

Halacarines (Acari: Halacaridae) from Rottnest Island, Western Australia: the genera *Agauopsis* Viets and *Halacaropsis* gen. nov.

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Abstract – From Rottnest Island, Western Australia, four species of *Agauopsis* (*A. aequilivestita* sp. nov., *A. australiensis* sp. nov., *A. elaborata* sp. nov., and *A. ornatella* sp. nov.) are described. *A. aequilivestita* is most similar to the African *A. punctata* Bartsch. *A. australiensis* and *A. ornatella* are members of the wide-spread *microrhyncha* and *ornata* groups respectively. *A. elaborata* belongs to the *pugio* group, a natural group common in the southern hemisphere. The *Agauopsis hirsuta* group is raised to generic level with *Agauopsis hirsuta* Trouessart, 1889, as type species, and *Halacaropsis capuzina* gen. et sp. nov. is described.

INTRODUCTION

An inventory of the marine fauna in shores and shallows of Rottnest Island, Western Australia, resulted in the recovery of more than 80 halacarid species. The genera, and in parenthesis the number of species, found to date are: *Actacarus* Schulz (3), *Agauopsis* Lohmann (4), *Agauopsis* Viets (5), *Arhodeoporus* Newell (4), *Anomalohalacarus* Newell (1), *Australacarus* Bartsch (1), *Bradyagaue* Newell (1), *Copidognathus* Trouessart (ca 30), *Halacarellus* Viets (2), *Halacaropsis* gen. nov. (1), *Halacarus* Gosse (11), *Lohmannella* Trouessart (2), *Phacacarus* Bartsch (1), *Rhombognathus* Trouessart (10), *Scaptognathides* Monniot (1), *Scaptognathus* Trouessart (3), *Simognathus* Trouessart (7), and *Werthella* Lohmann (1). Studies in other areas of Western Australia and other substrata than studied around Rottnest Island are expected to raise the number of species and genera. In the present paper, four species of *Agauopsis* and one of *Halacaropsis* are described.

MATERIAL AND METHODS

In January 1991, the halacarid fauna of Rottnest Island, Western Australia, was surveyed. Various substrata, 10–500 cm³ each, were taken to the laboratory and the halacarids extracted by washing with a strong jet of water over a 100 µm sieve.

The mites were cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared using a camera lucida. Holotypes and paratypes are deposited in the Western Australian Museum, Perth (WAM), other material in the Australian National Insect Collection, Canberra (ANIC), the Zoological Institute and Zoological Museum, Hamburg (ZIMH) and the author's halacarid collection.

Abbreviations used in the description and figures: a, alveolus; acp, accessory process; AD, anterior dorsal plate; ads, adanal setae (sixth pair of dorsal setae); AE, anterior epimeral plate; al, articular lamella; AP, anal plate; c, carina-like lamella; ca, canaliculi; cav, cavity; cp, central pit; dd, denticles; dl, dorsal lamella; ds, dorsal setae on idiosoma, ds-1, first pair of dorsal seta, ds-5, fifth pair of dorsal seta, ds-6, sixth pairs of setae (adanal setae); E, epimera; ep, epimeral pore; fa, lamella with famulus; GA, genitoanal plate; glp, gland pore; GO, genital opening; mcl, membrane of claw fossa; OC, ocular plate(s); ov, ovipositor; P, palp, P-2, second palpal segment; pa, porose areola; pas, parambulacral seta(e); pco, porose costa; PD, posterior dorsal plate; pds, pore from dorsal seta; PE, posterior epimeral plate; ri, ridge; sc, skeletal bars; so, solenidion; sp, spermatopositor; spl, spine-like lamella; spt, spermatheca; t, tines of pecten; vl, ventral lamella; vll, ventrolateral lamella. Legs numbered I to IV, leg segments 1 to 6, I-1, trochanter of leg I; II-2, basifemur of leg II; III-3, telofemur of leg III; IV-4, genu of leg IV; I-5, tibia of leg I; I-6, tarsus of leg I.

SYSTEMATICS

Genus *Agauopsis* Viets

Agauopsis Viets, 1927: 94.

Type species

Agauopsis brevipalpus Trouessart, 1889, by original designation.

Diagnosis

Idiosoma flattened, wide. Dorsum with AD, OC, PD and six, rarely five, pairs of idiosomatic setae;

sixth pairs of setae (adanal setae) in dorsal position. AE with three pairs of ventral setae and, generally, one pair of epimeral pores. Female typically with three pairs of pgs, male with 20–100 pgs close around the GO plus 0, one or two pairs of outlying setae. Gnathosomal base rectangular; rostrum parallel-sided. Basal pair of maxillary setae generally on base of gnathosoma, apical pair on rostrum. Palps four-segmented, attached laterally to base of gnathosoma. P-2 with one (rarely two) dorsal seta, P-3 with median spine or bristle. Leg I much wider than succeeding legs, bearing conspicuous spines. Tarsus I with three dorsal setae, dorsolateral solenidion, ventromedial spine, two unpaired ventral setae, and lateral and medial eupathid parambulacral setae. Tarsus II with solenidion dorsomedial in position. Paired claws on tarsus I smaller than those on succeeding tarsi. One larval and two nymphal stages.

Agauopsis aequilivestita sp. nov.

Figures 1–15

Holotype

♀, Duffield Ridge, off Rottneest Island, Western Australia, Australia, 30 m depth, medium to coarse sediment, 17 January 1991 (WAM 96/156).

Description

Female

Idiosoma 381 µm long, 230 µm wide. Most of dorsal plates with rather uniform porosity (Figure 1) which is made up by modified rosette pores. Each rosette pore typically with 6–9 canaliculi arranged along the borders of polygons; canaliculi running curved through the integument (Figure 2) and almost meeting in deeper layers. In centre of each polygon, surface of plate with very shallow central pit.

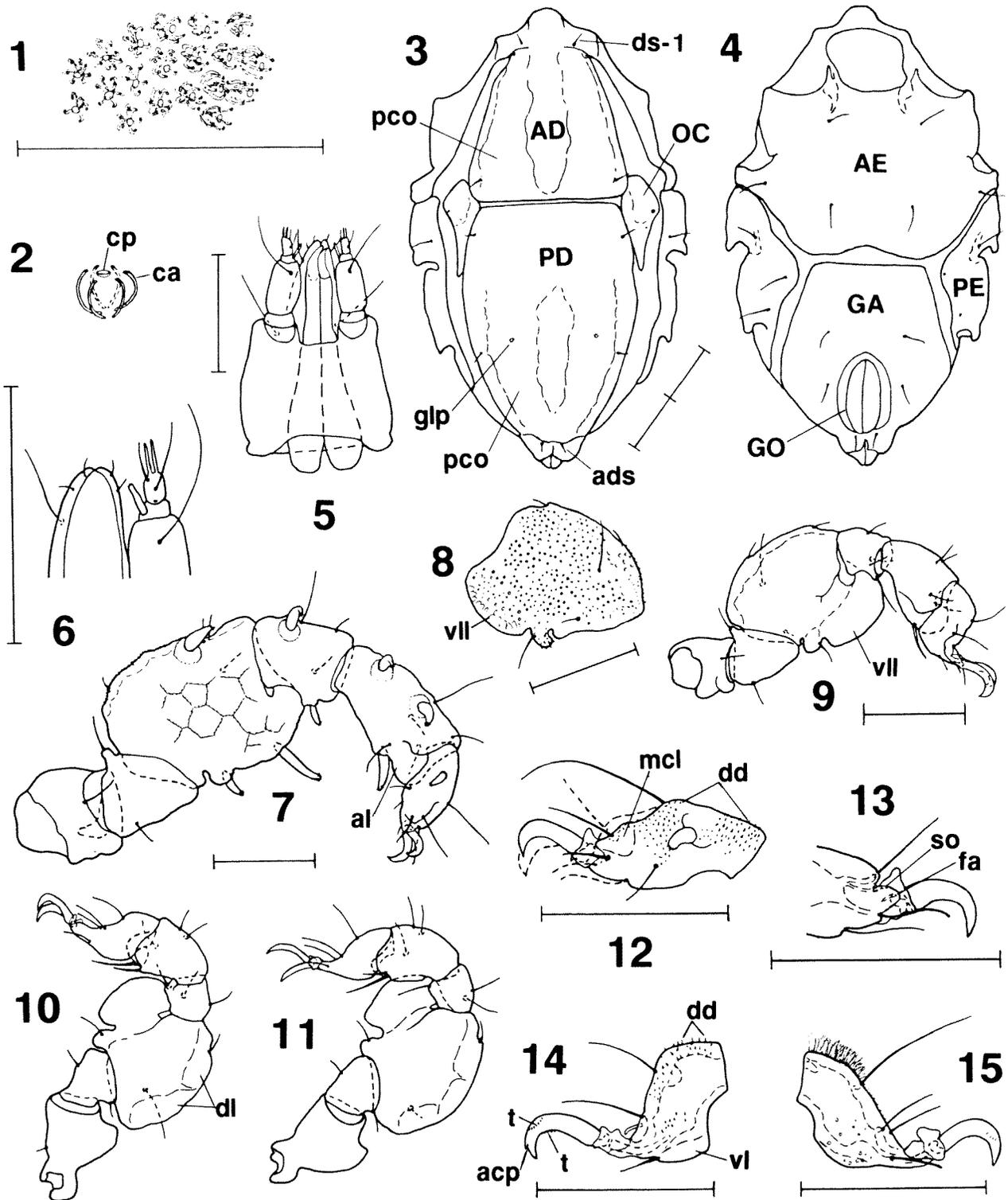
Anterior idiosoma (Figure 3) with rounded, dome-like frontal protuberance. AD anteriorly fused with dorsal portion of anterior epimeral plate; length of that plate, from posterior truncate margin to tip of frontal protuberance, 160 µm, width 130 µm. Two 25–40 µm wide porose costae joined posteriorly. Median area of plate with delicate pits, costae with canaliculi. Lateral portions of plate distinctly demarcated from abruptly raised porose area and densely studded with minute cuticular denticles. A pair of very delicate gland pores anterolateral to porose costae. OC 80 µm long, 32 µm wide, its posterior portion tapering. Corneae not seen. Anterior portion of OC with slightly raised porose areola, and with small gland pore and pore canaliculus in lateral margin. PD 202 µm long, 145 µm wide; its anterior margin truncate. Anterior portion and major parts of

raised wide median area of PD with very prominent porosity, a posterior oblong area without canaliculi. Lateral portion of PD beset with cuticular denticles. Pair of gland pores on level with insertion of leg IV. AD with setae ds-1 and ds-2, PD with setae ds-4, ds-5 and ds-6.

Marginal areas of ventral plates with small canaliculi, large ventral areas with delicate pycnic rosette pores; anterior AE and small transverse areas on GA with cuticular denticles. AE 132 µm long, 221 µm wide (Figure 4); posterior margin slightly concave. Epimeral processes I elongate; processes of epimera II lamellar. AE with three ventral setae. Epimeral pores not seen. PE with one dorsal and three ventral setae. GA 167 µm long, 145 µm wide. GO 65 µm long, 30 µm wide. Interval between anterior margin of GA and that of GO same as length of GO. Three pairs of pgs inserted as illustrated. Subgenital setae lacking.

Gnathosoma (Figure 5) 91 µm long, 66 µm wide. Gnathosomal base ventrally with small scattered pores, dorsally with delicate cuticular denticles. Rostrum and palps shorter than base of gnathosoma. Basal pair of maxillary setae on base of gnathosoma, the other pair inserted in apical third of rostrum. Chelicera 95 µm long. Dorsal seta on P-2 as long as length of that segment. Apical segments of right and left palp somewhat dissimilar in size, P-3 3 and 4 µm long and 6 µm wide, P-4 6 and 7 µm long and 4 µm wide. Medial 7 µm long spine of P-3 with truncate tip (Figure 6). P-4 with two setae and two apical spurs; length of two latter almost same as that of P-4.

Leg I (Figure 7) very wide; lateral flank of telofemur with conspicuous canaliculi, medial flank with reticulate pattern and delicate cuticular denticles. Genu, tibia and tarsus I laterally with cuticular denticles, dorsally with pits and medially again with denticles. Telofemur and tibia I each with large lateral articular lamella, I-3 also with about 6 µm high dorsal lamella. Telofemora II-IV very wide due to long, 20 µm high ventrolateral lamella, ventral protuberance and long, 11 µm high dorsal lamella; lateral flanks (Figure 8) with canaliculi, medial flanks with less conspicuous pores. Tibiae II-IV (Figures 9 - 11) with medial and lateral articular lamellae. Tarsus I shorter than tibia I; membranes of claw fossa (Figure 12) present though short. Tarsi II-IV each with ventral lamella, giving the tarsi a conspicuous truncate outline; dorsal and dorsolateral flank with cuticular denticles which often are tapering and filament-like. Membranes of claw fossae small. Leg chaetotaxy from trochanter to tarsus (solenidia excluded): leg I, 1, 2, 7, 5, 8, 8; leg II, 1, 2, 5, 4, 5, 5; leg III, 1, 2, 3, 3, 5, 4; leg IV, 0, 2, 3, 3, 5, 4. Leg I with wide, apically truncate and slightly dentate spines; telofemur with two ventral spines, 18 and 30 µm long, and one ventromedial spine; genu with



Figures 1–15 *Agauopsis aequilivestita* sp. nov., ♀: 1, portion of right PD anterior to gland pore; 2, diagram of modified rosette pore; 3, idiosoma, dorsal view; 4, idiosoma, ventral view; 5, gnathosoma, dorsal view; 6, tip of palp and rostrum, dorsal view; 7, leg I, medial view; 8, telofemur II, lateral view; 9, leg II, medial view; 10, leg III, medial view; 11, leg IV, medial view; 12, tarsus I, medial view (lateral setae and claw in broken line); 13, tip of tarsus I, lateral view (medial setae and claw omitted); 14, tarsus II, medial view (lateral setae and claw omitted); 15, tarsus IV, medial view (lateral claw omitted). Scale line = 50 μ m.

12 μ m long ventral spine and a distinctly longer ventromedial spine; tibia with 23 μ m long ventral spine, and two ventromedial ones. Tibia II ventrally with spine-like, tapering bristle, ventromedially with short seta; tibiae III and IV

with pair of ventral tapering spines; ventrolateral spine larger than ventromedial one. Tarsus I (Figure 13) with 4 μ m long solenidion obscured by 6 μ m long membrane with canalicular famulus; pair of parambulacral setae singlets. Tarsus II

(Figure 14) with 5 μm long dorsomedial solenidion; apex with one slender ventral seta and a rather stout lateral pas. Tarsi III and IV (Figure 15) each with three dorsal setae and long medial pas. All tarsi with carpite-like sclerite.

Paired claws on tarsus I distinctly smaller than on succeeding tarsi. Neither accessory process nor pecten present. Paired claws on succeeding tarsi with accessory process and small pectines with delicate tines.

Male

Not seen.

Remarks

Agauopsis aequilivestita is closely related to *A. punctata* Bartsch, a species living on the eastern coast of northern Africa (Bartsch 1981). Differences are: length of AD relative to that of PD larger in *A. aequilivestita* than in *A. punctata*; setae ds-2 in *A. aequilivestita* inserted level with anterior OC, in *A. punctata* distinctly anterior to that level and removed from posterior angles of AD.

Agauopsis australiensis sp. nov.

Figures 16–38

Holotype

♀, Cape Vlamingh, Fish Hook Bay, Rottnest Island, Western Australia, Australia, *Amphiroa* sp. and other corallines, from beneath rock platform, just beneath low water edge, 15 January 1991 (WAM 96/157).

Paratypes

Australia: Western Australia: 1 ♂, data same as for holotype (WAM 96/158); 1 ♀, data as for holotype (ANIC); 1 ♂, 1 deutonymph, 1 protonymph, 1 larva, data as for holotype (WAM 96/159–162). 1 ♀, 1 ♂, data as for holotype (ZIMH A49/95).

Other Material Examined

Australia: Western Australia: 5 ♀, 2 ♂, 2 deutonymphs, 2 protonymphs, 1 larva, Fish Hook Bay, Cape Vlamingh, red algae *Liagora* sp. from beneath edge of rocky platform, 9 January 1991; 1 ♂, Nancy Cove, seagrass *Amphibolis* sp. with epiflora and fauna, 1 m depth, 12 January 1991; 2 ♂, Little Armstrong Bay, seagrass *Amphibolis* sp., 1 m depth, 16 January 1991; 1 ♀, Bickley Point, from epiflora and fauna on seagrass *Amphibolis* sp., 1–2 m depth, 18 January 1991. All in the author's collection.

Description

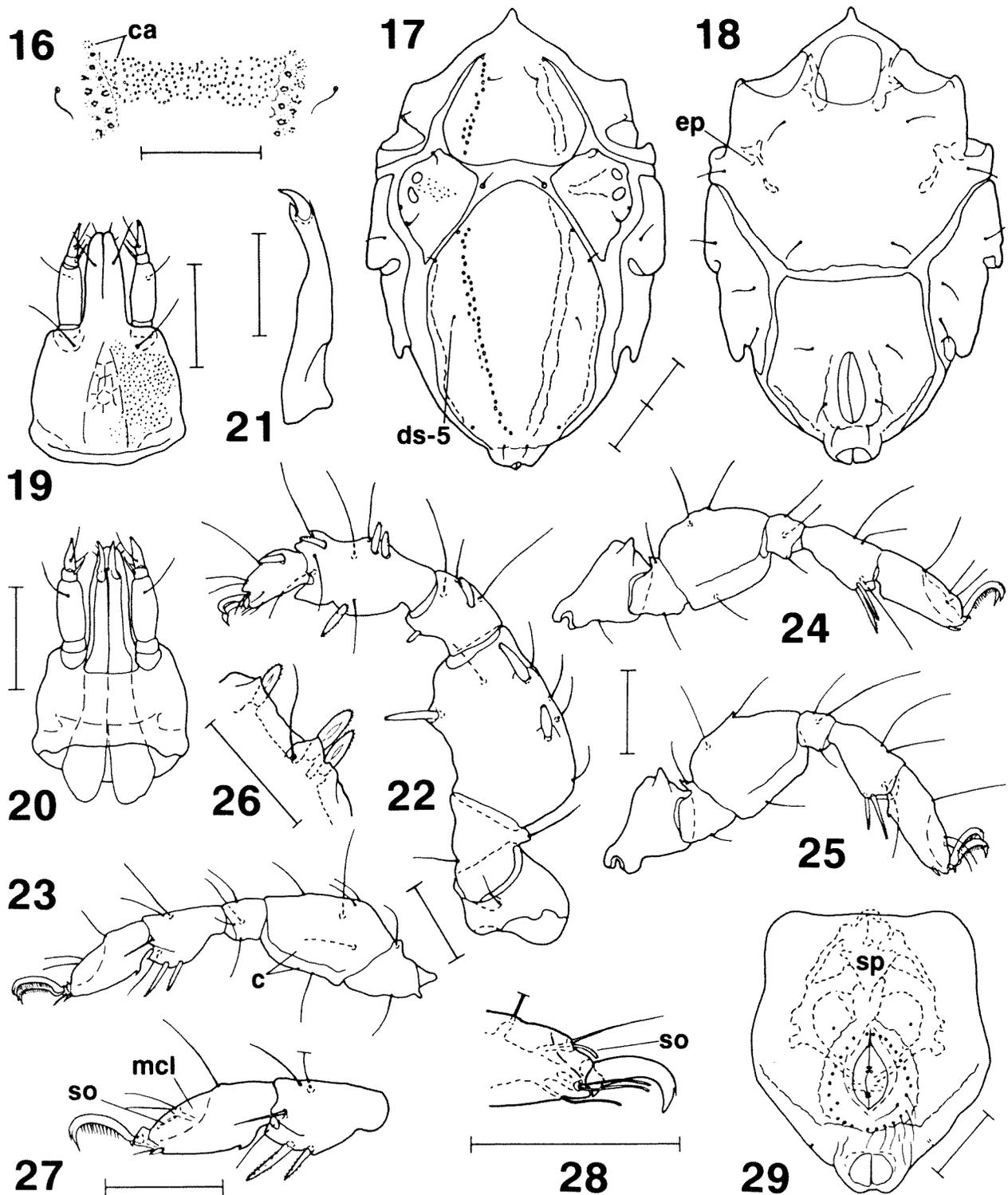
Female

Idiosoma 421–458 μm long, holotype 430 μm

long. Few coarse and parallel striae of membranous integument between large dorsal plates. Plates with raised, costa-like areas. Tegument of plates (Figure 16) traversed by canaliculi. Canaliculi within raised areas larger and arranged more densely than in remainder of plates; generally six to nine canaliculi assembled to groups (rosette pores); beneath each such group an alveolus present. Remainder of plate very faintly reticulated. AD fused with dorsal portion of anterior epimeral plate which in turn is prolonged into a bluntly ending frontal spine (Figure 17). The plate, from tip of frontal spine to posterior margin, 148 μm long, 139 μm wide. AD with pair of longitudinal costae, each two alveoli wide. Integument within transverse bar somewhat thicker. Pair of gland pores in lateral margin of AD immediately anterior to costae. OC 110 μm long, 73 μm wide. Two corneae near lateral margin. Medial to corneae triangular raised area with numerous groups of canaliculi present; alveoli lacking. Scattered canaliculi, a gland pore and a pore canaliculus present distolateral to posterior cornea. PD 248 μm long, 165 μm wide. Anterior margin rounded. Posterior portion of PD and anal plate fused. Pair of distinctly raised costae one to two alveoli wide. Lateral margin of plate somewhat thicker than remainder of plate but without alveoli. Pair of small gland pores in anterior PD, another pair in posterior PD. Dorsal setae ds-1 on AD, ds-2 in anterior edge of OC, ds-3 on small platelets within membranous integument between AD and PD, ds-4 in margin of PD level with insertion of legs III, ds-5 on PD lateral to costae, and ds-6 in posterior PD.

Ventral plates porose. AE 155 μm long, 278 μm wide. Pair of epimeral pores represented by small, 5 μm long slits at the surface and 5 μm wide sacculi in deeper integumental layers. Three pairs of setae as illustrated (Figure 18). PE with one dorsal and three ventral setae. GA 176 μm long, 161 μm wide. GO 65 μm long, 25 μm wide. Interval between anterior margin of GA and that of GO somewhat larger than length of GO. Proximal pair of pgs inserted slightly anterior level with anterior edge of GO. The other two pairs of setae near posterior portion of GO.

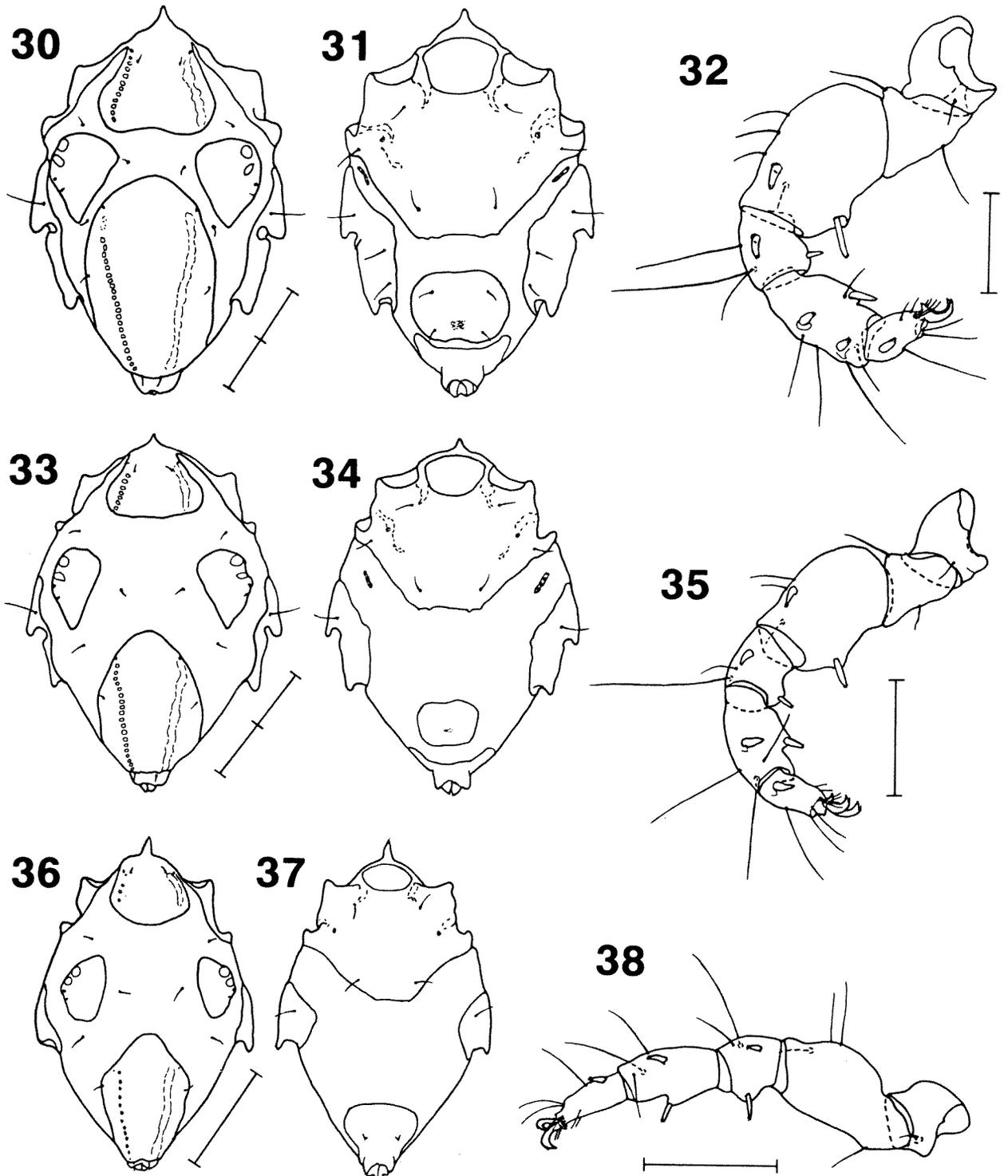
Gnathosoma 115 μm long, 78 μm wide. With coarse porosity in ventral and marginal portions of gnathosomal base and also within pharyngeal plate (Figure 19). Tectum truncate (Figure 20). Rostrum and palps shorter than gnathosomal base. Pair of long maxillary setae inserted on the base, another pair in distal third of rostrum; apex of rostrum with two pairs of rather long rostral setae. Median spine on P-3 longer than P-3. P-4 with two setae in basal whorl, one of which is shorter, the other longer than P-4. Chelicera slender (Figure 21), those of holotype 130 μm long, claw 21 μm long.



Figures 16–29 *Agauopsis australiensis* sp. nov.: 16, portion of PD between ds-5, ♀; 17, idiosoma, dorsal view, ♀ (left side shows alveoli from rosette pores, right side outline of raised areolae); 18, idiosoma, ventral view, ♀; 19, gnathosoma, ventral view, ♀; 20, gnathosoma, dorsal view, ♀; 21, chelicera, ♂; 22, leg I, medial view, ♀; 23, basifemur – tarsus II, medial view, ♀; 24, leg III, medial view, ♀; 25, leg IV, medial view, ♀; 26, ventromedial spines of tibia I, dorsal view, ♀; 27, tibia and tarsus II, medial view, ♀; 28, tip of tarsus I, lateral view, ♀ (medial setae and claw omitted); 29, genitoanal plate, ♂. Scale line = 50 µm.

Trochanters III and IV with dorsal spine-like lamella. All telofemora (Figures 22 – 25) widened, lateral flanks with coarse porosity; medial flank of I-3 with very delicate porosity. Telofemora II to III each with 2-3 µm high ventrolateral and 7-9 µm

high ventromedial carina-like lamella and 3 µm high dorsal lamella. Ventrolateral articular lamella of I-5 large, ventromedial lamella very small. Lateral and medial articular lamellae of succeeding tibiae subequal in length. Tarsus I shorter than tibia



Figures 30–38 *Agauopsis australiensis* sp. nov.: 30, idiosoma, dorsal view, deutonymph (left side shows alveoli from rosette pores, right side outline of raised areolae); 31, idiosoma, ventral view, deutonymph; 32 leg I, medial view, deutonymph; 33, idiosoma, dorsal view, protonymph (left side shows alveoli from rosette pores, right side outline of raised areolae); 34 idiosoma, ventral view, protonymph; 35, leg I, medial view, protonymph; 36, idiosoma, dorsal view, larva (left side shows alveoli from rosette pores, right side outline of raised areolae); 37, idiosoma, ventral view, larva; 38, leg I, medial view, larva. Scale line = 50 μ m.

I. Tarsi on legs II–IV longer than tibiae; each with large lateral and medial membranes of claw fossa and small ventral carina with delicate spine-like process. Chaetotaxy of legs, from trochanter to tarsus (parambulacral setae included, solenidia

excluded): leg I, 1, 2, 8, 5, 10, 10; leg II, 1, 2, 6, 4, 6, 5; leg III, 1, 2, 3, 3, 5, 4; leg IV, 0, 2, 3, 3, 5, 4. Leg I with bluntly ending pectinate spines (Figure 26). Ventral spine on I-3 32 μ m long, two ventromedial ones 25 and 35 μ m long. Ventral spine on I-4 13 μ m

long, ventromedial one 25 μm . Ventral spine on I-5 25 μm long, ventromedial spines, from basal to distal, 20, 25 and 17 μm long respectively; the two basal spines inserted adjacent. Ventromedial spine on I-6 18 μm long. Spines on succeeding tibiae less stout. Tibia II (Figure 27) with two blunt, apically dentate ventromedial spines and a ventromedial bristle-like seta. Tibiae III and IV each with pair of slightly pectinate spines. Tarsus I with short membranes of claw fossa, dorsolateral membrane with 7 μm long solenidion (Figure 28); tip of tarsus with pair of doubled pas. Tarsus II with three dorsal setae, a spine-like ventromedial and a seta-like ventrolateral pas; solenidion, 8 μm long, placed on inner flank of medial membrane of claw fossa (Figure 27). Tarsi III and IV each with lateral spine-like pas; medially pore of seta but no seta present.

Paired claws of tarsus I with accessory process but no pecten. Bidentate median claw with small dorsal and rather stout ventral tooth. Paired claws on tarsi II-III with J-shaped pecten with about 20 medial tines on the flank and five minute lateral tines on the apex of the claw. Median claw present, its dorsal tooth absent, ventral tooth very small.

Male

Idiosoma 402–433 μm long, GA (Figure 29) of a 421 μm long paratype 180 μm long, 161 μm wide. GO 52 μm long, 34 μm wide, placed within 65 μm wide, raised area. Interval between anterior margin of GA and that of GO somewhat more than length of GO. A pair of outlying setae on level with anterior edge of GO and 30–31 pgs on raised area close around the GO. Spermatopositor almost twice the length of GO, 105–112 μm long, extending to 0.05–0.1 relative to length of GA (in Figure 29 spermatopositor somewhat dislodged). Genital sclerites with four pairs of small spur-like subgenital setae.

Deutonymph

Idiosoma 335–403 μm long. Plates somewhat smaller than those of adults. Setae ds-2 inserted in membraneous integument anterior to OC (Figure 30), ds-5 in lateral margin of PD. Genital plate 62 μm long, 87 μm wide, not fused with anal plate (Figure 31). Genital plate with two pairs of pgs and two pairs of internal genital acetabula. Telfemur I with a ventral and a single ventromedial spine (Figure 32); tibia with a ventral and two ventromedial spines; setation of genu and tarsus I same as that of adults. Setation of tibiae II, III and IV same as known for adults.

Protonymph

Idiosoma 232–328 μm long (Figure 33). Dorsal plates smaller, their outline similar to those of deutonymph. Alveoli of porose costae

subrectangular. Genital plate 35 μm long, 50 μm wide, with a single pair of internal genital acetabula; pgs lacking (Figure 34). Telfemur, genu and tibia I each with one ventral and one ventromedial spine, tarsus with ventromedial spine (Figure 35). Tibia II with spine-like, delicately bipectinate ventral and short ventromedial seta. Setation of tibiae III and IV as in adults.

Larva

Idiosoma 232–248 μm long. Dorsal plates (Figure 36) more delicate than in nymphs. Porose costae of AD with three to four alveoli, costae of PD each with 12–14 rectangular alveoli. PD and anal plate contiguous. Anal plate (Figure 37) larger than in nymphs; plate with two spine-like protuberances. Except for median areas of AE and AP integument of ventral plates rather smooth. No spines on telfemur I (Figure 38); genu and tibia each with pair of spines; tarsus with ventromedial spine. Tibiae II and III each with pair of spine-like setae.

Variation

Several specimens have shorter ventromedial spines on leg I than has the holotype; in one male, e.g., the basalmost spine on I-3 is 19 μm long, the succeeding one 25 μm ; the ventromedial spine of I-4 is 20 μm long; the spines of I-5, from basal to distal, are 15, 20 and 15 μm , and the spine of I-6 15 μm long.

Remarks

Agauopsis australiensis is a member of the *microrhyncha* group. The most conspicuous character of this group is that tibia I has two of the three ventromedial spines inserted adjacent. Until now, 17 species have been described. In *A. australiensis*, as in the majority of species, the AD has a single frontal spine. *A. cryptorhyncha* (Trouessart), *A. felicitis* Newell, *A. filirostris* MacQuitty, *A. insularis* Newell, and *A. paulensis* (Lohmann) are distinguished from these species by the tridentate or trilobed anterior AD. *A. antarctica* (Lohmann), *A. curvata* Krantz and *A. glacialis* Bartsch have a single spine which is bifid, rounded or rectangular, but not triangular. *A. mokari* Otto is unique in having four spines on telfemur I. *A. australiensis* is distinguished from the other species – *A. crassipes* (Gimbel), *A. humilis* Bartsch, *A. microrhyncha* (Trouessart), *A. pusilla* Viets, *A. racki* Newell, *A. robusta* Sokolov, *A. similis* Bartsch, *A. vinnae* Newell – by its costae being narrow, one to two alveoli wide.

The species from southwestern Pacific, i.e. *A. similis*, from New Zealand (Bartsch 1979, 1985b), and *Agauopsis* sp., from Australia, Victoria, Philip Island – erroneously attributed to *A. similis* (Bartsch 1985b) – and *A. australiensis* can also be distinguished on the basis of insertion of ds-4

relative to anterior gland pore of PD. *A. australiensis* has a pair of gland pores distinctly anterior to the ds-4; in *A. similis*, the gland pores level with the ds-4, and in the species (a single female) from Philip Island, Victoria, the ds-4 insert anterior to the gland pores.

Agauopsis elaborata sp. nov.

Figures 39–49

Holotype

♀, Nancy Cove, Rottneest Island, Western Australia, Australia, corallines from rock platform, 20 January 1991 (WAM 96/163).

Description

Female

Idiosoma 310 µm long. Dorsal plates (Figure 39) with prominently raised porose areolae with modified rosette pores. Rosette pores with tube-like ostium, 4 µm deep, 2 µm in diameter; adjacent to ostia one to four canaliculi in deeper integumental layers. Remainder of plates with more or less distinct reticulate sculpturing.

Anterior margin of idiosoma rounded. An anterior dome-like area with 16 rosette pores; posterior pair of domes with about 30 pores each. AD fused with dorsal portion of anterior epimeral plate. Anterior plate, from anterior margin of idiosoma to posterior margin of the plate, 98 µm long, 87 µm wide. OC 95 µm long, 65 µm wide. Raised rounded areola, 25 µm in diameter, with about 20 rosette pores; dark-brown eye pigment beneath that areola. PD 170 µm long, 165 µm wide. From margins of deeply excavated median portion of the plate 25 µm long epicuticular filaments extending into the cavity (Figure 40). Pair of raised porose areolae swayed; widened on level with insertion of legs III, and dome-like on level with insertion of legs IV and in posterior PD. When focussing on deeper integumental parts, elaborate skeletal bars seen (Figure 40). Cavity beneath dome-like structures filled with epicuticular filaments. Pair of gland pores present in lateral margin of costae on level with insertion of leg III, another pair of pores in medial margin of costae on a level with insertion of leg IV. Setae ds-1 inserted within plate formed by dorsal fusion of anterior epimeral plate, ds-2 on OC at anterior margin of dome-like areola, ds-3 in anterolateral margin of PD. Setae ds-4, ds-5 and ds-6 enlarged, almost 50 µm long, directed towards the median cavity; ds-4 level with insertion of legs III, ds-5 level with legs IV, and ds-6 inserted posteriorly where PD and anal plate are fused.

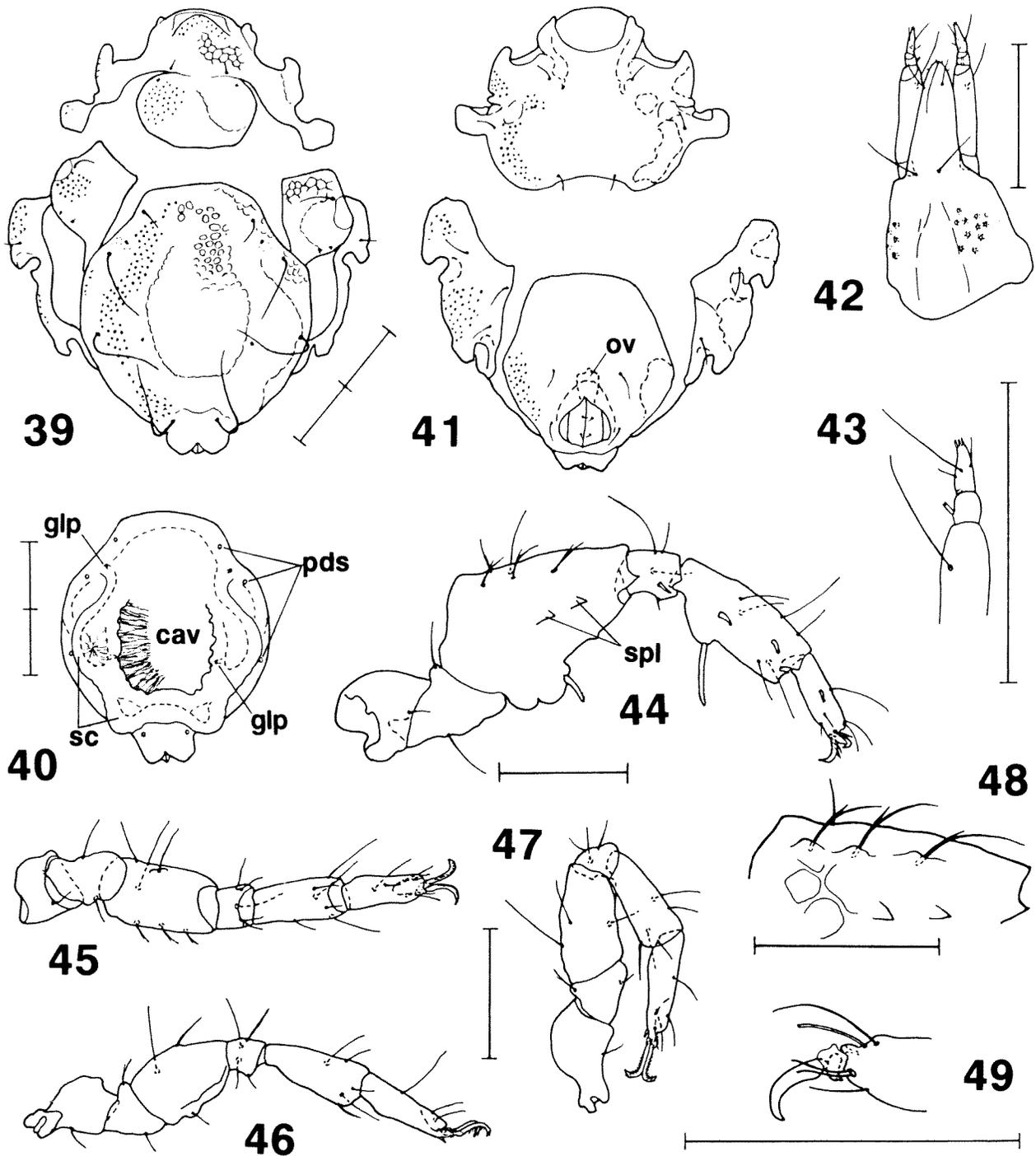
Ventral plates (Figures 41) with distinctly demarcated porose areolae, each pore represented

by small tube-like ostium which in deeper integumental layers is accompanied by two to four canaliculi. AE with three pairs of porose areolae, one marginal, one circular and one elongate crescentic one. PE with two marginal areolae and GA with pair of oblong areolae. Remainder of plate almost smooth. AE with very large cervical epimeral processes; coxal epimeral processes small, lamelliform. Insertion of trochanters II partly obscured by lamellar epimeral processes. AE 90 µm long, 197 µm wide, with three pairs of ventral setae; epimeral pores reduced. PE with one dorsal and three ventral setae. GA 140 µm long, 123 µm wide, with two pairs of pgs (a third pair thought to be present but obscured by protruding area with GO). GO 38 µm long, 35 µm wide. Interval between anterior margin of GA to that of GO equalling two times length of GO. Genital sclerites with two pairs of small subgenital setae. Ovipositor in rest extending beyond anterior margin of GO.

Gnathosoma 90 µm long. Base with pair of porose areolae, each areola with 10–11 modified rosette pores (Figure 42). Tectum truncate. Rostrum shorter than gnathosomal base, palps as long as base. Rostrum rather slender. P-3 5 µm long; its medial 2 µm long spine with serrate truncate apex (Figure 43). Medial seta on P-4 more than twice length of P-4.

Telofemur I (Figure 44) with two adjacent short and rounded basiventral lamellae, an almost 5 µm high dorsal lamella, two spine-like ventromedial lamellae and a pointed medial articular lamella. Lateral flank with reticulate sculpturing. Legs II–IV (Figures 45 – 47) slender; telofemora II–IV each with elongate but narrow ventrolateral lamella. Tibia II shorter than telofemur II; tibiae III and IV as long as telofemora respectively. Articular lamellae on tibiae II–IV lacking. Length of tarsi same or slightly less than that of tibiae. Tarsi II–IV with 12–15 µm long and 3–5 µm high membranes of claw fossae. Number of setae, from trochanter to tarsus: leg I, 1, 2, 6, 5, 9, 10; leg II, 1, 2, 6, 5, 6, 6; leg III 1, 2, 3, 4, 5, 5; leg IV, 1, 2, 3, 4, 5, 5. Ventral spine of telofemur I 13 µm long and placed on ventral lamella; ventromedial spines lacking. Ventral spine on tibia I 27 µm long, i.e. same as height of that segment; two ventromedial spines 6 and 5 µm long. Tarsus I with 5 µm long ventromedial spine. All spines with blunt, dentate tip. Succeeding legs lack spines. Dorsal setae on telofemora I (Figure 48) and II and basifemora III and IV clefted. Tarsus I with doubled pas; slender solenidion 10 µm long, inserted between dorsolateral seta and lamella with vestigial famulus (Figure 49). Tarsus II with three dorsal, one ventral seta and pair of single parambulacral setae. Tarsi III and IV each with three dorsal setae, a seta-like medial and a spine-like lateral pas.

Tarsus I with rather small paired claws which



Figures 39–49 *Agauopsis elaborata* sp. nov., ♀: 39, idiosoma, dorsal view (left side shows ostia from rosette pores, right side outline of raised areolae); 40, PD, showing internal skeletal bars, left side with filaments; 41, idiosoma, ventral view (right side shows ostia from rosette pores, left side outline of porose areolae); 42, gnathosoma, ventral view; 43, tip of palp, dorsolateral view; 44, leg I, medial view; 45, leg II, ventral view; 46, leg III, medial view; 47, leg IV, medial view; 48, dorsal portion of telofemur II, medial view; 49, tip of tarsus I, lateral view (medial setae and claw omitted). Scale line = 50 μ m.

lack accessory process and pecten. Paired claws on tarsi II–IV with accessory process and pectines. Median claw reduced to small sclerite.

Male

Not seen.

Remarks

Agauopsis elaborata is a member of the *pugio* group – key group 6500 in Newell (1984) – a natural group characterized by its modified rosette pores with tube-like pores and small number of surrounding canaliculi; the dome-like porose

areolae; the ventral plates being rather smooth save of the demarcated areolae with modified rosette pores. Species belonging to this group are *A. chelipes* Bartsch, *A. delicatula* Newell, *A. estuarina* Newell, *A. mccaini* Newell, *A. papillata* Bartsch, and *A. pugio* (Trouessart). *A. delicatula* lacks the conspicuous porose areolae on AE characterizing the other species, but the chaetotaxy of the palps and legs agrees with that known of the *pugio* group.

A. elaborata is distinguished from all other *Agauopsis* on the basis of its PD with the internal, sinuose sclerites, its deeply excavated median portion filled with protruding epicuticular filaments, and its enlarged ds-4, ds-5 and ds-6.

Agauopsis ornatella sp. nov.

Figures 50–62

Holotype

♀, Cape Vlamingh, Rottneest Island, Western Australia, Australia, green algae from rock platform, upper tidal area, 15 January 1991 (WAM 96/164).

Paratypes

Australia: Western Australia: 2 ♀, same data as holotype (author's collection).

Description

Female

Idiosoma 297–310 µm long, 200–223 µm wide, holotype 310 µm long, 223 µm wide. Dorsal plates with distinctly raised areolae. Within these areolae (Figure 50) integument thicker than in surrounding plate, and deeper layers of integument bear subquadrangular alveoli, 2–3 µm long, 3–5 µm wide. Alveoli separated from each other by cuticular bars. Each alveolus with four to seven, rarely up to nine canaliculi piercing the integument and opening with small pores at the surface. Areas between raised costae with pits which are more or less distinctly arranged within polygons.

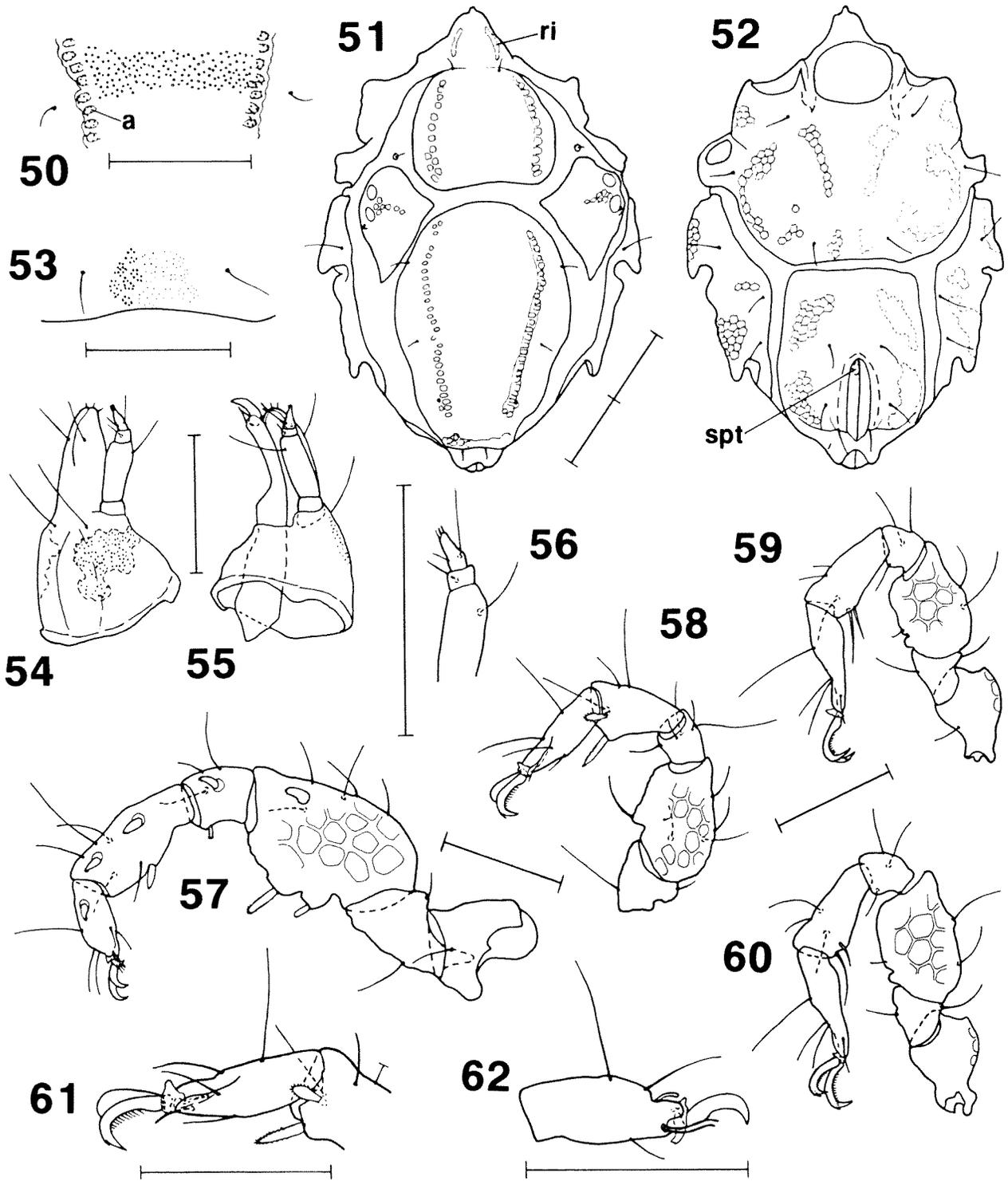
Dorsal portion of anterior epimeral plate (Figure 51) with 25 µm wide frontal process; that process with minute median spine and pair of approximately 20 µm long ridges. Length of anterior plate 115 µm (from tip of spine to the somewhat excavate posterior margin), width 97 µm. AD with pair of raised costae, major parts of these costae an alveolus wide, posterior portion of costae one to two alveoli wide. OC 78 µm long, 52 µm wide, with two distinct corneae and a transverse, raised porose areola. Gland pore and pore canaliculus almost adjacent in lateral margin of the plates. PD 165 µm long, 120 µm wide. Anterior margin rounded. Pair of longitudinal

costae not joined with transverse posterior bar. Anterior and middle portion of costae one alveolus wide, posterior portion two alveoli wide. Transverse bar two alveoli wide. Pair of gland pores present lateral to posterior portion of costae. Setae ds-1 inserted on level with insertions of leg I, setae ds-2 on 5 µm wide sclerite within striated integument between AD and OC, ds-3 not seen, ds-4 and ds-5 on PD level with insertions of legs III and IV, ds-6 posterior to transverse bar.

Ventral plates (Figure 52) with demarcated porose polygons, remainder of plates delicately pitted. Each porose polygon with 7–12 canaliculi (Figure 53). AE 100 µm long, 193 µm wide. Epimeral processes triangular, pointed. Area medial to insertions of legs II raised. Porose areolae garland-like, arranged as illustrated. GA 130 µm long, 98 µm wide, with two pairs of porose areolae. GO 55 µm long, 16 µm wide. Distance from anterior margin of GO to that of GA almost same as length of GO. Subgenital setae lacking. Anterior pair of perigenital setae level with anterior margin of GO. Ovipositor short, when at rest not reaching end of GO. Spermatheca 7 µm in diameter.

Gnathosoma 87 µm long. Gnathosomal base with pair of demarcated porose areolae (Figure 54). Tectum truncate (Figure 55). Rostrum 35 µm long. Palps extending somewhat beyond tip of rostrum. P-2 with long dorsal seta. P-3 4 µm long, its medial spine longer than P-3. P-4 10 µm long (apical spur-like setae included); with two basal setae, and apically with minute seta and two spurs (Figure 56).

Dorsal and medial flanks of telofemora (Figures 57 – 60) with wide reticulate sculpturing, lateral flanks with delicate reticulum. Telofemora II-IV with ventrolateral lamellae; articular lamellae lacking. Membranes of claw fossae reduced to small lamellae. Tibiae of legs I, II and IV shorter than telofemora of these legs, tibia III about as long as telofemur III. Tarsi of legs III and IV longer than tibiae. Leg chaetotaxy, from trochanter to tarsus (solenidion omitted): leg I, 1, 2, 8, 5, 8, 10; leg II, 1, 2, 5, 5, 5, 5; leg III, 1, 2, 3, 3, 5, 4; leg IV, 0, 2, 3, 3, 5, 4. Two ventral spines on telofemur I 11 and 18 µm long, ventromedial spine 18 µm long; ventral spine on genu I 7 µm and ventromedial spine 15 µm long; ventral spine on tibia I 10 µm and the two ventromedial ones 16 and 11 µm long; ventromedial spine on tarsus I 10 µm long. Spines delicately pectinate. Tibia II (Figure 61) with a pectinate ventral and a short, wide and bipectinate ventromedial spine. Tibiae III and IV with pair of tapering bristles, the ventrolateral one distinctly longer than the ventromedial one. Tarsus I (Figure 62) with doubled pas; 5 µm long solenidion between dorsolateral seta and lamella with vestiges of famulus. Tarsus II (Figure 61) with three dorsal seta, a 6 µm long solenidion behind narrow medial



Figures 50–62 *Agauopsis ornatella* sp. nov., ♀: 50, portion of PD between setae ds-5; 51, idiosoma, dorsal view (left side shows alveoli from rosette pores, right side alveoli and outline of raised areolae); 52, idiosoma, ventral view (right side alveoli and outline of porose areolae, left side outline of porose areolae); 53, portion of AE between third pair of ventral setae; 54, gnathosoma, ventrolateral view; 55, gnathosoma, dorsolateral view; 56, tip of palp, lateral view; 57, leg I, medial view; 58, basifemur – tarsus II, medial view; 59, leg III, medial view; 60, leg IV, medial view; 61, tibia and tarsus II, medial view; 62, tarsus I, lateral view (medial setae and claw omitted). Scale line = 50 μ m.

membrane of claw fossa, a ventral seta and a single lateral pas. Tarsi III and IV each with medial pas; lateral pas lacking. Solenidion on tarsus I 5 μ m, on tarsus II 6 μ m long.

Paired claws of tarsus I smooth, median claw

bidentate. Paired claws of tarsi II–IV with accessory process and pectines; the latter with about 10 tines.

Male

Not seen.

Remarks

Agauopsis ornatella is a member of the *ornata* group. The most prominent characters of this group are: porose areolae of dorsal plates with distinct alveoli and numerous canaliculi, ventral plates with garland-like arranged porose polygons. P-2 with tapering bristle-like spine. P-4 with two basal setae, an apical setula and two minute spurs. Legs with lamellae. Telfemur I with one ventromedial and two to three ventrolateral spines, tibia I with two ventromedial and one ventral spine. All tarsi with three dorsal setae. Tarsus II with lateral pas and ventral seta, and tarsi III and IV each with medial but no lateral pas. Members of the *ornata* group are *A. bacescui* Konnerth-Ionescu, *A. bermudensis* Bartsch and Iliffe, *A. inflata* Newell, *A. ornatella* (Lohmann), and *A. pseudoornata* Bartsch. *A. punctata* and *A. aequilivestita* are very closely related with the *ornata* group but their ventral plates lack the garland-like porose areolae.

A. ornatella is characterized by its frontal process with the two narrow ridges, the costae on PD being a single alveolus wide, the rather narrow porose areolae on the AE and the area with the lateral garland being raised. The Philippine *A. pseudoornata* has a triangular frontal process with a pair of rounded porose areolae, the costae on the PD are three porose polygons wide, the porose areolae of the AE are distinctly wider (Bartsch 1985a). The eastern African *A. bacescui* has, compared with *A. ornatella*, a longer frontal spine, the costae on PD are two porose polygons wide, and telfemur I bears four spines (Konnerth-Ionescu 1977).

Genus *Halacaropsis* gen. nov.**Type species**

Agauopsis hirsuta Trouessart, 1889.

Diagnosis

Dorsum with AD, OC and PD and the five pairs of setae ds-1 to ds-5. Adanal setae on anal plate, often in ventral position. AE with three pairs of ventral setae and pair of epimeral pores. PE with one dorsal and three ventral setae. Female GA with four to eight pairs of pgs and two to six pairs of subgenital setae. Male GA with about 50 perigenital setae close around GO; one or two pairs of setae may be outlying. Gnathosomal base quadrangular, rostrum parallel-sided. One pair of maxillary setae on gnathosomal base, one pair in distal rostrum. Palps four-segmented, attached laterally to base of gnathosoma. P-2 with dorsal seta, P-3 with dorsomedial seta, P-4 with three setae in basal whorl, one setula and two spurs apically. Leg I long and stout, telfemur, genu and tibia I with large spines; tarsus I with ventromedial

spine. Solenidion on tarsus I in dorsolateral position, on tarsus II in dorsomedial position. All tarsi with ventral setae. Median claw on all tarsi stouter than paired claws. One larval and two nymphal stages present.

Remarks

The genus *Halacaropsis* includes the species formerly assigned to the *Agauopsis hirsuta* group as defined in Bartsch (1986). *Halacaropsis* differs from representatives of the genus *Agauopsis* in the larger number of ventral setae on the tarsi I and II and the presence of ventral setae on tarsi III and IV. Moreover, tarsi of representatives of *Halacaropsis* have a remarkably enlarged median claw, much larger than that of *Agauopsis*; and the tarsi of the hind legs of *Halacaropsis* are rather slender, they may be somewhat curved. In juveniles of *Halacaropsis* are PD and anal plate widely separated, in juveniles of *Agauopsis*, PD and anal plate often are adjacent.

Halacaropsis resembles *Agauopsis* in the chaetotaxy of tibia I, and *Halacarus* in the number of ventral setae on the tarsi and the cerotegumental swellings on the plates.

***Halacaropsis capuzina* sp. nov.**

Figures 63–87

Holotype

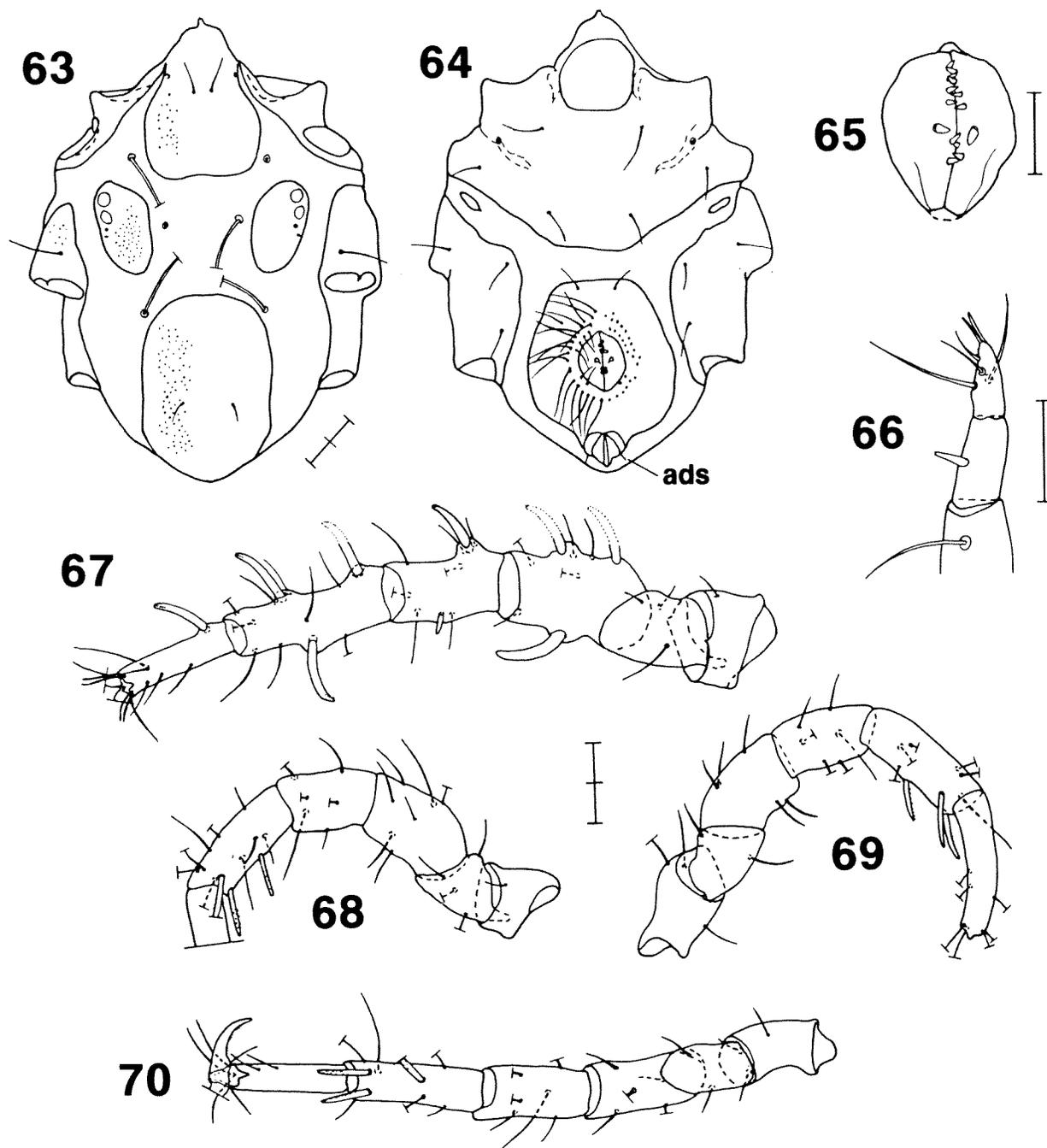
♂, Bickley Point, Rottneest Island, Western Australia, Australia, on seagrass *Amphibolis* sp. with dense epiflora and epifauna, 2 m depth, 18 January 1991 (WAM 96/165).

Paratypes

1 ♀ (WAM 96/166), data as holotype; 1 deutonymph, 1 protonymph, 1 larva (WAM 96/167–169), data as for holotype; 1 deutonymph, 1 protonymph (ANIC); 1 deutonymph, 1 protonymph, 1 larva (ZIMH A50/95), data as for holotype; 2 ♀, 3 deutonymphs, 5 protonymphs, 1 larva, data as for holotype (author's collection).

Description**Male**

Idiosomal length 795 µm. All plates covered with delicate, almost smooth cerotegumental membrane, this membrane thickened in anteromedian portion of AD and posteromedian portion of PD. Integument of AD, OC, PD and dorsal portion of PE pierced by small pores (Figure 63). AD 272 µm long, 210 µm wide; anterior rounded margin with minute frontal spinelet. First pair of gland pores in lateral margin just anterior to level with insertion of leg I. OC 158 µm long, 100 µm wide, with two corneae, gland pore and pore canaliculus. Area



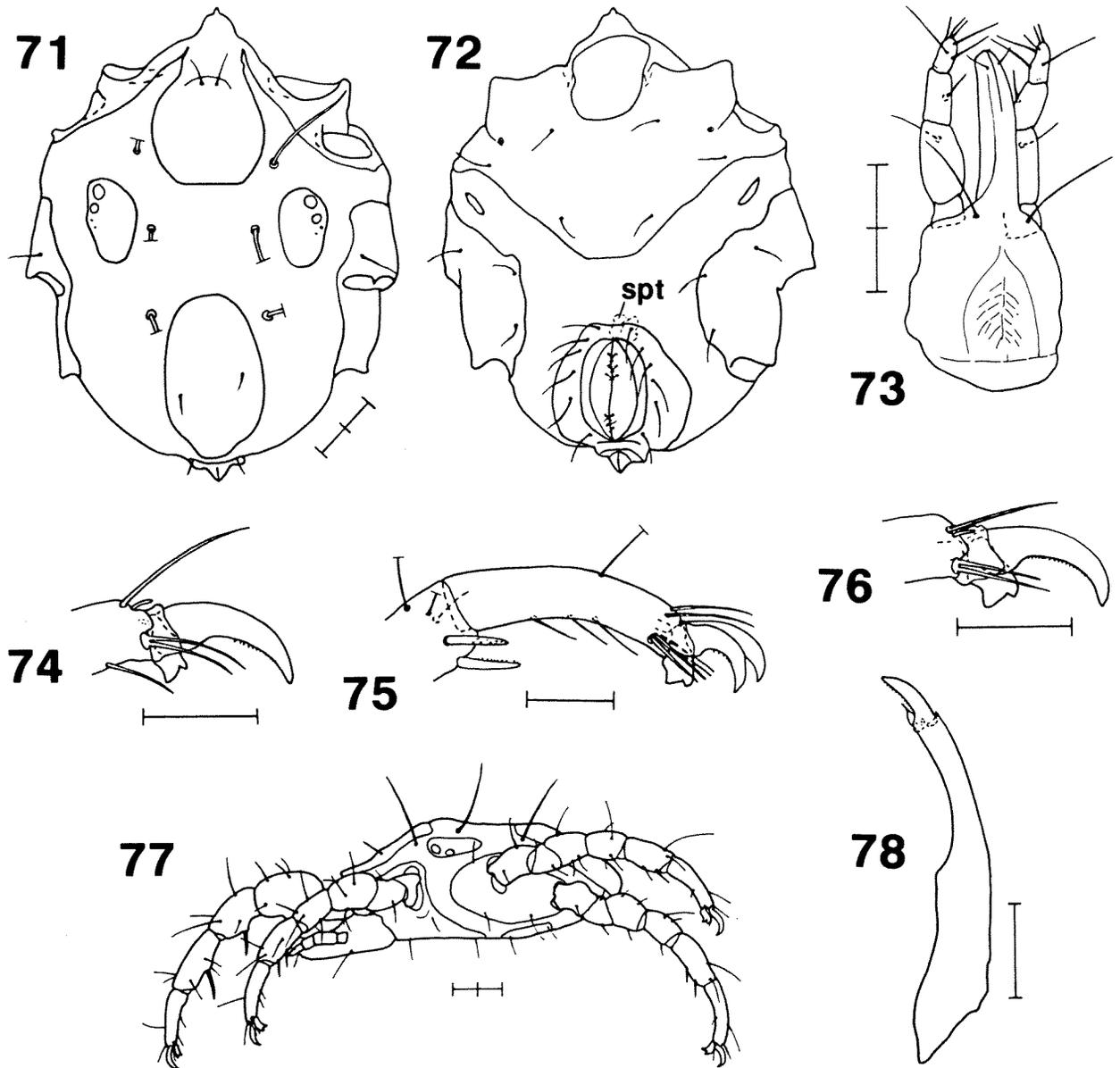
Figures 63–70 *Halacaropsis capuzina* sp. nov., ♂: 63, idiosoma, dorsal view (left side shows the minute pores); 64, idiosoma, ventral view; 65, genital sclerites; 66, tip of palp, dorsal view; 67, leg I, ventral view (broken spines completed with dotted lines); 68, leg II, medial view; 69, leg III, medial view; 70, leg IV, ventral view. Scale line = 50 μm .

with corneae slightly raised. PD 322 μm long, 230 μm wide. Anterior margin broadly rounded, almost truncate. PD and anal plate separated by striated integument. Setae ds-1 inserted in middle of AD. Setae ds-2, ds-3 and ds-4 conspicuously strong, inserted on 20 μm wide platelets within the striated integument. Small ds-5 on PD. Adanal setae on anal plate.

AE 242 μm long, 557 μm wide, with three pairs of ventral setae (Figure 64). Pair of epimeral pores adjacent to apodemes between EI and EII. PE with

a dorsal and three ventral setae. GA 322 μm long, 255 μm wide; its anterior margin truncate, angles rounded. GO 105 μm long, 80 μm wide. Interval between anterior margin of GO and GA almost same as length of GO. Fifty pgs close around GO, and one and a half pair of pgs outlying. Anterior pair of outlying setae close to anterior margin of GA. Genital sclerites each with seven blunt, spine-like subgenital setae (Figure 65).

Gnathosoma 260 μm long, 128 μm wide. Gnathosomal base rectangular; rostrum 130 μm



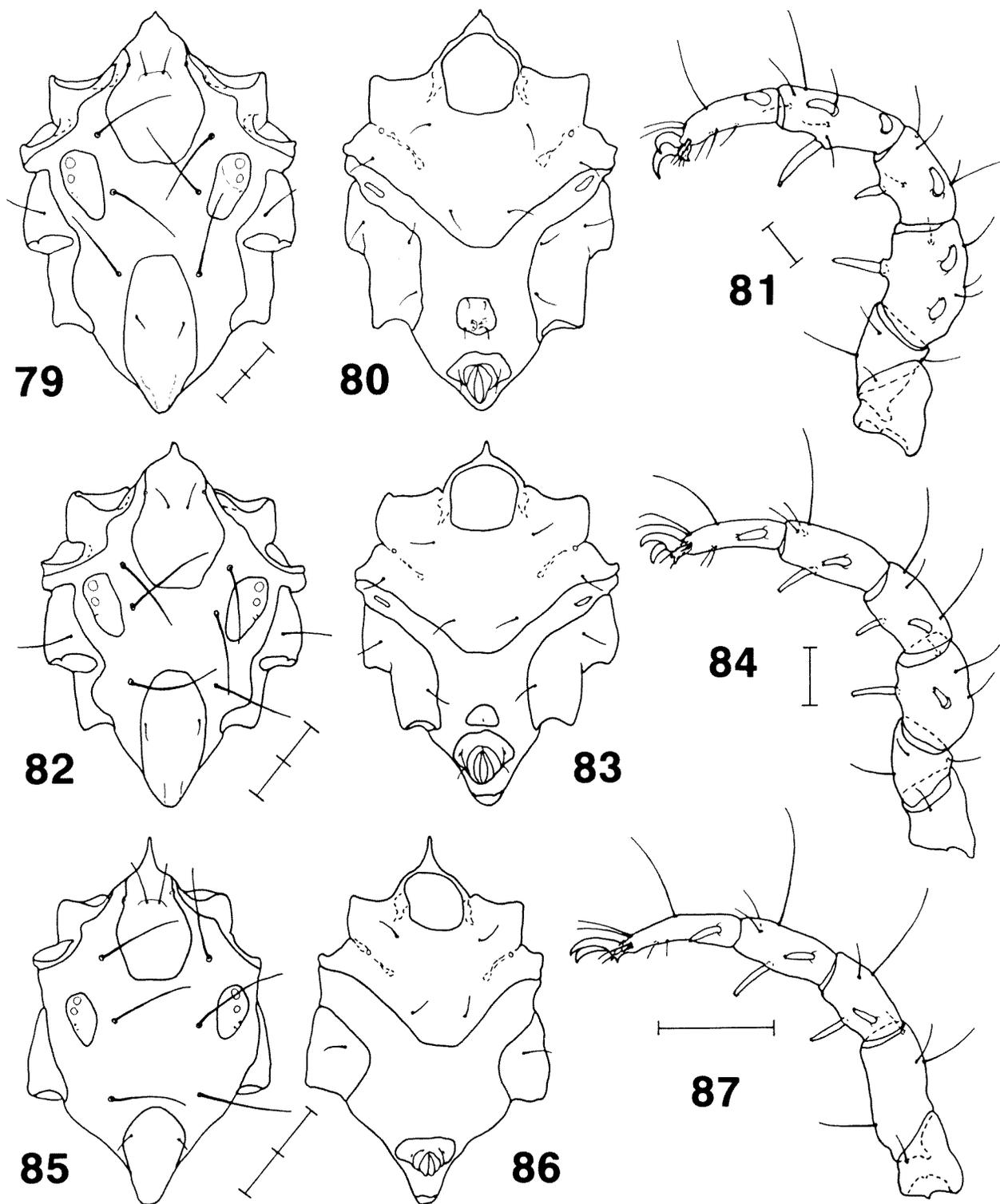
Figures 71-78 *Halacaropsis capuzina* sp. nov.: 71, idiosoma, dorsal view, ♀; 72, idiosoma, ventral view, ♀; 73, gnathosoma, ventral view, ♀; 74, tip of tarsus I, lateral view, ♀ (medial setae and claw omitted); 75, apex of tibia and tarsus II, medial view, ♀; 76, tip of tarsus II, medial view, ♀ (lateral setae and claw omitted); 77, deutonymph, lateral view; 78, chelicera, deutonymph. Scale line = 50 μm.

long, about as long as gnathosomal base. Basal pair of maxillary setae long; posterior pair of maxillary setae small, inserted close to tip of rostrum. Both pairs of rostral setae minute. Palps surpassing tip of rostrum. P-2 with dorsal seta; P-3 with dorsomedial blunt (broken?) seta (Figure 66). P-4 shorter than P-3, with three setae in basal whorl and apical setula and two spinelets. Elongate chelicera as figured for deutonymph.

Leg I (Figure 67) larger than the other legs (Figures 68 - 70) and longer than idiosoma; spines with blunt, delicately denticulate tip. Tarsus I shorter than tibia I; tarsi III and IV somewhat longer than tibiae III and IV respectively. Tarsi II-IV slightly bent. Numbers of setae from trochanter

to tarsus (solenidion omitted): leg I, 1, 3, 8, 9, 12, 12; leg II, 1, 4, 7, 6-7, 9-12, ?; leg III, 3, 2, 4-5, 5-6, 9-10, 7-8; leg IV, 3, 2, 5-6, 6-7, 9, 7. I-3 and I-5 both with one ventrolateral and two ventromedial spines; I-4 with pair of spines (left genu of holotype with both spines being stout, right genu with stout ventromedial and distinctly smaller ventrolateral spine). Tarsus I with three dorsal setae and a medial spine, one ventromedial and three ventrolateral setae, dorsolateral solenidion, and apical pair of doubled pas. Tibiae II-IV ventrally each with three delicately denticulate spines and one seta. Tarsi III and IV with two ventral setae and a pair of single pas.

All tarsi end with pair of slender claws and stout,



Figures 79–87 *Halacaropsis capuzina* sp. nov.: 79, idiosoma, dorsal view, deutonymph; 80, idiosoma, ventral view, deutonymph; 81, leg I, medial view, deutonymph; 82, idiosoma, dorsal view, protonymph; 83, idiosoma, ventral view, protonymph; 84, leg I, medial view, protonymph; 85, idiosoma, dorsal view, larva; 86, idiosoma, ventral view, larva; 87, leg I, medial view, larva. Scale line = 50 μm .

bidentate median claw. Paired claws with row of tines along ventral flank.

Female

Idiosomal length 670–750 μm . Anterior rounded AD with median spinelet (Figure 71), one specimen

without such a spine. AD of 670 μm paratype 242 μm long, 168 μm wide. OC 117 μm long, 68 μm wide. PD 235 μm long, 142 μm wide, more slender than PD of male, ds-5 inserted closer to margins of the plate than in male. AE 204 μm long, 483 μm wide, and GA 217 μm long, 207 μm wide. Anterior

margin of GA truncate; with six pairs of pgs (Figure 72). GO large, 142 µm long, 100 µm wide. Genital sclerites with five pairs of subgenital setae. Spermatheca 30 µm long, 35 µm wide. Gnathosoma as illustrated in Figure 73; dorsomedial seta on P-3 tapering and apically pointed. Tarsus I with 10 µm long solenidion between dorsolateral seta and lamella with canal from famulus (Figure 74). Tarsus II slightly longer than tibia II. Tarsus II (Figures 75, 76) with three ventral setae, 8 µm long solenidion adjacent to dorsomedial seta, and pair of doubled pas.

Deutonymph

Idiosoma (Figure 77) 524–603 µm long. OC and PD (Figure 79) smaller than plates of adults. Setae ds-5 near margin of PD. Quadrangular genital plate not fused with anal plate (Figure 80); its length 58 µm, width 62 µm; with two pairs of pgs, two pairs of subgenital setae and two pairs of internal genital acetabula. Anal plate in ventral position. Gnathosoma as in female with tapering pointed seta on P-3. Chelicera (Figure 78) elongate, its claw denticulate. Leg I (Figure 81) with number and arrangement of stout spines similar to that of adults. Tibiae II, III and IV each with two pairs of spine- or seta-like ventral setae. Tarsi I to IV with 3, 2, 1, 1 ventral setae respectively; tarsus I with doubled pas.

Protonymph

Idiosoma 410–503 µm long. Outline of dorsal plates (Figure 82) similar to that of deutonymph. Genital plate (Figure 83) 25 µm long and 35 µm wide; with single pair of internal acetabula; pgs and subgenital setae lacking. Telofemur, genu and tibia I each with pair of long spines (Figure 84). Tibiae II-IV each with a single pair of ventral setae. Tarsi I-IV with 2, 1, 0, 0 ventral setae. Tarsus I both medially and laterally with a large and a small pas.

Larva

Idiosoma 251–389 µm long. Frontal spine (Figure 85) much more slender than that of adults and nymphs. PD shorter than in nymphs. Genital plate lacking (Figure 86). No spines on femur I; genu and tibia I each with pair of spines; tarsus I with medial spine (Figure 87). Tibiae II and III each with pair of ventral setae. Tarsus II with one ventral seta; no ventral seta on tarsus III. Tarsus I, as well as the other tarsi, longer than tibiae of the legs. Tip of tarsus I medially and laterally each with a large and a small parambulacral seta.

Variations

In one of the adult specimens, the anterior idiosoma is evenly rounded, the others have a small frontal spinelet.

Table 1 Leg chaetotaxy of adult *Halacaropsis capuzina* (solenidia not included; spines in roman numerals)

segment	1	2	3	4	5	6
leg I	1	3	5–6+III	7+II	9+III	11+I
leg II	1	4	6–8	6–8	9–12	10
leg III	3	2	4–5	4–6	9–11	7–8
leg IV	3	2	4–6	6–7	9	7

The chaetotaxy of the legs varied and the number of setae of four adult specimens is summarized in Table 1.

Remarks

Halacaropsis capuzina is closely related to *H. warringa* (Otto), a species taken on the coast of New South Wales, southeastern Australia (Otto 1993). Both species are very similar in general facies, both have considerably enlarged ds-2, ds-3 and ds-4, the outline and chaetotaxy of the legs is almost identical. According to the material at hand, viz. four specimens of *H. capuzina* and six specimens of *H. warringa*, and the description by Otto (1993), the western and the southeastern Australian *Halacaropsis* can be discriminated on the basis of the anterior AD – wide rounded lobe terminating into a minute frontal spinelet (*H. capuzina*) vs trilobed, with two blunt lateral and a spine-like median lobe (*H. warringa*) – the ornamentation of the cerotegumental layer – smooth in *H. capuzina*, reticulate and with delicate filaments in *H. warringa* – and length of rostrum – as long (*H. capuzina*) vs shorter (*H. warringa*) than width of gnathosoma. The seta of P-3 is long, slender and evenly tapering at least in females and juveniles of *H. capuzina* (in old specimens it may be broken) but short and provided with a truncate spinose tip in both males and females of *H. warringa*.

The genus *Halacaropsis* includes the species *H. hirsuta* (Trouessart) **comb. nov.**, recorded from the Northern Atlantic and the Mediterranean (Viets 1940; André 1946; Chapman 1955), *H. warringa* (Otto) **comb. nov.**, taken on the coast of southeastern Australia, from coralline algae in areas exposed to moderate wave action (Otto 1993) and *H. capuzina*, abundant around Rottneest Island, with the adults living amongst the epifauna and flora on the seagrass *Amphibolis*, and the juveniles being more widely spread, present also within scrub-like corallines. The single *Halacaropsis*, a male, mentioned by Lohmann (1909) from Geraldton, Western Australia, differs from the specimens from southwestern and southeastern Australia in that its rostrum is much longer than the gnathosomal base, and the ds-3 are not enlarged but similar to the ds-1.

An undescribed species of the genus *Halacaropsis*,

distinctly differing from the Australian species, is recorded from South Africa (Bartsch 1986).

ECOLOGY

The two species *Agauopsis australiensis* and *Halacaropsis capuzina* were commonly taken in shallow water substrata, from intertidal to some few metres depth.

Juveniles of *Halacaropsis capuzina* were found in a wide range of habitats, regularly and in large numbers in samples with the seagrass *Amphibolis* as well as with coralline algae, whereas the adults were registered in seagrass washings. *H. capuzina* is thought to prefer the dense thicket of epifauna and flora on the seagrass. With the enlarged median claw and the slightly bent posterior tarsi, *H. capuzina* resembles representatives of the genus *Bradyagaue* which live on stolonaceous colonies. *H. warringa* and *H. hirsuta* are mostly recorded from samples with coralline algae (Chapman 1955; Otto 1993).

A remarkable feature of *H. capuzina*, as also of *H. warringa*, is the presence of long and very stout setae on the dorsum. These erect spines may both prevent its bearer from being swallowed by small fishes nibbling on the epifauna, and they may help to trap debris which serve as an optical and chemical camouflage.

Agauopsis elaborata, too, has conspicuously enlarged dorsal setae, but these setae are not erect but curved. Similar setae and an ornamentation resembling that of *A. elaborata* is described for *Thalassophthirus auster* Bartsch, *Copidognathus neptuneus* Bartsch and *C. nasutus* Bartsch (Bartsch 1988, 1992a, 1994). The single specimen of *A. elaborata* and *C. nasutus* were found within corallines, *C. neptuneus* was extracted from a dead coral block dredged in the Tolo Channel, Hong Kong; *T. auster* was taken from 13–34 m depth, Staten Island, South America, the substratum inhabited is not known.

A. australiensis, adults as well as nymphs and larvae, was taken from various substrata, from scrubs of corallines and calcareous tubes of polychaetes and together with *H. capuzina* from the epifauna and flora on *Amphibolis*.

In the collections gathered in January *Halacaropsis capuzina* was represented with rather large numbers of larvae, protonymphs and deutonymphs (only few of them were examined microscopically) whereas adults were sparse. In contrast to the juveniles, the four adult specimens available were intensely fouled with small algae and they lacked the claws on one or more legs. According to present knowledge, the majority of halacarines have a univoltine life cycle with either short or prolonged periods of reproduction (Bartsch 1989). *H. capuzina* obviously belongs to the

former category, with egg deposition within few weeks in early spring, larvae hatching in the spring, juveniles predominating in the summer months, and adults being present in autumn, winter and spring. The heavily fouled adults found in January obviously belong to the parental generation. *Agauopsis australiensis* has a less distinctive period of reproduction, adults are abundant also in summer months.

The larvae of both *H. capuzina* and *A. australiensis* have a slender, pointed frontal spine. These frontal spines may help the hatching larvae to rupture the egg membrane. The anterior spinelet of larvae of *Halacarellus psammophilus* (Krantz) and *H. subcrispus* Bartsch is thought to be such an egg bursting mechanism (Krantz 1976; Bartsch 1978).

BIOGEOGRAPHICAL REMARKS

According to present records, five representatives of *Agauopsis* and two of *Halacaropsis* live in Western Australian shallow waters, these are *A. aequilivestita*, *A. australiensis*, *A. elaborata*, *A. ornatella*, a representative of the *Agauopsis furcata* group (Bartsch 1993), *Halacaropsis capuzina* and *Halacaropsis* sp. (Lohmann 1909).

A. australiensis, *A. ornatella* and *A. elaborata* are members of the *microrhyncha*, *ornata* and *pugio* groups respectively. The *microrhyncha* group is wide-spread, present in warm as well as polar waters; most species are known from the southern hemisphere. Members of the *ornata* group are found in warm waters all around the globe. Records of representatives of the *pugio* group are from the southern hemisphere only, from South Africa, South America, and now also from Australia. *A. aequilivestita* is most similar to the African *A. punctata*. The *furcata* group includes psammobiont species; most records are from the Indo-Pacific region, but members of this group are also known from the Black Sea and northeastern Atlantic (Bartsch 1992b).

In the samples from Rottneest Island, there is no representative of the otherwise very common *brevipalpus* group. The lack of records may be due to the small size of Rottneest Island, many habitats are missing (Wells and Walker 1993), and being an area with rather constant environmental parameters such as high salinity and temperature.

Records of the genus *Agauopsis* from southeastern Australia are *A. mokari* and *Agauopsis* sp. (Otto 1994; Bartsch 1985b), both members of the *microrhyncha* group, and *A. collaris* Otto, a representative of the *brevipalpus* group (Otto 1994). The '*Agauopsis brevipalpus*' mentioned in Lohmann (1893) is certainly not conspecific with the northern Atlantic and Mediterranean *A. brevipalpus*. The records of '*Agauopsis microrhyncha*' and '*Agauopsis hirsuta*', listed by Lohmann (1893) from off Sydney, is

thought to be purely a lapse, these species are not included in the systematic part of that publication (Lohmann 1893) and no Australian record is given in Lohmann (1901).

The present knowledge of halacarids from Australian shores represents only scattered bits of information; the number of shore lines visited and habitats surveyed is small. In respect to *Agauopsis*, eastern and western Australia have no co-occurring species. The two species of *Halacaropsis* are sibling but distinct species. It is reasonable to expect distinct faunas in western and eastern shores of southern Australia.

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