

**A NEW SPECIES OF *HETEROMURUS (ALLOSCOPUS)* FROM
PAPUA NEW GUINEA AND DESCRIPTIVE NOTES FOR
THE OTHER SPECIES OF THE SUBGENUS
(COLLEMBOLA: ENTOMOBRYIDAE: ORCHESELLINAE)**

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Abstract. The new species *Heteromurus (Alloscopus) multispinatus* is described from specimens collected in Papua New Guinea. Complementary notes to previous descriptions of *H. (A.) tetracanthus* and *H. (A.) tenuicornis* are included; these are based on specimens from Micronesia, Samoa, and Australia (Queensland). Also included is a key to the species of the subgenus *Alloscopus* and a description of a specimen (tentatively identified as *H. (A.)* cf. *strebeli*) from an Ecuadorean cave that, excluding the Galapagos Islands, represents the first record of Collembola from Ecuador. A peculiar postantennal structure was found in the new species.

Through the courtesy of Ms Penelope Greenslade, South Australian Museum, Adelaide, I have received 6 specimens of *Heteromurus (Alloscopus)* from Papua New Guinea, Samoa, and Australia (Queensland). Material from the latter localities belongs to *H. (A.) tetracanthus* but that from Papua New Guinea represents a new species, *H. (A.) multispinatus*, distinguished by the large number of dental spines present in these individuals.

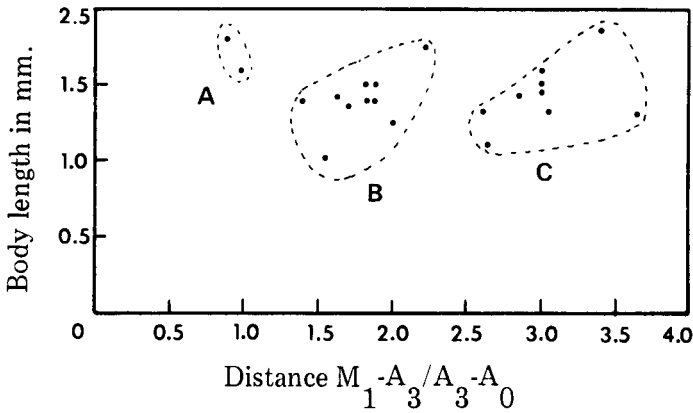
The correct identification of the aforementioned material was facilitated by comparisons with *H. (A.) tetracanthus* and *H. (A.) tenuicornis* obtained during the Insects of Micronesia survey. Such comparisons led to the discovery of additional differences between these 2 species and have allowed me to clarify or correct some details of their previous descriptions (e.g., Mari Mutt 1978).

Dr Kenneth A. Christiansen, Grinnell College, Iowa (USA), has kindly forwarded a springtail collected in a cave in Ecuador. It represents the first record of Collembola from that country (Galapagos Is excluded) and may belong to *Alloscopus strebeli* Winter, 1966, a species described from Peru that Mari Mutt (1978) transferred to *Indoscopus* Prabhoo. The specimen is described below and its probable identity with *I. strebeli* is discussed.

Morphological abbreviations used throughout this paper are as follows: Ant. 1, Th. 1, Abd. 1, etc. = 1st antennal segment, 1st thoracic segment, 1st abdominal segment, etc.

The lack of macrochaetae on the posterior ½ of the head, number and arrangement of the S group of setae, and the chaetotaxy of Abd. 1-Abd. 4 are shared by all the members of the subgenus. The latter features are illustrated only for *H. (A.) multispinatus*.

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H. (A.) tetracanthus

Specimen	1	2	3	4	5	6	7	8	9	10
Body length in mm.	1.0	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.8
Distance $M_1 - A_3 / A_3 - A_0$	1.6	2.0	1.4	1.6	1.7	1.9	1.9	1.8	1.8	2.2

H. (A.) tenuicornis

Specimen	1	2	3	4	5	6	7	8	9
Body length in mm.	1.1	1.3	1.3	1.3	1.4	1.5	1.5	1.6	1.9
Distance $M_1 - A_3 / A_3 - A_0$	2.6	2.6	3.0	3.6	2.8	3.0	3.0	3.0	3.4

FIG. 1. Relationship between the length of the body (including head) and the distance between head macrochaetae M_1 and A_3 divided by the distance between setae A_3 and A_0 (see Fig. 2 for the position of these setae). **A**, *H. (A.) multispinatus*; **B**, *H. (A.) tetracanthus*; **C**, *H. (A.) tenuicornis*. Values for *H. (A.) multispinatus* ($n = 2$) are body length, 1.6 and 1.8 mm and ratio, 0.97 and 0.88.

The Micronesian specimens were collected under the auspices of the Pacific Science Board and are administered by the Bishop Museum. These specimens are deposited as follows: Bernice P. Bishop Museum (BISHOP), Field Museum (FM), J. A. Mari Mutt Collection (JAMM), and U.S. National Museum of Natural History (USNM). The specimens submitted by Ms Greenslade are at the Division of Entomology, South Australian Museum, Adelaide (SAM), the remaining specimens are in my collection (JAMM).

Heteromurus (Alloscopus) multispinatus Mari Mutt, new species Fig. 2-17

Length to 1.8 mm. Totally unpigmented. Scales absent from Ant. 4, Ant. 5, dorsum of furcula, and prothoracic tibiotarsi; 2 and 12 scales found, respectively, on meso- and meta-thoracic tibiotarsus of largest specimen. Antennae $0.5\times$ length of head and body combined, ratio of segment 1-5 as 7:20:34:64:55. Ant. 4 and Ant. 5 conspicuously annulated, apex of Ant. 5 without pin seta but with an apically hooked seta and a small bulblike sensilla (Fig. 8). Eyes 1 + 1, a conspicuous postantennal structure (see comments) in front of each eye (Fig. 14-17). Inner pair of labral papillae as in *H. (A.) tetracanthus* (Fig. 25), outer pair not discernible in either specimen at hand. Chaetotaxy of labial triangle as in Fig. 11; 2 small sockets behind posterior row may represent insertions of scales. Differentiated seta of outer labial papilla as in Fig. 6. Setae of postlabial quadrangle (Fig. 12) and most other setae on venter of head smooth. Head macrochaetotaxy as in Fig. 2, distance of $M_1-A_3/A_3-A_0 \cong 0.9$ ($n = 2$, see Fig. 1). Trochanteral organ as in Fig. 13. Tibiotarsi without rows of smooth setae. Unguis (Fig. 9, 10) with a pair of large basal teeth. Unguiculus with a large outer tooth. Tenent hair slender and lanceolate. Body macrochaetotaxy as in Fig. 4. Dorsum of manubrium with 2 erect smooth setae (Fig. 5), a similar seta on proximal portion of each dens. Dens with 2 rows of spines; 1 specimen with 27 spines on each dens (Fig. 7), other with 33 spines on one dens and 39 on other. Mucro with 2 teeth but no basal spine.

Holotype: PNG: NEW GUINEA (SE): Muller Plateau, VII.1978, forest pit traps, Campbell (SAM). Paratype: as preceding but VIII.1978, on moss on a log, G. Smith (SAM).

Remarks. It is possible that Handschin's (1925) redescription of *Alloscopus tenuicornis* from Java was based on springtails belonging to this species. The author states that his specimens had no fewer than 20 + 20 dental spines, but Mari Mutt (1978) studied the Javan material and found no more than 10 spines (only 1 specimen, however, had intact dentes). Handschin also states that the ungues of his specimens are tridentate (bidentate in *multispinatus*) and that there is a transverse row of several spines near the base of the dens (none in the new species). Handschin (1930) reported similar specimens from the Philippine Islands but Gapud (1971) collected in the same area and found only *H. (A.) tenuicornis* (reported as *tetracanthus*, see Mari Mutt 1978).

Between the eye and the base of the antenna is a rather conspicuous postantennal structure (PS) (Fig. 14-17). Its position, size, and overall shape is that expected of the postantennal organ (PAO) found in other Entomobryomorpha, including *Indoscopus* Prabhoo (1971: 34, Fig. 165, 168) and *Alloscopus strebeli* Winter (1966: 166, Fig. 6). Under the surface of the PS is a rounded structure resembling the socket of a macrochaeta (Fig. 14, 15).

Altner & Thies (1976) studied the histology of the PAO of hypogastrurids, onychiurids and isotomids, and found that in all these groups the PAO is a sensory organ connected to the protocerebrum by a single neuron. The PS of *H. (A.) multispinatus* and the PAO of the species of *Indoscopus* may be homologous to those of other Collembola or they may be structures of independent origin; the latter seems to be the case with the accessory ocular structure found by Mitra (1972) in 2 genera of Paronellinae (Entomobryidae).

Regardless of the nature of the PS, I feel that its presence should not be regarded

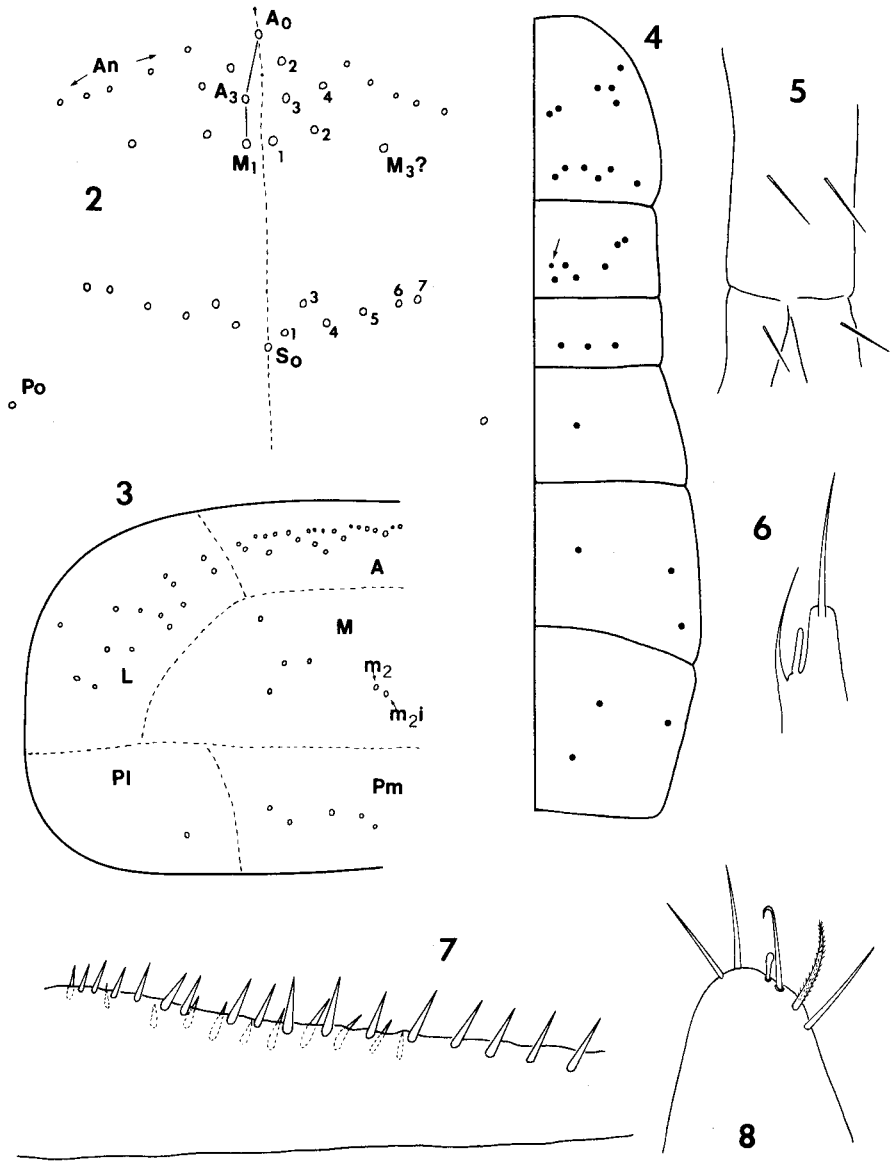


FIG. 2-8. *H. (A.) multispinatus*. 2. Head macrochaetotaxy (each circle represents a seta). A = Anterior, M = Median, S = Sutural, An = Antennal group, Po = Postocellar macrochaeta; nomenclature after Mari Mutt (1979). 3. Macrochaetotaxy of Th. 2; nomenclature after Szeptycki (1979). 4. Body macrochaetotaxy (compare with Fig. 3); arrow indicates a short macrochaeta (see also Fig. 32). 5. Dorsal view of manubrium showing distribution of smooth erect setae. 6. Outer labial papilla and its differentiated seta. 7. Arrangement of denta spines. 8. Apex of Ant. 6, showing clublike sensilla and apically hooked seta.

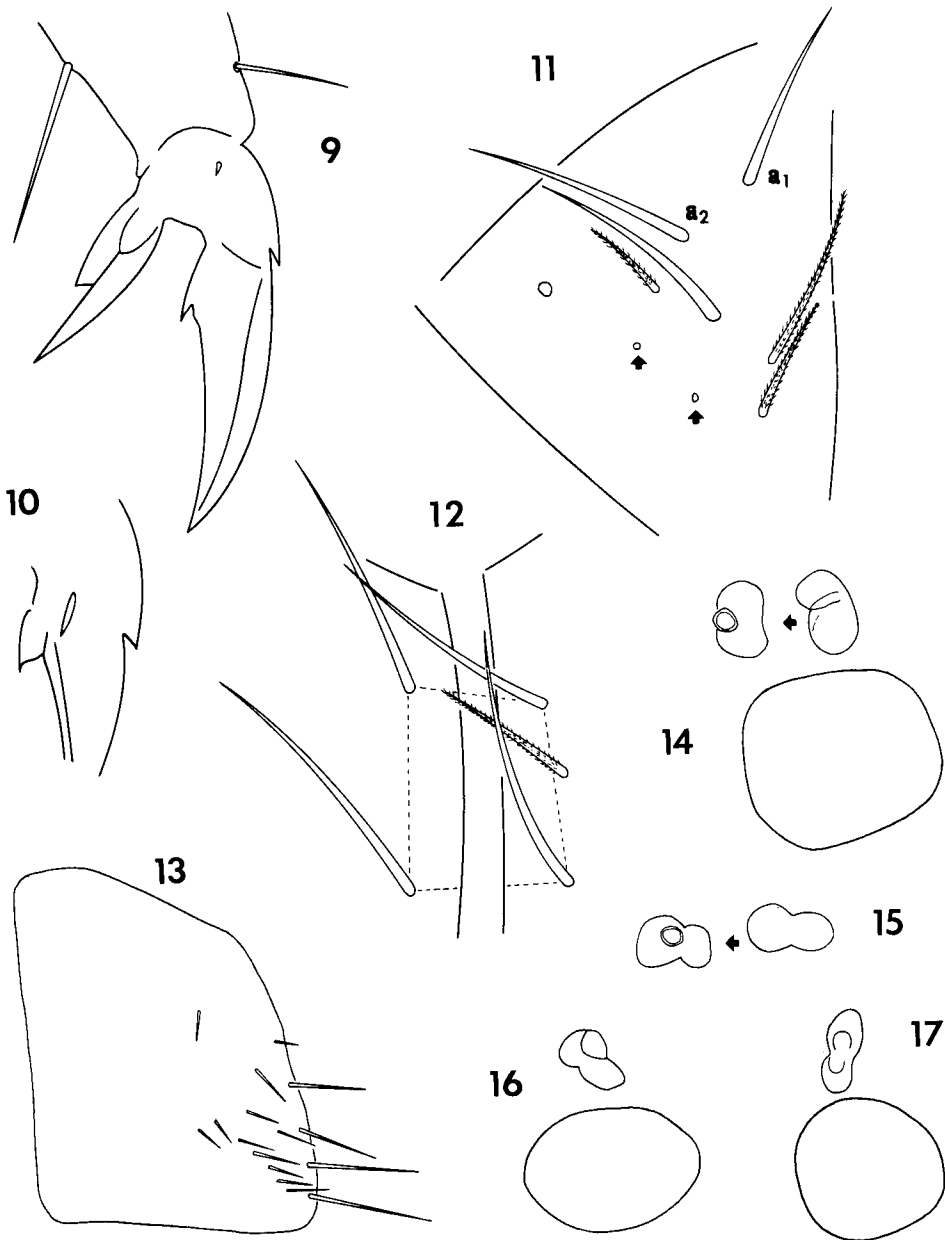


FIG. 9-17. *H. (A.) multispinatus*. 9. Lateral view of metathoracic claws. 10. Ventrolateral view of a metathoracic unguis. 11. Chaetotaxy of labial triangle [nomenclature after Gisin (1964)]; arrows point to probable insertions of scales. 12. Smooth setae of postlabial quadrangle. 13. Trochanteral organ. 14-17. Eyes and postantennal structures (PS) of the 2 specimens studied; arrows indicate changes in appearance of the PS as one focuses down through it.

as a character of generic importance. A similar structure has not been found in *H. (A.) tetracanthus* or *H. (A.) tenuicornis*, but the new species shares with them a very similar distribution of head and body macrochaetae, labial chaetotaxy, structure of claws, and presence of dental spines.

KEY TO SPECIES OF THE SUBGENUS *Alloscopus*

- 1. Inner pair of unguual teeth very long and narrow (Fig. 29–31); head seta M_1 placed far back from A_3 , distance $M_1-A_3/A_3-A_0 > 2.6$ ($\bar{X} = 3.0$, see Fig. 1, 35); head seta M_3 absent (Fig. 35); dorsum of manubrium with 2 parallel rows of 4 smooth setae each (Fig. 34) **tenuicornis**
 Inner pair of unguual teeth shorter and broader (Fig. 9, 10); head seta M_1 placed closer to A_3 , distance $M_1-A_3/A_3-A_0 < 2.3$ (Fig. 1, 2, 23); head seta M_3 present (e.g., Fig. 2); dorsum of manubrium with 2 parallel rows of either 1 or 5 smooth setae each (Fig. 5, 24) 2
- 2. Dens with 27–39 spines arranged in 2 parallel rows (Fig. 7); macrochaetotaxy of Th. 2 and Th. 3 as in Fig. 3, 4; seta m2i present, posterior region of Th. 2 with 6 setae, Th. 3 with 7 setae; dorsum of manubrium with a pair of smooth setae (Fig. 5); distance $M_1-A_3/A_3-A_0 = 0.9$ (Fig. 1, 2) **multispinatus**
 Dens with 4–7 spines arranged in a single row; macrochaetotaxy of Th. 2 and Th. 3 as in Fig. 19, 20; seta m2i absent, posterior region of Th. 2 with 5 setae, Th. 3 with 6 setae; dorsum of manubrium with 2 parallel rows of 5 smooth setae each (Fig. 24); distance $M_1-A_3/A_3-A_0 = 1.8$ (Fig. 1, 23) **tetracanthus**

Heteromurus (Alloscopus) tetracanthus Börner, 1906 Fig. 18–25

Ant. 5 without pin seta. Labral papillae as in Fig. 25. Labial chaetotaxy as in Fig. 21, 22; M_1 may be smooth or ciliated, a few large specimens with a small scale behind posterior row. Setae of venter of head smooth. Arrangement of A and M group of head macrochaetae as in Fig. 23; distance $M_1-A_3/A_3-A_0 = 1.6-2.3$ ($\bar{X} = 1.8$, $n = 10$, see Fig. 1). Macrochaetotaxy of Th. 2 and Th. 3 as in Fig. 19, 20. Lateral anal valve with 2 smooth setae (Fig. 18). Distribution of erect smooth setae on dorsum of manubrium as in Fig. 24. Dens with 4–7 spines in a single row similar to that of *H. (A.) tenuicornis* (Fig. 26).

Material examined. MICRONESIA: Caroline Is: Ponape, Colonia Agric. Exp. Stn., 7.I.1953, coffee leaf litter, J.L. Gressitt, 9 specimens (BISHOP 5, JAMM 2, USNM 2); Colonia, 6.I.1953, litter, Gressitt, 14 specimens (BISHOP 7, JAMM 4, USNM 3). SAMOA: 22.VII.1977, Alofar Cabbage, Edwards, 3 specimens (SAM). AUSTRALIA: Queensland, SE Crawford's Lookout, 300 m, 10.X.1971, in rain forest, 1 specimen (SAM).

Distribution. Micronesia (Ponape), Java, Malaysia, Singapore, India, New Britain, Australia (Queensland), Samoa.

Remarks. Yosii's (1959) description of specimens from Malaya and Singapore agrees well with my descriptions except for a most intriguing detail: the chaetotaxy of Th. 3 is that of *tetracanthus* but Th. 2 has the *tenuicornis* pattern.

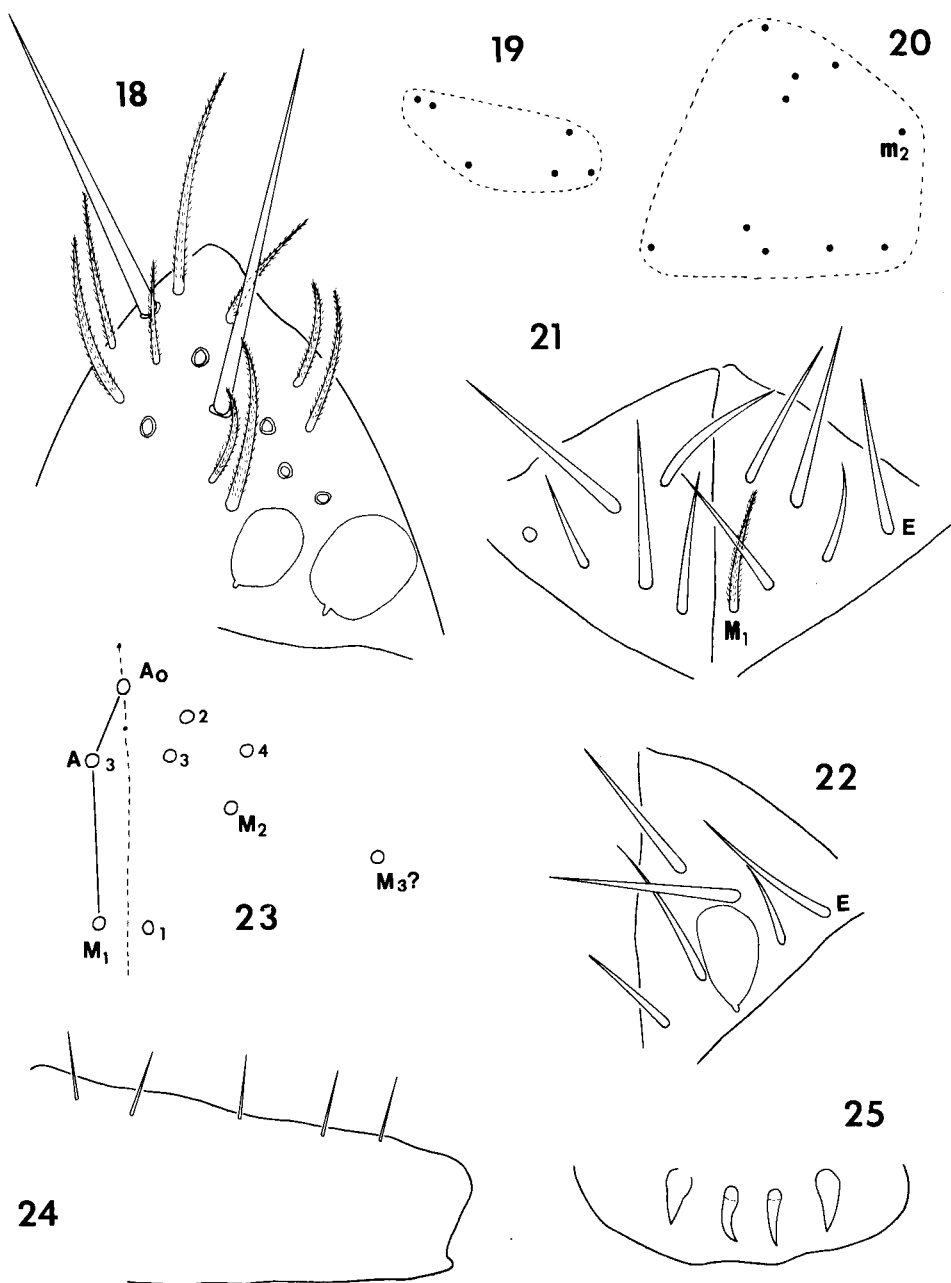


FIG. 18-25. *H. (A.) tetracanthus*. 18. Lateral anal valve. 19. Macrochaetotaxy of Th. 3. 20. Macrochaetotaxy of Th. 2. 21. Labial triangles. 22. Labial triangle of a larger specimen, note scale behind posterior row of setae. 23. Distribution of A and M groups of head macrochaetae. 24. Lateral view of manubrium showing distribution of smooth erect setae. 25. Labral papillae.

***Heteromurus (Alloscopus) tenuicornis* Börner, 1906**

Fig. 26–35

Ant. 5 without pin seta. Posterior row of labial triangle with 2 large scales (Fig. 28); M_1 may be smooth or ciliated, substituted by an extra scale in 1 specimen (Fig. 27). Setae of venter of head smooth. Arrangement of A and M groups of head macrochaetae as in Fig. 35, distance $M_1-A_3/A_3-A_0 = 2.6-3.6$, $n = 9$, see Fig. 1). Chaetotaxy of Th. 2 and Th. 3 as in Fig. 32, 33 (for Fig. 32 note relationship between socket diameter and length of macrochaeta; elimination of small seta would result in pattern of *H. (A.) tetracanthus* or *H. (A.) cf. strebeli*, see Fig. 19, 41). Structure of claws as in Fig. 29–31. Lateral anal valves without smooth setae. Distribution of smooth erect setae on dorsum of manubrium as in Fig. 34. Arrangement of dental spines as in Fig. 26 (up to 7 spines may be present, usual number is 5–6).

Material examined. MICRONESIA. Mariana Is: Guam: 1 km SE of Asan, 200–250 m, 1.XI.1947, H.S. Dybas, 3 specimens (FM 1, JAMM 1, USNM 1). Palau I: Babelthuap, 65 m, 9.XII.1952, litter, J.L. Gressitt, 12 specimens (BISHOP 6, JAMM 3, USNM 3); NW Auluptagel, 25 m, 13.XII.1952, Gressitt, 3 specimens (BISHOP 1, JAMM 1, USNM 1). Caroline Is: Truk, Tol I, Mt Unibot, 31.XII.1952, litter, Gressitt, 1 specimen (BISHOP).

Distribution. Micronesia (Ngatpang, Babelthuap, Yap, Guam, Truk, Ponape, Kusaie), Java, Sumatra, Philippine Is (Luzon), Hawaii.

***Heteromurus (Alloscopus) cf. strebeli* Winter, 1966**

Fig. 36–45

Length 1.4 mm. Dark blue pigment restricted to anterior $\frac{1}{2}$ of head and to antennae. Scales absent from Ant. 4 (Ant. 5 accidentally missing). Eyes 3 + 3 (Fig. 37) on a violet patch. Labral papillae as in Fig. 43; inner pair conelike as in *H. tetracanthus* (Fig. 25), outer pair rounded. Labial chaetotaxy as in Fig. 45, small sockets behind posterior row may be insertions of scales. Differentiated seta of outer labial papilla as in Fig. 38. Many setae on venter of head have fallen off; remaining ones are smooth. Arrangement of A and M groups of head macrochaetae as in Fig. 40; M_2 close to M_1 (compare with Fig. 2, 23, 35). Trochanteral organ as in Fig. 39. Tibiotarsi without rows of smooth setae. Metathoracic claws (only 1 leg examined) as in Fig. 36. Macrochaetotaxy of Th. 2 and Th. 3 as in Fig. 41, 42. Most setae on dorsum of manubrium have fallen off, only 1 pair of distal smooth setae seen. Arrangement of dental spines as in Fig. 44. Mucro with 2 teeth and a basal spine.

Material examined. ECUADOR: Los Tayos main cave, 25.VII.1976, bottom of seed shaft, seed deposit from birds, $\frac{1}{2}$ m into soil, Ashmole, 1 specimen (JAMM).

Remarks. Unfortunately, the only springtail available is mounted in such a way that I cannot determine if a postantennal organ is present. The specimen is evidently closely related to *Indoscopus strebeli* (Winter), a Peruvian edaphic species which possesses a PAO. Judging from Winter's description, they share the pigmentation, overall length, number of eyes (3 + 3), body macrochaetotaxy, presence of a strong spine on the dental lobe, and the occurrence of the mucronal spine. They differ in the structure of the claws (Winter found a pair of basal teeth and a distal unpaired tooth but states that they are visible only in the largest specimens; I could study only 1 metathoracic claw) and in the number of dental spines (7–8 in *strebeli*, 6 in my specimen). The antennal ratios and the presence of smooth setae besides the strong spine of the dental lobe could not be verified for my specimen.

The close relationship between this specimen, *Indoscopus strebeli*, and the 3 species

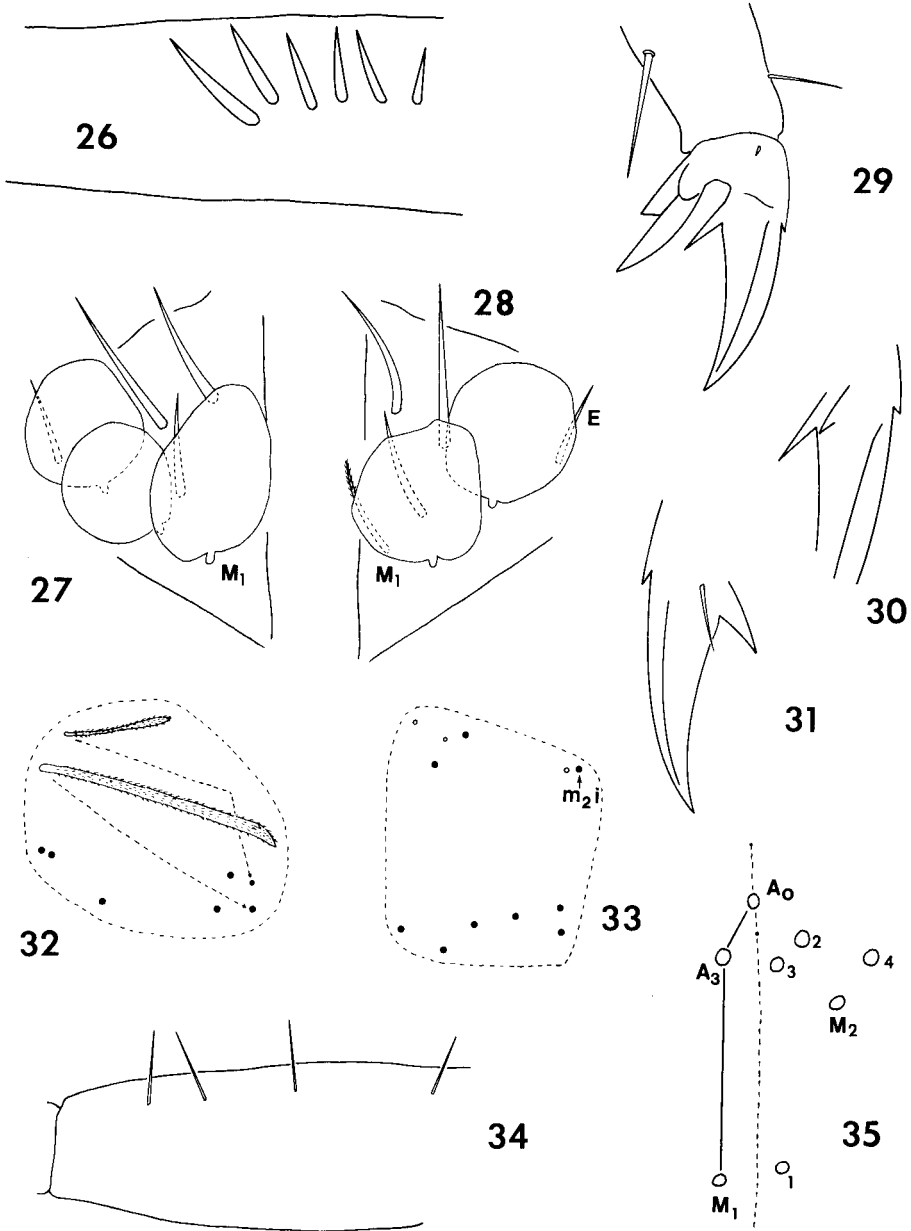


FIG. 26-35. *H. (A.) tenuicornis*. 26. Arrangement of dental spines. 27. Labial triangle with 3 scales behind posterior row of setae. 28. As preceding but with the usual pair of scales behind posterior row. 29. Lateral view of metathoracic claws. 30-31. Ventrolateral view of unguis. 32. Macrochaetotaxy of Th. 3. 33. Macrochaetotaxy of Th. 2. 34. Lateral view of manubrium showing distribution of smooth erect setae. 35. Distribution of A and M groups of head macrochaetae.

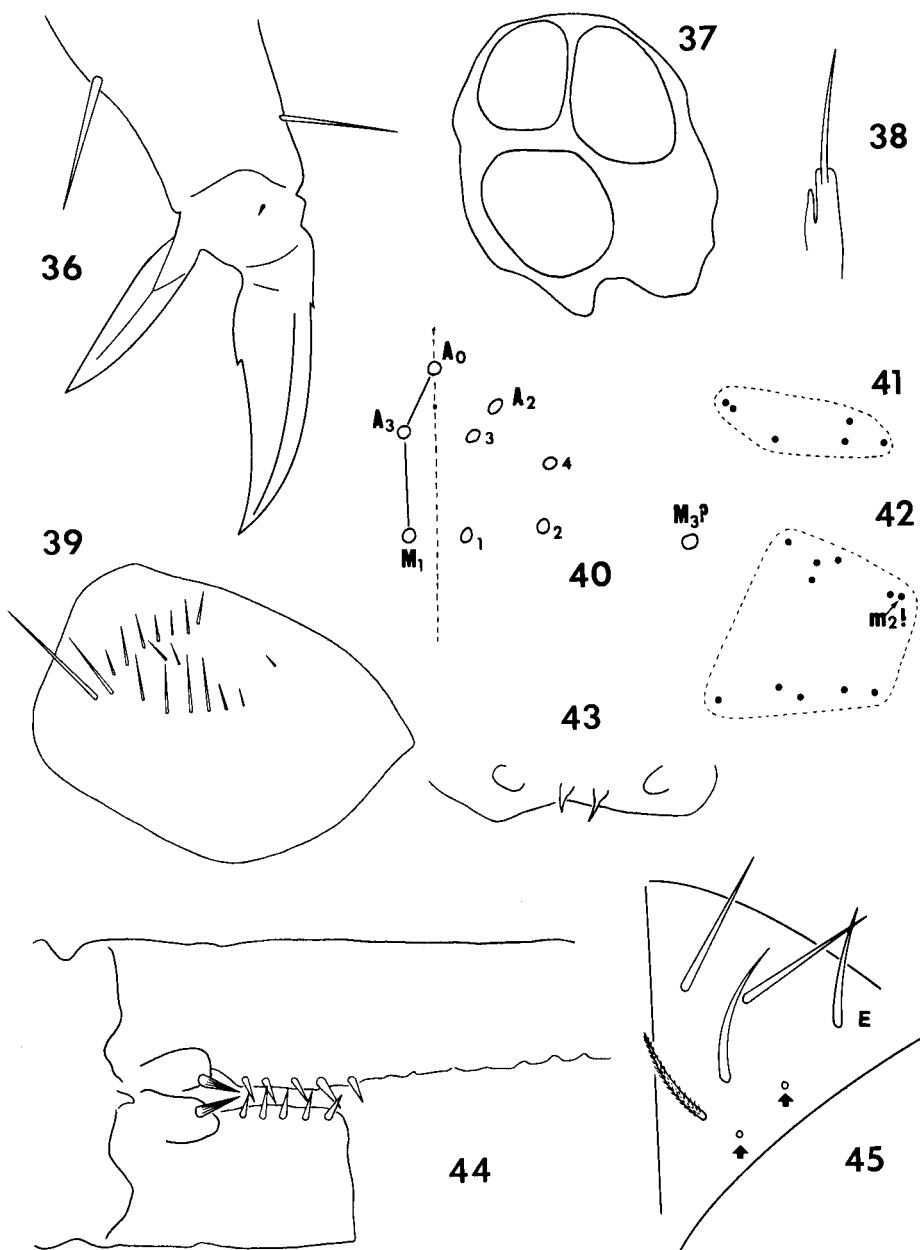


FIG. 36-45. *H. (A.) cf. strebeli*. 36. Metathoracic claws. 37. Arrangement of eyes. 38. Outer labial papilla and its differentiated seta. 39. Trochanteral organ. 40. Distribution of A and M groups of head macrochaetae. 41. Macrochaetotaxy of Th. 3. 42. Macrochaetotaxy of Th. 2. 43. Labral papillae. 44. Distribution of dental spines; the large spine of the dental lobe is striated. 45. Chaetotaxy of labial triangle; arrows point to probable insertions of scales.

of the subgenus *Alloscopus* strongly suggests that *Indoscopus* is a synonym of *Alloscopus*. A formal synonymy should wait, however, until the types of *Indoscopus* are available for study.

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