

NEW SPECIES OF HALACARIDAE FROM AUSTRALIA (ACARINA : PROSTIGMATA)

BY J. C. OTTO *

HALACARIDAE TAXONOMY DEVELOPMENT NEW SPECIES AUSTRALIA	ABSTRACT : Four new species of Halacaridae (Acarina : Prostigmata) are described from Australian coastal waters : <i>Lohmannella pinggi</i> sp. n., <i>Agauopsis mokari</i> sp. n., <i>Agauopsis collaris</i> sp. n. and <i>Copidognathus scuna</i> sp. n. ; <i>Thalassarachna lubricus</i> (Bartsch), a species described from New Zealand, is recorded from Australia, and the descriptions of the female and the deutonymph are given.
HALACARIDAE TAXONOMIE ENTWICKLUNG NEUEN ARTEN AUSTRALIA	ZUSAMMENFASSUNG : Von der australischen Küste werden vier neue Arten von Halacaridae (Acarina : Prostigmata) beschrieben, <i>Lohmannella pinggi</i> sp. n., <i>Agauopsis mokari</i> sp. n., <i>Agauopsis collaris</i> sp. n. und <i>Copidognathus scuna</i> sp. n. ; <i>Thalassarachna lubricus</i> (Bartsch), eine von Neuseeland beschriebene Art wird von Australien gemeldet und durch die Beschreibung von Weibchen und Deutonymphe ergänzt.
HALACARIDAE TAXONOMIE DÉVELOPPEMENT ESPÈCES NOUVELLES AUSTRALIE	RÉSUMÉ : Quatre espèces nouvelles d'Halacaridae des côtes de l'Australie sont décrites : <i>Lohmannella pinggi</i> sp. n., <i>Agauopsis mokari</i> sp. n., <i>Agauopsis collaris</i> sp. n. et <i>Copidognathus scuna</i> sp. n. ; <i>Thalassarachna lubricus</i> (Bartsch), une espèce décrite de la Nouvelle-Zélande, est signalée en Australie, et les descriptions de la femelle et de la deutonymphe sont données.

INTRODUCTION

Halacarids are primarily marine mites, but may be found in brackish or fresh water habitats. Over 700 species have been described from all over the world but the knowledge of the fauna of large areas of the world is inadequate due to a lack of collecting activity (BARTSCH, 1989). Since Halacaridae are recorded from tropical as well as temperate shores, the entire Australian coastline appears suitable for their occurrence. Early collections in Australia have been carried out by LOHMANN, who found 9 species near Sydney (LOHMANN, 1893) and a tenth species at Shark Bay (LOHMANN, 1909). VIETS (1933) found 1 parasitic species of freshwater Halacaridae in the branchial chambers of the

freshwater crayfish *Astacopsis serratus*. BARTSCH (1985, 1986b) recorded a species from Philip Island (Victoria) which had previously been described from New Zealand (BARTSCH, 1979), and HARVEY (1988) described a freshwater species from Victoria. OTTO (1993) described a species of the "*Agauopsis hirsuta* — group" from the southeastern coast of Australia and found the records of *Agauopsis hirsuta* (Trouessart) (LOHMANN 1893, 1909) from Sydney and Champion Bay to be a mistake. An investigation of the halacarid fauna of Rottnest Island (Western Australia) has recently been undertaken by BARTSCH, who collected a large number of undescribed species (ANONYMUS, 1991).

Considering the extensive coastline with its variety of habitats suitable for halacarids, the

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number of halacarid species known in Australian coastal waters is low, as already pointed out by VIETS (1932). The number of species in Australia is expected to be at least as high as that of the northeastern Atlantic (116 species) or the Mediterranean, where 83 species have been recorded. To improve the poor knowledge of Australian Halacaridae, collections have been carried out around Port Phillip Bay (Victoria) and along the southeastern coast, where a further 5 species have been found, all belonging to genera which are thought to be predatory.

METHODS

All specimens were collected from intertidal algae and barnacles. Measurements are given in micrometres (μm) and refer to the median length and width at the widest point. Measurements of the anterodorsal plate include the anterior noselike projection, if present. Measurements of the gnathosoma are from the posterior end of the base to the tip of the rostrum and do not include palps or chelicerae. Length of ocular plates is measured as the greatest distance within the plate. Counts and measurements are usually expressed as ranges, followed by the number of cases involved (in brackets). The terms *anterior* and *posterior* for position of setae on appendages are used as in NEWELL (1971). Terminology and higher classification follows GREEN & MACQUITTY (1987). Measurements in decimal notations are taken from 1 specimen only and refer to the distance of a structure from the anterior margin of a sclerite or the proximal end of a segment in relation to the length of that particular segment or sclerite which is given as 1 (for example : seta inserted at 0.67 of rostrum means that a seta is situated at a distance from the anterior end of the rostrum which is $0.67 \times$ the length of the rostrum). Drawings were made with the aid of a camera lucida. Each scale bar indicates $100\mu\text{m}$, if not stated otherwise. For chaetotaxy, all available specimens were examined. If variation occurred, the number of cases involved is given in the tables in brackets. Abbreviations : AD, anterodorsal plate ; OC, ocular plate ; PD, poste-

rodorsal plate ; PE, posterior epimeral plate ; AE, anterior epimeral plate ; GA, genitoanal plate ; GO, genital opening ; P-1, P-2, P-3, P-4, segments of palps designated from base of palp ; I — IV, leg I to leg IV ; ds, dorsal setae numbered in sequence as ds-1 to ds-6 from anterior to posterior (not including dorsal epimeral setae) ; PAS, parambulacral setae ; ANIC, Australian National Insect Collection.

Genus *Lohmannella* Trouessart

Lohmannella TROUSSERT, 1901 : 250. — LOHMANN, 1907 : 391. VIETS, 1927 : 148 ; 1950 : 35 ; 1956 : 691. NEWELL, 1947 : 23 ; 1984 : 248. BARTSCH, 1977 : 141 ; 1986a : 231.

Type species : *Leptognathus falcata* Hodge, 1863 — by monotypy.

Diagnosis

Gnathosoma usually very long. Rostrum about as long as palpi and uniform in width beyond middle ; rounded terminally, not broadened, opposed to downwardly turned palpi. Palpi distinctly 4-segmented, attached to base of gnathosoma dorsally, separated at their bases by an interval no greater than width of P-1. P-3 no longer than wide. Genital acetabula internal in position. No setae on base of gnathosoma.

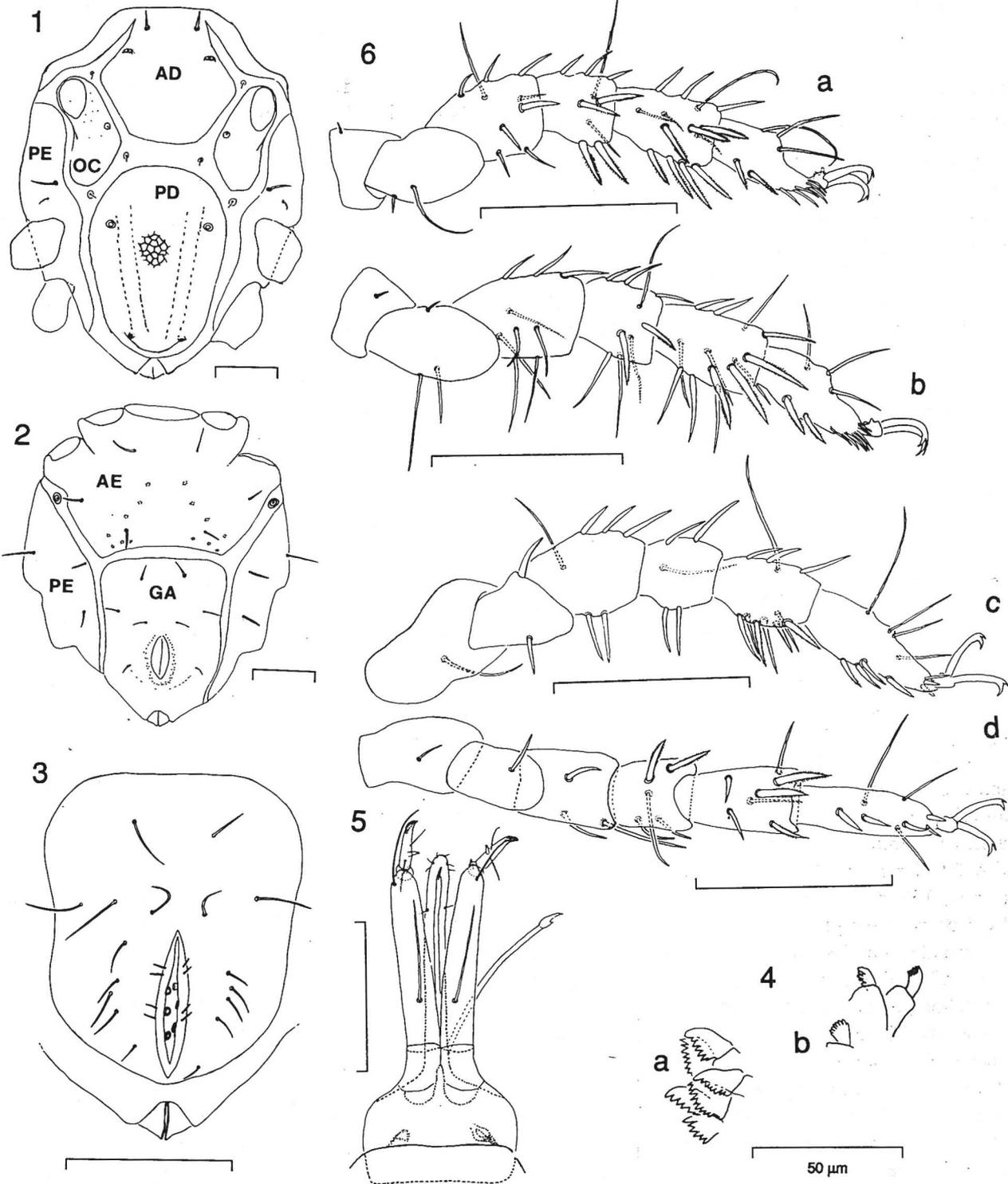
Lohmannella pinggi sp. n.

(Figs. 1-8)

Material examined

Holotype. Male, Victoria, Ricketts Point ($38^{\circ}0'S.$, $145^{\circ}2'E.$), 22.ii.1990, J. C. OTTO.

Paratypes. 9 males, 1 female, 1 nymph, data as for holotype, New South Wales, 1 male Mystery Bay ($36^{\circ}15'S.$, $150^{\circ}9'E.$) 12.i.91, J. C. OTTO ; 2 males, Guerilla Bay ($35^{\circ}48'S.$, $150^{\circ}14'E.$), 12.i.91 and 2.ii.91, J. C. OTTO ; 1 male, Malua Bay ($35^{\circ}47'S.$, $150^{\circ}14'E.$), 2.iii.91 ; 1 deutonymph,



FIGS. 1-6 : *Lohmannella pinggi* sp. n.

1. — Dorsal view of idiosoma of male. 2. — Ventral view of idiosoma of male. 3. — GO of female. 4 a, b. — Endogenous setae of female genitalia. 5. — Dorsal view of gnathosoma of male. 6. — Legs of male. a) leg I anterior b) leg II anterior c) leg III posterior d) leg IV ventral.

same data as for holotype ; all types from intertidal coralline algae ; holotype and paratypes in ANIC.

FEMALE

(measurements and counts from 2 specimens)

Idiosoma. Outline of body and plates as for male in Figs. 1, 2. Length 378-437, width 336-349. AD fused with AE anteriorly. One pair of large pores situated posteriorly to ds-1 on AD, as shown for male in Fig. 1. Dorsal and ventral plates smooth, PD 198 long and 160 wide ($n=1$), slightly reticulated between the two faint costae, rounded anteriorly, with 2 pairs of large pores, one of them in the anterior half, the other in the posterior half. OC 121 long ($n=1$), punctate, with 1 large cornea and with 1 large pore near inner margin ; opposite large pore at outer margin with a slitlike structure that runs into a pore internally. Setae *ds-2*, *ds-3* and *ds-4* situated in striated integument between dorsal plates, all with an alveolar ring in membranous cuticle surrounded by striae. One pair of adanal setae situated dorsally on anal papilla, but often obscured by PD. Striated integument between AE and PE with 1 pair of large pores, ventrolaterally in position. In compressed specimens these pores appear ventrally whereas in thick mounts they appear laterally and then may be obscured by surrounding striae. PE with 2 dorsal and 3 ventral setae, one of the ventral setae close to margin. The anterior dorsal setae much heavier than the other which is minute. AE with 3 pairs of ventral setae. GA 223 long and 139 wide ($n=1$). GO 87 long ($n=1$), $0.39 \times$ the length of GA (Fig. 3), bordered by 5 pairs of perigenital setae. A further 6-7 setae are situated on GA anteriorly to GO. GO with 4 pairs of spiniform subgenital setae inserted at the inside of genital sclerites and 3 pairs of genital acetabula (Fig. 3). Internal genitalia with 3 pairs of heavy claw-shaped endogenital setae which are distally greatly expanded and divided into 8 teeth (Fig. 4a). A further 3 endogenital setae have been found in 1 specimen, where the genitalia were everted. These setae were divided distally in 8 fingerlike projections (Fig. 4b).

Gnathosoma. Slender. Length 210-227, width at base 101 ($n=1$). Rostrum $0.66 \times$ the length of

gnathosoma ($n=1$). Rostrum and palps robust. P-2 118 long with 1 basal seta, $0.6 \times$ the length of P-2, inserted at 0.67 of P-2, and with 1 shorter dorsal setae inserted distally. P-1, P-3 and P-4 much shorter than P-2, as shown for male in Fig. 5. P-3 with 1 ventral spine. P-4 with 1 spine, 3 tapering setae and 1 seta with rounded tip at the distal end of the segment. Rostrum dorsally with 1 pair of distally inserted setae and 3 pairs of tiny rostral setae near tip of rostrum (1 pair may be visible only when using oil immersion).

Legs. Shorter than idiosoma. Tibia I with 7 bipectinate setae as shown for male in Fig. 6a. Chaetotaxy as shown for male in Figs. 6a-d and as summarized in Table 1. Tarsus I with 8 eupathidia and 1 dorsal solenidion ($n=1$), as shown for male in Fig. 7. Tarsus II with 7 eupathidia ($n=1$) and 1 solenidion. Tarsus III with 2 spiniform PAS and 1 eupathidium. Tarsus IV with a pair of spiniform PAS. All claws with a small accessory comb (can only be seen as a comb when viewed dorsally or ventrally under oil immersion ; in most cases claws are only visible laterally, therefore small comb appears rather like an accessory tooth).

	leg I	II	III	IV
Trochanter	1	1	1	1
Basifemur	2	3	2	1
Telofemur	9	9	6	3/4
Genu	5+IV	7+II	5	3+II
Tibia	7+VII	10+III	9+II	4+III
Tarsus	3+II	3+II	4+IV	6

TABLE 1 : Chaetotaxy of legs of *Lohmannella pinggi* sp. n. male. Number of conspicuously bipectinate setae in Roman numerals. Solenidia and parambulacral setae excluded.

MALE

(measurements and counts from 9 specimens)

Similar to female except for the morphology of GA.

Idiosoma. Length 382-424 ($n=9$), width 315-319 ($n=9$). PD 195 long and 151 wide ($n=1$), OC 114 long ($n=1$), GA 202 long and 151 wide ($n=1$). GO small (Fig. 2), $0.23 \times$ the length of GA including anal papilla ; surrounded by about 50 perigenital setae, anteriorly in a single row, posteriorly in a double row (Fig. 8). A further 3 pairs of setae are situated in the anterior half of the plate and a

further 1 pair of setae lies in the posterior half of the plate closer to the margin than to the other perigenital setae (Fig. 2). Genital sclerites with 2 pairs of stout subgenital setae (Fig. 8).

Gnathosoma. (Fig. 4). Length 202 (n=1), 0.52 × the length of idiosoma. Width at base 99 (n=1). Rostrum 0.68 × the length of gnathosoma. P-2 92 long (n=1).

DEUTONYMPH

(measurements and counts from 1 specimen)

Similar to female except for the smaller dimensions of body and plates, the morphology of OC, the chaetotaxy and morphology of GA and the chaetotaxy of the legs.

Idiosoma. Length 374, width 298. PD small compared with body, 121 long and 92 wide, separated from AD by more than length of PD by a band of striated cuticle. OC 67 long and about half as wide, with large pore situated in posterior inner corner of plate. GA 82 long and 71 wide with 3 pairs of setae close to lateral margin of the plate. GO with 2 pairs of genital acetabula and flanked by 2 pairs of small setae. Only 1 dorsal seta could be found in integument, inserted between PE and AE; other setae may be present but obscured. AE with 3 pairs of pore-like marks. PE with only 1 dorsal and 3 ventral setae.

Gnathosoma. Length 163, 0.44 × length of idiosoma. Width at base 77. Rostrum 0.62 × length of gnathosoma.

Legs. Chaetotaxy as summarised in Table 2. Tarsus I with 5 eupathidia and 1 solenidion, tarsus II with 4 eupathidia and 1 solenidion. Tarsi III and IV as in female.

	Leg I	II	III	IV
Trochanter	1	1	1	1
Basifemur	3	3	2	1
Telofemur	5	6	5	2
Genu	4+II	4+II	3	2+I
Tibia	5+V	7+II	3+II	3+III
Tarsus	3+II	3+II	4+II	3+I

TABLE 2 : Chaetotaxy of legs of *Lohmannella pinggi* sp. n. deutonymph. Number of bipectinate setae in Roman numerals. Solenidia and parambulacral setae excluded.

COMMENTS

Lohmannella pinggi sp. n. can be assigned to Newells "key group 3500" (see Newell, 1984). Species of that group lack ventral spines on P-2, have dorsal pore 1 posterior to *ds*-1, or at the same level or scarcely anterior to *ds*-1. Of this species — group, only *L. humerosa* possesses 7 heavy bipectinate setae on tibia I. *L. pinggi* differs from this species by having the pore on OC closer to the inner than to the outer margin of the plate, by having *ds*-2 in striated integument, the presence of only 5 *ds*, by the lack of setae on PD, and by the presence of 1 pair of large pores ventrolaterally in striated integument, typically lacking in all species from the northern hemisphere (NEWELL, 1984). *L. pinggi* is further characterized by the presence of 2 pairs of pores on PD, and long basal setae on P-2.

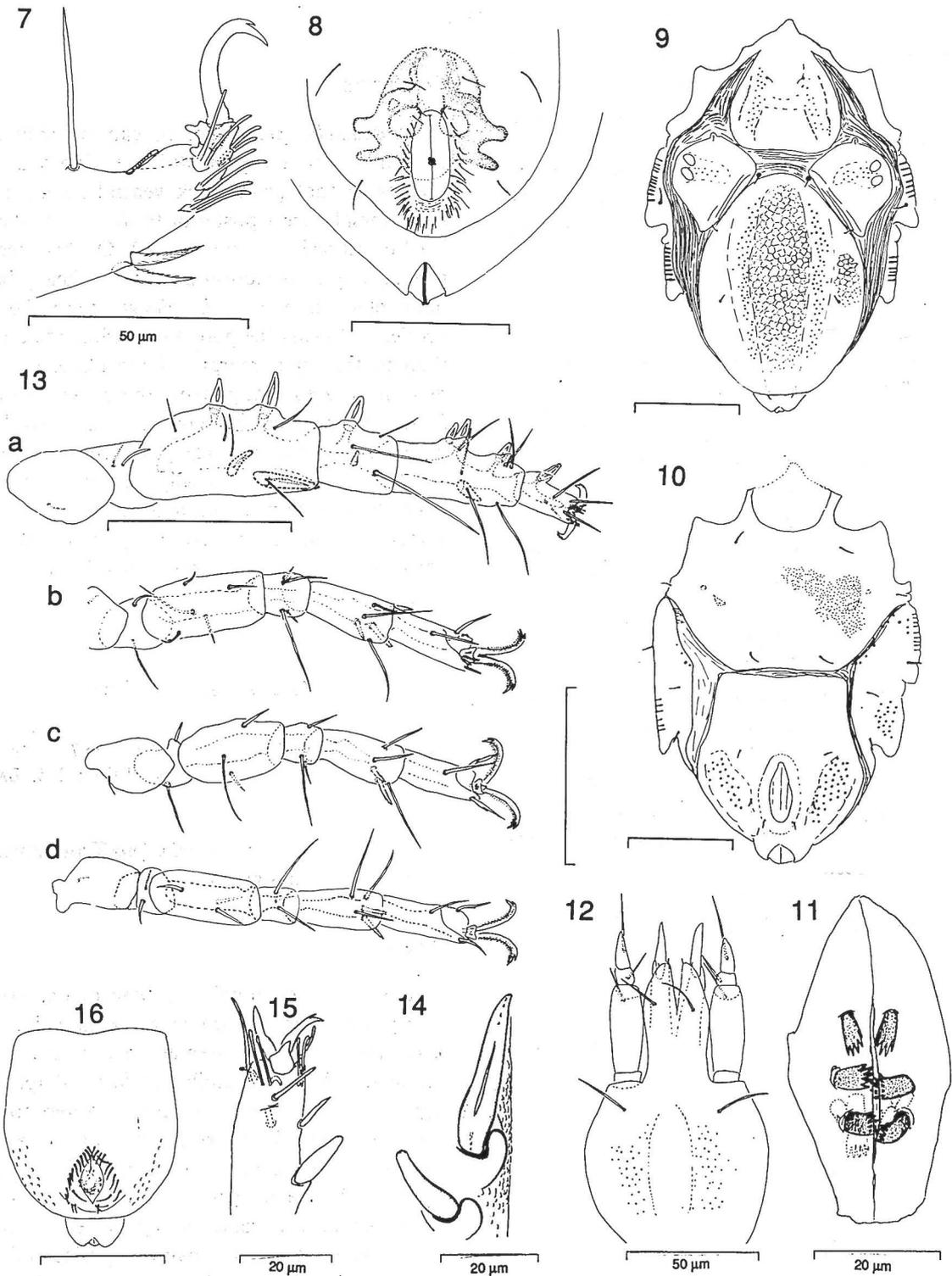
Genus *Agauopsis* Viets

Agauopsis VIETS, 1927 : 94; 1956 : 687. — NEWELL, 1947 : 21, 38, 184; 1971 : 28; 1984 : 215. BARTSCH 1986b : 165.

Type species : *Agau brevivalpus* Trouessart, 1889 — by original designation.

Diagnosis

Palpi attached laterally to base of gnathosoma, clearly visible in ventral view, separated at their bases by a distance greater than width of P-1. Ambulacra I and II similar in form. Palpi with 4 segments. Seta of P-3 anterior or anterodorsal in position. Genu II short in relation to adjacent telofemur and tibia. Legs I typically (but not always) rakelike in general appearance, owing to heavy spiniform setae along anterior margin. Female typically with 3 pairs of perigenital setae. Gnathosoma relatively short, never reaching to end of telofemur I.



FIGS. 7-8 : *Lohmannella pingii* sp. n.

7. — Anterior view of tarsus I of male. 8. — GA of male.

FIGS. 9-16 : *Agauopsis mokari* sp. n.

9. — Dorsal view of idiosoma of female. 10. — Ventral view of idiosoma of female. 11. — GO of female. 12. — Ventral view of gnathosoma of female. 13. — Legs of female a) leg I dorsal b) leg II dorsal c) leg III dorsal d) leg IV dorsal. 14. — Heavy spines on ventral side of telofemur I of female. 15. — Tarsus I of female ventral. 16. — GA of male.

Agauopsis mokari sp. n.

(Figs. 9-16)

Material examined

Holotype. Female, New South Wales, Guerilla Bay (35°48'S., 150°14'E.), 2-II-1991, intertidal coralline algae, J. C. OTTO, in ANIC.

Paratypes. 3 females, 3 males, data as for holotype; 2 females, 1 male, data as for holotype except collected from intertidal algae *Padina pavonea*; 1 male, 1 female, data as for holotype except 2.III.1991; 1 female, data as for holotype except 12.I.1991; 1 female, data as for holotype except 12.V.1991; 3 females, Victoria, Walkerville, intertidal algae, 8.XII.1991, J. C. OTTO coll. All types in ANIC.

FEMALE

(measurements and counts from 7 specimens)

Idiosoma. Outline of body and plates as in Figs. 9, 10. Length 344-386, width 244-302. AD 121-126 long and 105-118 wide, frontal margin clearly unidentate; with an H-shaped elevated ridge that carries small pores on its lateral sides. Seta *ds*-1 inserted at anterior extensions of ridge; *ds*-2 inserted on anterior edges of ocular plates; *ds*-3 inserted in integument between AD and PD. PD elongate, closely abutting AD, strongly ornamented throughout; with two elevated costae, divergent anteriorly and terminating at anterolateral margins of shield; with *ds*-4 inserted on anterolateral corners and *ds*-5 lateromedially on plate and with adanal setae inserting on posterior end of plate. OC pointed posteriorly, closely abutting PD; with a median areola and 2 corneae lateromedially. AE with 3 pairs of setae and evenly punctate with small pores; with 1 pair of epimeral pores and 1 pair of lyrifissures. PE with two areolae laterally and a series of small porelike marks present near margin close to AE. PE each with 1 dorsal and 3 ventral setae. GA closely abutting AE and PE, slightly incurved anteriorly and laterally above level of GO; with 3 pairs of perigenital setae, one inserted anterolateral to the genital opening, and 2 pairs flanking the genital sclerites posteriorly (Fig. 10);

with 6 pairs of internally inserted endogenital setae which are greatly expanded and distally divided into 5 fingerlike projections; 3 pairs are more superficial than the other pairs (Fig. 11); with a group of pores lateral to GO. Anal sclerites separated from genital sclerites; with a pair of adanal setae on the posterior end of PD, in most specimens obscured.

Gnathosoma. Length 252, width 172 (n=1). Rostrum 0.4 × the length of gnathosoma (n=1). Palpi distinctly longer than rostrum (Fig. 12). P-2, P-3 and P-4 each with 1 dorsal seta. Protorostral and deutorostral setae clearly visible. Tritorostral setae longer and at 0.33 of rostrum. Base of gnathosoma with groups of small pores surrounding the pharyngeal plate and with a pair of elongate setae inserted posterior to P-1.

	Leg I	II	III	IV
Trochanter	1	1	1	0
Basifemur	2	2	2	2
Telofemur	4#+5	5	3	3
Genu	2#+3	4	3	3
Tibia	4#+6	3'+3	2'+3	2'+3
Tarsus	1#+4	3	3	3

TABLE 3 : Chaetotaxy of legs of *Agauopsis mokari* sp. n. Parambulacral setae and solenidia excluded. Setae on trochanters I, II and IV in most specimens obscured. # = spiniform setae typical for leg I. ' = bipectinate spiniform setae.

Legs. Shorter than idiosoma. Leg I thickened, raketlike (Fig. 13a); telofemur greatly thickened, with 2 anterior and 2 ventral spines, the distoventral spine being heaviest and pointing towards distal end of leg (Figs. 13a, 14). Genu I with 1 anterior spine and 1 smaller anterior-directed ventral spine. Tibia I with 3 anterior spines and 1 ventral spine, the proximal ones of the anterior spines close together. Tarsus I with 1 anterior spine. Leg chaetotaxy as shown in Figs. 13 a-d and summarized in Table 3. All spines on legs II-IV slightly bipectinate. Tarsus I with 2 lateral claws that carry a small additional hook at their ends and with a small median claw (Fig. 15). All spiniform setae on leg I are covered by minute denticles on their distal half. Claws on tarsi II-IV all with a well developed comb. Tarsi III and IV each with 1 spiniform PAS

distally Two of the three dorsal setae on tarsi III and IV appear slightly split at about halfway. Tarsus I with 5 eupathidia and 1 solenidion (Fig. 15), tarsus II with 1 eupathidium, 1 spiniform PAS and 1 solenidion (n=2).

MALE

Similar to female except for the morphology of GA and a slightly different ornamentation on AD.

Idiosoma. Length 349-357, width 239-269 (n=3). The H-shaped ridge on AD bears pores on the transverse ridge connecting the 2 longitudinal ridges. GA with a posteriorly incomplete circle of approximately 28 setae (Fig. 16).

COMMENTS

A. mokari is similar to species of the *microrhyncha* - group (BARTSCH, 1986b), including all species of Newell's "keygroup 7000" (see NEWELL, 1984) in having 3 anterior (= ventromedial in BARTSCH, 1986b) spines on tibia I (2 of these close together). *A. mokari* differs from the *microrhyncha* - group by having 4 spines on telofemur I rather than 3.

Agauopsis collaris sp. n. (Figs. 17-24)

Material examined

Holotype. Female, New South Wales, Huskisson (35°3'S., 150°40'E.), 9.iii.1991, from barnacles, J. C. OTTO, in ANIC.

Paratypes. 3 females, 5 males, 5 deutonymphs, same data as for holotype.

FEMALE

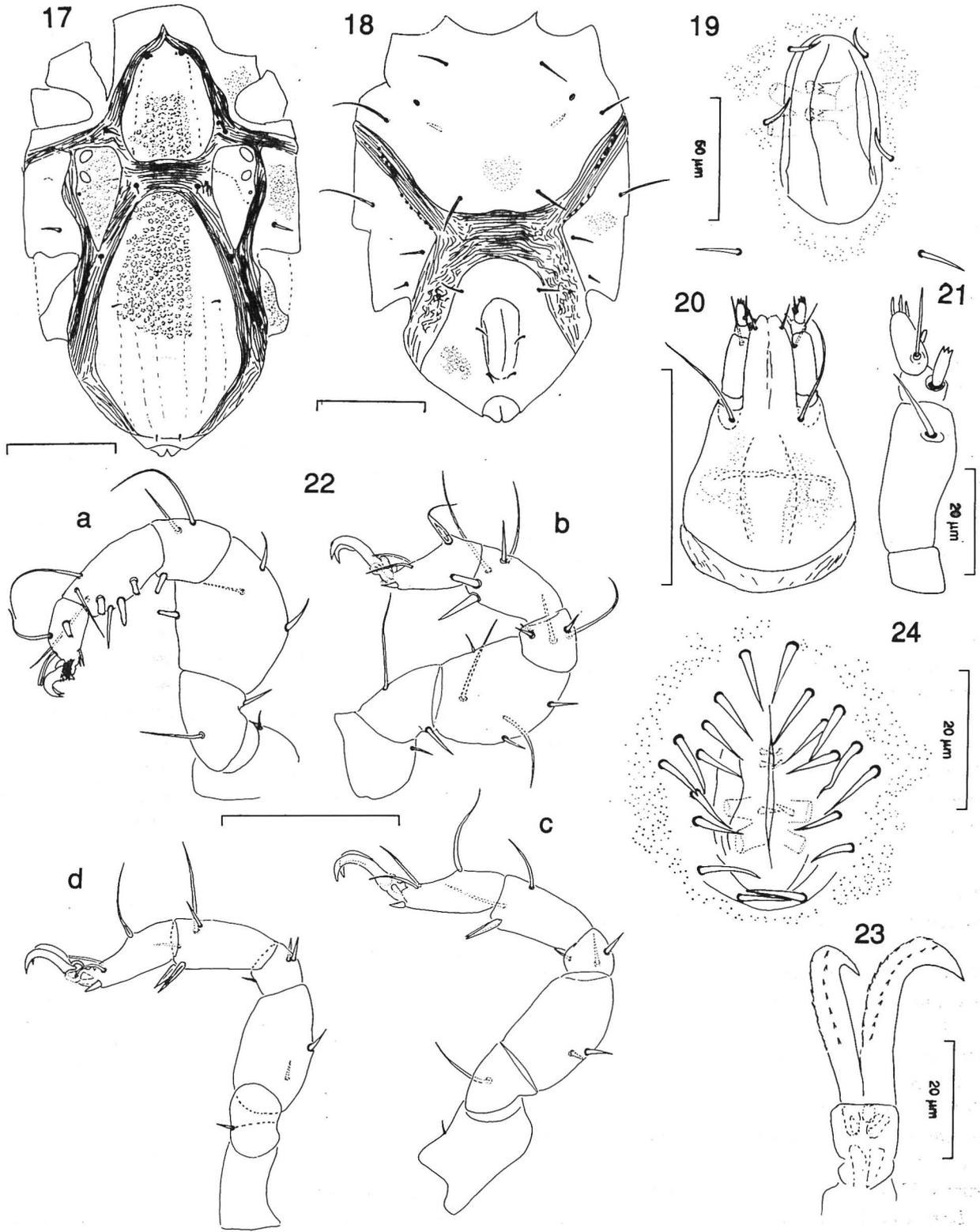
(measurements and counts from 4 specimens)

Idiosoma. Outline and plates as in Figs. 17, 18. Length 416-428, width 258-260 (n=3). Dorsal plates uniformly ornamented, punctate with small pores arranged in circles and with a network formed by small cuticular bars. AD without frontal

spine, completely surrounded by striated membranous cuticle. In 1 specimen AD was fused with AE anteriorly. AD pointed anteriorly and slightly concave posteriorly; with 1 pair of larger pores near anterior margin of AD, and medially to them a pair of thick short *ds*-1, almost invisible. OC 92-108 long, pointed posteriorly, with 2 corneae and 2 pores at outer medial margin. PD 227-252 long and 139-147 wide, slightly incurved posterior to *ds*-5. Seta *ds*-6 inserted on posterior end of PD. Costae and paracostae indistinct and visible only in high magnification. AE punctate, pores arranged irregularly; with 3 pairs of setae; both sides fused anteriorly to form a collar-like extension. AE with 1 pair of epimeral pores and 1 pair of lyrifissures. PE punctate with minute pores arranged in circular groups, pattern less conspicuous than on dorsal plates; with 1 pair of dorsal and 3 pairs of ventral setae. GA conical in shape, widening towards posterior, 151-168 long and 134-160 wide, covered with minute pores arranged in circular groups. GA with 1 pair of setae near anterior corners and 2 pairs of setae flanking GO medially and at posterior end of GO. GO with 2 pairs of genital acetabula and 2 pairs of internal setae which are divided distally into 3 toothlike projections (Fig. 19). Setae *ds*-2, *ds*-3 and *ds*-4 inserted in striated integument, *ds*-2 anterior to OC, *ds*-3 between corners of AD, OC and PD, *ds*-4 posterior to OC. Ventral striated integument with 2 groups of pore-like marks on each side. Striae lateral to GA not straight, but in a conspicuous zig-zag pattern. GO about 0.5 × the length of GA.

Gnathosoma. Length 72-118 (n=3), width at base 81-89 (n=3). Rostrum 0.37 × the length of gnathosoma (n=1). Palps slightly longer than rostrum (Fig. 20). P-4 with 3 small setae on tip and 1 small spine dorsally. P-3 with 1 anterior spine (Fig. 21), with only 2 pairs of rostral setae, of which 1 pair is minute. One pair of basirostral setae posterior to insertion of palps. Gnathosoma punctate dorsally and ventrally except on pharyngeal plate.

Legs. Shorter than idiosoma. All leg segments punctate dorsally, pores arranged in a more or less circular pattern. Tarsus II with a dorsal seta, thick in the basal half and fine distally (Fig. 22b).



FIGS. 17-24 : *Agauopsis collaris* sp. n.

17. — Dorsal view of idiosoma of female. 18. — Ventral view of idiosoma of female. 19. — GO of female. 20. — Ventral view of gnathosoma of female. 21. — Dorsal view of palp of female. 22a. — Anterior view of leg I of female. 22b. — Anterior view of leg II of female. 22c. — Posterior view of leg III of female. 22d. — Posterior view of leg IV of female. 23. — Dorsal view of ambulacrum IV of female. 24. — Genital opening of male.

Chaetotaxy of legs as shown in Figs. 22a-d and summarized in Table 4. All tarsi with 2 lateral claws. Tarsus I additionally with 1 small median claw. All ambulacra dorsally with a double row of small teeth, visible only in oil immersion (Fig. 23). Tarsus I with 4 PAS, tarsus II with 2 (in 1 specimen 3) spiniform PAS and 1 solenidion, tarsi III and IV each with 1 spiniform PAS.

	Leg I	II	III	IV
Trochanter	1	1	1	0
Basifemur	2	2	1	1
Telofemur	3+1*	5	2	2
Genu	2+1*	5	3	3
Tibia	4+3*	4+1*	4	5
Tarsus	5+1*	3	3	3

TABLE 4 : Chaetotaxy of legs of *Agauopsis collaris* sp. n. female. Parambulacral setae and solenidia excluded. * = spiniform seta with minute denticles at the end.

MALE

Similar to female except for chaetotaxy of GA and morphology of GO.

Idiosoma. Length 399-454, width 244-302 (n=3), GO surrounded by 20 perigenital setae (n=1); with 3 pairs of internally inserted subgenital setae and 2 pairs of genital acetabula (Fig. 24).

DEUTONYMPH

(measurements and counts from 1 specimen).

Similar to female except size of body and plates, GA, and leg chaetotaxy.

Idiosoma. Length 353, width 231. PD 188 long and 96 wide. AD 104 long and 72 wide. PD separated from AD by 59, less than length of OC (76). GA 64 long and 50 wide, with 2 pairs of genital acetabula and 3 pairs of setae.

Gnathosoma. Length 92, width at base 67. Rostrum 0.33 × the length of gnathosoma.

Legs. Chaetotaxy summarized in Table 5. Tarsus I with 4 eupathidia, tarsus II with 1 eupathidium and 2 spiniform PAS, tarsi III and IV each with 1 spiniform PAS.

	Leg I	II	III	IV
Trochanter	1	1	1	0
Basifemur	2	2	1	1
Telofemur	3+1'	5	2	2
Genu	3+2*	5	3	3
Tibia	5+3*	3+2*	2+2(*)	3+2*
Tarsus	5+1*	3	3	3

TABLE 5 : Chaetotaxy of legs of *Agauopsis collaris* sp. n. deutonymph. Parambulacral setae and solenidia excluded; ' = spiniform seta; * = spiniform seta with denticles at tip; (*) = slightly bipectinate spiniform seta.

COMMENTS

A. collaris has a collarlike extension of the anterior epimeral plate, which is otherwise found only in *A. roseus* NEWELL 1984. *A. collaris* and *A. roseus* are also similar in the relatively small size of the spiniform setae on leg I, very small *ds*-1, porose patterning of plates and the lack of a frontal spine. *A. collaris* differs from *A. roseus* by having a double row of denticles dorsally on the ambulacra, a second pore on OC, minute denticles at the end of the spiniform setae of most segments of leg I, especially tibia I, by lacking very distinct costae and the stepped structure (see NEWELL, 1984) of most fossorial setae. *A. collaris* cannot be assigned to any of the species groups defined by BARTSCH (1986b).

Genus *Thalassarachna* Packard

Thalassarachna PACKARD, 1871 : 108. — NEWELL, 1947 : 100; 1984 : 89.

Type species : *Thalassarachna verrilli* Packard, 1871 (= *Acarus basteri* Johnston, 1836) — by monotypy.

Halacarus (*Halacarellus*) VIETS, 1927 : 116, 120.

Type species : *Halacarus balticus* Lohmann, 1889 — by original designation.

Diagnosis

Palpi attached to gnathosoma laterally so that they are visible in ventral view. Ambulacra I and II similar in structure. Seta of P-3 anterior in position. Genu of legs I-IV much shorter than adjacent telofemur and tibia. Legs I not with rakelike

armature. Ocular plates dorsal in position, shield-like in form, or more rarely bandlike. Basirostral setae either on basis gnathosomae or on the rostrum. Cheliceral tarsus with many minute denticles along dorsal margin. Adanal setae on anal papilla, dorsal in position.

Thalassarachna lubricus (Bartsch)

Halacarellus lubricus BARTSCH, 1985 : 552. LUXTON, 1990a : 405; 1990b : 423.

Material examined

Holotype. Male, New Zealand, Omaha Cove, near Leigh, ex Corallina from sheltered shore, 26.ii.1967, M. LUXTON, in New Zealand Arthropod collection, 4 females, 5 males, 3 deutonymphs. New South Wales, Guerilla Bay (35°48'S., 150°14'E.), intertidal coralline algae, 12.i.1991, J. C. OTTO 1 female, 2 males, 1 deutonymph, Guerilla Bay, intertidal coralline algae, 2.ii.1991, J. C. OTTO; 1 deutonymph, Malua Bay, intertidal coralline algae, 7.xii.1990, J. C. OTTO; Australian specimens in ANIC.

FEMALE

(measurements from 4 specimens)

Idiosoma. Outline of body and plates as in Figs. 25, 26. Length 496-550, width 323-420. AD 172-185 long and 151-164 wide, slightly convex anteriorly, indented posteriorly and laterally, with a pair of small pores anteriorly to lateral indents. On same level as pores, a median areola with a raised protuberance. Another areola in posterior half of plate is flanked by groups of small pores. *ds-1* are situated between the 2 areolae. OC 134-155 long, pointed posteriorly and rounded anteriorly; with 2 pores, one posterolateral to cornea, another in posterior corner; with one cornea; ornamented with a granular texture apart from a narrow ridge at outer margin of the plate. PD 265-294 long and 216-231 wide, narrowing towards the anterior end, with distinct costae and with 1 pair of setae and a pair of pores directly posterior to the setae. Alveoli

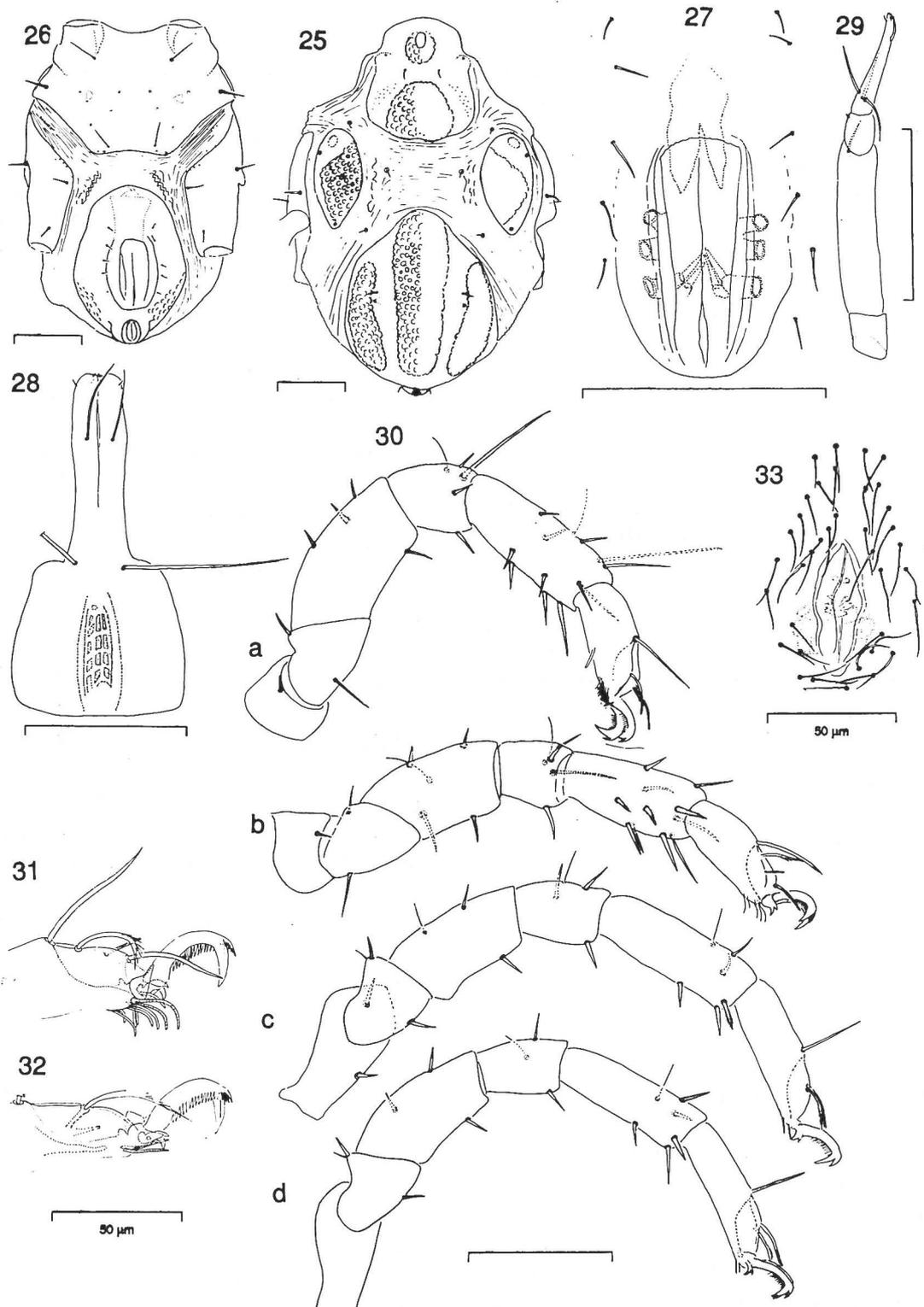
of *ds-2*, *ds-3* and *ds-4* small, in membranous cuticle. Setae *ds-2* anterior, *ds-3* mediad, *ds-4* posteromedial to OC (Fig. 25). PD with 3 granulate areolae lateral to costae. One dorsal and 3 ventral setae on PE. AE with 3 pairs of setae. Adanal setae located dorsally on anal papilla. GA 218-248 long and 164-181 (n=3) wide, with a variable number of perigenital setae, sometimes asymmetrical. Numbers of perigenital setae in 4 specimens on either side : 5/5; 6/5; 7/6; 4/4. Internal genitalia with 3 pairs of genital acetabula and 2 pairs of spiniform setae (Fig. 27). Ovipositor reaching anteriorly to margin of GA.

Gnathosoma. Length 210-214 (n=3), width at base 97-105. Pharyngeal plate with 4 pairs of central squares (Fig. 28). Rostrum 0.57 × the length of gnathosoma, parallel-sided, in most specimens widening in distal half of rostrum at level of tritorostral setae. Protorostral setae very small, spine-like. Deutorostral setae more slender than protorostral setae. Tritorostral setae slender, a little longer than width of rostrum at that level, inserted at 0.35 of rostrum. Basirostral setae inserted at level of base of rostrum (Fig. 28). Seta of P-3 very small, only visible in oil immersion and high magnification (1250 x), situated distally. P-4 proximal with a whorl of 3 setae, distally with 1 small seta near tip and a heavier solenidion-like setae at 0.26 of P-4 (Fig. 29).

Legs. Slightly shorter than idiosoma. Chaetotaxy as in Figs. 30a-d and summarized in Table 6. Tarsus I with 1 dorsal erect solenidion and 21 eupathidia (n=1). Tarsus II with 1 erect solenidia and 9 eupathidia (n=1) (Fig. 31). Tarsi III (Fig. 32) and IV each with 2 eupathidia. All claws with accessory process and pecten well developed. Median claw of all legs bidentate.

	leg I	II	III	IV
Trochanter	1	1	2	0
Basifemur	2	2	3	3
Telofemur	4	5	3	3
Genu	5	5	4	3
Tibia	13	11	6	6
Tarsus	4	3	3	3

TABLE 6 : Chaetotaxy of legs of *Thalassarachna lubricus* (Bartsch) female. Parambulacral setae and solenidia excluded.



FIGS. 25-33 : *Thalassarachna lubricus* (Bartsch).

25. — Dorsal view of idiosoma of female. 26. — Ventral view of idiosoma of female. 27. — GO of female. 28. — Ventral view of gnathosoma of female. 29. — Ventral view of palp of female. 30a. — Anterior view of leg I of female. 30b. — Anterior view of leg II of female. 30c. — Posterior view of leg III of female. 30d. — Posterior view of leg IV of female. 31. — Anterior view of tip of tarsus II of female (only 1 lateral claw drawn). 32. — Posterior view of tip of tarsus III (only 1 lateral claw and 1 of the 3 fossorial setae drawn in full). 33. — GO of male.

MALE

The Australian males are similar to the holotype male from New Zealand in all respects, except for a different body size. The length of the idiosoma in the Australian specimen was measured as 483-648 (n=7), the width 332-470 (n=7). Size differences also occur in the plates, as most measurements taken from plates of Australian specimens exceed those of the holotype. Only 1 specimen is known from New Zealand and the importance of the different size is therefore uncertain. The GO was typically observed as in Fig. 33.

DEUTONYMPH

(measurements and counts from 4 specimens)

Similar to female and male except smaller dimensions of body and plates, chaetotaxy and morphology of GA.

Idiosoma. Length 487-571 (n=3), width 315-445. PD 168-193 long (n=3) and 113-164 (n=3) wide. AD 126-164 long and 97-130 wide. PD and AD separated by more than length of PD through striated cuticle. OC 97-126 long (n=3) and 32-42 wide (n=3). GA 63-84 long and 63-92 wide, sometimes longer than wide, sometimes wider than long. GO 25 long (n=3). PE with only 1 dorsal and 1 ventral seta.

Gnathosoma. Length 168 (n=1), width at base 87. Rostrum 0.56 × the length of gnathosoma.

Legs. Chaetotaxy of legs as shown in Table 7. Tarsi I and II each with 1 solenidion. Number of parambulacral setae : 10-18 on tarsus I (n=3), 4-5 on tarsus II (n=3), 2 on tarsus III (n=2) and 2 on tarsus IV (n=2).

	leg I	II	III	IV
Trochanter	1	1	2	0
Basifemur	2	2(5), 3(1)	3	1
Telofemur	4(2), 3(3), 2(2)	4	3	3
Genu	5	5(5), 4(3)	4(6), 3(2)	3
Tibia	9(7), 5(1)	8(4), 5(1)	5	5
Tarsus	4	3	3	3

TABLE 7 : Chaetotaxy of *Thalassarachna lubricus* (Bartsch) deutonymphs (number of cases involved in brackets. Parambulacral setae and solenidia excluded).

COMMENTS

The chaetotaxy as illustrated by BARTSCH (1985) for the holotype is incorrect. On one of the tibiae of the holotype, 10 setae plus 1 insertion point were counted; on the other tibia II in holotype 10 plus 1 broken setae were counted. Both counts indicate that the correct number of setae on tibia II is 11. Also incorrectly drawn is basifemur III, as the holotype possesses 3 setae on basifemur III. BARTSCH distinguishes *T. lubricus* (Bartsch) from *T. antipodianus* Newell 1984 by the number and shape of setae on tibia II. However, they may also be distinguished by the number of pores on OC. *T. lubricus* possesses 2 pores, while *T. antipodianus* as described by NEWELL (1984) has only 1 pore. In addition, telofemur I in *T. antipodianus* possesses 5 setae, while telofemur I in *T. lubricus* has only 4 setae. Furthermore, the number of pairs of perigenital setae in the *T. antipodianus* females is 3 whereas, in *T. lubricus* females, more than 3 pairs always could be counted (see text).

The genus *Thalassarachna* Packard is sometimes referred to as *Halacarellus* Viets (e.g. BARTSCH, 1985) *Halacarellus*, however, is a synonym of *Thalassarachna* since their type species are congeneric and *Thalassarachna* has priority over *Halacarellus* (NEWELL, 1984).

Genus *Copidognathus* Trouessart

Copidognathus TROUESSART, 1888 : 754. — NEWELL 1984 : 119-197. GREEN and MACQUITTY, 1987 : 76.

Type species : *Copidognathus glyptoderma* Trouessart, 1888 — by monotypy.

Diagnosis

Palpi attached to gnathosoma laterally; bases of palpi separated by a distance considerably greater than width of P-1, and clearly visible in ventral view. Palpi distinctly 4-segmented. P-4 usually longer than P-2, slender, tapering; attenuate distal portion longer than basal portion. P-2 with a single, usually long dorsal seta. P-3 without setae; P-4

with 3 setae on the thick basal portion. Palpi distinctly geniculate.

Copidognathus scuna sp. n.

(Figs. 34-44)

Material examined

Holotype. Female, New South Wales, Malua Bay (35°47'S., 150°14'E.), 2.iii.1991 intertidal coralline algae, J. C. OTTO, in ANIC.

Paratypes. New South Wales, 2 females, 4 males, 1 protonymph, Guerilla Bay (35°48'S., 150°14'E.), 12.i.1991, intertidal coralline algae, J. C. OTTO 2 females, 3 males, Guerilla Bay, 2.ii.1991, intertidal coralline algae, J. C. OTTO, in ANIC.

FEMALE

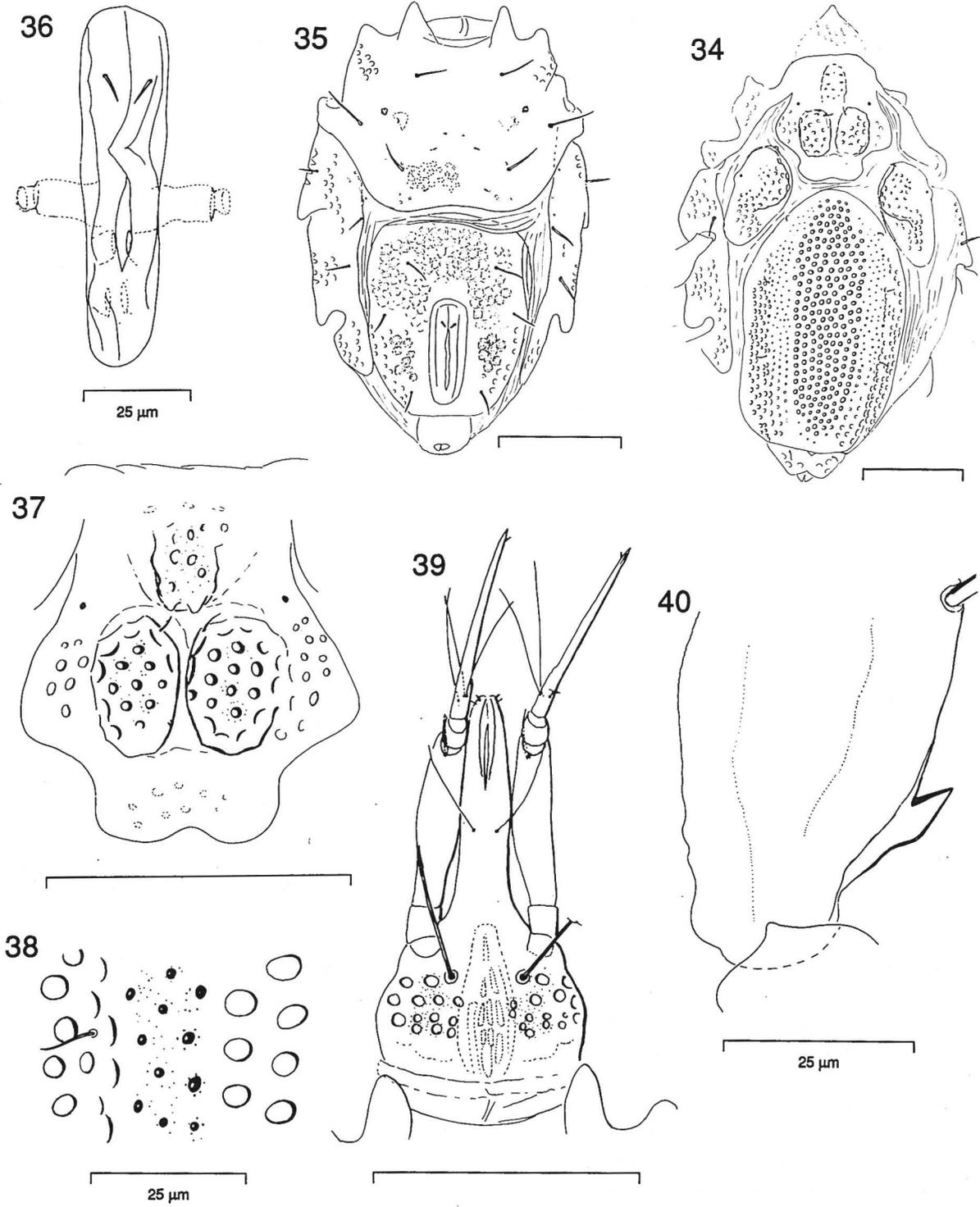
(measurements from 3 specimens)

Idiosoma. Outline of body and plates as in Figs. 34, 35. Length 357-424, width 218-298. AD 116-130 long and 84-118 wide, with 3 separate areolae all carrying rosette pores (Fig. 37). The rosette structure may be obscured through thick cuticle. The posterior pair have their axes oriented longitudinally and are approximately twice as long as wide. Setae *ds-1* lie anterior to the posterior areolae. Posterior to the areolae the plate is extended into a thinner part that lack rosette pores but may be marked with fine pores. The remainder of the plate is lacunose. Anterolateral to posterior areolae with 1 pair of small, but clearly visible pores. Setae *ds-2* are found on the anterior margin of OC which has a very strong areola extending from the anterior (where it has a group of rosette pores) to the posterolateral part of plate; corneae not clearly visible; with a pore situated on a small protrusion on the outer margin in anterior half of OC. Setae *ds-3* and *ds-4* situated in anterior half of PD, *ds-5* in posterior half, closer to the middle than to posterior margin of PD. All setae on PD inserted on outer margins of costae. Between with a pair of small pores; a pair of rather cryptic pores between *ds-4* and *ds-5*. A pair of adanal setae is situated on anal papilla. PD areolate medially and laterally to

costae. Costae 2 to 3 rosette pores wide (Fig. 37). Rosette pores may be obscured by overlying cuticle. AE with a coxal process on each epimere I (Fig. 35), 3 pairs of setae and a pair of epimeral pores, and a group of rosette pores at the level of the anterior setae on each side. AE punctate with pores arranged in a circular pattern. PE lacunose, carrying groups of rosette pores; with 1 pair of dorsal setae anterior to insertion of legs III, and 3 pairs of ventral setae. GA 171-181 long and 138-160 wide (n=2) with 3 pairs of perigenital setae situated closer to the margin of the plate than to the GO. Only the anterior pair of setae is inserted anterior to GO. GO 84-97 long and 30-37 (n=2) wide with 1 pair of spiniform setae on anterior half of the genital sclerites (Fig. 35). Internal genitalia with 3 pairs of genital acetabula arranged as shown in Fig. 36. GA ornamented with cuticular bars in a reticulate pattern and small pores at the side of these bars. Laterally the ornamentation is developed into clearly visible rosette pores.

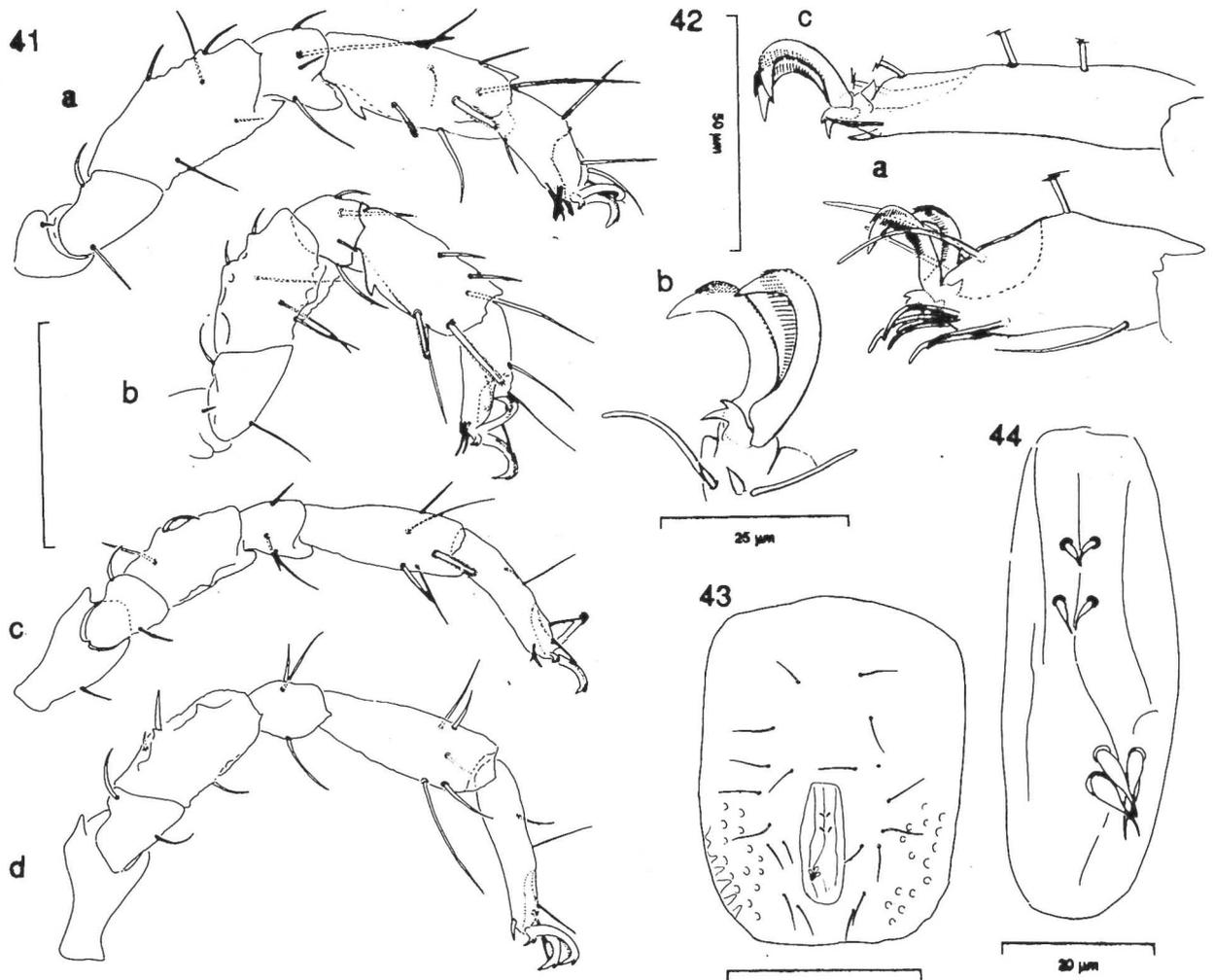
Gnathosoma. (similar to that of male shown in Fig. 39). Length 143-166, width at base 78 (n=1), with rosette pores on both sides of the pharyngeal plate and a pair of basirostral setae. Rostrum slender, 0.6 × the length of gnathosoma; sides parallel, reaching to level of insertion of basal setae on P-4. Tritorostral setae at 0.5 of rostrum, far beyond proximal end of rostral sulcus. A pair of small protorostral and a pair of small deutorostral setae at tip of rostrum. P-2 with a dorsal seta near distal end. P-4 as long as P-2 and P-3 together, with 3 setae in basal whorl and 1 small seta near tip. Tectum lacunose, running out anteriorly into a sharp projection (Fig. 34).

Legs. All segments may be asperous, especially telofemur I and II. Telofemur I, genua and tibiae I and II with ventral pararthrodial lamellae which can be seen clearly when legs are viewed from anterior or posterior. Tibiae I and II each bear a sharp dentate process on the proximal part of the lamellae (Fig. 40). Telofemur I with a rather strong posteroventral ridge. Trochanters III and IV have large posterodorsal spines. Tibiae I and II each with 2 anterior pectinate setae, the proximal one smaller than the distal one. Leg chaetotaxy as summarized in table 8 and shown in Figs. 41c,d. Legs I and II



FIGS. 34-40 : *Copidognathus scuna* sp. n.

34. — Dorsal view of female. 35. — Ventral view of female. 36. — GO of female. 37. — AD of female. 38. — Part of costa of PD with rosette pores of female. 39. — Ventral view of gnathosoma of male. 40. — Posterior view of tibia II of female.



Figs. 41-44 : *Copidognathus scuna* sp. n.

41a. — Anterior view of leg I of male. 41b. — Anterior view of leg II of male. 41c. — Posterior view of leg III of female. 41d. — Posterior view of leg IV of female. 42a. — Posterior view of tarsus I of male. 42b. — Anteroventral view of tarsus II of male. 42c. — Posterior view of tarsus III of male. 42d. — Posterior view of tarsus IV of male. 43. — GA of male. 44. — GO of male.

similar to those of males shown in Figs. 41 a, b. Lateral claws with pecten on inner edge which are continuous with teeth in accessory process. Teeth may only be visible under oil immersion. Median claws small and bidentate. Tarsus I with 2 paired and 2 single PAS and with 1 seta-like solenidion similar to those of male shown in Fig. 42a. Tarsus II with eupathidia, 2 spiniform PAS, (similar to those of male shown in Fig. 42b) and with 1 seta-like solenidion. Each spiniform PAS forms a pair with 1 eupathidium. Tarsi III and IV each with 1 posterior eupathidium and 1

anterior spiniform PAS similar to those shown for male in Figs. 42c,d.

	leg I	II	III	IV
Trochanter	1	1	1	0
Basifemur	2	2	2	2
Telofemur	5	5	2	3
Genu	4	4	3	3
Tibia	5+II	5+II	4+I	5
Tarsus	4	4	4	4

TABLE 8 : Chaetotaxy of *Copidognathus scuna* sp. n. female. Number of bipectinate setae in Roman numerals. Parambulacral setae and solenidia excluded.

MALE

Similar to female in all aspects except morphology of GA.

Idiosoma. Length 353-424, width 244-260 (n=5). GA with 10 perigenital setae on each side of the GO (Fig. 43), in one specimen 10 and 11. Setae on GA not arranged in a dense circle around GO, but in a loose pattern reaching far into the anterior half close to the margin of GA. GO 55-67 (n=4) long and 34-39 wide (n=4), with 4 pairs of subgenital setae on genital sclerites. The 2 pairs situated in the posterior half rather heavy, the 2 pairs in anterior half distinctly smaller. In 1 specimen, both pairs of setae were tapering as in Fig. 44. In other specimens this could not be observed.

PROTONYMPH

(counts and measurements from 1 specimen)

Similar to female except smaller dimensions of body and plates, chaetotaxy and morphology of GA, number of leg segments on leg IV and morphology of tibiae I, II.

Idiosoma. Length 412, width 172. PD 134 long and 86 wide. OC 50 long. GA 50 long and 50 wide. No setae present on GA. PE with only 1 dorsal and 2 ventral setae.

Gnathosoma. Length 126, width at base 62. Rostrum 0.64 × the length of gnathosoma. No sharp dentate process on tibiae I, II as described for the adults in the single protonymph examined.

Legs. Chaetotaxy of legs as in Table 9. The protonymph possesses only 5 free leg segments on leg IV, since femur IV is not divided.

	leg I	II	III	IV
Trochanter	1	1	1	0
Basifemur	2	2	1(?)	3*
Telofemur	3	3	2	-
Genu	4	4	3	3
Tibia	4+I	4+I	4+I	3
Tarsus	4	4	4	4

TABLE 9 : Chaetotaxy of legs of *Copidognathus scuna* sp. n. protonymph. Number of bipectinate setae in Roman numerals. * Number given is that for setae on femur IV, since femora of protonymphs are not divided into basifemur and telofemur.

COMMENTS

Copidognathus scuna sp. n. belongs to Newell's "key group 5800" characterized by possession of distinct coxal processes on epimere I, *ds*-2 in the ocular plate, *ds*-3 in posterior dorsal plate, 1 pair of basirostral setae, absence of a ventral seta on telofemur III, presence of 1 ventral seta on telofemur IV, and parallel striae between anterior and posterior dorsal plates (NEWELL, 1984). Species in this group usually have angular leg segments, pararthrodial lamellae on genua, and an anterodorsal spine on trochanter III (NEWELL, 1984). *C. scuna* and *C. asperatus* in "key group 5800" have in common 2 oval posterior areolae on AD, a sharply demarcated posterolateral ridge on the ocular plate, rosette pores on costae at level of insertion of leg IV, the lack of marginal areolae at the posterior margin of AD, the presence of a extension at the posterior margin of AD and 10 perigenital setae on each side of the GO in the male (except 1 specimen that had 10 and 11 setae). *C. scuna* differs from *C. asperatus* in having a longer and more slender rostrum that reaches beyond the distal end of P-3 and in possessing a ventral dentate process on tibia I. MACQUITTY (1984) assigned *C. spinifer* Macquitty, *C. ilsebarschi* Macquitty, *C. peregrinus* Bartsch, *C. angustus* Viets, *C. tuberipes* Bartsch and *C. novus* Bartsch to "key group 5800". *C. spinifer* is the only species in this group that possesses proximal ventral dentate processes on tibiae I and II. (MACQUITTY, 1984). *C. spinifer* has *ds*-6 on PD and possesses a shorter and more triangular rostrum than does *C. scuna*. Most other known species of *Copidognathus* possess a shorter and more triangular rostrum. *C. scuna*, therefore may be identified by the characters of "key group 5800" (NEWELL, 1984), by possessing a ventral and proximal dentate process on tibiae I and II, and by having a parallel-sided rostrum that reaches beyond the distal end of P-3.

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