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TEN NEW SPECIES OF WATER MITES FROM SULAWESI AND WAIGEO, INDONESIA (ACARI, HYDRACHNELLAE)

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Key words. - Acari, Hydrachnellae, Sulawesi, Waigeo, New Guinea.

ABSTRACT

Six new species of water mites are described from Sulawesi, Indonesia, viz., *Hygrobates rotundus, Neumania parvula, Albia inopinata, Albia molibaguensis, Arrenurus bruzelioides*, and *Arrenurus duffelsi*, and four new species from Waigeo, Indonesia, viz., *Torrenticola papillata, Limnesia argelooi, Recifella rumei*, and *Axonopsella waigeoensis*. In addition, eight species are reported new for the fauna of Sulawesi, and two species new for the fauna of Waigeo.

INTRODUCTION

The water mites treated in this paper were collected in Sulawesi Utara (northern Sulawesi), in Sulawesi Selatan (central Sulawesi) and on Waigeo, an island northwest of New Guinea (see fig. 1).

The fauna of Sulawesi is very incompletely known. The first water mite species from Sulawesi was described by Viets (1927) from a fresh water sponge. It lasted until 1989 before water mite workers again paid attention to this area. Wiles (1989, 1990, 1992) and Smit (1992) reported 38 species from northern Sulawesi. So far, no water mites were known from Waigeo, an island northwest of New Guinea. A total of 24 water mites species have been described from New Guinea by Daday (1901), Oudemans (1905, 1906), Imamura (1983) and Wiles (1991, 1992, 1994), while Walter (1911) and Viets (1923) contributed to our knowledge of the water mite fauna of respectively the Aru Islands and Buru (Moluccas).

In this paper ten new species new to science are described, eight species are reported for the first time for the fauna of Sulawesi, and two species for Waigeo. Water mites of the genus *Torrenticola* Piersig from Sulawesi are not treated in this paper, as they are part of a major revision carried out by P.R. Wiles (Wiles, in litt.).

All material, including the type material, is deposited in the collection of the Zoological Museum of the University of Amsterdam. Measurements are in µm, those of the para-types are given in parentheses. Leg and palp lengths are dorsal lengths. The following abbreviations are used: II-leg-5 (fifth segment of second leg), PI-PV (palp segments), CX I (first coxal plate), C4 (Coxoglandularia 4), D1 (Dorsoglandularia 1), V2 (Ventroglandularia 2), L1 (Latero-glandularia 1).

SYSTEMATIC PART

Torrenticola (Monatractides) papillata sp. n. (figs. 2-5)

Type material. - Holotype ♂: River Rumei, Waigeo, 17.x.1993; leg. M. Argeloo.

DESCRIPTION

Male: Dorsal shield with 4 small anterior platelets, length anterior platelet 132, posterior platelet 204-213, and a large posterior plate, length 689, width 495. Length ventral shield 757, width 645; capitular bay U-shaped; capitulum 233 long. First coxal plate 233 long, with small papillae (measurements according to Cicolani & Di Sabatino 1990). Length of median suture between second and third coxal plate 60. Coxal plates with many fine hairs. Genital field typical, 155 long, 126 wide; 310 from posterior margin of

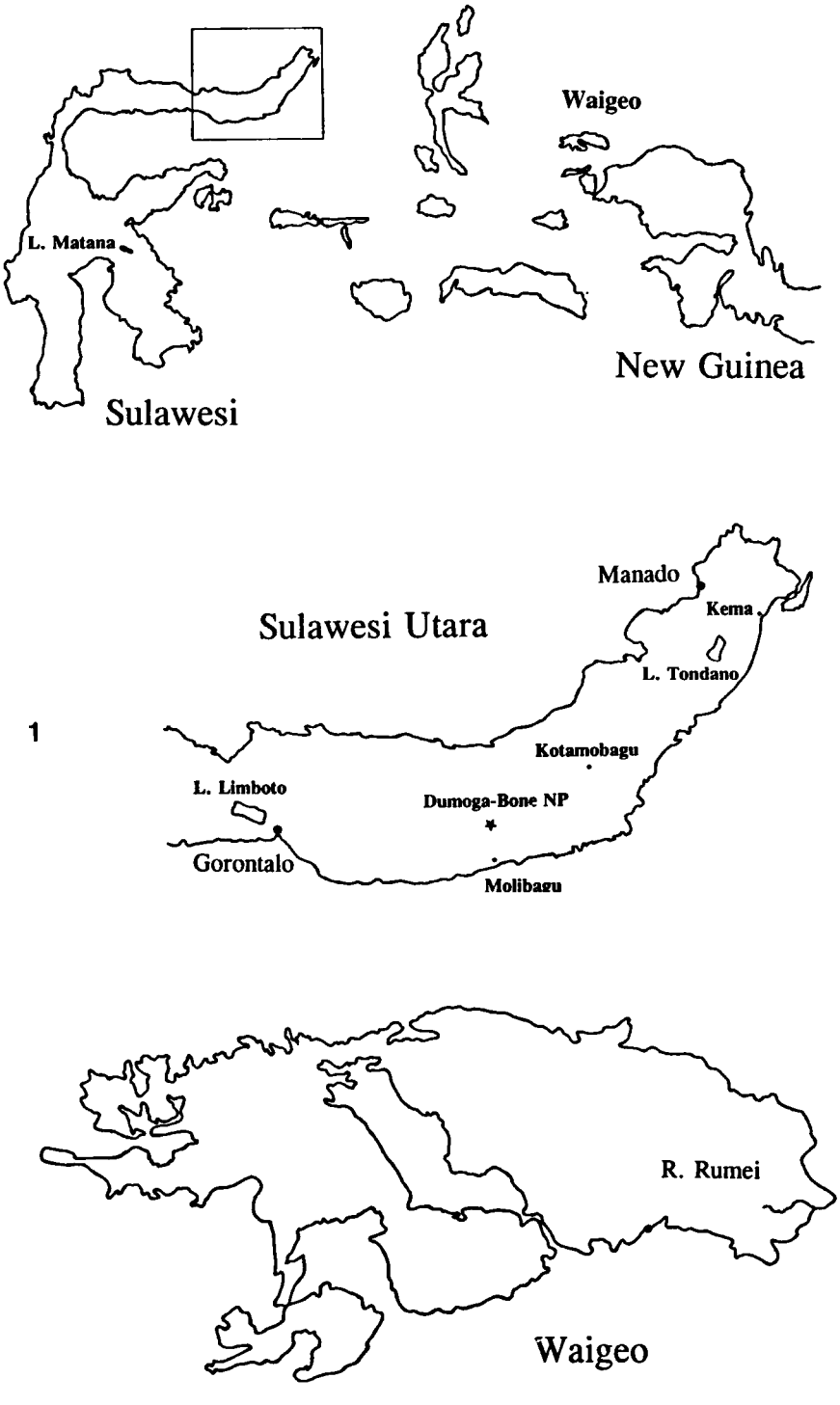


Fig. 1. Map of Indonesia with details of northern Sulawesi and Waigeo

body. Excretory pore situated on suture line of ventral shield. Palp typical, lengths PI-PV: 29, 67, 43, 58, 26; PII ventral margin straight; PIV with large setal tubercles. Legs typical, lengths I-leg-4-6: 113, 127, 108; lengths IV-leg-4-6: 161, 194, 144.

Female: Unknown.

Etymology. - The species is named for the papillae on the first coxal plates.

Discussion. - The straight ventral margin of PII, the shape of PIV, the large setal tubercles on PIV and the papillate coxal plates are diagnostic for the species.

Limnesia (Limnesia) argelooi sp. n. (figs. 6-7)

Type material. - Holotype ♀: River Rumei, Waigeo, 13.x.1993; leg. M. Argeloo.

DESCRIPTION

Female: Body soft, 630 long and 533 wide. Capitular bay V-shaped. First coxal plates separated medially. C4 (= Glandulae Limnesiae) situated on third coxal plate; seta located close to C4. Genital field 165 long and 136 wide. Three pairs of acetabula. V2 lying close to posterior margin of fourth coxal plates, accompanying setae close to genital field. Lengths PI-PV: 17, 77, 82, 142, 28. PII with a very long seta on ventral margin, 38 long, on a small tubercle; PII with a straight ventral margin. One or more anteroventral seta on ventral margin of PIV probably broken. Lengths I-leg-4-6: 101, 120, 130; lengths IV-leg-4-6: 166, 178; 173. Legs with numerous spine-like setae, longest on IV-leg-3, length 165 µm; IV-leg-6 without a distal seta. IV-leg 4 with 6 and IV-leg-5 with 10 swimming setae; the number of swimming setae on III-leg-4 and III-leg-5 cannot be determined with certainty. Claws large, 24 high and 31 wide, with one clawlet.

Male: Unknown.

Etymology. - The species is named after M. Argeloo, collector of the material.

Discussion. - The long seta on PII, the straight ventral margin of PII and the absence of a distal seta on IV-leg-6 are diagnostic for the new species. Most closely related species are *Limnesia volzi* Piersig, known from Sumatra and Burma, and *L. buruensis* Viets, known from Buru (Moluccas), Formosa and Japan. However, the seta on the ventral margin of PII of both species is much shorter.

Hygrobates rotundus sp. n. (figs. 8-10)

Type material. - Holotype ♀: Small stream 16 km west of Molibagu, Sulawesi Utara, 16.iv.1991; leg. H. Smit.

DESCRIPTION

Female: Body soft, 669 long and 514 wide. Capitulum probably fused with first coxal plates, but, as a result of slide making, this is difficult to examine. Capitulum without a posterior process. Suture lines between third and fourth coxal plates incomplete. Fourth coxal plates with small projections on posterior margins. Apodemes of first coxal plates absent. Glandularia on fourth coxal plates small, lying near suture line of third and fourth coxal plates. Four pairs of acetabula; genital plate 86 long and 62 wide. Lengths of PI-PV: 29, 65, 46, 84, 33. Projections on ventral margin of PII and PIV absent. PV with a large seta on ventral margin; setae at tip of PV downturned. Lengths I-leg-2-6: 58, 72, 103, 110, 115; lengths IV-leg-2-6: 86, 109, 149, 161, 144. I-leg-6 not bowed; I-leg-5 with sharp posteroventral setae; swimming setae absent.

Male: Unknown.

Etymology. - The species is named for its rounded shape.

Discussion. - Diagnostic for the new species is the combination of the following characters: four pairs of acetabula, the absence of a posteroventral process of the capitulum and the shape of the palp. The systematic position of the new species is somewhat uncertain, as the degree of fusion between the capitulum and the first coxal plates is difficult to examine.

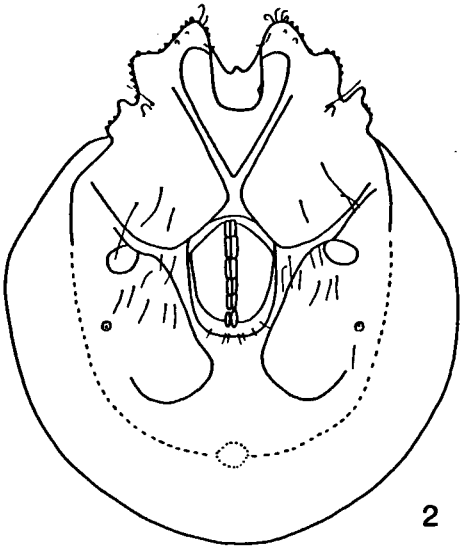
Atractides neoclipeatus Lundblad

So far, this species has been reported from Java (Lundblad, 1971) and Sulawesi (Wiles, 1990). First leg segments are longer in specimens from Sulawesi, but otherwise agree well with Lundblad's description (op. cit.). The dorsal lengths of the three distal segments of the first leg of specimens from S. Toput measure I-leg-4 149-154, I-leg-5 148-151, I-leg-6 108-117. The measurements of these segments of the holotype are 125, 120 and 100 respectively.

Material examined. - Sulawesi Utara: S. Tumokang, Dumoga-Bone NP, 9.iv.1991, 1 ♀; S. Toput, tributary of S. Tumokang, 23.iv.1991, 2 ♀♀; S. Tumpah, Dumoga-Bone NP, 11.iv.1991, 1 ♀; S. Pusian, between Kotamobagu and Imandi, 21.iv.1991, 1 ♀.

Unionicola crassipalpis Walter

The species was originally described from New Caledonia by Walter (1915), and has been reported from Australia (Viets, 1980; Cook, 1986) and Sulawesi (Wiles, 1990), without further details on the morphology. The specimens from Sulawesi agree in most aspects with material from Australia, all but one have both genital plates with three acetabula. One specimen has one genital plate with two acetabula, the other with three.



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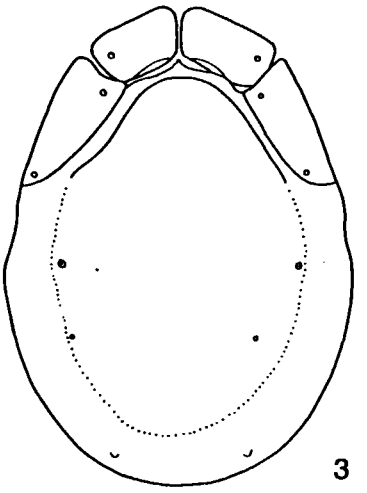

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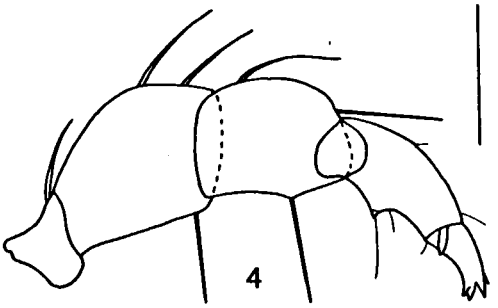

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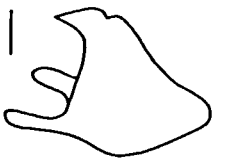

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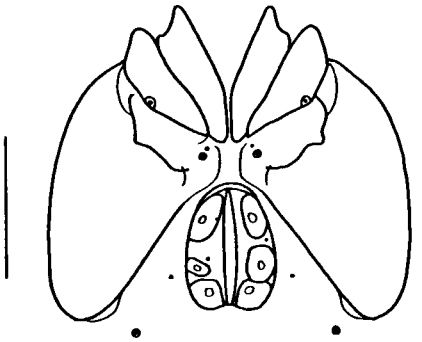

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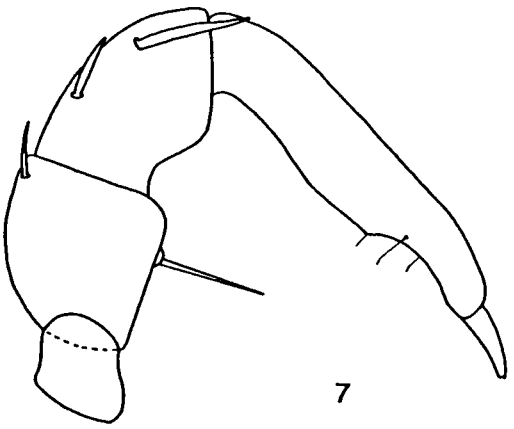

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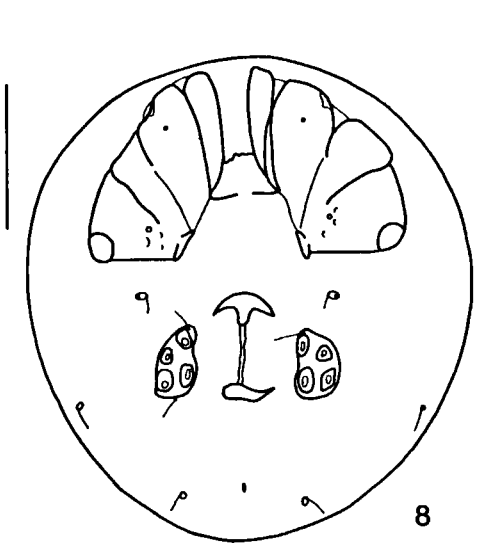
Fig. 2. *Torrenticola papillata* sp. n., ventral view ♂
Fig. 3. *Torrenticola papillata* sp. n., dorsal shield ♂
Fig. 4. *Torrenticola papillata* sp. n., palp ♂
Fig. 5. *Torrenticola papillata* sp. n., capitulum ♂
Fig. 6. *Limnesia argelooi* sp. n., ventral view ♀
Fig. 7. *Limnesia argelooi* sp. n., palp ♀

Scale lines: 2, 3, 6 = 200 µm; 4, 5, 7 = 50 µm



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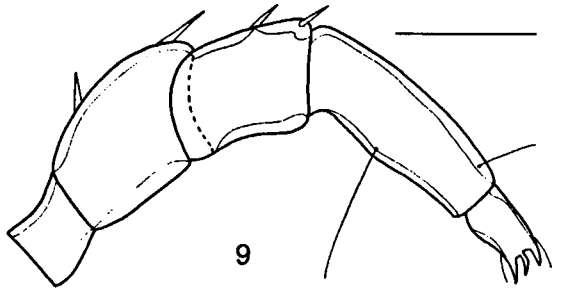

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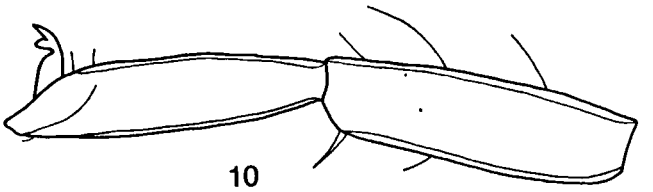

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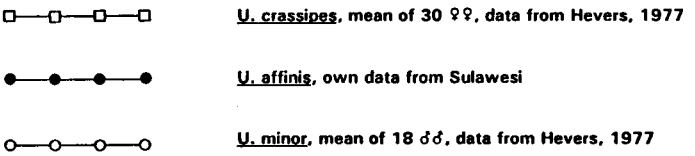


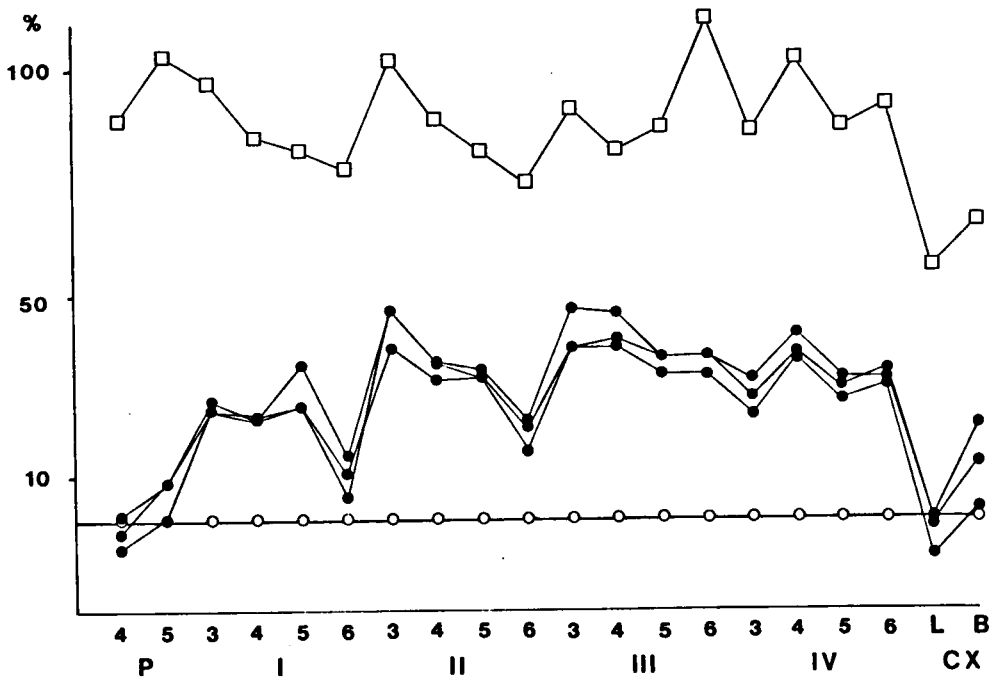
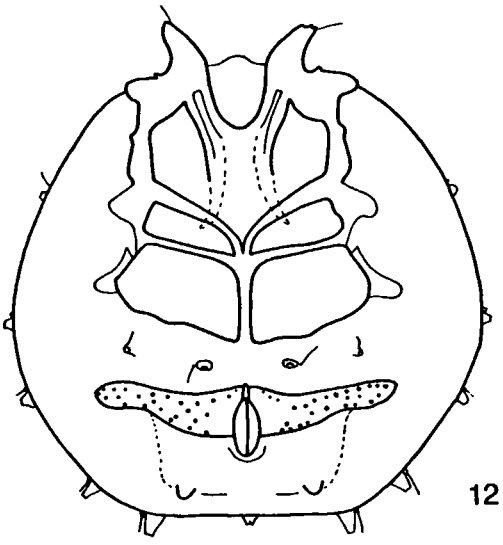


Fig. 8. *Hygrobates rotundus* sp. n., ventral view ♀
Fig. 9. *Hygrobates rotundus* sp. n., palp ♀
Fig. 10. *Hygrobates rotundus* sp. n., I-leg- 5 and 6 ♀
Fig. 11. Ratio diagram of *Unionicola crassipes*, *U. affinis* and *U. minor*

Scale lines: 8 = 200 µm; 9, 10 = 50 µm



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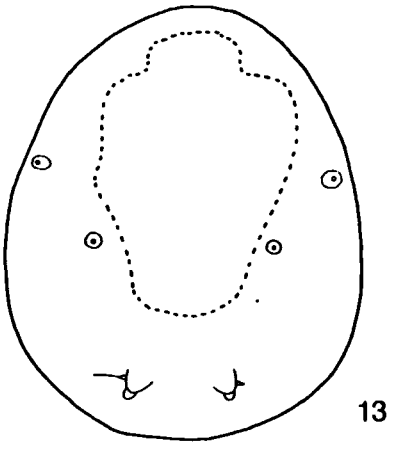

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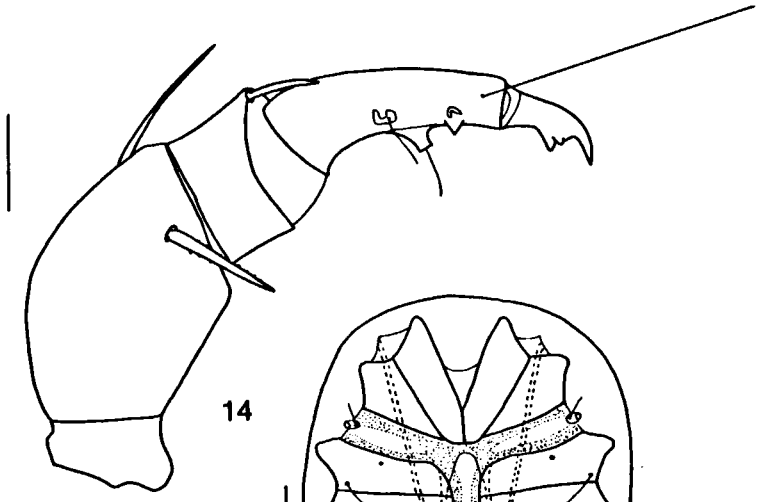

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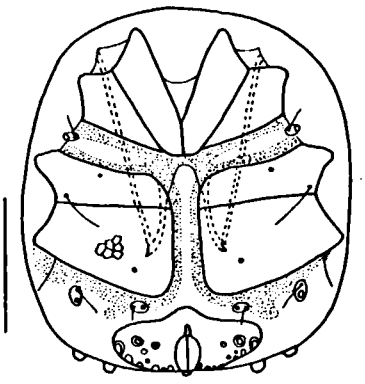

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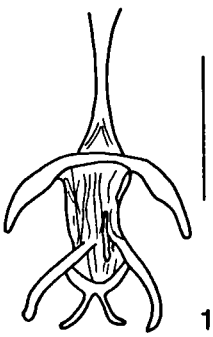

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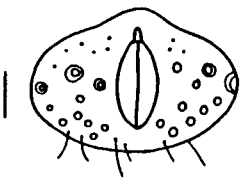

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Fig. 12. *Recifella rumei* sp. n., ventral view ♂
Fig. 13. *Recifella rumei* sp. n., dorsal shield ♂
Fig. 14. *Recifella rumei* sp. n., palp ♂
Fig. 15. *Recifella rumei* sp. n., ejaculatory complex
Fig. 16. *Neumania parvula* sp. n., ventral view ♂
Fig. 17. *Neumania parvula* sp. n., genital field ♂

Scale lines: 12, 13, 16 = 200 µm; 14, 15, 17 = 50 µm

Table I. Measurements (in µm) of three *Unionicola*-species (all ♀♀). Data from Hevers (1977) for *U. crassipes* and *U. minor*, own data from Sulawesi for *U. affinis*.

Species	*U. crassipes*	*U. minor*	*U. affinis*
n	30	30	10
	min-max-mean	min-max-mean	min-max-mean
PIV	159-305-216	101-156-123	103-120-109
PV	141-245-181	79-115-95	88-98-93
IV-P-4	415-795-596	248-400-311	388-432-403
IV-P-5	545-980-745	333-517-415	504-553-522
IV-P-6	493-875-665	291-474-375	436-485-453

Material examined. - Sulawesi Utara: Fish pond near Lake Tondano, 4-iv-1991, 17 ♀♀.

Unionicola affinis (Piersig)

U. affinis Piersig from India and Java has 5-6 pairs of acetabula (Cook, 1967; Lundblad, 1969). Specimens from Sulawesi have a similar number of acetabula. The closely related *U. crassipes* (Müller) has 5 pairs of acetabula. As the separation of the two species was based on the number of acetabula, new criteria have to be defined. According to Cook (1967), *U. crassipes* from the Oriental region has a shorter palp than *U. affinis* from India. Hevers (1984) showed, that the Japanese specimens, in the past assigned to a subspecies of *U. crassipes*, should stand as a distinct species. Further, it is clear from table I, that PIV and PV of the European *U. crassipes* are much longer than in *U. affinis* from Sulawesi. Based on a ratio diagram (fig. 11), which shows the relative length of each body part in comparison with one or more (arbitrarily) chosen specimens, a method introduced by Hevers (1977), it can be concluded that specimens of *U. affinis* from Sulawesi differ clearly from European specimens of *U. crassipes* and *U. minor* (Soar). Therefore, it can be concluded that *U. affinis* from Sulawesi should stand as a distinct species. Measurements of the palp segments of the Indian specimens of *U. affinis* (Cook, 1967; Lundblad,1969) agree with my own measurements of specimens from Sulawesi, but the segments of the fourth leg of Cook's specimens are much shorter. More study will be needed to elucidate the status of the Indian *U. affinis*.
Wiles (1990) reported *U. crassipes* for Sulawesi, but gives no further details. It is likely that his specimens must be assigned to *U. affinis*.

Material examined. - Sulawesi Utara: Fish pond southeast corner of Lake Tondano, 4.iv.1991, 16 ♀♀; Northern part of Lake Tondano, 4.iv.1991, 3 ♀♀; Small stream east of Kema, 5.iv.1991, 1 ♂.

Recifella (Eorecifella) rumei sp. n. (figs. 12-15)

Type material. - Holotype ♂: River Rumei, Waigeo, 13.x.1993; leg. M. Argeloo.

DESCRIPTION
Male: Body 655 µm long and 664 wide; colour of body purple. Dorsal shield with three pairs of glandularia, 621 long and 514 wide, not fused with ventral shield. Body with large glandularia tubercles, 31 high. Capitular bay U-shaped. First coxal plates extending well beyond the body margin. Apodemes of first coxal plates ending just beyond anterior margin of third coxal plates. Genital plate 208 wide, with ± 20-25 acetabula. Gonopore 82 long. PIV with three large tubercles, the largest on the ventral margin and two smaller ones on the medial side; PIV distally with a long seta. Claw-like seta of PV widely diverging. Lengths of PI-PV: 17, 106, 36, 89, 42. Lengths I-leg-4-6: 168, 158, 127; lengths IV-leg-4-6: 161, 197, 185. First legs with blunt setae, enlarged at distal end. Fourth leg unmodified. IV-leg-4-6 with 2-4 large pectinate setae. III-leg-4 and 5 with similar large pectinate setae. III-leg 4-5 and IV-leg 4-5 with 2-3 swimming setae.

Female: Unknown.

Etymology. - The species is named after the type locality.

Discussion. - This is the third species of the subgenus *Eorecifella*, which also includes *R. flagellata* Cook and *R. australica* Cook from Australia. It is characterized with large tubercles on PIV and a narrow genital plate.

Neumania parvula sp. n. (figs. 16-19)

Type material. - Holotype ♂: Small stream 16 km west of Molibagu, Sulawesi Utara, 16.iv.1991; leg. H. Smit. - Paratypes: 2 ♂♂ and 4 ♀♀, same location.

DESCRIPTION
Male: Body soft, 533 (533) long and 504 (446) wide. Dorsum with two small platelets, 43 (58) in diameter. Apodemes of first coxal plates reaching middle of fourth coxal plates. Coxal plates partially reticulate, exhibiting secondary sclerotization. Genital field located at posterior body margin. Genital plates with 9-10 acetabula; gonopore 97 long. Glandularia on small tubercles at posterior body margin. Lengths PI-PV (the following measurements are of

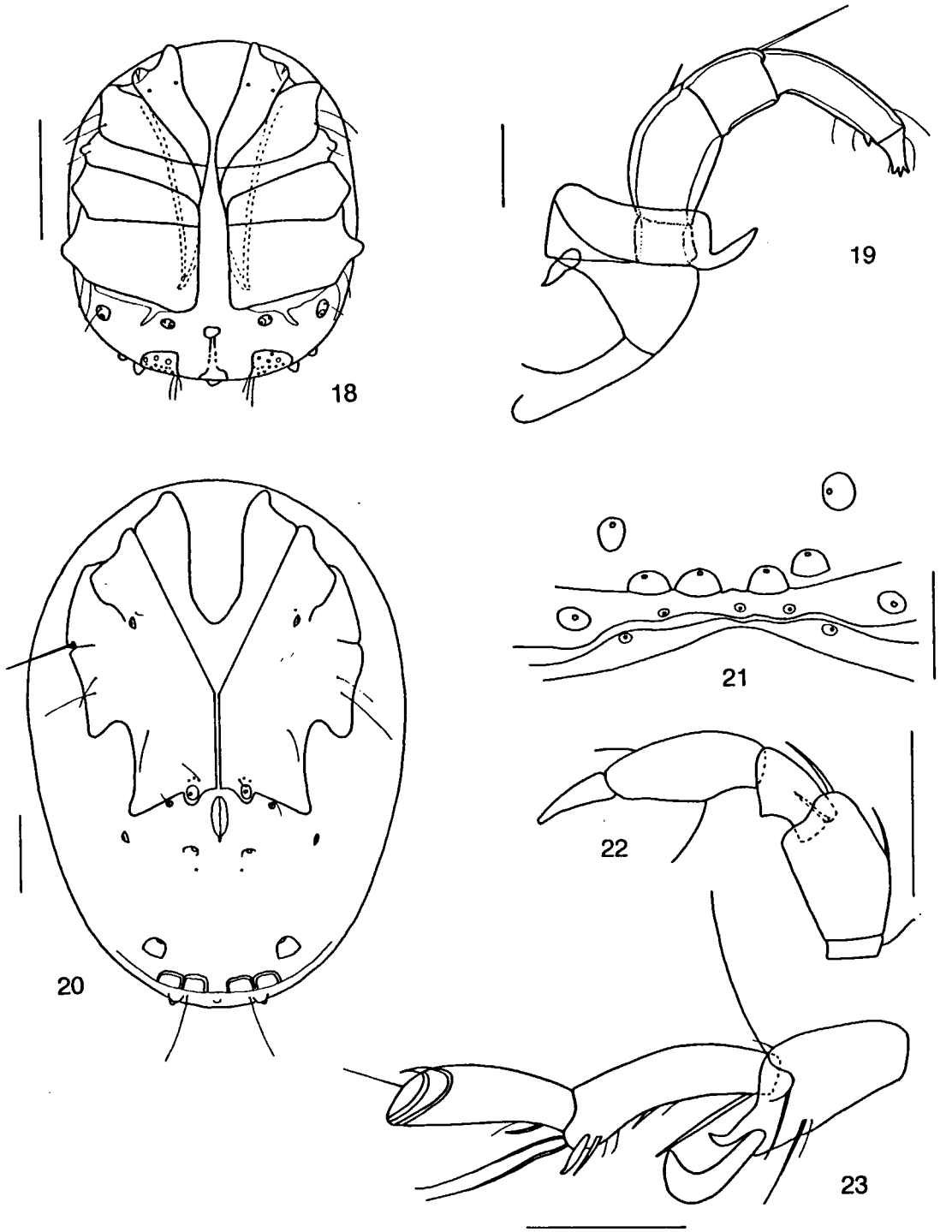


Fig. 18. *Neumania parvula* sp. n., ventral view ♀
Fig. 19. *Neumania parvula* sp. n., palp ♀
Fig. 20. *Axonopsella waigeoensis* sp. n., ventral view ♂
Fig. 21. *Axonopsella waigeoensis* sp. n., posterolateral view of ♂
Fig. 22. *Axonopsella waigeoensis* sp. n., palp ♂
Fig. 23. *Axonopsella waigeoensis* sp. n., distal segments of fourth leg ♂

Scale lines: 18 = 200 µm; 19, 20, 21, 22, 23 = 50 µm

one of the paratypes): 26, 80, 48, 79, 29; PIV with small peg-like seta located ventroproximally. Lengths I-leg-4-6: 182, 175, 132; lengths IV-leg-4-6: 163, 180, 185. Legs with a conspicuous reticulate pattern, with swimming setae: IV-leg-4-5 with 3, IV-leg-3 with 1, III-leg-5 with 2, III-leg-4 with 5, and III-leg-3, II-leg-5 and II-leg-4 with 1.

Female: Body soft, 558-582 long and 475-504 wide. Dorsum with two small platelets, 41 in diameter. Apodemes of first coxal plates ending posterior to middle of fourth coxal plates. Venter with little secondary sclerotization. Genital plates with 13 acetabula. Small tubercles on posterior margin of body. Palp similar as in male. Length of PI-PV: 29-31, 89-91, 50-62, 95-117, 24-29. Lengths I-leg-4-6 209-216, 192-194, 146-149; lengths IV-leg-4-6 180-185, 192-199, 185. Legs with swimming setae: II-leg-4 with 1, III-leg-4 with 6, III-leg-5 with 3, IV-leg-3 with 2, IV-leg-4 with 5 and IV-leg-5 with 3.

Etymology. - The species is named for its small size.

Discussion. - Secondary sclerotization of the male, only two platelets on the dorsum and conspicuous reticulation of the legs and coxal plates of both male and female separates this new species from *N. ambigua* Piersig. This latter species also exhibits reticulation on the legs and coxal plates, but less conspicuous. Further, it has two pairs of small platelets on the dorsum.

Axonopsella waigeoensis sp. n. (figs. 20-23)

Type material. - Holotype ♂: River Rumei, Waigeo, 13.x.1993; leg. M. Argeloo.

DESCRIPTION

Male: Dorsal and ventral shields present; dorsal furrow complete. Body 335 long and 233 wide. Antenniform setae on a small platelet, which can only be observed from an anterolateral view. No glandularia present on fourth coxal plates. Gonopore 25 long. Anterior acetabula situated on posterior margin of fourth coxal plates. Second, third and fourth pair of acetabula situated at posterior end of ventral shield. Second pair of acetabula located more anteriorly than third and fourth pair. For position of other glands and glandularia (for a definition of glandularia see Cook, 1986) see figs. 20 and 21. The last illustration gives a posterolateral view of the dorsal furrow, in which a number of glandularia are located. Palp typical, lengths of PI-PV: 7, 46, 23, 50, 24; PII with one seta on medial side. Lengths I-leg-4-6: 55, 58, 58; lengths IV-leg-4-6: 46, 60, 62. Small projection and heavy hook-like seta located distroventrally on IV-leg-4.

Female: Unknown.

Etymology. - The species is named after the island of Waigeo.

Discussion. - The position of the glands, glandularia and acetabula and the projection on IV-leg-4 are diagnostic for the new species. The most closely related species is *A. oldora* Cook, which differs in the shape of the body (rounded in *waigeoensis*, with hook-like extensions posteriorly in *oldora*) while the second pair of acetabula is in one line with the third and fourth pair.
So far, no *Axonopsella* species have been described from Indonesia and New Guinea. The distribution area of the genus is the neotropics and Australia. In the last country, the genus has undergone extensive speciation, and 28 species are known so far (Cook, 1986).

Albia (Albiella) inopinata sp. n. (figs. 24-26)

Type material. - Holotype ♀: S. Tapokolintang, 5 km north of Molibagu, 16.iv.1991; leg. H. Smit.

DESCRIPTION

Female: Dorsal shield 1009 long and 805 wide. Coxal plates without thickened setae. L1 anterior and median to L2 (for the terminology of the glandularia of this genus see Wiles, 1992). Location of D1, D2, D3 and D4 typical, L4 shifted to a position between dorsal and ventral shield. Suture line CX III/IV complete. C4 lying near suture line of third and fourth coxal plates. Median fusing point of CX I/II anterior to IV leg sockets. Suture lines of CX II/III fused to suture lines of CX I/II above median fusion point. Suture lines of CX III/IV meet at midline between IV leg sockets. Genital plate with numerous acetabula, 107 long and 145 wide. Lengths of PI-PV: 53 µm, 105 µm, 82 µm, 151 µm, 46 µm. Lengths I-leg-4-6: 113, 130, 125; lengths IV-leg-4-6: 165, 177, 156. Second, third and fourth leg with swimming setae: II-, III- and IV-leg-5 with 8, III- and IV-leg-4 with 3 swimming setae.

Male: Unknown.

Etymology. - The name of the species refers to my surprise.

Discussion. - The newly described species differs from other species in the configuration of suture lines between the coxal plates, the location of the C4 between IV-leg sockets, and the relative position of L1 and L2. The species is close to *A. molibaguensis* sp. n. (for discussion see below) and to *A. longipalpis* Wiles in configuration of venter and dorsum, but this species has a different palp.

Albia (Albiella) molibaguensis sp. n. (figs. 27-29)

Type material. - Holotype ♀: S. Tapokolintang, 5 km north of Molibagu, 16.iv.1991; leg. H. Smit.

DESCRIPTION

Female: Dorsal shield 1086 long and 766 wide, rounded posteriorly and anteriorly. Coxal plates without thickened

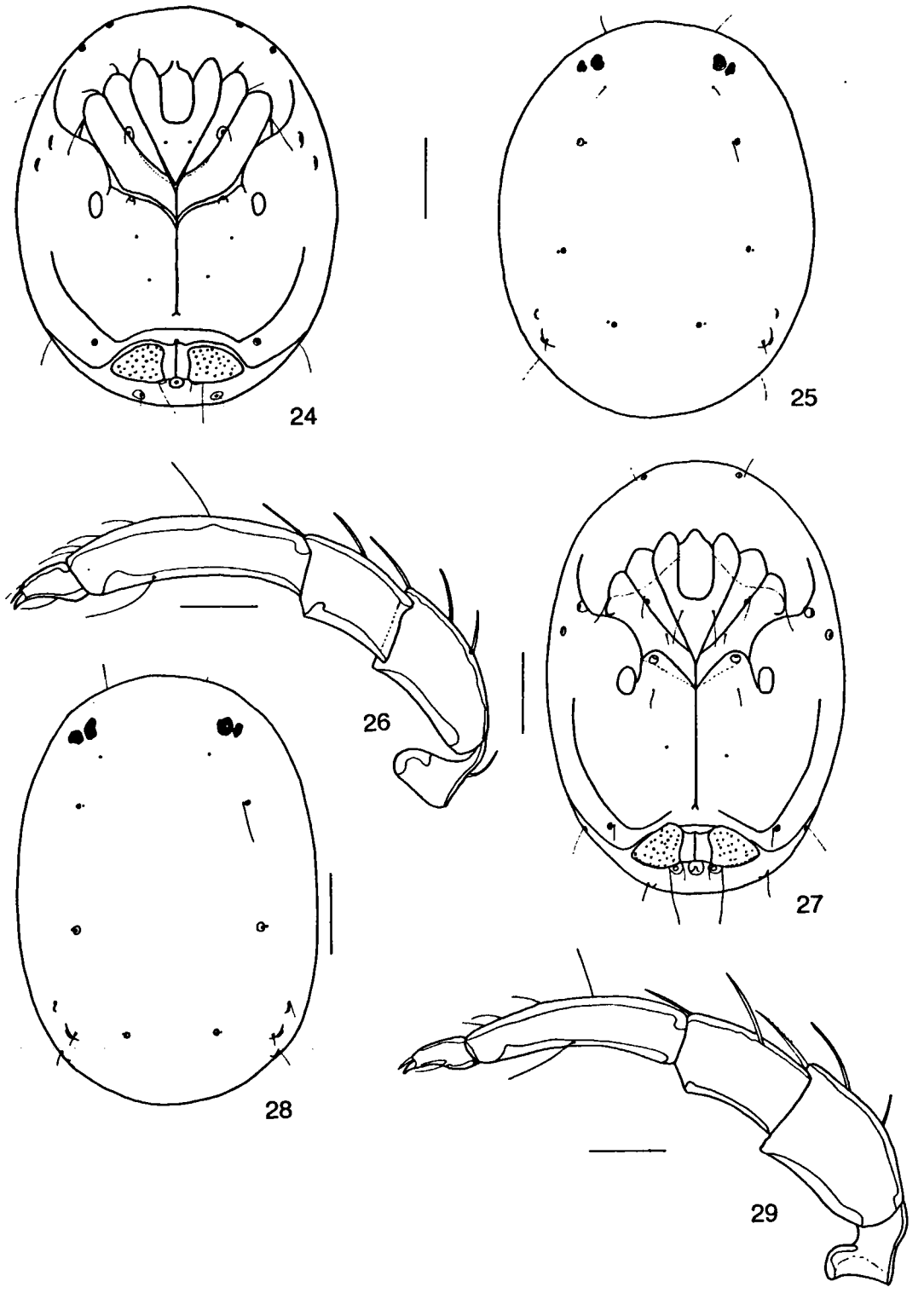


Fig. 24. *Albia inopinata* sp. n., ventral view ♀
Fig. 25. *Albia inopinata* sp. n., dorsal view ♀
Fig. 26. *Albia inopinata* sp. n., palp ♀
Fig. 27. *Albia molibaguensis* sp. n., ventral view ♀
Fig. 28. *Albia molibaguensis* sp. n., dorsal view ♀
Fig. 29. *Albia molibaguensis* sp. n., palp ♀

Scale lines: 24, 25, 27, 28 = 200 µm; 26, 29 = 50 µm

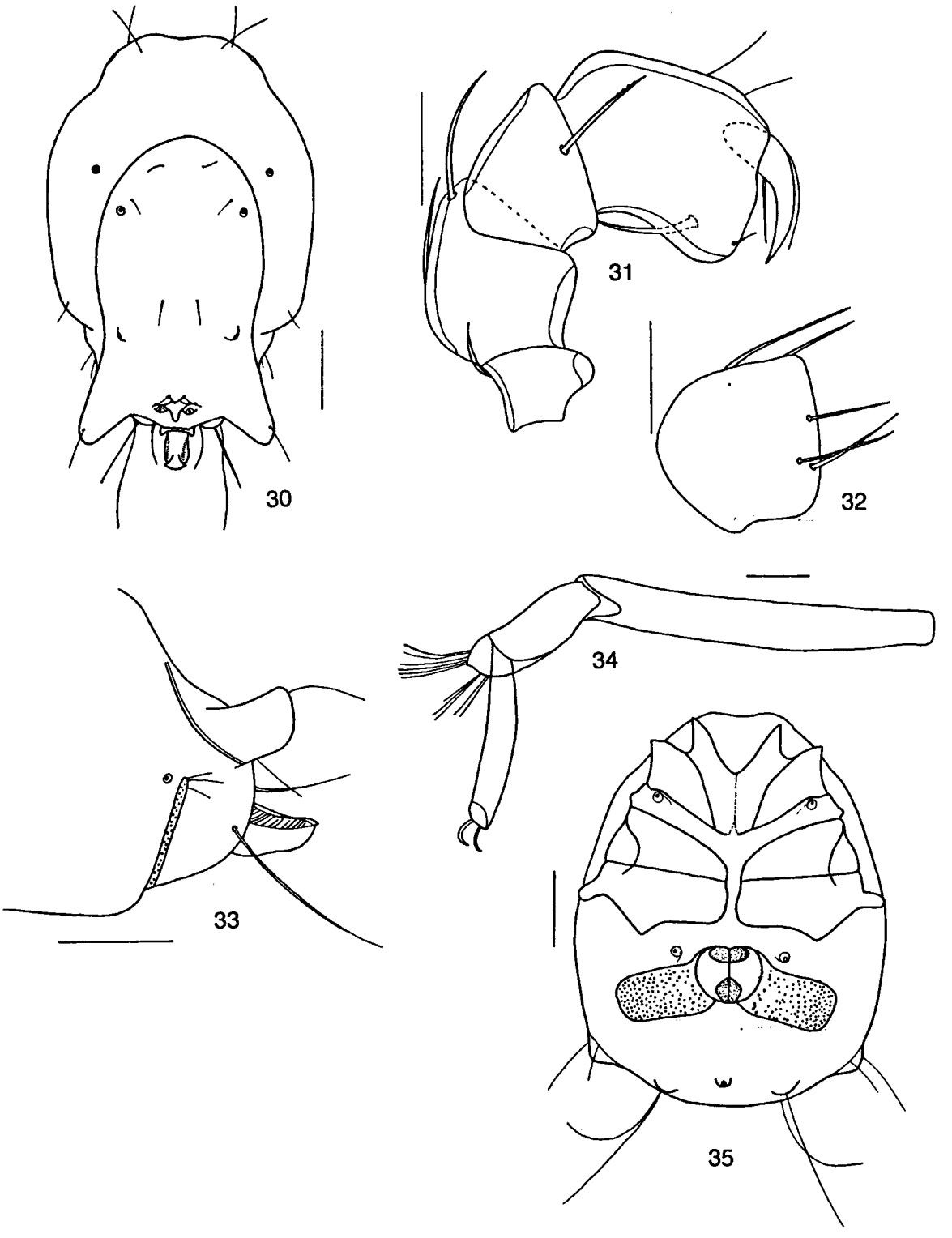
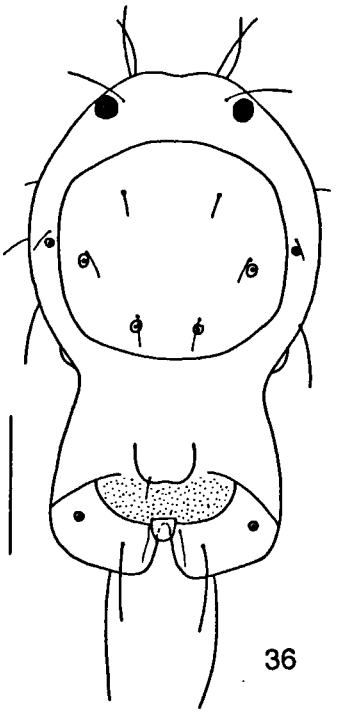
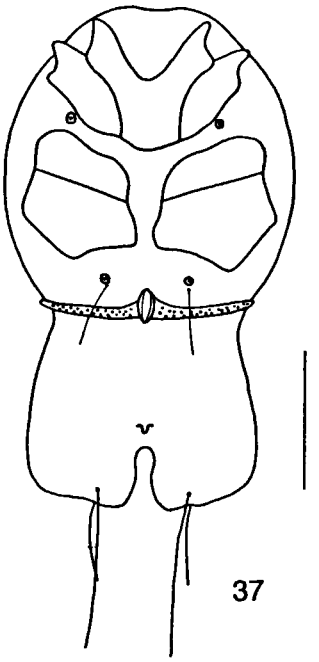
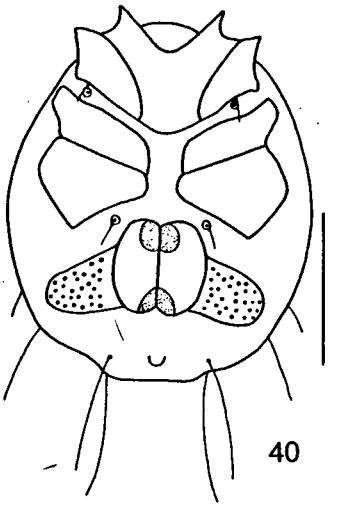


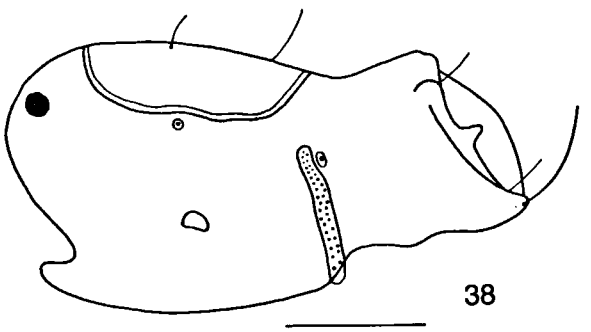
Fig. 30. *Arrenurus bruzelioides* sp. n., dorsal view ♂
Fig. 31. *Arrenurus bruzelioides* sp. n., palp ♂
Fig. 32. *Arrenurus bruzelioides* sp. n., medial side of PII ♂
Fig. 33. *Arrenurus bruzelioides* sp. n., lateral view petiole ♂
Fig. 34. *Arrenurus bruzelioides* sp. n., IV-leg-4-6 ♂ (not all setae illustrated)
Fig. 35. *Arrenurus bruzelioides* sp. n., ventral view ♀

Scale lines: 30, 33, 35 = 200 µm; 31, 32, 34 = 50 µm









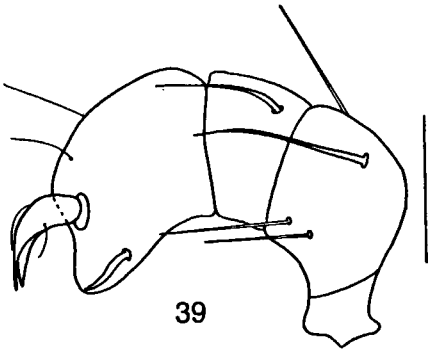


Fig. 36. *Arrenurus duffelsi* sp. n., dorsal view ♂
Fig. 37. *Arrenurus duffelsi* sp. n., ventral view ♂
Fig. 38. *Arrenurus duffelsi* sp. n., lateral view ♂
Fig. 39. *Arrenurus duffelsi* sp. n., palp ♂
Fig. 40. *Arrenurus duffelsi* sp. n., ventral view ♀

Scale lines: 36, 37, 38, 40 = 200 µm; 39 = 50 µm

setae. L1 and L2 not lying at equal distance from lateral margin. Location of D1, D2, D3 and D4 typical, L4 shifted to a position between dorsal and ventral shield. Suture line CX II/III fusing with suture line CX I/II above median fusion point. Suture line of CX III/IV complete. C4 located anterior to IV-leg socket. Genital plate with numerous acetabula, 107 long and 131 wide. Lengths of PI-PV: 53, 108, 89, 142, 46. Lengths I-leg-4-6: 96, 115, 91; lengths IV-leg-4-6: 163, 175, 139. Second, third and fourth leg with swimming setae: II-, III- and IV-leg-5 with 8, III- and IV-leg-4 with 3 swimming setae.

Male: Unknown.

Etymology. - The species is named after the village of Molibagu.

Discussion. - The configuration of suture lines between the coxal plates is similar to *A. inopinata* (CX II/III fused to CX I/II above median fusion point) but C4 are located anterior to the IV-leg socket, and PIV is shorter and narrower.

Arrenurus (Arrenurus) bruzelioides sp. n. (figs. 30-35)

Type material. - Holotype ♂: Lake Tondano, northern side, 4.iv.1991; leg. H. Smit. - Paratypes: 1 ♂ and 1 ♀, same location.

DESCRIPTION

Male: Body 1062 long and 713 wide; colour of body greenish. Anterior margin of body concave. Dorsal furrow complete. D3 on small, obtuse humps. Pygal lobes well developed; distance between pygal lobes 475. Hyaline appendage well developed, with a concave posterior margin and acute lateral angles. Petiole simple, 136 long, with an axe-shaped ligulate process. Gonopore 68 long. Lengths of PI-PV: 38, 84, 67, 91, 62. Inner medial side of PII with three setae located near anterior margin. Lengths of I-leg-4-6: 155, 146, 204; lengths of IV-leg-4-6: 281, 97, 146. Second, third and fourth legs with numerous swimming setae. IV-leg-4 without a spur.

Female: Body 1048 long and 844 wide. Body with distinct posterolateral corners; D1 on small humps. Distance between fourth coxal plates small. Medial margin of fourth coxal plates larger than medial margin of third coxal plates. Genital plates broad and short, not narrowed laterally; gonopore 150 long. Extensive pigmentation on genital valve. Lengths of palp segments: PI-PV 41, 74, 67, 98, 61. Chaetotaxy of palp as in male. Lengths of I-leg-4-6 175, 145, 145; lengths of IV-leg-4-6 213, 175, 155.

Etymology. - The species is named for its superficial resemblance to *A. bruzelii* Koenike.

Discussion. - The palearctic *A. bruzelii* has an axe-shaped petiole, the ligulate process however is triangular. The asian *A. beschi* Lundblad has a similar body shape and a superficially similar petiole, but differs in the presence of a spur.
The female of *A. bruzelioides* is close to *A. pseudoaffinis* Piersig. Both species differ in the shape of the genital plates (broad in *bruzelioides*, narrow in *A. pseudoaffinis*) and the pigmentation of the gonopore (anterior and posterior patch separated in *bruzelioides*, fused in *pseudoaffinis*).

Arrenurus (Megaluracarus) duffelsi sp. n. (figs. 36-40)

Type material. - Holotype ♂: Lake Matana, southeast of Soroako, Sulawesi Selatan, 13.x.1993; leg. J.P. Duffels. - Paratypes: 1 ♂ and 3 ♀♀, same location.

DESCRIPTION

Male: Body 727 (538) long and 407 (301) wide; colour brownish. Dorsal furrow complete, dorsal shield 310 long and 320 wide, glandularia of dorsal shield not on humps. D4 on fused tubercles. Gonopore 48 long. Genital plates extending onto lateral sides of body. Cauda broad, 325 wide with a large median cleft. Petiole simple, hyaline with rounded apex. Lengths of PI-PV: 22, 60, 31, 62, 34. PII with three setae on lateral side (one long seta dorsally and two shorter setae more ventrally). Lengths I-leg-4-6: 96, 94, 78; lengths IV-leg-4-6: 184, 87, 87. Third and fourth leg with swimming setae. IV-leg-4 with a short spur.

Female: Body 470 long and 387 wide; colour purple/brown. V-shaped capitular bay broad. Dorsal furrow complete, dorsum without humps. Posterior side of body with two small humps. Medial margin of third coxal plate as large as medial margin of fourth coxal plate. Genital valve large, pigmented, 116 long. Genital plates short and broad. Lengths of palp segments: PI-PV 17, 48, 34, 58, 36. Chaetotaxy of palp as in male. Lengths I-leg-4-6 74, 74, 56; lengths IV-leg-4-6 98, 94, 89. III and IV-legs with numerous swimming setae.

Etymology. - The species is named after the collector of the species, Dr. J.P. Duffels.

Discussion. - The shape of the cauda and the petiole are diagnostic for the new species. The paratype ♂ is similar to the holotype, but differs in smaller body size, more brightly coloured purple body, and minor differences in the shape of the cauda.
The only related species is *A. caviger* Viets, which has a cauda with two lobes posteriorly, more pointed coxal plates and a smaller dorsal shield. The female of *A. caviger* is unknown.

NEW SPECIES FOR THE FAUNA OF SULAWESI AND WAIGEO

The following species are new for the fauna of Sulawesi or Waigeo. Almost all species are widespread, most of them known from a number of Asian countries and/or Australia.

Diplodontus silvestrii (Daday)

Distribution: China, India, Shri Lanka and Sumatra.

Material examined. - Sulawesi Utara: Pond near Pinonobatuan (or Tambun), 21 km east of Dumoga-Bone NP, 12.iv.1991, 1 ♂, 1 ♀.

Limnesia lembangensis Piersig

Distribution: SE. Asia, Australia.

Material examined. - Sulawesi Utara: Fish pond near Tungoi, 10 km southwest of Kotamobagu, 21.iv.1991, 30 ♂♂, 14 ♀♀; Fish pond southeastern corner of Lake Tondano, 4.iv.1991, 16 ♂♂, 29 ♀♀; Lake Tondano, northern side, 4.iv.1991, 22 ♂♂, 19 ♀♀. Sulawesi Selatan: Lake Matana, 13.x.1993, 3 ♀♀.

Limnesia patens Viets

Distribution: Java and Burma.

Material examined. - Sulawesi Utara: Pond at Headquarter of Dumoga Bone National Park, 12.iv.1991, 4 ♂♂, 1 ♀.

Hygrobates hamatus hamatus Viets

Distribution: Sumatra, Java, Sulawesi and Australia; a subspecies has been described from India.

Material examined. - Waigeo: River Rumei, 13.x.1993, 1 ♂, 2 ♀♀.

H. australicus Cook

Cook (1986) described this species from Queensland, Australia. I compared my own specimen from Waigeo with the paratype, and it agrees well. Only the lengths of the palp segments are shorter in the specimen from Waigeo. Dorsal lengths of the palp segments of the specimen from Waigeo (in brackets the measurements of the paratype): PI 24 (28) µm, PII 94 (118) µm, PIII 53 (69) µm, PIV 122 (162), PV 50 (59) µm.

Material examined. - Waigeo, River Rumei, 13.x.1993, 1 ♀.

Atractides spatiosus Viets

Distribution: Sumatra, Java, Burma, Malay peninsula and Brunei (Wiles, in litt.).

Material examined. - Sulawesi Utara: Stream 18 km west of Molibagu, 16.iv.1991, 2 ♀♀; Boliohuto River at Lombongo, 30 km east of Gorontalo, 20.vii.1991, 1 ♀.

Neumania ambigua Piersig

Distribution: Asia, Australia.

Material examined. - Sulawesi Utara: Fish pond southeastern corner of Lake Tondano, 4.iv.1991, 2 ♀♀.

Neumania nodosa (Daday)

Distribution: Asia, Australia.

Material examined. - Sulawesi Utara: Fish pond near Tungoi, 10 km southwest of Kotamobagu, 21.iv.1991, 1 ♂; Fish pond southeastern corner of Lake Tondano, 4.iv.1991, 4 ♀♀; Lake Limboto, 27.vii.1991, 1 ♀.

Arrenurus rostratus rostratus Daday

Distribution: Asia, one subspecies reported from Australia.

Material examined. - Sulawesi Utara: Fish pond near Tungoi, 10 km southwest of Kotamobagu, 21.iv.1991, 2 ♂♂, 13 ♀♀; Fish pond SE corner of Lake Tondano, 4.iv.1991, 5 ♂♂, 2 ♀♀; Lake Limboto, 27.vii.1991, 1 ♀.

Arrenurus bharatensis Cook

The species is only known from India, this record means a considerable range extension of the species.

Material examined. - Sulawesi Utara: Lake Limboto, 27.vii.1991, 1 ♂.

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