosome, Fig. 5. Hypandrium.

Plate II.



Camelopsocus monticolus n. sp., Fig. 8. Male epiproct and left paraproct. Fig. 10. Apex of internal valve. Fig. 12. Subgenital plate.

Camelopsocus similis n. sp., Fig. 9. Male epiproct and right paraproct. Fig. 11. Gonapophyses. Fig. 13. Subgenital plate.