

Halacarid mites (Acari: Halacaridae) from Esperance, Western Australia: Notes on taxonomy and faunal distribution of non-Copidognathinae

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Abstract – A recent survey on the halacarid fauna of Esperance (Western Australia) resulted in records of more than 40 species. The genera, and in parentheses the number of species, are: *Actacarus* (1), *Agauae* (4), *Agauopsis* (3), *Arhodeoporus* (2), *Atelopsalis* (1), *Bradyagaue* (1), *Copidognathus* (ca 13), *Halacarellus* (2), *Halacaropsis* (1), *Halacarus* (4), *Lohmannella* (2), *Rhombognathus* (5), *Scaptognathus* (1), *Simognathus* (3) and *Werthella* (1). In the present study the copidognathine genera *Copidognathus* and *Werthella* are excluded. Data on relevant taxonomic characters and distribution are given for 30 non-copidognathine species. Five species new to science are described; the species belong to the genera *Agauae*, *Agauopsis*, *Arhodeoporus*, *Halacarus*, and *Scaptognathus*. The diversity of non-copidognathine species collected from Esperance and its vicinity is distinctly lower than that collected on Rottnest Island (52 named non-copidognathines). Almost two-third (19 species) of the species from Esperance have also been taken in other areas of Australia, and about half of the species are known from Rottnest Island.

Key words: Western Australia, southern coast, Halacaridae, list of species, descriptions, biogeography

INTRODUCTION

In the past two decades there has been a considerable increase in knowledge of the Australian halacarid fauna, especially that of Western Australia. At present 28 species are known from tropical north-western Dampier and about 80 species from the warm-temperate western area, from Rottnest Island off Perth. In February 2003, the author had the opportunity to visit Esperance, which lies on the southern coast. First observations on the fauna and descriptions of species of the genera *Agauopsis*, *Bradyagaue*, *Lohmannella*, *Rhombognathus*, *Simognathus* and the copidognathine genus *Werthella* have been published recently (Bartsch 2004a, 2005b–e), and more follow in the present contribution. From the south-eastern and eastern coast of Australia, from Victoria, New South Wales and Queensland, slightly more than 100 species are recorded, but this number is incomplete, as that from the tropical Western Australia, as a large part of the halacarid fauna still is undescribed. World-wide more than 1000 marine halacarid species are known (Bartsch, 2004b).

STUDY AREA AND METHODS

Esperance, situated on the southern coast of Western Australia, at 33°51'S, 121°53'E, lies in the

temperate climate zone of Australia (Knox, 1963; O'Hara and Poore, 2000). The water temperature in winter is about 13–15°C, in summer around 22°C (Li *et al.*, 1999; Kendrick *et al.*, 2005). The two major currents along Australia's southern coastline are the eastward flowing Leeuwin current, bringing warm water to Esperance from the western coast of Western Australia, and the westward flowing Flinders Current, transporting water masses from Victoria to Esperance (Middleton and Cirano, 2002; Cirano and Middleton, 2004). The coastline is exposed to almost continuous Southern Ocean swell and the wave action can be significant even in rather protected areas (Short, 2006). The coastline includes a moderate variety of habitats, long arcuate beaches with fine grained siliceous sand, rocky headland areas with cliffs, rocks and small bays with coarse, calcareous sediment, and patches of limestone reefs (Sanderson *et al.*, 2000). There are no mangroves (Wells *et al.*, 2005). Tides are semi-diurnal and the tidal range is generally less than 1 m (Short, 2006).

Various substrata, algae, seagrasses, colonial organisms and sediments, were collected from the tidal and shallow subtidal zone, some few samples are from depth of 10–40 m. If not stated otherwise, the material was collected by the author. The meiofauna, including the mites, was extracted by washing the substrata. The mites were cleared in lactic acid and mounted in glycerine jelly.

Holotypes, paratypes and voucher specimens are deposited in the Western Australian Museum, Perth (WAM), other slides in the Senckenberg Museum, Frankfurt (SMF) and the Zoological Institute and Zoological Museum, Hamburg (ZMH). Diagnostic data given to species are based on material from Esperance. Rare character states are in parentheses. Information on collection sites is restricted to new material, not studied and published before. To each species the known geographical distribution is given; the citation of the source of these data is restricted to references not mentioned in the preceding lines.

Abbreviations used in the descriptions are: AD = anterior dorsal plate; AE = anterior epimeral plate; ds-1 to ds-5 = first to fifth pairs of dorsal setae numbered from anterior backward; GA = genitoanal plate; glp-1 to glp-5 = pair(s) of gland pores numbered 1 to 5 from anterior backward; GO = genital opening; GP = genital plate; OC = ocular plate(s); P-2 to P-4 = second to fourth palpal segment(s); pas = parambulacral seta(e); PD = posterior dorsal plate; PE = posterior epimeral plate(s); pgs = perigenital setae; sgs = subgenital setae, sgs-1 to sgs-5 are numbered from anterior backward. The epimeral plates and legs, with their segments and claws, are numbered I to IV. The leg segments are trochanter, basifemur, telofemur, genu, tibia, and tarsus. The setation formula of the legs presents the number of setae from trochanter to tarsus. Unless stated otherwise the given number of setae of the tarsi includes the solenidion but excludes famulus and parambulacral setae. The position of a seta or gland pore is given in a decimal system with reference to the length of the relevant structure, from its anterior to posterior or basal to distal end.

ANNOTATED LIST AND DESCRIPTION OF SPECIES

The genera are arranged in an alphabetical order, not in subfamilies, as some, though not all of the present day subfamilies are not natural units. The subfamily of Copidognathinae, which is excluded from the present study, is based on a unique combination of characters with several synapomorphies. The characters are: AE of all instars with epimeral pores. Number of genital acetabula reduced, adults with no more than one pair of acetabula. Palps three- to four-segmented; one seta on P-2, none on P-3 (or in part representing P-3); one to three setae in basal whorl of P-4 (or in part representing P-4). One pair of maxillary setae on rostrum, one pair (rarely more pairs) on gnathosomal base. Genua of all legs shorter than adjoining tibiae and telofemora. Genua I and II in general with four setae. Tibiae I and II with two to three ventral setae, tibiae III and IV with two ventral

setae. Tarsus I with one to three ventral setae. Tarsi III and IV without ventral setae (except for that one of the parambulacral setae is moved to a ventral position). Solenidion on tarsus II in dorsolateral position. Paired claws distinct and present on all legs. Claw-like process of median sclerite minute. Trito- and deutonymphal instar reduced; no more than one nymph (the protonymph) during ontogeny. The subfamily of Copidognathinae includes the genera *Acarothrix*, *Copidognathides*, *Copidognathus*, *Phacacarus*, and *Werthella*. The non-copidognathine genera, treated below, have a character combination different from that just outlined.

Genus *Actacarus* Schulz, 1937

Actacarus pacificus Bartsch, 1979

Actacarus pacificus Bartsch, 1979a: 231–234, figures 1–14; Bartsch, 1993d: 75, 76, figure 1; Abé, 1997: 33–34, figure 2A–C; Bartsch, 2003d: 25–27, figure 2A–D.

Actacarus orthotectus Newell, 1984: 245–247, figures 705–707 (cf Bartsch, 1996a).

Actacarus marindicus Otto, 2000c: 116–119, figures 3a–e, 4a–e (cf Bartsch, 2003d).

New Material

Australia: Western Australia: 1 female, WAM T 78317, 1 male, WAM T 78318, Esperance, Lucky Bay, 33°59'S, 122°13'E, shallow water sediment, 30–50 cm below low water line, 15 February 2003; 1 female, 1 male, ZMH, collection data as above.

Remarks

Characters of *A. pacificus* are: length of female 259–263 µm, of male 251–269 µm; dorsal and ventral plates separate and delicately punctate; OC distinctly longer than wide; AE with four pairs of setae, PE with two ventral setae; ovipositor extending beyond anterior margin of GA; integument of palps faintly punctate; P-4 with short spur; tibia I with three apparently smooth ventral setae and tibiae III and IV each with a long, bipectinate seta.

Seven named species of *Actacarus* are known from Australia, the just mentioned *A. pacificus*, as well as *A. australis* Bartsch, 1993, *A. chelonis* Otto, 2000, *A. cornutus* Otto, 2000, *A. festivus* Bartsch, 2003, *A. nanus* Otto, 2000, and *A. spinosus* Otto, 2000 (Bartsch, 1993d, 2003d; Otto, 2000c). *Actacarus pacificus*, *A. nanus* and *A. spinosus* have four pairs of setae on the AE. *Actacarus pacificus* and *A. nanus* can be distinguished from the others by the size of the OC and AE and the ornamentation of P-2. *A. pacificus* has elongate OC with a gland pore in the posterior third, the AE

does not reach the level of the posterior setae of the PE, and the P-2 are faintly punctate, in contrast the OC of *A. nanus* are short, the gland pore is almost in the middle of the plate, the AE extends almost to the level of the posterior setae of the PE and the insertion of leg IV, and the P-2 are coarsely punctate. *Actacarus spinosus* is characterized by its tibia I, with one of the ventral setae being coarsely bipectinate, and the P-4, with one of the setae thickened and bent.

Distribution and ecology

Western Australia (Esperance, Rottneest Island and Dampier), Hawaiian Island, Chile (Robinson Crusoe Island), Japan (Hokkaido). Present in intertidal and shallow subtidal (10 m) sandy deposits.

Genus *Agau* Lohmann, 1889

Agau brevipes Bartsch, 1999

Figure 1A

Agau brevipes Bartsch, 1999c: 343–346, figures 6A–K, 7A–D.

New Material

Australia: Western Australia: 1 female, WAM T 78319, 1 male, WAM T 78320, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, seagrass (*Posidonia* sp.) from 0.5 m below water line, 10 February 2003; 1 female, ZMH, Esperance Bay, 33°50'S, 121°56'E, 11 m depth, from *Scaberia agardhii* Greville (Phaeophyta), 11 February 2003.

Remarks

The length of the female idiosoma is 556 µm, of the male 390 µm, of the gnathosoma 200 and 195 µm respectively. The dorsal and epimeral plates bear smooth cerotegumental lamellae, such lamellae are present also on the telofemora, genua and tibiae, and on trochanters III and IV. The dorsal setae ds-2, ds-3 and ds-4 are distinctly longer than ds-1. The PE bears three dorsal setae anterior to leg III and one seta anterior to leg IV. In the female the GO is close to the anterior half of the GA, there is a ring of 18–21 setae around the GO, the ovipositor extends beyond the GO. In the male the GO is in the middle of the GA, and 21 and 76 pgs are in an inner and outer ring, respectively. The dorsal setae of P-2 and P-3 are slender in both females and males. The number of setae on trochanter to tibia are on the legs I and II 1, 2, 5, 4, 11, on leg III 2, 2, 3, 4, 9 and on leg IV 0, 2, 3, 3, 8–9. The length of all telofemora is less than three times the height, from telofemur I to IV the length equals 2.6–2.9, 2.3–2.4, 2.4–2.6 and 2.5–2.7 the height, respectively. Each of the paired claws bear a large accessory process. Tines of pectines are present on the accessory process and the shaft of claw, with a gap between (Figure 1A).

Distribution and ecology

Western Australia, Esperance and Rottneest Island. An epibiotic species, often present on seagrass or large algal fronds, in a depth range from 0.5 to 11 m.

Agau similis sp. nov.

Figure 1B–F, 2A–F

Material examined

Holotype

female, WAM T 78321, near Dempster Head, 33°53'S, 121°54'E, Esperance, Western Australia, Australia, from moderately exposed lower tidal brown algae (*Acrocarpia robusta* (J. Agardh) Womersley), 9 February 2003.

Paratype

Australia: Western Australia: 1 female, ZMH, collection data as above.

Further material

Australia: Western Australia: 1 male, WAM T 78322, Nine Mile Beach, 33°53'S, 121°47'E, tufts of algae on wave-washed edge of limestone platform, 18 February 2003; 1 male, SMF, collection data as above.

Etymology

This species is extraordinarily similar (similis, Latin) in shape and chaetotaxy to the above mentioned *A. brevipes*.

Diagnosis

Length of female 480–495 µm, of male 470 µm. Cerotegumental lamellae of idiosoma small, smooth. AD and PD with pair of smooth lamellae indistinctly delimited. Pairs of ds-2, ds-3 and ds-4 longer than ds-1 and ds-5. Female perigenital setae close around GO, no setae near anterior margin of GA. PE with three dorsal setae anterior to insertions of legs III but none anterior to leg IV. Cerotegumental lamella of telofemora smooth, narrow. Dorsal seta on both P-2 and P-3 smooth in female and male. Claws with accessory process, pectines on accessory process and shaft with numerous tines.

Description

Female. Length 480–495 µm, length of holotype 492 µm, width 342 µm. Surface of dorsal plates almost smooth, cerotegumental lamellae small, crest-like. Length of AD 142 µm, width 157 µm; plate widest level with gland pores (Figure 1B), with parallel cerotegumental lamellae. Posterior margin truncate. Length of OC 84 µm, width 70 µm; OC with two corneae; pore canaliculus

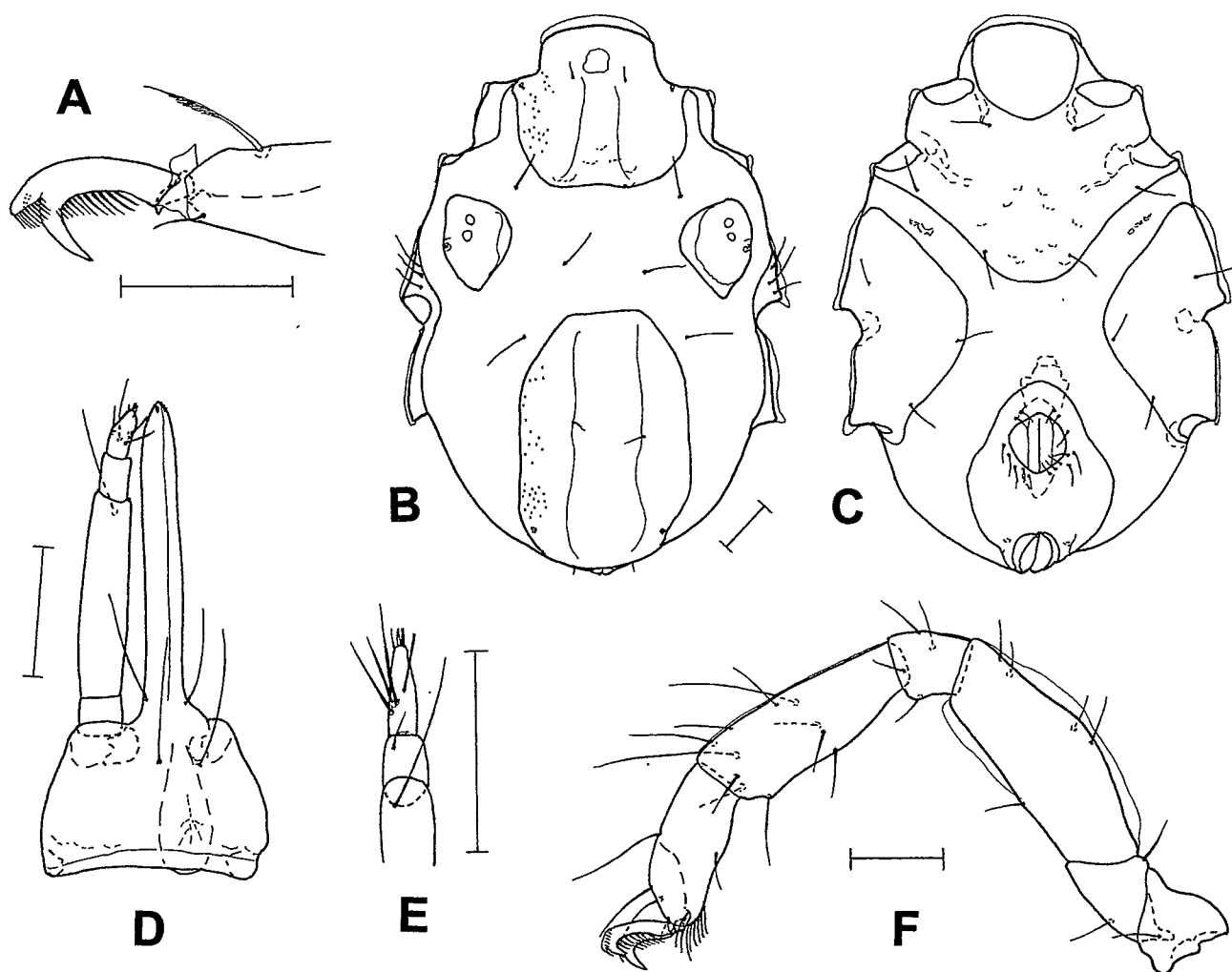


Figure 1 A. *Agave brevipes* Bartsch, 1999, male, tip and one of claws of tarsus III, lateral. B–F. *Agave similis* sp. nov., B, idiosoma, dorsal, female; C, idiosoma, ventral, female; D, gnathosoma, ventral, female; E, tip of palp, dorsal, male; F, leg I, medial, female. Scale = 50 μm .

immediately anterior to gland pore. Length of PD 230 μm , width 155 μm ; anterior margin truncate. Pair of ds-1 small, on AD at the level of gland pores. Pairs of ds-2, ds-3 and ds-4 in striated integument, longer than ds-1. Pair of ds-5 short, on PD.

Ventral plates smooth. Length of AE 144 μm , width 272 μm . With three pairs of ventral setae and distinct markings from muscle insertion (Figure 1C). PE with three dorsal setae anterior to insertion of leg III, three ventral setae but no dorsal seta anterior to insertion of leg IV. Length of PE 212 μm . Length of GA 167 μm , width 122 μm . Anterior margin rounded. With seven to nine pairs of perigenital setae close around GO. Length of GO 57 μm . Distance between anterior margin of GA to that of GO about half length of GO.

Gnathosoma slender, almost twice as long as wide; length 174 μm , width 90 μm . Rostrum slender, more than twice the length of gnathosomal base (Figure 1D). Two pairs of maxillary setae almost equal-sized. Tectum with scaliform lamella. Palps extending to end of rostrum. P-4 hardly

longer than P-3. As in male (Figure 1E) P-2 with long dorsal seta, P-3 with short, slender dorsal seta, P-4 with four setae, three in basal whorl and one in middle of segment; apex with two spurs and one setula.

Legs slender; leg I slightly shorter than leg IV. Telfemora of legs I and II longer than their tibiae, telfemora III and IV about as long as tibiae (Figures 1F, 2A–C). All telfemora and basifemora III and IV with smooth and narrow dorsal and ventral cerotegumental lamellae. Length:height ratio (without cerotegumental lamellae) of telfemora I–IV, 2.8, 2.3, 2.7, 2.8:1, respectively. Tarsi with large fossa membranes. Chaetotaxy of leg I, 1, 2, 5, 4, 11, 5 (cluster of eupathidia excluded); leg II, 1, 2, 4, 4, 10, 4 (cluster of eupathidia excluded); leg III, 2, 2, 3–4, 4, 9, 3; leg IV, 1, 2, 3, 3, 9, 3. Dorsal seta on both basifemur III and IV wide. Tibiae I and II each with two pairs of ventral setae; tibiae III and IV with four setae in line. Tarsi I to IV with three dorsal fossary setae, the two distal ones situated paired on fossa membranes. Lateral fossa

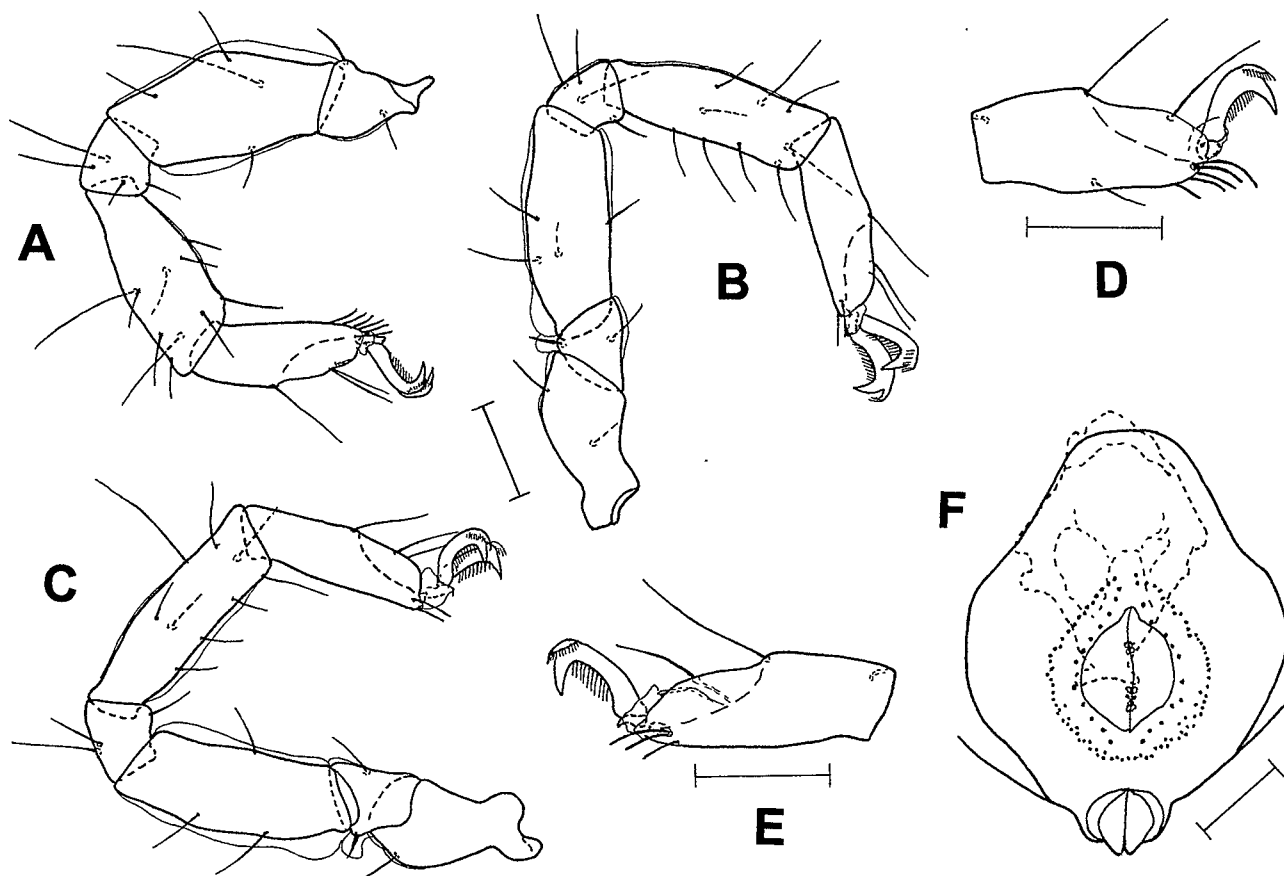


Figure 2 A-F. *Agaue similis* sp. nov., A, basifemur to tarsus II, medial, female; B, leg III, medial, female; C, leg IV, medial, female; D, tarsus I, lateral (medial setae and claw omitted), female; E, tarsus II, medial (lateral setae and claw omitted), female; F, genitoanal plate, male. Scale = 50 μ m.

membrane of tarsus I with short solenidion (15 μ m) and afferent canal representing vestigial famulus (Figure 2D). Solenidion on tarsus II on medial membrane, 10 μ m long (Figure 2E). Tips of tarsi I and II with 12 and 6 eupathidia, respectively. Tips of tarsi III and IV each with pair of pas.

Paired claws with widened accessory process, this process with about 10 tines, shaft of claw with about 12 tines. Central sclerite with small tooth-like process.

Male. Length 470 μ m. PD slightly larger than in female (relative to its size), in male 247 μ m long, 180 μ m wide. Plate extending further beyond ds-4 than in female but not reaching level of ds-3. Genitoanal plate larger than in female, length 222 μ m, width 169 μ m; length of GO 62 μ m, width 50 μ m. Spermatopositor large, length 137 μ m, width 97 μ m, reaching to anterior truncate margin of GA. Distance from anterior margin of GO to that of GA 1.5 times length of GO. Perigenital setae arranged in two rings around GO, inner ring with 22 setae, outer ring with 90 setae (Figure 2F). Setae of inner ring apically splitted into three to four filaments; setae of outer ring seemingly more slender though at high magnification (oil immersion) slightly plumulose, too. Each genital sclerite with five sgs,

sgs-1 to sgs-3 and sgs-5 wide, sgs-4 more slender, bristle-like. Gnathosoma as in female. P-2 and P-3 each with slender dorsal seta (Figure 1E). Legs as in female.

Remarks

Agaue similis is very similar to the Australian species *A. brevipes* and *A. tenuipes* Bartsch, 1999 (Bartsch, 1999c) in the shape of the idiosoma, gnathosoma and legs and the cerotegumental ornamentation but differs in that the PE lacks dorsal setae anterior to the insertion of leg IV and the accessory process on the claws only slightly extends beyond the arc of the claws.

The typical combination of characters of *A. similis* is: dorsal plates and legs with smooth cerotegumental lamellae; lamellae on AD parallel; PE with three dorsal setae anterior to insertion of leg III but none anterior to leg IV; in female distance between GO and anterior margin of GA somewhat less than half length of GO, 7-9 pairs of pgs arranged close to GO, none outlying; dorsal seta on both P-2 and P-3 smooth, tibiae cylindrical, not markedly club-shaped; claws with pectines. The Western Australian *A. subglabra* Bartsch, 1999 (Bartsch, 1999d) resembles *A. similis*, but

discriminating character of *A. subglabra* are, the cerotegumental lamellae on the AD are in a gable-like arrangement, the distance from the GO to the margin of GO equals the length of GO, the height of the dorsal cerotegumental lamellae of the telofemora is at least half that of the segment, and the claws bear minute tines on the shaft. Females of *Agauae kurilensis* Makarova, 1977 have, in contrast to *A. similis*, a larger number of pgs and the large GO is removed from the anterior margin of the GA. *Agauae kurilensis* is recorded from the cold-temperate Kurilen Islands (Makarova, 1977). In *Agauae magellanica* Newell, 1971 the cerotegumental lamellae on the AD form a gable; the interval between the anterior margin of GO and GA is less and the claws and tines are more slender than in *A. similis*.

Agauae circellaris Bartsch, 1999, *A. hamiltoni* Womersley, 1937 and *A. heterunguis* Newell 1984 are known from their males only. The single record of *Agauae circellaris* is from Western Australia, those of *A. hamiltoni* and *A. heterunguis* from the west coast of Macquarie Island and from off Chile, respectively (Womersley, 1937; Newell, 1984; Bartsch, 1999c). *Agauae circellaris* can be easily separated from other species on the basis of its long gnathosoma, slender palps and the arrangement of setae on the P-4, *A. heterunguis* because of its unusual claws, with few large tines but no accessory process, and absence of cerotegumental lamellae on the telofemora. The male GA of *A. hamiltoni* is much longer than in *A. similis*. The stated number of dorsal setae on the PE (two instead of three) of *A. hamiltoni* is probably an error.

Three setae on the PE anterior to the insertion of leg III are expected to be present in *A. debilis* (Lohmann, 1907), too. The illustration (Lohmann, 1907: figure 4,1) is said to represent a female, accordingly, the adult has unusual narrow dorsal plates, resembling those generally present in nymphs.

Distribution and ecology

Western Australia, Esperance. From wave-washed tufts of algae.

Agauae subglabra Bartsch, 1999

Figure 3A–E

Agauae subglabra Bartsch, 1999d: 184–187, figures 23–30.

New Material

Australia: Western Australia: 1 male, WAM T 78323, Esperance, New Island, 34°01'S, 122°13'E, 7 m depth, from epiflora and fauna on *Halictis* sp. (Gastropoda) (coll. A.F. Longbottom), 6 February 2003.

Supplementary description

Length of male idiosoma 470 µm, length of gnathosoma 197 µm. Cerotegumental lamellae on AD gable-like. Anterior cornea slightly larger than posterior one. Gland pore and pore canaliculus separated. PD rather narrow, its length 227 µm, width 150 µm; its pair of cerotegumental lamellae fused posteriorly. Pair of lamellae and anterior part of PD with faint foveate sculpturing (Figure 3A). Anal cone distinct. Pairs of ds-2, ds-3 and ds-4 only slightly longer than ds-1 and ds-5; ds-4 in margin or just outside PD. Ventral plates with thin cerotegumental cover. PE with three dorsal setae anterior to insertion of leg III, two of these setae close to insertion of leg III, one seta close to anterior edge of PE, distinctly removed from two following setae. No dorsal seta anterior to insertion of leg IV. Ventral setae on AE and PE short; anterior setae on AE inserted medial to internal apodemes (Figure 3B). Length of GA 192 µm, width 147 µm, length of GO 47 µm, width 37 µm. Spermatopositor 90 µm long, 78 µm wide. Distance from anterior margin of GO to that of GA equalling 1.4 times length of GO, distance from posterior margin of GO to end of anal cone 1.6 times length of GO. GO surrounded by slightly divaricate perigenital setae, 15 setae in an inner ring and about 50 in an outer ring (Figure 3C). Genital sclerites with five pairs of wide and flattened sgs. Gnathosoma slender; length of rostrum about twice that of gnathosomal base. Tectum scaliform. Setae on P-2 and P-3 slender (Figure 3D). Telofemora I to IV with dorsal cerotegument, height of lamellae about 0.35 of that of segment; ventral lamellae present in distal half. Tibiae without lamellae. Telofemora I to IV 3.0, 2.7, 2.4 and 2.6 times longer than high, respectively. Telofemora I and II longer than these legs' tibiae; telofemur IV almost as long as tibia IV. Chaetotaxy of trochanters to tibiae I to IV: legs I and II, 1, 2, 5, 4, 11, leg III, 2, 2, 3, 4, 8; leg IV, 0, 2, 3, 4, 8. Claws with accessory process apically and four to six very delicate tines on shaft (Figure 3E).

Remarks

The male resembles *A. similis* in that the idiosoma and legs have cerotegumental lamellae and the PE bears three dorsal setae anterior to the insertion of leg III but none anterior to leg IV, but the present male differs from that of *A. similis* on the basis of the rounded GA with a smaller number of perigenital setae (65 vs more than 100), smaller spermatopositor (not reaching anterior margin of GA vs reaching to or extending beyond that margin) and the claws (with few, very delicate tines vs numerous distinct tines).

Agauae subglabra was described from Rottneest Island on the basis of a single female (Bartsch, 1999d). The newly collected male from Esperance shares characters with the female *A. subglabra* such

as shape of cerotegumental lamellae, size of ds-2 to ds-4, arrangement of dorsal setae on PE anterior to insertion of leg III, length of gnathosoma, length relation of rostrum to gnathosomal base, and reduced claw pectines on the claws. The two individuals are considered to be conspecific.

Distribution and ecology

Western Australia, Esperance. Subtidal.

Agaua tenuipes Bartsch, 1999

Figure 3F

Agaua tenuipes Bartsch, 1999c: 341–343, figures 4A–L, 5A–D.

New Material

Australia: Western Australia: 1 male, WAM T 78324, Esperance Bay, 33°50'S, 121°56'E, 11 m depth, from *Scaberia agardhii* Greville (Phaeophyta), 11 February 2003.

Remarks

This single male has a length of 556 µm, and the

gnathosoma is 232 µm long. The idiosoma and telofemora have smooth lamellae as described by Bartsch (1999c). The pairs of ds-2, ds-3 and ds-4 are longer than the ds-1. The pore canaliculus on the OC and the gland pore are immediately adjacent. The PE bears three dorsal setae anterior to leg III and one seta anterior to leg IV, the spermatopositor extends almost to the anterior margin of the ovate GA. The pgs are arranged around the GO, 74 in an outer and 23 in an inner ring, the setae in the inner ring are slightly plumose (oil immersion). The dorsal seta of both P-2 and P-3 is slender. The telofemora are slender, from leg I to IV 3.3, 2.9, 3.3 and 3.5 times longer than high. The number of setae, from the trochanter to tibia, of legs I and II are: 1, 2, 5, 4, 11, of leg III: 2, 2, 3, 4, 9, and of leg IV: 0, 2, 3, 3, 9. On the claws the accessory process extends far beyond the arc; the claws bear J-shaped pectines (Figure 3F).

Distribution and ecology

Western Australia, Esperance and Rottnest Island. An epibiotic species, present from 1 to 11 m depth, amongst the epibios on seagrass and algal fronds.

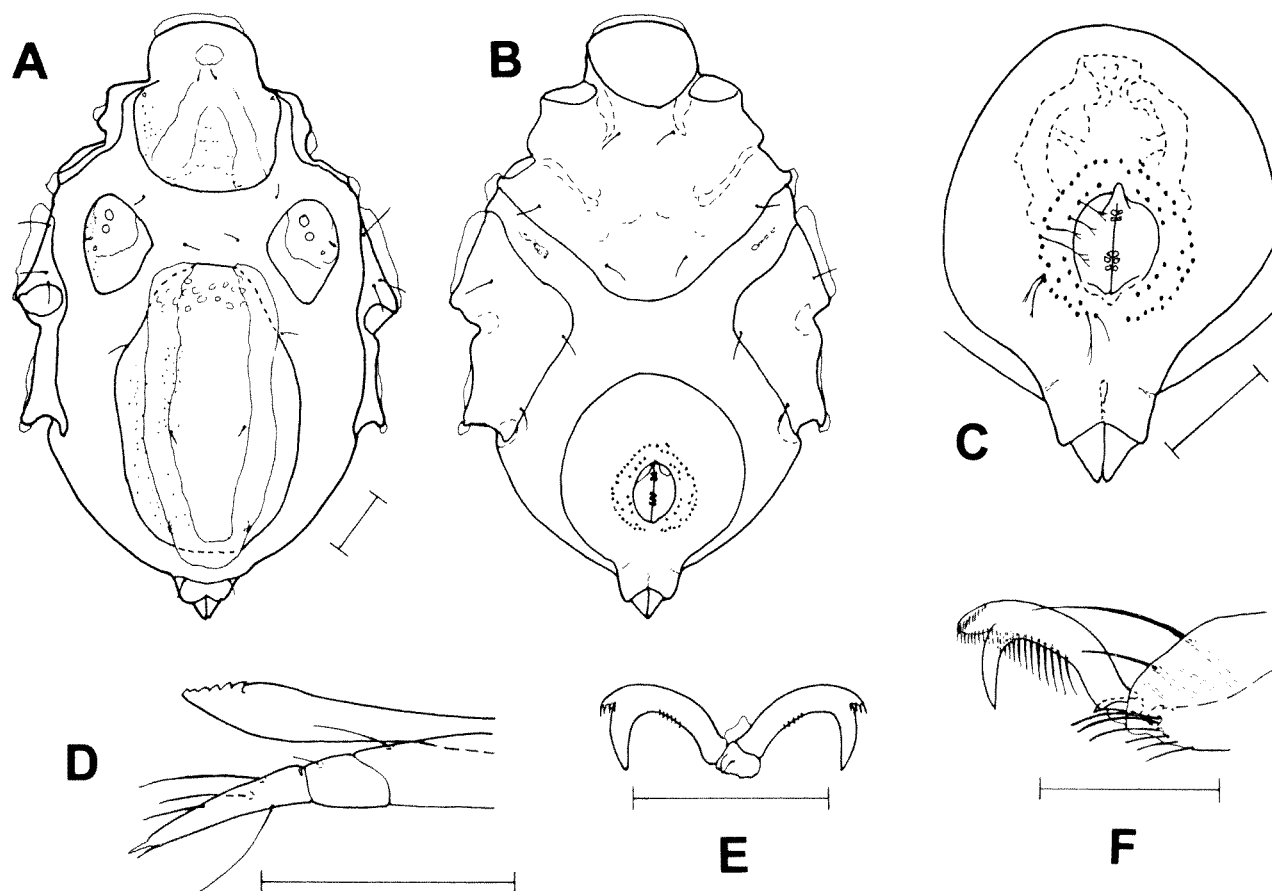


Figure 3 A–E. *Agaua subglabra* Bartsch, 1999, male, A, idiosoma, dorsal; B, idiosoma, ventral; C, genital and anal plates, ventral; D, tip of palp and chelicera; E, claws on tarsus III. F. *Agaua tenuipes* Bartsch, 1999, male, tip and one of claws of tarsus I, lateral. Scale = 50 µm.

Genus *Agauopsis* Viets, 1927

Agauopsis calidictyota sp. nov.

Figure 4A–I

Material examined

Holotype

male, WAM T 78325, Nine Mile Beach, 33°53'S, 121°47'E, Esperance, Western Australia, Australia, tufts of algae on wave-washed edge of limestone platform, 18 February 2003.

Etymology

The name is derived from the ornamental porose panels, from kalos (Greek), beautiful and diktyon (Greek), a net, a reticulum; diktyotos, reticulated.

Diagnosis

Length of male 275 µm, with small frontal spine. Member of the *Agauopsis ornata* group. PD with pair of panelled costae near lateral margin of plate; each panel with large procuticular alveolus and delicate surficial canaliculi. AE with paired, garland-like arranged porose panels. Rostrum shorter than gnathosomal base. Telofemur to tibia I with 3, 2, 3, 1 short, bluntly ending, denticulate spines. Ventral seta of tibia II spiniform, with delicate denticles, ventromedial seta short, slender and smooth.

Description

Male. Length of idiosoma 275 µm, width 165 µm. Idiosoma with small, triangular frontal spine. AD and PD each with pair of costae, costae near lateral margins (Figure 4A). Integument of costae with porose panels. This panelling caused by procuticular alveoli, not by surficial reticulum. Alveoli, 2–4 µm in diameter, not opening to external via ostium but with six to eight minute canaliculi. Integument outside porose panels with minute foveae, 1 µm in diameter. Costae of AD extending from posterior margin anterior to level of insertion of leg I; costae one to two such porose panels wide; slightly raised frontal spine with five porose polygons. Length of AD 107 µm, width 75 µm; posterior margin truncate. Length of OC 65 µm, width 42 µm; with two corneae, three to four porose polygons medial to corneae. Length of PD 145 µm, width 97 µm; costae U-shaped, fused posteriorly and extending to anterior margin of PD; costae mostly two panels wide. Interval between costa and lateral margin of PD less than half that between costae. Pair of ds-1 on AD level with insertion of leg I. Pair of ds-2 on small sclerites in striated integument. Pair of ds-3 absent. Pairs of ds-4 and ds-5 on PD lateral to costae, ds-4 and ds-5 level with insertion of legs III and IV, respectively.

Ventral plates with garland-like arranged porose

panels (Figure 4B); outside porose panels integument with very delicate foveae (oil immersion). On AE each panel with 10–13 canaliculi at the surface and either one large or two to four small alveoli in procuticula; on GA four to five alveoli per panel. Length of AE 92 µm, width 154 µm. Porose areolae paired as illustrated; no unpaired areola in the median. Plate with three pairs of setae; epimeral slits not seen. Length of PE 119 µm; with one dorsal and three ventral setae. Length of GA 123 µm, width 95 µm; with porose panels along lateral margin and a pair of five to six panels just anterior to GO. Length of GO 38 µm, width 24 µm. Interval between GO and margin of GA equalling 1.5 times length of GO. GO surrounded by 25 wide, somewhat plumose pgs (Figure 4C) and one pair of smooth outlying setae. Genital sclerites with five pairs of subgenital setae, two anterior and two of posterior pairs short, setiform, middle pair of posterior setae spur-like.

Length of gnathosoma 67 µm, width 46 µm. Gnathosomal base marginally with porose panels (Figure 4D). Rostrum 27 µm in length, hence shorter than gnathosomal base. Basal pair of maxillary setae on gnathosomal base, apical pair in posterior half of rostrum. Palps passing slightly beyond tip of rostrum. P-2 with dorsal seta; P-3 with medial spiniform seta; P-4 basally with one long and one short seta, apically with setula and two spiniform processes.

Leg I wider than following legs. Basifemur I with minute distoventral lamella (Figure 4E). Telofemur I with coarse reticulate sculpturing, polygons of lateral flank with small foveae. Sculpturing of telofemora II to IV present but less prominent than on leg I. Leg chaetotaxy (spines in roman numerals), leg I: 1, 2, 5+III, 3+II, 4+III, 6+I; leg II, 1, 2, 5, 4, 5, 5; leg III, 1, 2, 3, 3, 5, 3; leg IV, 0, 2, 3, 3, 5, 3. Spines of leg I short, with blunt, denticulate tip; two spines on genu I similar in size. Ventral seta of tibia II spiniform, with few delicate tines, ventromedial seta much more slender and apparently smooth (Figure 4F and I). Tibiae III (Figure 4G) and IV each with two stout ventral setae; ventrolateral seta larger than ventromedial seta and with very delicate denticles. Fossary setae of tarsus I wide and short; solenidion, 4 µm in length, situated between lateral fossary seta and lamellar famulus (Figure 4H). Tip of tarsus I with pair of doubled pas; two small ventral setae not paired. Tarsus II with three short and wide fossary setae, a solenidion, 3 µm in length, concealed by delicate dorsomedial fossary membrane, single ventral seta, and single blunt lateral pas (medial pas lacking) (Figure 4I). Tarsi III and IV with single medial pas but no lateral pas.

Paired claws of tarsus I smooth and somewhat smaller than those of following legs. Claws of tarsi II to IV with accessory process. At high magnification few minute tines recognizable on

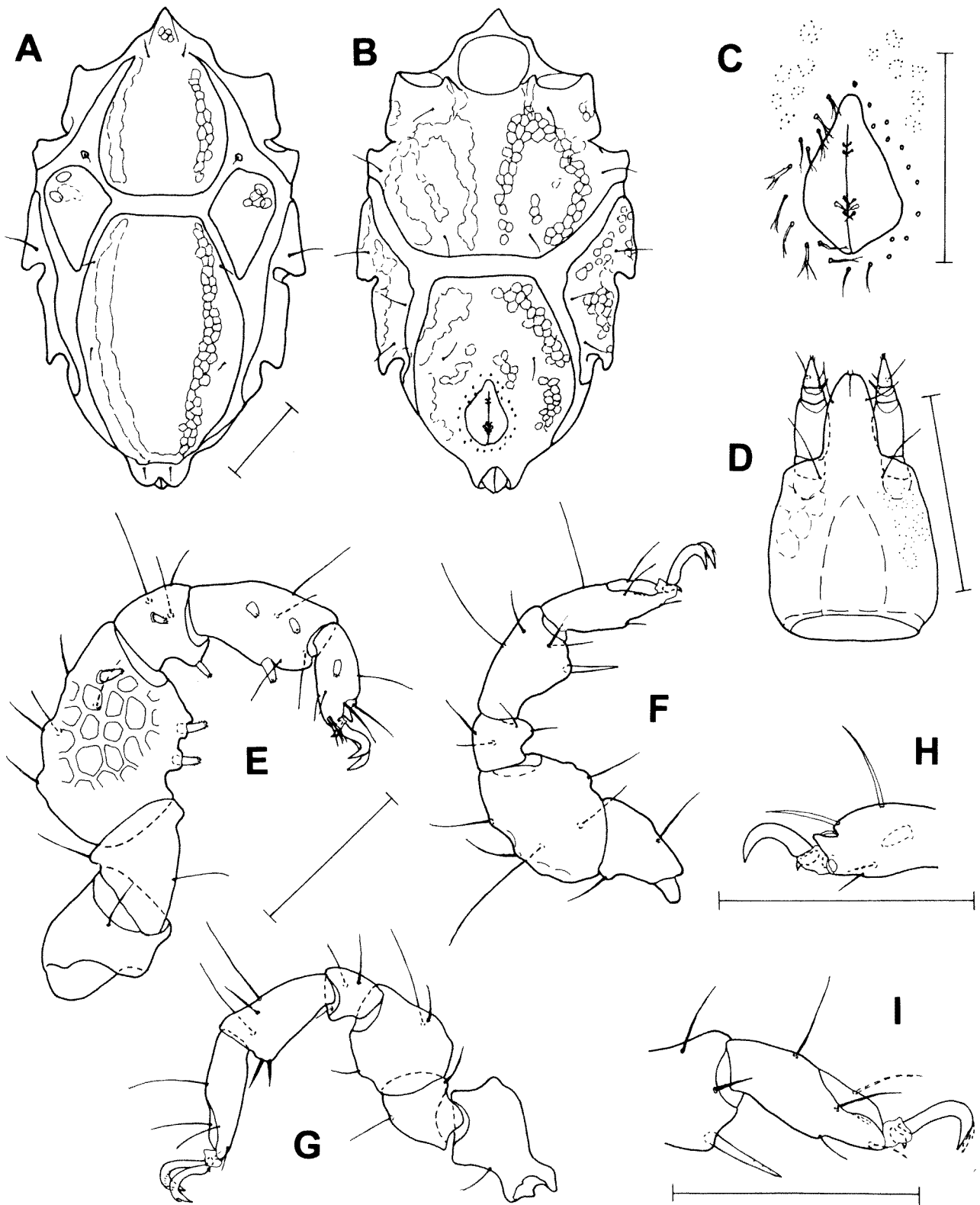


Figure 4 A–I. *Agauopsis calidictyota* sp. nov., male, A, idiosoma, dorsal; B, idiosoma, ventral; C, genital area; D, gnathosoma, ventral; E, leg I, medial; F, basifemur to tarsus II, medial; G, leg III, medial; H, tip of tarsus I, lateral (parambulacral setae, medial fossary seta and claw omitted); I, tibia and tarsus II, medial (lateral fossary seta, parambulacral seta and claw in broken line). Scale = 50 μ m.

inner flank of claw arc. Central sclerite on tarsus I with large ventral and minute apical tooth. Central sclerite of tarsi II to IV with ventral tooth only.

Remarks

Agauopsis calidictyota is a member of the *A. ornata* group, a group characterized by the garland-like porose areolae on the AE (Bartsch, 1996b). Three species of this group have previously been recorded from Australia, *A. decorata* Otto, 1999, *A. fenneri* Otto, 1999 and *A. ornatella* Bartsch, 1996, with records from Queensland and Western Australia (Bartsch, 1996b, 2005c; Otto, 1999). The AE of *A. calidictyota* has no unpaired porose areola in the median, as present in *A. decorata* and *A. fenneri*. In contrast to *A. ornatella* the porose costae on AD and PD of *A. calidictyota* are wider, in general two panels wide, and there is no pair of ridges on the frontal spine.

Other species of the *Agauopsis ornata* group are: *A. bacescui* Konnert-Ionescu, 1977, *A. bermudensis* Bartsch and Iliffe, 1985, *A. inflata* Newell, 1984, *A. nonornata* Bartsch, 1999, *A. ornata* (Lohmann, 1893) and *A. pseudoornata* Bartsch, 1985, with records from the Indian, Atlantic and Pacific Ocean (Lohmann, 1893; Konnert-Ionescu, 1977, Newell, 1984; Bartsch, 1985, 1999b; Bartsch and Iliffe, 1985). *Agauopsis bacescui* has a combination of 3/1 ventral/ventromedial spines on telofemur I whereas all the other species have the combination 2/1 ventral/ventromedial spines. The porose costae on the PD of *A. calidictyota* are close to the lateral margins of the plate, the interval between costa and lateral margin of the PD is distinctly less than half that between the two costae (at the level of ds-5). A similar position of the costae is present in *A. inflata*, whereas in the other species, *A. bermudensis*, *A. nonornata*, *A. ornata* and *A. pseudoornata*, the PD is wider and the costae removed from the lateral margins. *Agauopsis inflata* can be separated from *A. calidictyota* on the basis of its truncate, rectangular frontal spine, a rostrum that is longer than the gnathosomal base, and the wide, bipectinate ventromedial seta on tibia II; in contrast, in *A. calidictyota* the frontal spine is spiniform, the rostrum shorter than the gnathosomal base and the ventromedial seta on tibia II slender and apparently smooth.

Distribution and ecology

Western Australia, Esperance. The only record is from tufts of algae from the wave-washed edge of a limestone platform.

Agauopsis miliaris Bartsch, 2005

Agauopsis miliaris Bartsch, 2005c: 346–349, figure 2A–J, 3A–F.

Remarks

Agauopsis miliaris is a member of the *A. microrhyncha* group (Bartsch, 2005c), a group primarily characterized by its tibia I bearing one ventral and three ventromedial spines, the two basal ones being immediately adjacent. Four species are known from Australian shores, *A. miliaris*, *A. australiensis* Bartsch, 1996, *A. mokari* Otto, 1994, and *A. narinosa* Otto, 1994 (Otto, 1994, 1999; Bartsch, 1996b, 2005c).

From the small frontal spine to the anal cone the length of adult *A. miliaris* ranges from 399 to 426 µm, the costae of the dorsal plates bear groups (polygons) with numerous canaliculi, the pair of gland pores on the PD is situated posterior to ds-4, the males have 46 pgs (outlying setae included), the telofemur I bears three spines and the trochanters III and IV a small, rounded apical process. *Agauopsis miliaris* and *A. australiensis* (in parentheses) differ in their PD, with the ornamentation of its costae (with foveae and canaliculi) and the position of its anterior gland pores relative to the ds-4 (anterior to ds-4), the process on trochanters III and IV (large, triangular), and the number of male pgs (32–33 pgs).

Differences between *A. miliaris* and *A. mokari* are mentioned below. *Agauopsis narinosa* is characterized by its wide, flattened frontal spine and the ventral lamella on each of basifemora I and II, characters not present in the species from Esperance.

Distribution and ecology

Southern coast of Western Australia. Common on and amongst a variety of algae and seagrasses, from small, dense algal tufts, fronds of *Scaberia* sp. and *Posidonia* rhizoms. The records are from the water line to about 10 m depth.

Agauopsis mokari Otto, 1994

Agauopsis mokari Otto, 1994: 37–38, figures 9–16; Bartsch, 2005c: 350–351, figures 4A–G, 5A–D.

Remarks

This is another species of the *Agauopsis microrhyncha* group. In contrast to *A. miliaris* and the majority of species of this group, there are four spines on telofemur I. Deutonymphs can be identified on the basis of the three bipectinate setae on tibia II (instead of two bipectinate and one slender seta) and straight ventral margin of the tarsi III and IV, without any spiniform process. The length of adult *A. mokari* is 350–375 µm.

Distribution and ecology

Southern and south-eastern coast of Australia. Regular inhabitant of a variety of shallow water substrata.

Genus *Arhodeoporus* Newell, 1947*Arhodeoporus psammophilus* Bartsch, 1993

Arhodeoporus psammophilus Bartsch, 1993d: 82–84, figure 6A–K.

New Material

Australia: Western Australia: 1 female, WAM T 78326, 1 male, WAM T 78327, Esperance, Lucky Bay, 33°59'S, 122°13'E, sediment from about 0.5 m depth, 9 February 2003; 1 male, ZMH, Esperance, Lucky Bay, sediment and small algae, 30 cm below low water line, 15 February 2003.

Remarks

Length of female 465 µm, of male 402–435 µm. The specimens are somewhat larger than the types from Rottneest Island. The dorsal and ventral plates are uniformly and delicately punctate; the OC are long and extend beyond the insertion of leg IV; in the anterior part of the OC there is one distinct and one faintly delimited cornea. The gnathosomal base bears punctate areolae. One of the two ventromedial setae on the tibia I is short and delicately bipectinate; the tibia II bears two bipectinate setae, and each of the tibiae III and IV one such seta.

Arhodeoporus psammophilus as well as the eastern Australian species *A. caudatus* Otto, 2000, *A. clypeatus* Otto, 2000, *A. corallicolus* Otto, 2000, and *A. lizardensis* Otto, 2000, the Philippine *A. mactanus* Bartsch, 1991, and the eastern African species *A. longirostris* Bartsch, 1981 (Bartsch 1981, 1991; Otto, 2000d) are extraordinarily similar in their shape. *Arhodeoporus psammophilus* comes close to *A. corallicolus*. According to Otto (2000d), the most marked differences are (1) *A. corallicolus* has only one distinct cornea on the OC and (2) the punctuation of the ventral plates is not uniform, that of on the AE is more coarse than on the other plates. The variability of these characters and a possible effect of mounting and mounting medium is not known.

Distribution and ecology

Records of *Arhodeoporus psammophilus* are from Western Australia, from Rottneest Island and Esperance. The species is psammophilous.

Arhodeoporus robustus sp. nov.

Figure 5A–K

Material examined

Holotype

male, WAM T 78328, Duke of Orleans Bay, 33°55'S, 122°35'E, Esperance, Western Australia, Australia, on rock with tufts of small algae and amounts of debris, low tide area, 19 February 2003.

Etymology

This species is more robust than the similar looking *Arhodeoporus disparilis* Bartsch, 1997, hence the name *robustus* from *robustus* (Latin), strong, robust.

Diagnosis

Length of male 242 µm. Member of the *Arhodeoporus bonairensis* group. Dorsal plates with porose costae, remainder with small pits. PD with pair of costae and scattered marginal porose panels. AE and GA in males fused. Ventral plates with distinctly demarcated porose areolae. Area of AE with three pairs of porose areolae, GA with pair of minute lateral porose areolae. Tibiae I to IV ventrally with 0, 2, 1, 0 bipectinate and 4, 1, 1, 2 smooth setae. Claws with accessory process and minute tines.

Description

Male. Length of idiosoma 242 µm, width 133 µm. Dorsal plates with slightly raised areolae (Figure 5A), remainder of plate with scattered small pits (Figure 5C). Raised areolae with porose panels, each panel with 7–12 canaliculi (Figure 5C), integument immediately around porose areolae smooth. AD with small truncate frontal lamella. Length of AD 75 µm, width 62 µm. Raised area in shape of an inverted wine-glass, with an anterior and pair of posterior porose areolae, 12 and 20 µm in length, respectively; raised area between porose panels distinctly foveate, ovate pits 2–3 µm long. Length of OC 82 µm, width 25 µm; its tail-like posterior end extending halfway between insertions of legs III and IV. A small porose areola medial to two corneae, gland pore and pore canaliculus lateral to posterior cornea. Length of PD 162 µm, width 100 µm; anterior margin wide, truncate. Medial pair of costae almost parallel; scattered porose panels in lateral margins immediately anterior and somewhat posterior to level of insertion of leg IV. Dorsal setae small, ds-1 on AD in about middle of plate, ds-2 in anteromedial margin of OC, ds-3 to ds-5 on PD, ds-3 near anterior margin, ds-4 and ds-5 immediately lateral to costae, ds-4 halfway between ds-3 and ds-5. Pair of ds-6 on anal plate.

Ventral plates with demarcated areolae (Figure 5B) with porose panels, remainder of plates with pits, these pits distinct just posterior to camerostome and between GO and anal sclerites but vestigial in remainder of plates. AE and GA fused to a ventral shield; length of shield 229 µm, width 108 µm. Area of AE with marginal porose panels between insertion of legs I and II, a minute porose panel posterior to insertion of leg II, and a third pair of porose panels in posterior part of plate. Area of AE with pair of epimeral pores and three pairs of slender ventral setae. Length of PE 120 µm. Marginal porose panels anterior to insertions of legs

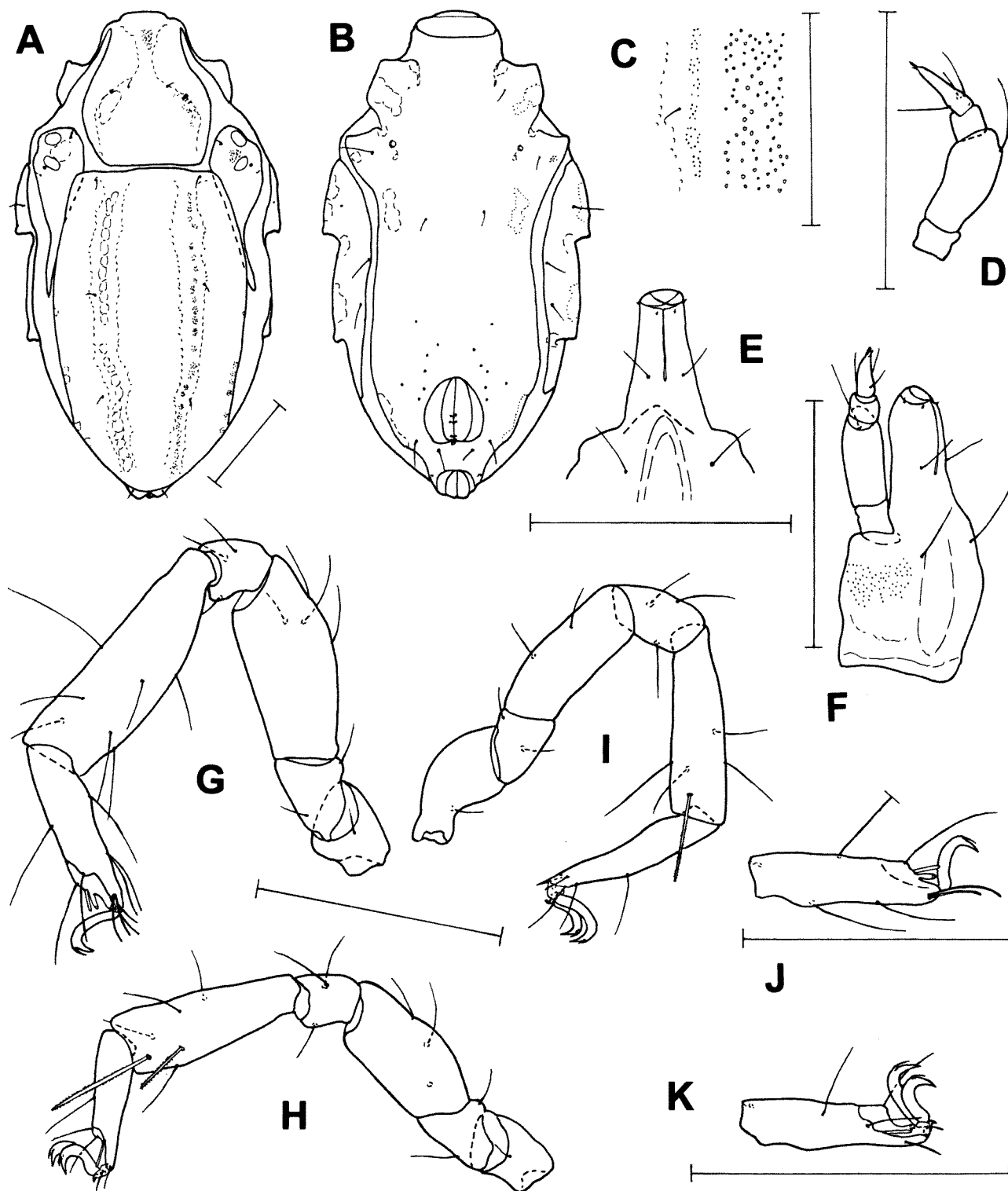


Figure 5 A-K. *Arhodeoporus robustus* sp. nov., male, A, idiosoma, dorsal; B, idiosoma, ventral; C, portion of PD at the level of left ds-4; D, palp, lateral; E, rostrum and adjacent gnathosomal base, ventral; F, gnathosoma, ventrolateral; G, leg I, medial; H, leg II, medial; I, leg III, medial; J, tarsus I, lateral (medial setae and claw omitted); K, tarsus II, dorsomedial. Scale = 50 μm .

III and IV. Area of GA with pair of small porose areolae lateral to GO. Length of GO 32 μm , width 30 μm . With nine pairs of pgs. Genital sclerites with five pairs of minute pgs, two anterior and three posterior ones. A pair of small internal genital acetabula shining through genital sclerites.

Gnathosoma short, length 60 μm , width 36 μm . Gnathosomal base with five to six marginal porose panels (Figure 5F). One pair of maxillary setae on gnathosomal base, one pair on rostrum. Tip of rostrum with two pairs of tiny rostral setae and a pair of spiniform lamellae. Rostral sulcus extending

just beyond rostral pair of maxillary setae. Triangular tectum short (Figure 5E). Palps slender, extending beyond tip of rostrum. P-2 with dorsal seta; P-4 with three setae in basal whorl.

Legs slender. Telfemora shorter than corresponding tibiae. Length:height ratio of telfemur I 2.4:1. Integument delicately foveate. Leg chaetotaxy: leg I, 1, 2, 4, 3, 7, 7; leg II, 1, 2, 3, 3, 6, 4; leg III, 1, 2, 2, 3, 5, 3; leg IV, 0, 2, 2, 3, 5, 3. Four ventral setae on tibia I slender, smooth (Figure 5G). On tibia II ventral seta slender and smooth, two ventromedial setae bipectinate, the apical one distinctly longer than the basal seta (Figure 5H). On tibia III ventral seta slender and smooth, ventromedial seta bipectinate (Figure 5I), and on tibia IV both setae smooth. Tarsus I with pair of doubled pas; both solenidion, 6 μm long, and famulus, 3 μm long, on dorsolateral fossa membrane (Figure 5J). Tarsus II with eupathid singlets and dorsomedial solenidion (Figure 5K); on tarsus III medial pas slender, lateral pas widened; on tarsus IV both medial and lateral pas widened.

Claws of tarsi apically with accessory process and delicate tines. No tines on shaft of claw. Central sclerite with minute claw-like process.

Remarks

Arhodeoporus robustus belongs to the *A. bonairensis* group, a group characterized by an AD with a raised area in the shape of an inverted wine-glass; both this area and the longitudinal costae on the PD bear porose panels. The ventral plates have demarcated porose panels; two or more of the ventral plates are fused. *Arhodeoporus robustus* is extraordinarily similar to *A. disparilis* Bartsch, 1997, known from Rottneest Island, Western Australian (Bartsch, 1997); *A. robustus* is larger than *A. disparilis* (242 vs 200 μm), the porose panels on the dorsal and ventral plates and the anterior part of the PD are wider (cf. Figure 5A and B vs Bartsch, 1997: figures 13 and 14), the dorsal plates outside the costae bear delicate foveae (vs reticulate), the costae on the PD are in an almost parallel arrangement (vs divergent), and the ds-4 are halfway between the ds-3 and ds-5 (vs close to the ds-3). Unfortunately only one male of each species is available for study and it cannot be excluded that the just mentioned differences represent extremities in a series of variants.

Other species of the *Arhodeoporus bonairensis* group are *A. bonairensis* Viets, 1936, *A. thyreophorus* André, 1959 and *A. ventromaculatus* Otto, 2000. In these species the adults have the ventral plates AE, GA and PE fused to a ventral shield.

Distribution and ecology

Western Australia, Esperance, from tufts of small algae (corallines) growing at the low tide edge. All

present records of representatives of the *Arhodeoporus bonairensis* group are from shallow water in tropical and warm-temperate areas (Viets, 1936; Newell, 1947; André, 1959; Bartsch, 1977c, 1997; Sarma & Chatterjee, 1993b; Otto, 2000d).

Genus *Atelopsalis* Trouessart, 1896

Atelopsalis pacifica Bartsch, 1985

Figure 6A–D

Atelopsalis pacifica Bartsch, 1985: 272–275, figures 12–23; Sarma & Chatterjee, 1993a: 117–119, figures 1–5.

New Material

Australia: Western Australia: 1 male, WAM T 78329, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, demosponge with rich epi- and endofauna, just below low water edge, 19 February 2003.

Remarks

The length of the single available male is 198 μm . The AD bears a gable-shaped costa, the PD a pair of costae (Figure 6A), the remainder of the plates is reticulate, the polygons are in turn subdivided. Each of the rosette pores within the costae is reduced to a small ostium with a slightly larger alveolus; the canaliculi are lacking. The ventral plates have demarcated porose areolae (Figure 6B) with pores similar to those on the costae of the dorsal plates; the ventral parts of the plates are smooth, the marginal parts foveate. On the AE there are two porose areolae plus a single pore at the level of the epimeral vesicles, on the PE two marginal areolae and one ventral porose areola and on the GA a pair of porose areolae lateral to the GO. Leg I is much wider than the following legs. Tibia I bears a pair of short mid-segmental spines and, near the end of the segment, a pair of ventral setae (Figure 6C). The surface of telfemur I is coarsely sculptured, reticulate, with a pair of cuticular spines. The tibiae II (Figure 6D), III and IV each bear a bipectinate ventral seta, and the tarsi II to IV 4, 4, 3 dorsal setae, respectively. The tarsi end with a pair of claws and a minute claw-like median sclerite. The paired claws of all tarsi are similar in size, they bear an accessory process and on the tarsi II to IV pectines with minute tines.

In contrast to the holotype collected on Mactan Island, the Phillippines (Bartsch, 1985), the present specimen has fewer rosette pores; the porose areolae on the ventral plates are smaller. But obviously, as demonstrated by Bartsch (1985: figures 12 and 23) in presenting the dorsal aspect of two specimens, the number of rosette pores is variable.

A female from Rottneest Island (Duck Rock, 7–10



Figure 6 A–D. *Atelopsalis pacifica* Bartsch, 1985, male, A, idiosoma, dorsal; B, idiosoma, ventral; C, leg I, medial; D, tibia and tarsus II, medial. E and F. *Halacarellus lubricus* Bartsch, 1985, female, E, genitoanal plate, ventral; F, ocular plate. G and H. *Halacarellus rotnnestensis* Bartsch, 1999, female, G, ovipositor with genital spines (enlarged) (genital spines of opposite side in broken line); H, ocular plate. (glp = gland pore; pc = pore canaliculus) Scale = 50 μ m.

m depth, 9 January 1991), has a length of 197 μ m. The arrangement of the pores on the dorsal plates is similar to that of the holotype from the Philippines.

Distribution and ecology

Records of *Atelopsalis pacifica* are from the Philippines (Sulu Sea), India (Bay of Bengal), and Western Australia, from Rottnest Island (Indian Ocean, new record) and Esperance (Southern Ocean).

Genus *Bradyagaue* Newell, 1971

Bradyagaue exilis Bartsch, 2004

Bradyagaue exilis Bartsch, 2004a: 66–68, figures 1–16.

Remarks

Length 730 μ m. The most obvious character of *B. exilis* is the anteriorly ovate, lobe-like idiosoma that extends beyond the camerostome. Most of the

Bradygaue species have an anteriorly broadly arched or truncate idiosoma, exceptions are *B. medialis* Newell, 1984 and *B. scutella* Bartsch, 1992 which have a frontal lobe similar to that of *B. exilis*. *Bradygaue medialis* is known from south-eastern Africa, *B. scutella* from Rottnest Island, Western Australia (Newell, 1984; Bartsch, 1992b). *Bradygaue exilis* can be distinguished from these two species by the position of ds-3, on the OC in *B. exilis*, but in the striated integument in *B. medialis* and *B. scutella*.

Distribution and ecology

Western Australia, Esperance. The only record is from the Esperance Bay, extracted from fronds of *Scaberia* (Phaeophyta), from 11 m depth.

Genus *Halacarellus* Viets 1927

Halacarellus lubricus Bartsch, 1986

Figure 6E and F

Halacarellus lubricus Bartsch, 1986: 552–553, figures 24–34; Otto, 1994: 41–43, figures 25–33.

New Material

Australia: Western Australia: 1 female, 1 male, WAM T 78330, Esperance, Lucky Bay, 33°59'S, 122°13'E, algal scrub on rocks, just below water line; 13 February 2003; 1 female, 1 deutonymph, ZMH, collection data as above; 1 male, SMF, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, demosponge with epiflora, low water line, 17 February 2003.

Remarks

Length of the female 490–549 µm, of the male 491–525 µm. The dorsal plates have panelled reticulate areolae distinctly delimited from slightly raised areas with almost smooth integument. Delicate canaliculi are present in the integument but may be obscured by the panelling. The two gland pores of the OC are widely separated, the posterior one is in the distal corner of the plate followed by the pore canaliculus (Figure 6F). The pair of gland pores on the PD is at 0.65. The female GA bears three pairs of pgs; the ovipositor (in rest) extends to or slightly beyond the anterior margin of GA (Figure 6E). The telofemora I to IV are 2.3, 2.0, 2.4, 2.3 times longer than high; the genua III and IV 1.8 times longer than high. From trochanter to tibia the number of setae of leg I is: 1, 2, 4, 5, 13, of leg II: 1, 2, 5, 5, 11, of leg III: 2, 3, 3, 4, 6, and of leg IV: 0, 3, 3, 3, 6.

Specimens from New South Wales have four to seven pgs on either side of the GA (Otto, 1994: 41)

Halacarellus lubricus is similar to *H. rotnnestensis* Bartsch, 1999 and *H. katwilsonae* Otto, 2001, both species are recorded from Australia (Bartsch, 1999c;

Otto, 2001). Discriminating characters are discussed below.

Distribution and ecology

Australia, Western Australia and New South Wales, and New Zealand, North Island. All records are from scrub-like algal formations, mostly from corallines. One specimen was intensely fouled with suctorians (Protozoa: Suctoraria), which were fixed to the gnathosoma, legs (from trochanter to tarsus) and idiosoma.

Halacarellus rotnnestensis Bartsch, 1999

Figure 6G and H

Halacarellus rotnnestensis Bartsch, 1999c: 337–340, figures 2A–I, 3A–H.

New Material

Australia: Western Australia: 1 female, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, from seagrass (*Amphibolis* sp.), 17 February 2003.

Supplementary description

Length of the single female found 735 µm. Dorsal plates with areolae with reticulate surface, delicately and minutely punctate surface and canaliculi which cross the integument. Areolae with canaliculi distinct (Figure 6H). OC with one delimited cornea and one very small and faint one. Gland pores on PD at 0.61. Ovipositor elongate, basal pair of papillae with slender, smooth genital spines, about 22 µm in length. Apex of ovipositor with two pairs of slender, smooth genital spines, 25 µm in length, and two pairs of wide and flattened spines (Figure 6G), their outer edge dentate. Legs III and IV slender, length:height ratio of telofemora I to IV 2.7, 3.0, 3.3, 3.4; genua III and IV 3.1 times longer than high. Leg chaetotaxy, from trochanter to tarsus: leg I, 1, 2, 4, 5, 13; leg II, 1, 2, 5, 5, 12; leg III, 2, 3, 3, 4, 5–6; leg IV, 0, 3, 3, 3, 6.

Remarks

The two species *H. lubricus* and *H. rotnnestensis* belong to the *Halacarellus harioti* group (Bartsch, 1999c). *Halacarellus rotnnestensis* is much larger than *H. lubricus*, the ornamentation of its dorsal plates is weaker, the telofemora and genua of legs III and IV are much more slender and longer than in *H. lubricus*. A third Australian species of this group, *H. katwilsonae*, known from the Queensland Plateau, Queensland (Otto, 2001), is characterized by its slender OC, PD and GA, more slender than in the other species.

The ovipositor is provided with differently shaped apical genital spines, some are long and slender, others wide and flattened. According to Womersley (1937), a similar difference in the shape

of spines is present in the closely related *H. harioti* (Trouessart, 1889b). In other *Halacarellus* species, e.g. in *H. discretus* Bartsch, 1998, a Black Sea species (Bartsch, 1998), a difference in the shape of the antero- and posteroapical genital spines is present but less marked. Dissimilar apical genital spines are also present in *Actacarus* and *Anomalohalacarus* (Bartsch, 1976, 1999a), whereas in other genera, e.g. in *Copidognathus*, *Isobactrus*, *Lohmannella*, *Halacarus*, *Metarhombognathus*, *Rhombognathus*, *Rhombognathides*, and *Scaptognathides* species (Bartsch, 1975, 1977a, 1979b, 2000, 2003d, 2005a; Newell, 1984) the apical genital spines are rather similar in shape. The single basal pair of spines (or papillae) are in general different in shape.

Distribution and ecology

Western Australia, Rottnest Island and Esperance, from *Amphibolis* sp.

Genus *Halacaropsis* Bartsch, 1996

Halacaropsis capuzina Bartsch, 1996

Halacaropsis capuzina Bartsch, 1996b: 12–16, figures 63–87.

New Material

Australia: Western Australia: 1 deutonymph, WAM T 78331, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, from seagrass (*Amphibolis* sp.) with epiflora and fauna, 17 February 2003; 1 protonymph, SMF, Esperance, Duke of Orleans Bay, small algae with large amounts of debris, from rocks, 17 February 2003; 1 protonymph, ZMH, Esperance, Duke of Orleans Bay, demosponge with epiflora and fauna, 17 February 2003.

Remarks

The samples contained juveniles but no adults. The deutonymph idiosoma measures 548 µm, the protonymph 439–455 µm. The AD is longer than wide, anteriorly rounded and ending with a small frontal process. The setae ds-2, ds-3 and ds-4 are much longer and stronger than ds-1 and ds-5. The rostrum is about as long as the gnathosomal base. P-3 bears a seta. Telofemur to tibia I of the deutonymph bear 3, 2, 3 spines, those of the protonymph 2, 2, 2 spines, tarsi I to IV of the deutonymph 3, 2, 1, 1 ventral setae, of the protonymph 1, 1, 0, 0 setae. The claw pectines with their numerous minute tines extend to the base of the claws. The median claw of the tarsi is bidentate.

At present, three *Halacaropsis* species are described from Australia, *H. capuzina*, known from Rottnest Island, Western Australia, *H. warringi* (Otto, 1993), from Guerilla Bay, New South Wales, and *H. nereis* Otto, 1999, from the Great Barrier Reef, Queensland (Bartsch, 1996b; Otto, 1993, 1999).

Another species is recorded from Geraldton, Western Australia (Lohmann, 1909; cf. Bartsch, 1996b). The Australian species are very similar in their general shape and distinguishing characters of the juveniles have not been described in detail. *Halacaropsis nereis* differs from others in that its tarsi II to IV end with smooth paired claws and a unidentate median claw, whereas *H. capuzina*, *H. warringi* and the juveniles from Duke of Orleans Bay have claw pectines and a bidentate median claw. Adults of *H. capuzina* and *H. warringi* can easily be separated by the shape of the anterior margin of the AD and the ornamentation of the epicuticula, but unfortunately juveniles often differ from adults in these characters. The shape of the dorsal and ventral plates of the juveniles from Duke of Orleans Bay agrees with that of *H. capuzina*, the surface of the plates lacks the very marked filaments of *H. warringi* which are illustrated by Otto (1993: figures 5, 6), and P-3 bears a long, slender seta, similar to that of *H. capuzina*, whereas in *H. warringi* and *H. nereis* this seta is short, its tip blunt and denticulate. The juveniles from Esperance most likely belong to *Halacaropsis capuzina*.

Distribution and ecology

Western Australia, Rottnest Island and Esperance. Generally present, often abundant amongst the epifauna on *Amphibolis*, but present also amongst scrub-like corallines covering rocks and demospoges.

Genus *Halacarus* Gosse, 1855

Halacarus flavellus Bartsch, 1993

Figure 7A–E

Halacarus flavellus Bartsch, 1993c: 53–56, figures 5A–F, 6A–E

New Material

Australia: Western Australia: 1 female, WAM T 78332, 1 male, WAM T 78333, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, on seagrass (*Amphibolis* sp.) with epifauna and flora, 17 February 2003; 1 male, ZMH, Duke of Orleans Bay, 33°55'S, 122°35'E, on seagrass *Posidonia* sp. from 40 cm depth, 10 February 2003; 1 female, SMF, Esperance, Lucky Bay, 33°59'S, 122°13'E, algae from rocks, 10–30 cm below water edge, 13 February 2003.

Remarks

Halacarus flavellus is a soft-skinned species. The females are 531–720 µm long, males 555–565 µm (the flattened frontal spine included - Figure 7A). The AD includes the ds-1 whereas the gland pores are within the striated integument (Figure 7A). The OC are small, they include a cornea and the pore canaliculus. A PD is lacking. The female GA is

swollen due to the cerotegument; one pair of the perigenital setae is within the striated integument, two pairs adjacent to the GO (Figure 7B). The males have a pair of outlying pgs either in the anterior margin of the genital plate, on small protuberances, or on sclerites immediately outside the plate. The GO is surrounded by about 90 perigenital setae. Both the setae on P-2 are inserted apically. A very delicate, maze-like or delicately reticulate cerotegument covers the leg segments. All the ventral setae on leg I are long, spiniform and

apically tapering, their number from telofemur to tibia: 2, 2, 4. The genu and tibia II bear one and two pairs of ventral setae, respectively (Figure 7C); the ventromedial seta(e) of each pair is bipectinate, the ventral one long, smooth and tapering. The four ventral setae on tibiae III and IV are slender and smooth. The number of strong ventral setae of the tarsi I to IV is 2, 1, 1, 1, the number of dorsal setae 4, 4, 4, 3. The solenidion and famulus of tarsus I are similar in size (Figure 7D). The claws bear an apical cluster of tines (Figure 7E).

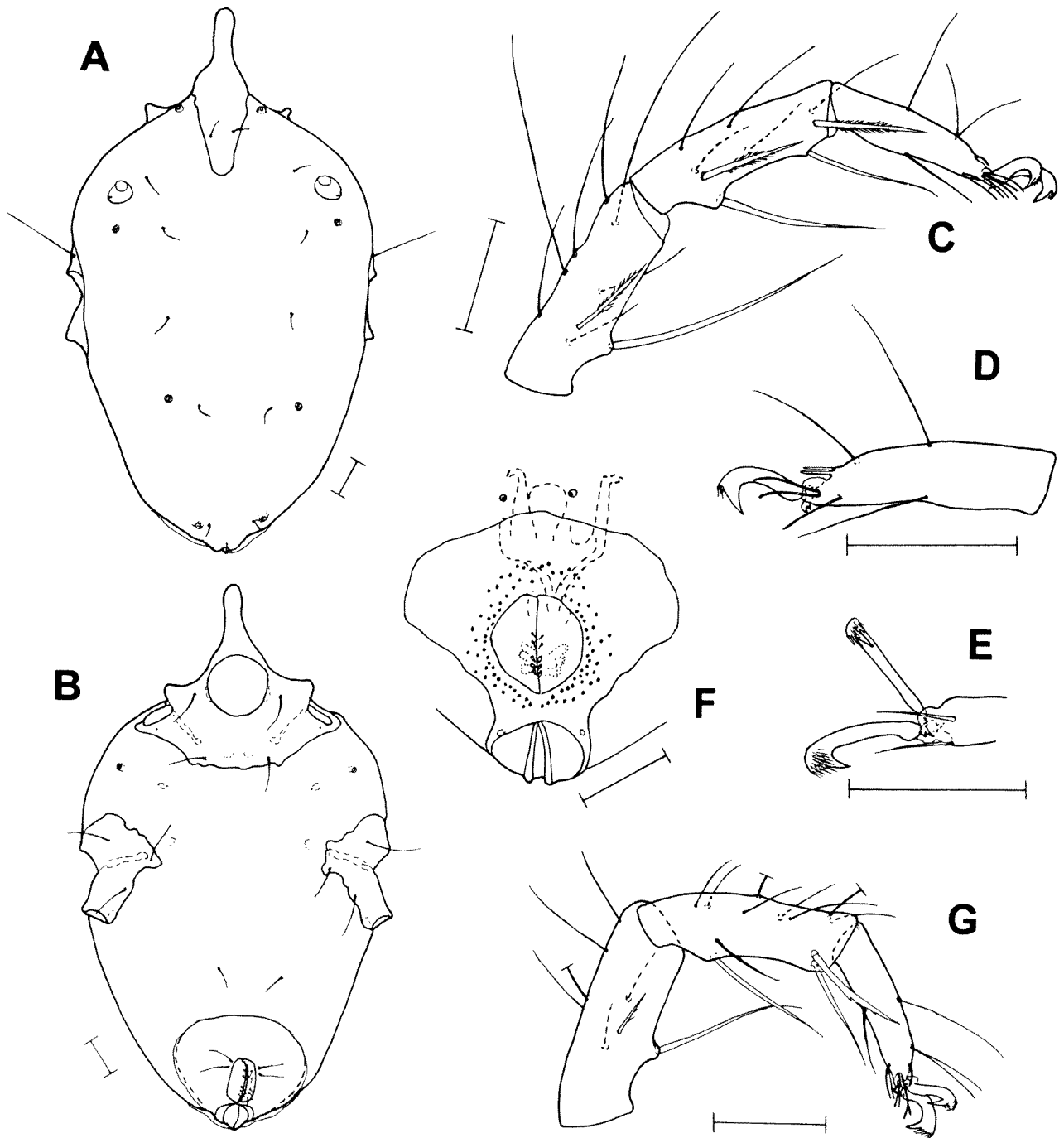


Figure 7 A-C. *Halacarus flavellus* Bartsch, 1993, female, A, idiosoma, dorsal; B, idiosoma, ventral; C, genu to tarsus II, medial; D, tarsus I, lateral (medial setae and claw omitted); E, tip of tarsus IV, ventral. F and G. *Halacarus fuscatus* Bartsch, 1993, male, F, genitaloanal plate, ventral; genu to tarsus II, medial. Scale = 50 μm .

Halacarus flavellus was described on the basis of females and males from Rottneest Island (Bartsch, 1993c). All those specimens had a long and slender frontal spine; in contrast, in the material from Esperance the frontal spine is flattened, spatula-shaped. Else the specimens from the two localities agree in their diagnostic characters as well as in the substratum inhabited. They are expected to be conspecific.

Distribution and Biology

Western Australia, Rottneest Island and Esperance. Regularly taken in protected shallow water bays, amongst seagrass as well as algae.

Halacarus fuscatus Bartsch, 1993

Figure 7F and G

Halacarus fuscatus Bartsch, 1993c: 56–58, figures 7A–G, 8A–D.

New Material

Australia: Western Australia: 1 female, WAM T 78334, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, corallines on demosponge from just below water line, 17 February 2003; 1 male, ZMH, Duke of Orleans Bay, bay with seagrass (*Amphibolis* sp.) with epifauna and flora, 17 February 2003; 1 male, WAM T 78335, Esperance, Lucky Bay, 33°59'S, 122°13'E, tufts with small algae, 15 February 2003.

Remarks

The most marked character of this soft-skinned species is that the legs, gnathosoma and the cerotegument of the female GA are of a yellow-brown colour, but the rather thin dorsal and ventral plates lack such prominent colour. With the triangular frontal spine included, the female is 635 µm long, the males 470–560 µm. The first pair of gland pores are on the AD, followed by the ds-1. The OC are small, a PD absent. The idiosoma and especially the legs and gnathosoma are covered with delicately reticulate cerotegument. The cerotegument on the female GA is thick and uniform. One pair of the pgs is in the striated integument, two pairs on the female GA close to the GO. The GA of the male is wide, its outline strongly influenced by the orientation (and deformation/distortion) of the specimen in the mounting medium. The spermatopositor is calyx-shaped (Figure 7F). Leg I has the typical number of 2, 2, 4 smooth, tapering bristles on telofemur, genu and tibia, respectively. The ventromedial seta on genu II is short, pectinate, the basal one of the two ventromedial setae on tibia II is slender, the apical one wide and pectinate (Figure 7G). Tarsi I to IV bear 2, 1, 1, 1 strong ventral bristles. Tarsus III bears four dorsal setae. The paired claws end with a raised apical cluster of tines.

Both *H. flavellus* and *H. fuscatus* can be attributed to the *Halacarus actenos* group, named after *H. actenos* Trouessart, 1889b. Species of this group are characterized by the combination of: AD present, OC small or reduced, PD absent; pair of ds-1 slightly posterior to the level of gland pores; female GA uniformly covered with cerotegument, one pair of pgs within the striated integument anterior to GA, two pairs of pgs close to GO; spines on leg I tapering, almost equal in shape and size; ventromedial seta of genu II bipectinate; on tibia II distal one of ventromedial setae pectinate, basal seta pectinate or short and smooth; all tarsi with ventral seta(e). *Halacarus fuscatus* and *H. flavellus* differ in their colour (brown vs pale), the size of the frontal spine (short, tapering vs long, slender or spatula-shaped), the position of glp-1 (on the AD vs in the striated integument), and the size and shape of the ventromedial setae on tibia II (basal seta slender, distal one strong and pectinate vs both setae strong and pectinate).

Distribution and ecology

Western Australia, Esperance and Rottneest Island. Extracted from an epiflora growing on seagrass, algal fronds and sponges.

Halacarus helenae Bartsch, 1993

Halacarus helenae Bartsch, 1993c: 59–61, figure 9A–J.

New Material

Australia: Western Australia: 1 female, WAM T 78336, Esperance, Lucky Bay, 33°59'S, 122°13'E, sediment from 0.5 m depth, 15 February 2003; 1 female, SMF, same collection data; 1 female, ZMH, same collection data.

Remarks

A small-sized species, measuring 340–410 µm from the short, wide frontal spine to the anal cone. The idiosoma is pale or somewhat light-brown, due to the translucent gut content, and there is no eye pigment present. The legs and idiosoma form a slightly curved unit. The AD and PD are coarsely reticulate, with ridges dividing each polygon, the striated integument is papillose; the surface of the ventral plates has a maze-like ornamented epicuticula and that of the legs is striated. The epicuticular layers on the female GA are slightly raised, somewhat bean-shaped, though not distinctly delimited from the anterior part of GA. None of the three pairs of perigenital setae is outlying, one pair is close to the anterior margin, one close to the posterior margin of GO and one pair between. The telofemora of the legs are flattened. Tarsus I bears two bristle-like ventral

setae, tarsi II to IV 2, 1, 1 ventral setae, respectively. Tarsus III bears no more than three dorsal setae.

This *Halacarus* species is much smaller than the two above-mentioned species.

There were no males amongst the material studied.

Distribution and ecology

Western Australia, Rottnest Island and Esperance. Inhabitant of sediment from shallow water to 30 m depth. The collecting data, coarse sediment, as well as the shape, with the legs and idiosoma forming a slightly curved unit, and the absence of eye-pigment are evidence that this species is psammobiont.

Halacarus strigatus sp. nov.

Figure 8A–H, 9A–G

Material examined

Holotype

male, WAM T 78337, Duke of Orleans Bay, 33°55'S, 122°35'E, Esperance, Western Australia, Australia, about 1 cm thick tufts of small algae growing on sediment, just below low water line, 19 February 2003.

Further material

Australia: Western Australia: 1 protonymph, WAM T 78338, Esperance, Cape le Grand, New Island, 34°00'S, 122°50'E, *Cystoseira* sp. (Phaeophyta) from about 0.5 m depth, 6 February 2003.

Etymology

The name *strigatus*, from *strigatus* (Latin), striped, is derived from the striae in the epicuticula.

Diagnosis

Length of male 415 µm. Surface of plates, gnathosoma and legs with delicate striae in fingerprint-like or parallel arrangement. AD with short, triangular frontal spine. AD, OC and PD present. OC with cornea but no gland pore. PD with gland pore in margin of plate. Male GA with 31 pgs in an inner ring and 13 outlying setae. Pair of spines on telofemur I blunt. On tibia II basal one of ventromedial setae slender, apical one larger and bipectinate. Tarsi I to IV with 2, 0, 0, 0 ventral bristles and 4, 4, 4, 3 dorsal setae. Claws with accessory process and few delicate tines on arc of claw.

Description

Male. Length 415 µm, width 220 µm. Epicuticula of idiosoma, of plates and membraneous integument, densely striated, striae in fingerprint-

like or parallel arrangement. Dorsal plates with scattered delicate canaliculi. Frontal process triangular (Figure 8A). Length of AD 140 µm, width 75 µm. Pair of glp-1 on AD, near lateral margin. Second and third pair of gland pores on platelets in striated integument, second pair in margin, third pair posterior to OC; glp-4 in lateral margin of PD. OC short, length 33 µm, width 26 µm; with single large cornea and, in posterior margin, a pore canaliculus. Length of PD 142 µm, width 75 µm; anterior rounded margin extending beyond pair of gland pores. Dorsal setae short; ds-1 on AD posterior to glp-1, ds-2, ds-3 and ds-4 in striated integument, ds-2 close to OC, ds-3 medial to glp-3; pair of ds-5 in anterior margin of PD well anterior to pair of glp-4. Pair of ds-6 in posterior margin of PD immediately medial to glp-5.

Ventral plates with delicately striated integument. Length of AE 112 µm, width 202 µm. Apodemes between epimeral plates I and II very long, almost extending to third pair of ventral setae (Figure 8B). Length of PE 179 µm, extending to but not beyond insertion of leg IV; PE with one dorsal and three ventral setae; apodemes between epimeral plates III and IV short. Length of GA 169 µm, width 92 µm; anterior margin of plate ovate. Length of GO 38 µm, width 32 µm, distance between anterior margin of GO to that of GA equalling twice length of GO. Perigenital setae smooth; 31 pgs in an inner ring and 13 pgs in an outer ring (Figure 8C). Each genital sclerite with five sgs, of these four setae spiniform and one seta minute and setiform (Figure 8D). Three pairs of internal genital acetabula shining through integument.

Length of gnathosoma 115 µm, width 60 µm. Gnathosomal base rectangular in ventral aspect (Figure 8E); its epicuticula, as well as that of palps, delicately striated. Rostrum about as long as gnathosomal base and extending to end of P-2. Both pairs of maxillary setae on rostrum. Tectum slightly arched. P-2 with two dorsal setae at 0.5 and 0.9, from basal to apical. P-3 with bluntly ending spine. P-4 with three setae in basal whorl, one lateral seta in middle of segment and two slender spurs at the tip.

Leg I wider than following legs. Genua of all legs about as long as telofemora and tibiae. Trochanters to tibiae with delicately striated epicuticula, striae in parallel or fingerprint-like arrangement (Figure 8H); ornamentation partly absent on medial flank of basi- and telofemora III and IV. Tarsi I and II without such epicuticula. Tarsi III and IV with striated epicuticula in basal fifth, remainder almost smooth. Leg chaetotaxy: leg I, 1, 2, 8, 11, 13, 8; leg II, 1, 4, 7, 9, 11, 6; leg III, 2, 2, 6, 7, 9, 4; leg IV, 1, 2, 4, 5, 8, 3. Pair of spines on telofemur I bluntly ending, ventromedial spine much shorter than ventral spine (Figure 8F). Spines on genu (one pair) and tibia I (two pairs) tapering. Tarsus I ventrally with two

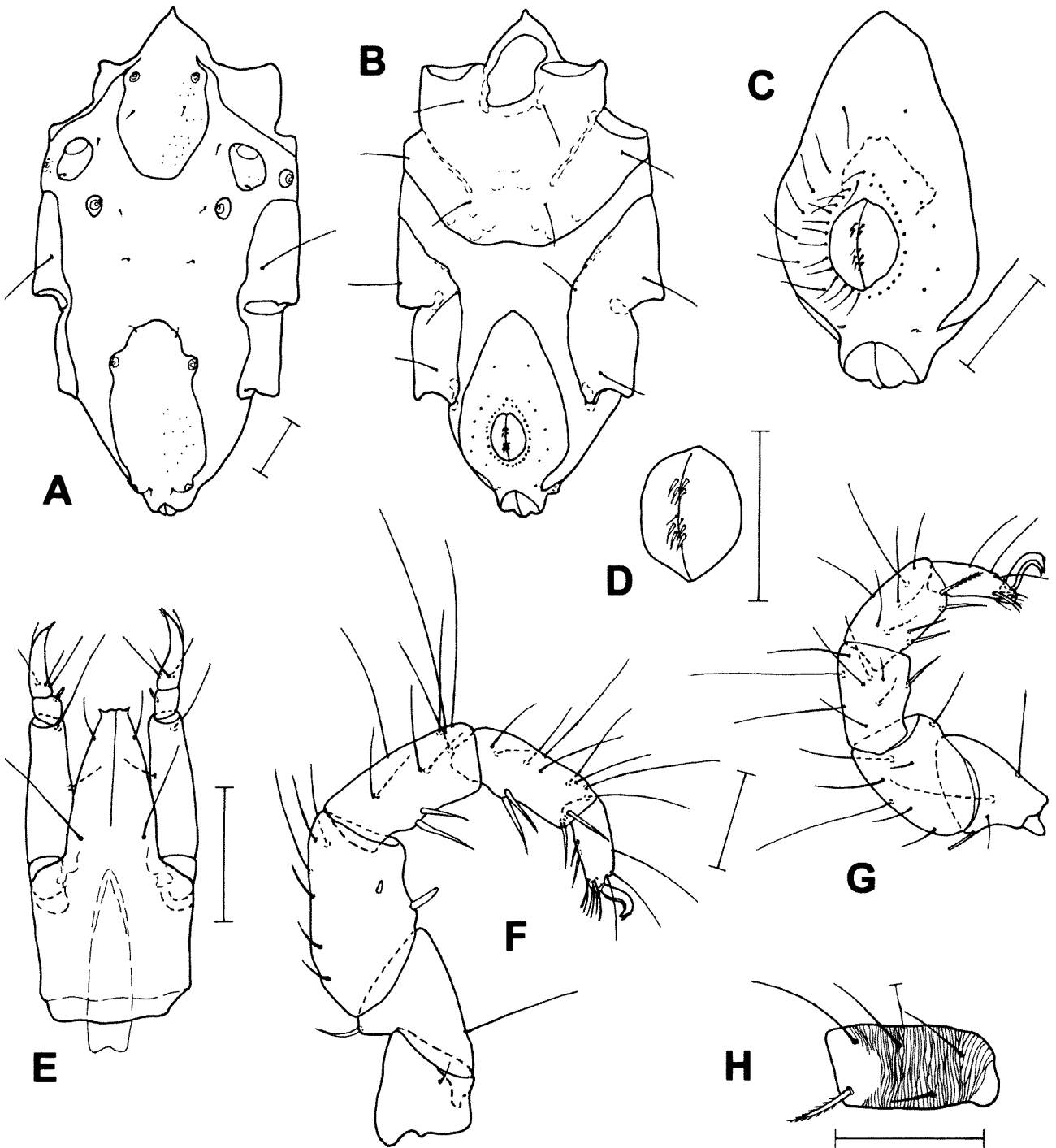


Figure 8 A–H. *Halacarus strigatus* sp. nov., male, A, idiosoma, dorsal; B, idiosoma, ventral; C, genitoanal plate, ventral; D, genital opening; E, gnathosoma, ventral; F, leg I, medial; G, basifemur to tarsus II, medial; H, tibia II, medial. Scale = 50 μ m.

spiniform setae, apically with pair of eupathidia and pair of doubled pas; dorsally with three fossary setae; solenidion and famulus similar in size and 7 μ m long (Figure 9C). Dorsal seta on basifemur II blunt (Figure 8G). On tibia II two ventral setae tapering, basal one of ventromedial setae slender, distal one thicker and bipectinate (Figure 8H). Solenidion on tarsus II in dorsomedial position, about 6 μ m in length (Figure 9D); tip of tarsus II with pair of eupathidia and pair of doubled pas.

Tibiae III and IV each with four slender, tapering ventral setae (Figure 9A and B). Tip of tarsus III with pair of slender pas; on tarsus IV both medial and lateral pas plumulose (Figure 9E).

Paired claws of legs I slightly smaller than those of following legs. Arc of claws with accessory process and few delicate tines; no tines on shaft of claws. Central sclerite with small claw-like process, with large ventral and delicate upper tooth.

Female. Not seen. Females and males of

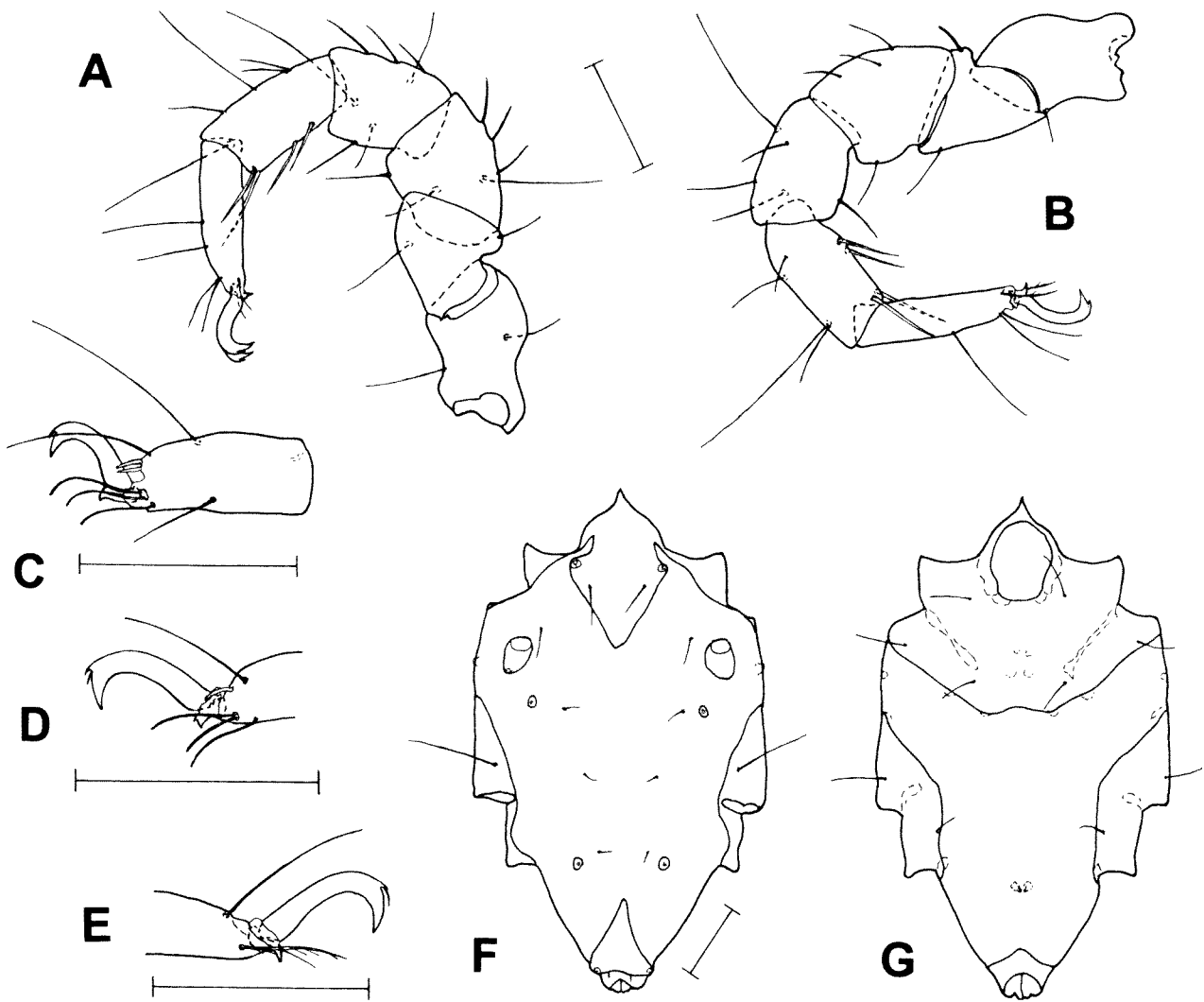


Figure 9 A–G. *Halacarus strigatus* sp. nov., A, leg III, medial, male; B, leg IV, medial, male; C, tarsus I, lateral, male (medial setae and claw omitted); D, tip of tarsus II, medial, male (lateral setae and claw omitted); E, tip of tarsus IV, lateral, male (medial setae and claw omitted); F, idiosoma, dorsal, protonymph; G, idiosoma, ventral, protonymph. Scale = 50 μ m.

Halacarus species often differ in the size of PD, accordingly in females of this species the glp-4 may be on platelets contiguous or outside the PD, and the GA is expected to have bean-shaped areas lateral to the GO.

Protonymph. Length 325 μ m, width 195 μ m. Integument of dorsal and ventral plates, gnathosoma and legs with striated epicuticula. AD with a short frontal spine (Figure 9F). With five pairs of gland pores and six pairs of idiosomatic dorsal setae; pair of glp-1 on AD, pair of ds-1 posterior to gland pores. Setae ds-1 and ds-2 longer than following setae. OC small, with delicate cornea. PD narrow, short, triangular. AE with three pairs of ventral setae, PE with one dorsal seta and two ventral setae (Figure 9G). Genital plate reduced, with pair of minute setae (subgenital setae); a pair of genital acetabula shining through striated integument. Telfemur to tibia I with 2, 2, 4

ventral spines; spines of telfemur I similar in size. Tibiae II to IV with 3, 2, 2 bristle-like ventral setae. None of ventral setae of tibia II coarsely plumose. Tarsi I to IV with 2, 0, 0, 0 ventral bristles and 4 (famulus excluded), 4, 4, 3 dorsal setae. Accessory process of claws not markedly raised.

Remarks

Halacarus strigatus has the character combination: AD, OC and PD present; epicuticula of idiosoma, gnathosoma and legs with delicate striae in parallel or fingerprint-like arrangement; OC with cornea but no gland pore; male GA with numerous outlying setae; tibia I with two pairs of tapering spines; tibia II with one smooth and one bipectinate ventromedial seta; tarsi III and IV with four and three dorsal but no ventral setae. *Halacarus strigatus* resembles species of the *H. tenopus* group, but differs from the nine species mentioned

(Bartsch, 2003b) in that the pair of glp-3 is not included in the OC. *Halacarus aegyptus* Viets, 1935 is another species with an overall similarity, but in that species the glp-3 are on the OC (in contrast to *H. strigatus*) and the glp-4 outside the PD. Other species with a character combination similar to that of *H. strigatus* are *H. bisulcus* Viets, 1927, *H. elegans* Newell, 1984, *H. gracileunguiculatus* Lohmann, 1907, and *H. rismondoi* Viets, 1940. *Halacarus bisulcus* and *H. rismondoi* are known from the North Atlantic, the Mediterranean included (Viets, 1940; Green and MacQuitty, 1987), *H. elegans* and *H. gracileunguiculatus* from the southern hemisphere, from the Auckland and Kerguelen Islands, respectively (Newell, 1984). The claws of tarsi II and III of *H. bisulcus* bear claw pectines, these are lacking in *H. strigatus*. The frontal spine of *H. elegans* is slender, much longer than in *H. strigatus*. The males of *H. gracileunguiculatus* and *H. strigatus* can be separated on the basis of the GA which differs in its length:width relation and arrangement of the pgs. In *H. rismondoi* both females and males have the fourth pair of gland pores outside the PD and the claws of tarsi II and III bear pectines.

Not included in this list of species are *H. arnaudi* Newell, 1984, *H. laterculatus* Viets, 1950, *H. minor* Lohmann, 1907, *H. nanus* Gimbel, 1919, and *H. propinquus* Viets, 1940 which are all from the southern hemisphere (Gimbel, 1919; Viets, 1950; Newell, 1984; Bartsch, 1993a). In dorsal aspect they demonstrate an overall similarity, but in contrast to *H. strigatus* males bear most of the pgs around the GO, there is just a single pair of outlying setae near the anterior margin of the GA. In the females of these five species the anterior GA is rounded or truncate, the anterior pair of pgs is within the striated integument anterior to the GO and there are no distinctly delimited bean-shaped cerotegumental areas on either side of the GO.

In the protonymph mentioned above the pairs of ds-1 and ds-2 are longer than the following setae and the two spiniform setae on telofemur are almost equal in size, in the male the dorsal setae demonstrate no marked difference in length but the spines on telofemur I differ in size. Nonetheless the male and protonymph are expected to be conspecific.

In most halacarid genera, protonymphs have a pair of genital acetabula but no perigenital or subgenital setae (Bartsch, 2003a). In contrast, in *Halacarus* species studied so far, protonymphs have a pair of minute setae close to the primordial genital slit. Similar setae are also present in *Lohmannella* species (Bartsch, 1977b).

Distribution

Western Australia, Esperance.

Genus *Lohmannella* Trouessart, 1901

Lohmannella pinggi Otto, 1994

Lohmannella pinggi Otto, 1994: 32–35, figures 1–8; Bartsch, 2005b: 296–298, figure 3A–G.

New Material

Australia: Western Australia: 1 female, WAM T 78339, Esperance, Nine Mile Beach, 33°53'S, 121°47'E, tufts of algae on wave-washed edge of limestone platform, 18 February 2003; 1 female, ZMH, same collection data.

Remarks

Length of the idiosoma 278–300 µm. The characters of the specimens agree with those presented in Bartsch (2005b: figure A–D), the length of the OC is at least twice the width, there is one distinct and one small, indistinctly demarcated cornea. The ds-4 are situated in the striated integument posterior to the OC and the small ds-5 on the PD immediately posterior to the pair of gland pores. The portion of the PE anterior to the insertion of leg III is long and extends to or beyond the level of the ventromarginal pair of gland pores.

Distribution and ecology

Western Australia (Rottnest Island and Esperance), Victoria and New South Wales. The specimens from Esperance are from the wave-washed tidal edge of a rocky platform.

Lohmannella septemsetosa Bartsch, 2005

Figure 10A–C

Lohmannella septemsetosa Bartsch, 2005b: 293–296, figures 1A–K, 2A–F.

New Material

Australia: Western Australia: 1 female, WAM T 78340, Esperance, Duke of Orleans Bay, 33°55'S, 122°35'E, tufts of algae and sediment rich in debris, 50 cm depth, 19 February 2003; 1 larva, author's collection, same collection data.

Supplementary description

Female. Idiosomal length 447 µm, gnathosomal length 317 µm, ratio idiosoma:gnathosoma 1:0.71. Surface of dorsal and ventral plates, gnathosoma and legs with irregularly reticulate epicuticula. Gland pores large. Pair of ds-1 posterior to level of gland pores. OC with gland pore in middle of plate. Anterior margin of GA truncate, length 224 µm, width 170 µm, with 8–9 pairs of pgs (Figure 10A). Genital sclerites with four pairs of setae. P-2 without spiniform ventral process. Genu and tibia I with four and six to seven bipectinate ventral setae. Tibiae II to IV with 6, 5, 5 ventral setae; number of ventromedial/ventrolateral bipectinate setae: 3/1, 2/

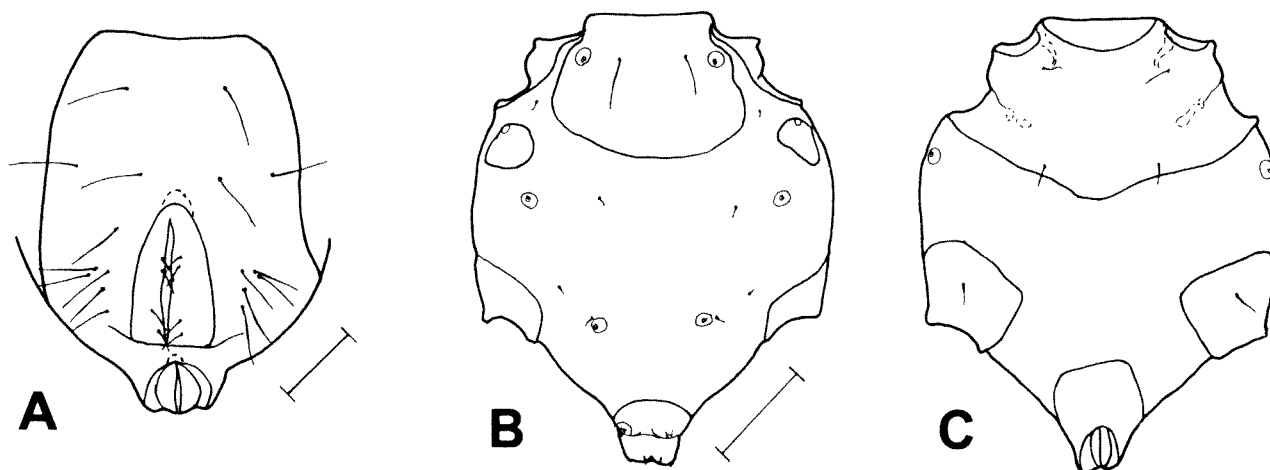


Figure 10 A–C. *Lohmannella septemsetosa* Bartsch, 2005, A, genitoanal plate, female; B, idiosoma, dorsal, larva; C, idiosoma, ventral, larva. Scale = 50 μ m.

3, 0/3; other setae slender, not distinctly bipectinate. Number of bipectinate ventral setae on tarsi I to IV: 2, 2, 3, 2, number of eupathidia or slender ventral setae: 6, 3, 1, 1; in addition, all tarsi with pas. Claws with accessory process.

Larva. Length of idiosoma 202 μ m, width 167 μ m; length of gnathosoma 119 μ m. OC much smaller than in adults, not including the pair of gland pores (Figure 10B). PD very short, with fifth pair of gland pores. AE with pair of internal tubes and two pairs of setae; PE with a single ventral seta (Figure 10C). Tibiae I, II and III each with one pair of ventral setae. Tarsi I to III with 2, 1, 0 bipectinate ventral setae.

Remarks

Lohmannella septemsetosa bears large gland pores, as most southern hemisphere *Lohmannella* species. Other *Lohmannella* from Australia are *L. arenaria* Bartsch, 1993, *L. dictyota* Bartsch, 1992a, and *L. pinggi* (Bartsch, 1993d; Otto, 1994, 2000b). The dorsal plates of *L. arenaria* are much wider than in *L. septemsetosa* and the second palpal segment bears two cuticular ventral processes which are lacking on the palps of *L. septemsetosa*. *Lohmannella dictyota* is characterized by its elongate PD, 1.7 times longer than wide, and the fused P-1. *Lohmannella pinggi* has unusual elongate OC, their length is twice or more the width. Amongst the presently known *Lohmannella* species, *L. kerguelensis* Lohmann, 1907 is most similar to *L. septemsetosa*. *Lohmannella kerguelensis* is known from Kerguelen and the Palmer Peninsula (Bartsch, 1993a), the most marked difference is that in *L. kerguelensis* the ds-3 are included in an anteriorly arched PD.

Distribution and ecology

Western Australia, Esperance. The present records are from shallow water, from algal tufts with debris.

Genus *Rhombognathus* Trouessart, 1888

Rhombognathus delicatulus Bartsch, 2000

Rhombognathus delicatulus Bartsch, 2000: 171–174, figures 4A–H, 5A–I, 6A–D; Bartsch, 2003c: 260, 261, figures 2A–G; Bartsch, 2005e: 376–377, figure 1A–D.

Remarks

Rhombognathus delicatulus is small and slender, its length about 187–202 μ m. The anal cone is conspicuously narrow, the anal sclerites squeezed between the anal valves. Each claw has a very narrow accessory process with one or two tines. The PD is faintly reticulated and bears a single pair of setae. Telfemur I is slender, about 1.8 times longer than high, and telfemora I to IV bear 4/1, 3–4/1, 3/0, 3/0 dorsal/ventral setae.

Distribution and ecology

Queensland, Great Barrier Reef, and Western Australia, Dampier and Esperance. Inhabitant of algae, coral rubble and coarse sand, from low water edge to depth of 38 m.

Rhombognathus lepidus Bartsch, 1993

Rhombognathus lepidus Bartsch, 1993b: 29–31, figure 7A–H; Bartsch, 2005e: 378–380, figure 2A–H.

Remarks

This species is small and slender, its length 187–239 μ m. The PD is uniformly though faintly reticulate, as in the above mentioned *R. delicatulus*, but the anal sclerites are distinct and extend beyond the anal valves and the accessory process of the claws is slightly widened, bearing 9–10 tines. The telfemur I is slender, about 2.1 times longer than high and the number of dorsal/

ventral setae on the telofemora I to IV is 4/2, 4/2, 3/1, 3/1.

Distribution and ecology

Western Australia, from Dampier and Esperance. Records are from just beneath the low water edge to about 8 m, from algal turf from rocky platforms and the surface of demosponges.

Rhombognathus marginalis Bartsch, 1993

Rhombognathus marginalis Bartsch, 1993b: 31–33, figure 8A–G; Bartsch, 2005e: 380–383, figure 3A–F, 4A–F.

Remarks

The length of females is 240–244 μm , of males 215–225 μm . This is one of the species with rake-like claws, each bearing 22–24 tines. Adults have small ventral plates which are restricted to the margins; the major parts of the venter is covered by striated integument. Both the adults and juveniles can be distinguished from others on the basis of the very short leg segments (telofemur I 1.4–1.5 times longer than high), and absence of a second ventral seta on tibiae III and IV (four setae on each tibia).

Distribution and ecology

Western Australia, Rottnest Island and Esperance. An inhabitant of lower tidal algae exposed to swell.

Rhombognathus tener Bartsch, 2005

Rhombognathus tener Bartsch, 2005e: 384–387, figure 5A–H, 6A–E.

Remarks

The females are 307–310 μm long, males 253–290 μm . The claws are rake-like, as in the above mentioned *R. marginalis*, the accessory process bears 16–19 tines. The PD is faintly foveate, without marked costae, and bears two pairs of setae. The plates AE, PE and GP are fused to a ventral shield in both the females and males. Telofemur I is about 1.7 times longer than high and there are 3–4/1, 3–4/1, 2–3/0, 2–3/0 dorsal/ventral setae on the telofemora I to IV.

Distribution and ecology

At present known only from Esperance Bay, Western Australia, from subtidal brown algae (*Scaberia* sp.).

Rhombognathus vulgaris Bartsch, 2005

Rhombognathus vulgaris Bartsch, 2005e: 388–391, figure 7A–I, 8A–C.

Remarks

The females are 252–279 μm long, the males 225–269 μm . *Rhombognathus vulgaris* is most similar to *R. tener*; the rake-like claws bear 21–22 tines. As in *R. tener*, there are two pairs of setae on the PD, but the PD of *R. vulgaris* is more narrow and bears a pair of costae. The ventral plates AE, PE and GP are fused in both the female and male. Telofemur I is 1.8 times longer than high, its shape accordingly similar to that of *R. tener*, but the telofemora I to IV bear 4/2, 4/2, 3/1–0, 3/1–0 dorsal/ventral setae.

Distribution and ecology

Esperance, Western Australia. A very common species amongst macro-algae on granite rocks and limestone platforms exposed to strong and moderate swell. Records are from the low water edge to about 2 m water depth.

Genus *Scaptognathus* Trouessart, 1889

Scaptognathus arenarius sp. nov.

Figure 11A–G, 12A–G

Material

Holotype

male, WAM T 78341, Duke of Orleans Bay, 33°55'S, 122°35'E, Esperance, Western Australia, Australia, patch with unsorted sediment, just below low water line, 10 February 2003.

Paratypes

Australia: Western Australia: 1 female, WAM T 78342, same collection data; 1 larva, WAM T 78343, same collection data; 1 female, SMF, same collection data; 1 female and 1 male, ZMH, same collection data.

Etymology

The name is derived from arena (Latin), sand, arenarius, living in sand, as the only records are from a patch of sand.

Diagnosis

Dorsal plates minutely foveate. Length of female 246–278 μm , of male 240–266 μm . Gnathosoma 0.7 of length of idiosoma. Posterior margin of AD wide. OC large, gland pore at 0.8, dorsum with seven pairs of dorsal setae. Female and male GA bipartite. Female with three pairs of pgs and two pairs of sgs, male with six to seven pairs of pgs close to GO, two pairs of outlying setae and two pairs of sgs. Tibia I with five bipectinate setae. Genu to tarsus I with 2, 5, 1 bipectinate setae; tibiae II to IV with 2(–4), (2–)3, 3 bipectinate setae, tarsi II to IV with 1, 0, 0 bipectinate ventral setae. Claws with minute

accessory process. Central sclerite with minute claw-like process.

Description

Male. Length 240–266 μm , length of holotype 260 μm , width 165 μm . Dorsal plates completely ornamented with numerous small, rounded to ovate foveae, 0.5 to 2 μm in diameter or length. Each fovea with delicate canaliculi (oil immersion) (Figure 11D). First pair of gland pores almost at the level of insertion of leg I. Anterior margin of AD truncate, posterior margin very broadly rounded (Figure 11A), length of plate 102 μm , width 112 μm . Length of OC 30 μm , width 25 μm . Gland pore near posterior margin, at 0.8. Anterior margin of PD truncate, with evenly rounded corners, length of PD 122 μm , width 104 μm . Pair of gland pores in

posterior margin of plate. First pair of dorsal setae much longer than following setae, situated close to pair of gland pores. Pairs ds-2 to ds-5 within striated integument, ds-2 very close to anterior margin of OC, ds-3 near margin of PE, ds-4 posterior to AD and ds-5 lateral to anterior margin of PD; setae ds-6 and ds-7 on PD, ds-6 level with insertion of leg IV, at 0.3, ds-7 at 0.7.

Ventral plates irregularly foveate (Figure 11B), with delicate canaliculi when focused on procuticula; on PE integument along medial margin almost smooth. Length of AE 85 μm , width 157 μm , plate with pair of epimeral pores and three pairs of short setae. Length of PE 117 μm , extending far beyond insertion of leg IV; PE with one small lateral seta and three ventral setae. GA bipartite, total length 125 μm , posterior part 107

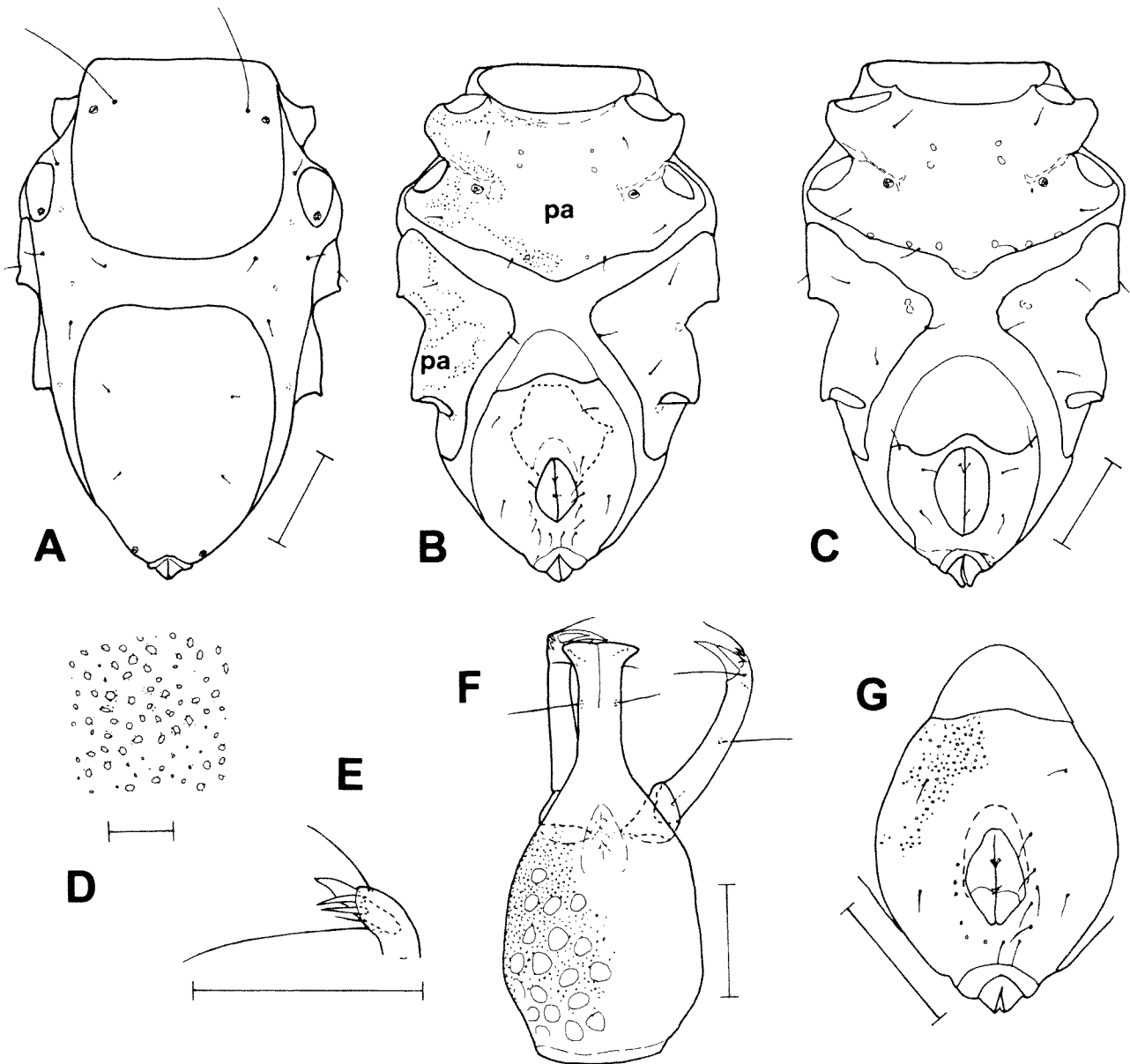


Figure 11 A–G, *Scaptognathus arenarius* sp. nov., A, idiosoma, dorsal, male; B, idiosoma, ventral, male; C, idiosoma, ventral, female; D, middle part of AD, male; E, tip of palp, female; F, gnathosoma, ventral, male; G, genitaloanal plate, male. (pa = foveate areola) Scale = 50 μm .

μm , width $87 \mu\text{m}$. Surface of posterior part with small foveae. Length of GO $33 \mu\text{m}$, width $20 \mu\text{m}$. Interval between anterior margin of GO and that of posterior GA equalling 1.3 times length of GO. With six to seven short pgs lateral and posterior to GO and two pairs of outlying setae (Figure 11G). Anterior pair of outlying setae level with insertion of leg IV, posterior pair lateral to GO. Genital sclerites with two pairs of sgs. Length of spermatopositor $60 \mu\text{m}$, width $47 \mu\text{m}$, extending to margin of posterior GA.

Length of gnathosoma $187 \mu\text{m}$ or 0.72 of idiosomal length, width $88 \mu\text{m}$. Dorsal flank of gnathosomal base almost uniformly covered with small, irregularly shaped foveae, ventral flank with large, ovate 'cells', $15\text{--}17 \mu\text{m}$ in diameter, each surrounded by minute foveae (Figure 11F). Pharyngeal field small. Rostrum spatula-shaped, apically truncate. Both pairs of maxillary setae situated in anterior portion of rostrum, truncate apex with two pairs of rostral setae. Palps attached dorsally, P-1 almost contiguous. Palps two-segmented, parts equalling P-2 to P-4 fused. Two setae in part of palp representing P-2, large spine in that of P-3, and basal spine, two long setae, minute apical seta and two apical spiniform setae in that of P-4 (Figure 11E).

Legs slender; leg I longer than the other legs. Ventrolateral flanks of telofemora and lateral flank of trochanters III and IV with foveate integument. Telofemora slender, their length:height ratio 3.2, 2.5, 2.4 and 2.4:1, from leg I to IV, respectively. Leg chaetotaxy: leg I, 1, 1, 6, 7, 8, 5; leg II, 1, 1, 5, 4, 5, 5; leg III, 1, 1, 2, 2, 5-6, 3; leg IV, 1, 1, 2-3, 3, 6, 3. Ventromedial seta of telofemur I bristle-like and bipectinate, ventral seta almost smooth (Figure 12A). Telofemur II with 4/1 dorsal/ventral setae (Figure 12B). Telofemora III and IV with 2/0 and 2/0-1 dorsal/ventral setae, respectively (Figure 12C and D), in paratype male with 2/1 and 2/0 setae, respectively. Genu to tarsus I with 2, 5, 1 bipectinate setae; tibiae II to IV with 2, 2-3, 3 such setae, and tarsi I to IV with 1, 1, 0, 0 bipectinate ventral setae. Paratype male with two bipectinate setae on one of tibiae II and three such setae on the other. In holotype, tibia III on one side with two bipectinate setae (ventralmost seta lacking), the other tibia III, as in paratype male, with three bipectinate setae. Tarsus I with tubiform solenidion, $14 \mu\text{m}$ in length, and digitiform, solid famulus (Figure 12E), tip of tarsus with pair of doubled pas. Tarsus II with tubiform dorsomedial solenidion, $10 \mu\text{m}$ long, situated between two distal fossary setae (Figure 12F). Tip of tarsus II, III and IV each with pair of pas singlets.

Claws with accessory process but no pecten. Central sclerite with rather inconspicuous, claw-like process.

Female. Length $246\text{--}278 \mu\text{m}$, length of

gnathosoma $190\text{--}200 \mu\text{m}$. Dorsal aspect as in male. Genital plate bipartite. Posterior GA with three pairs of pgs, one pair in anterolateral angles of posterior GA, the others close to GO. Genital sclerites with anterior pair of sgs; posterior sgs paired, single-sided (Figure 11C) or absent. Telofemora III and IV with 2/1 and 2/0 dorsal/ventral setae, respectively. One of females with anomalous combination of three and four bipectinate ventral setae on tibia II, the other two females with two bipectinate setae on tibia II.

Larva. Length of idiosoma $113 \mu\text{m}$, of gnathosoma $100 \mu\text{m}$. Dorsal plates very delicately foveate, at low magnification apparently smooth. PD much shorter than in adults (Figure 12G); gland pores obscured. AE with two pairs of setae; middle portion distinctly foveate. PE with single ventral seta. Genu, tibia and tarsus I with 2, 2, 1 bipectinate bristles, respectively. Bipectinate bristles on genu, tibia and tarsus II numbering 1, 2, 1; on tibia II ventromedial bristle long, ventrolateral one short. Tibia III with pair of bipectinate bristles.

Remarks

Scaptognathus arenarius is characterized by the combination of: OC large and gland pore at about 0.8, GA bipartite in both female and male and tibia I with five bipectinate setae. The majority of species have short OC, rounded or wider than long and the gland pore is in about the middle of the plate. Elongate OC are present in *S. gibbosus* Bartsch, 1977, *S. pacificus* Newell 1971, *S. newelli* Bartsch, 1988, and *S. trouessarti* Halbert, 1915. The tibiae I of *S. gibbosus*, *S. newelli* and *S. pacificus* have three bipectinate setae. The three species are known from the Pacific (Bartsch 1977c; Newell, 1971, 1984), in addition, there is a record of *S. gibbosus* from the Indian Ocean (Morselli & Mari, 1986). *S. trouessarti* is a species from the north-eastern Atlantic (Halbert, 1915); according to the re-description by Abé and O'Connor (1991) there is no large gland pore on the OC.

Distribution and ecology

Western Australia, Esperance. Inhabiting medium-sorted sediment.

Genus *Simognathus* Trouessart, 1889

Simognathus cruciferus Bartsch, 2005

Simognathus cruciferus Bartsch, 2005b: 298-300, figure 4A-L.

Remarks

Length $375 \mu\text{m}$. The dorsal plates are pale, their surface almost uniformly foveate, the integument crossed by numerous delicate canaliculi. The AD and OC bear cornea-like structures. The OC are

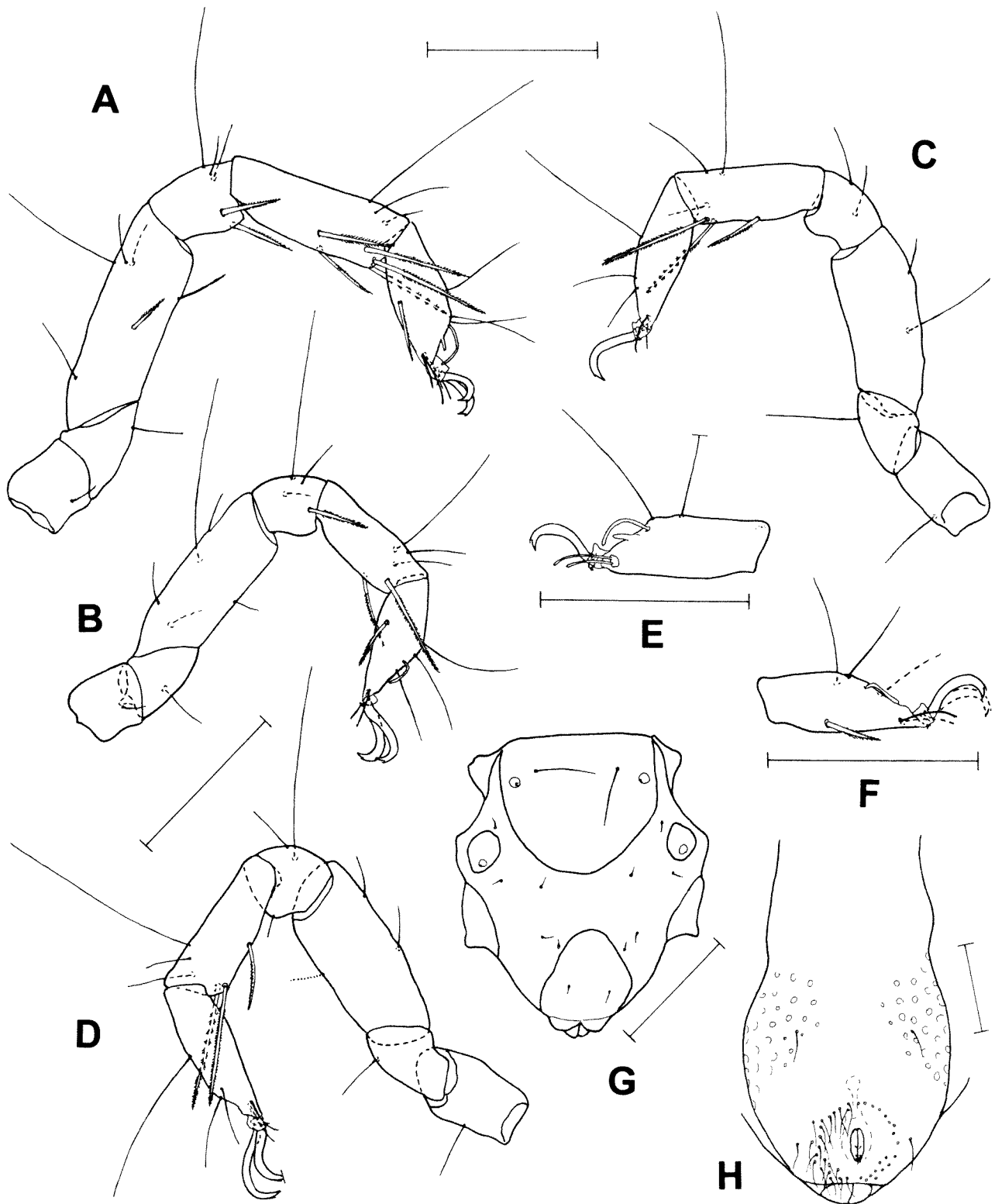


Figure 12 A–G. *Scaptognathus arenarius* sp. nov., A, leg I, medial, male; B, leg II, medial, male; C, leg III, medial, male; D, leg IV, medial, male (dotted seta present only on opposite leg); E, tarsus I, lateral, male (medial setae and claw omitted); F, tarsus II, medial (lateral fossary seta and claw in broken line), male; G, idiosoma, dorsal, larva. H. *Simognathus uniscutatus* Bartsch, 1994, area of genitoanal plate, male. Scale = 50 μ m.

almost triangular. The pair of ds-4 inserts on the PD. The adanal setae are in a ventral position. The integument of the marginal areolae of the AE is foveate and crossed by canaliculi whereas it is almost smooth in a cross-shaped median area. On

the GA similar smooth integument is shaped like a T. The anterior margin of the female GA is arched. On the P-2 there is a ventral protuberance and a bristle. Tibia I bears a wide but short, bluntly ending spine.

Table 1 Non-Copidognathinae (Acari: Halacaridae) from Western Australia, from Esperance, Dampier and Rottnest Island, and further records of these species from in and outside Australia. (–, no record; E, Esperance; D, Dampier; NSW, New South Wales; RI, Rottnest Island; QLD, Queensland; VIC, Victoria; WA, Western Australia).

	WA localities	other Australian localities	localities outside Australia
<i>Actacarus australis</i> Bartsch, 1993	RI	–	–
<i>Actacarus festivus</i> Bartsch, 2003	D	–	–
<i>Actacarus pacificus</i> Bartsch, 1979	D, E, RI	–	Japan, Hawaii, Chile
<i>Actacarus</i> sp.	RI	–	–
<i>Agauae brevipes</i> Bartsch, 1999	E, RI	–	–
<i>Agauae circellaris</i> Bartsch, 1999	RI	–	–
<i>Agauae scita</i> Bartsch, 1999	RI	–	–
<i>Agauae similis</i> sp. nov.	E	–	–
<i>Agauae subglabra</i> Bartsch, 1999	E, RI	–	–
<i>Agauae tenuipes</i> Bartsch, 1999	E, RI	–	–
<i>Agauopsis aequilivestita</i> Bartsch, 1996	RI	QLD	–
<i>Agauopsis arborea</i> Bartsch, 2003	D	–	–
<i>Agauopsis australiensis</i> Bartsch, 1996	RI	–	–
<i>Agauopsis calidictyota</i> sp. nov.	E	–	–
<i>Agauopsis dasyderma</i> Bartsch, 2003	D	–	–
<i>Agauopsis elaborata</i> Bartsch, 1996	RI	–	–
<i>Agauopsis fenneri</i> Otto, 1999	–	QLD	–
<i>Agauopsis</i> cf. <i>fenneri</i> Otto, 1999	D	–	–
<i>Agauopsis miliaris</i> Bartsch, 2005	E	–	–
<i>Agauopsis mokari</i> Otto, 1994	E	NSW, VIC	–
<i>Agauopsis moorea</i> Bartsch, 1992	D	–	–
<i>Agauopsis obtusa</i> Bartsch, 2003	D	–	–
<i>Agauopsis ornatella</i> Bartsch, 1996	RI	–	–
<i>Agauopsis</i> sp.	RI	–	–
<i>Anomalohalacarus dampierensis</i> Bartsch, 2003	D	–	–
<i>Anomalohalacarus macellus</i> Bartsch, 1993	RI	–	–
<i>Arhodeoporus disparilis</i> Bartsch, 1997	RI	–	–
<i>Arhodeoporus corallicolus</i> Otto, 2000	D	QLD	–
<i>Arhodeoporus leptopus</i> Bartsch, 1997	RI	–	–
<i>Arhodeoporus psammophilus</i> Bartsch, 1993	E, RI	–	–
<i>Arhodeoporus robustus</i> sp. nov.	E	–	–
<i>Arhodeoporus wadjemupis</i> Bartsch, 1997	RI	–	–
<i>Atelopsalis pacifica</i> Bartsch, 1985	E, RI	–	India (East), Philippines
<i>Australacarus pustulatus</i> Bartsch, 1993	RI	–	–
<i>Bradyagaue exilis</i> Bartsch, 2004	E	–	–
<i>Bradyagaue scutella</i> Bartsch, 1992	RI	–	–
<i>Halacarellus lubricus</i> Bartsch, 1986	E	NSW	New Zealand
<i>Halacarellus rotnestensis</i> Bartsch, 1999	E, RI	–	–
<i>Halacaropsis capuzina</i> Bartsch, 1996	E, RI	–	–
<i>Halacarus arenarius</i> Bartsch, 1994	RI	–	–
<i>Halacarus celatus</i> Bartsch, 1994	RI	–	–
<i>Halacarus discophorus</i> Bartsch, 1994	RI	QLD	–
<i>Halacarus flavellus</i> Bartsch, 1993	E, RI	–	–
<i>Halacarus fuscatus</i> Bartsch, 1993	E, RI	–	–
<i>Halacarus helenae</i> Bartsch, 1993	E, RI	–	–
<i>Halacarus mitrellus</i> Bartsch, 1994	RI	–	–
<i>Halacarus parvulus</i> Bartsch, 1994	RI	–	–
<i>Halacarus psammophilus</i> Bartsch, 1994	RI	–	–
<i>Halacarus strigatus</i> sp. nov.	E	–	–
<i>Halacarus</i> spp.	RI	–	–

Table 1 (cont.)

	WA localities	other Australian localities	localities outside Australia
<i>Isobactrus australiensis</i> Bartsch, 2002	D	–	–
<i>Isobactrus obesus</i> Bartsch, 1992	D	–	China
<i>Lohmannella arenaria</i> Bartsch, 1993	RI	–	–
<i>Lohmannella pinggi</i> Otto, 1994	E, RI	NSW, VIC	–
<i>Lohmannella septemsetosa</i> Bartsch, 2005	E	–	–
<i>Rhombognathus biscutatus</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus delicatulus</i> Bartsch, 2000	E, D	QLD	–
<i>Rhombognathus dispar</i> Bartsch, 2003	D	–	–
<i>Rhombognathus foveolatus</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus latens</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus latibulus</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus lathridius</i> Bartsch, 2000	D	QLD	–
<i>Rhombognathus lepidus</i> Bartsch, 1993	E, RI	–	–
<i>Rhombognathus levigatus</i> Bartsch, 2000	D	QLD	–
<i>Rhombognathus marginalis</i> Bartsch, 1993	E, RI	–	–
<i>Rhombognathus ocularis</i> Bartsch, 2002	D	–	–
<i>Rhombognathus petraeus</i> Bartsch, 2003	D	–	–
<i>Rhombognathus placidus</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus psammophilus</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus scutulatus</i> Bartsch, 1983	D, RI	–	–
<i>Rhombognathus tener</i> Bartsch, 2005	E	–	–
<i>Rhombognathus thalassinus</i> Bartsch, 1993	RI	–	–
<i>Rhombognathus vulgaris</i> Bartsch, 2005	E	–	–
<i>Scaptognathides australis</i> Bartsch, 1993	RI	–	–
<i>Scaptognathides hawaiiensis</i> Bartsch, 1988	D	–	Hawaii, South China
<i>Scaptognathides ornatus</i> Bartsch, 1988	D	–	Hawaii
<i>Scaptognathus arenarius</i> sp. nov.	E	–	–
<i>Scaptognathus australis</i> Bartsch, 1993	RI	–	–
<i>Scaptognathus exquisitus</i> Otto, 2000	D	QLD	–
<i>Scaptognathus peregrinus</i> Bartsch, 1993	RI	–	–
<i>Scaptognathus</i> sp.	RI	–	–
<i>Simognathus cruciferus</i> Bartsch, 2005	E	–	–
<i>Simognathus delicatulus</i> Bartsch, 1994	RI	–	–
<i>Simognathus gibberosus</i> Bartsch, 1994	E, RI	–	–
<i>Simognathus gracilis</i> Bartsch, 1994	RI	–	–
<i>Simognathus maculatus</i> Bartsch, 1994	RI	–	–
<i>Simognathus platyaspis</i> Otto, 2000	D	QLD	–
<i>Simognathus scutatus</i> Bartsch, 1993	RI	–	–
<i>Simognathus salebrosus</i> Bartsch, 2003	D	–	–
<i>Simognathus tener</i> Bartsch, 2003	D	–	–
<i>Simognathus uniscutatus</i> Bartsch, 1994	D, E, RI	–	–
<i>Simognathus variolosus</i> Bartsch, 1994	RI	–	–

Distribution

Western Australia, Esperance.

Duke of Orleans Bay, 33°55'S, 122°35'E, algal scrub and debris, 19 February 2003.

***Simognathus gibberosus* Bartsch, 1994**

Simognathus gibberosus Bartsch, 1994: 136–140, figures 11–22.

New Material

Australia: Western Australia: 1 deutonymphal exuvia with a male, WAM T 78344, Esperance,

Supplementary description

Deutonymph. Dorsal plates small, PD much smaller than in adults; ds-2, ds-3 and ds-4 within striated integument. AD and OC with cornea. Ventral plates separate. AE with three pairs of setae, integument smooth within a gable-like area, else foveate. PE with one dorsal and three ventral setae. Genital plate small, with pair of perigenital setae

and two pairs of internal genital acetabula. Second palpal segment short, with ventral bristle-like seta. All telofemora short, about 1.1 times longer than high. Tibiae I and II short, tibiae III and IV slender. Tarsus II with ventral setae and pair of pas; tarsi III and IV each with one ventral seta and medial pas; lateral pas lacking. Claws II to IV with accessory process.

Remarks

The deutonymphal exuvia and the male with still soft, unhardened integument and wrinkled legs obviously belong to *S. gibberosus*. The species is characterized by a long AD that extends almost to the level of the insertion of leg III, large OC, each with a cornea, a gable-shaped area on the AE that lacks the pits covering the remainder of the plate, a fusion of the ventral plates in males (AE and PE fused with GA but AE and PE separate), the two pairs of outlying setae close to the ring of pgs, a short, slender P-2 with a ventral seta but no apophysis, a cubical tectum with protuberances, the very short telofemora and tibiae, the unusually short but wide spine on tibia I, and the presence of two ventral setae on tarsi III and IV but absence of a pair of pas.

Simognathus gibberosus and the above mentioned *S. cruciferus* are at a first glance strikingly similar, distinguishing characters are: the ornamentation of the AE (smooth integument in a gable-shaped vs cross-shaped area) and the shape of the P-2 (without vs with ventral protuberans).

Distribution and ecology

Western Australia, Rottneest Island and Esperance. From shallow waters, from algal turf and sediment.

Simognathus uniscutatus Bartsch, 1994

Figure 12H

Simognathus uniscutatus Bartsch, 1994: 145, figures 45–52.

New Material

Australia: Western Australia: 1 male, WAM T 78345, Esperance, Lucky Bay, 33°59'S, 122°13'E, unsorted, medium coarse sediment from about 50 cm water depth, 15 February 2003; 1 female, ZMH, same collecting data.

Supplementary description

Male. Length of idiosoma 404 µm. AE and GA fused. Ventral shield foveate, foveation in area representing the AE extending backward just beyond the level of insertion of leg III; foveation on GA reduced to pair of lateral ovate areas (Figure 12H). GO small; 40 setae in a ring close to GO, two pairs outlying. Genital sclerites with three pairs of short sgs.

Remarks

The female is 335 µm long, the male 404 µm. This is one of the species in which the OC are reduced to narrow sclerites and often obscured by the striated integument, the AE and GA are fused in both females and males, the second palpal segment has two small ventral protuberances, tibia I has a narrow base and then is abruptly widened, its length, as that of the small tarsus, is about twice the height, the tarsus ends with three claws, the slender paired ones and the large median claw.

Four species in the Australian *Simognathus* fauna (cf Otto, 2000a; Bartsch, 2003d) have a rather similar character combination, *S. aspidotus* Otto, 2000, *S. clypeatus* Otto, 2000, *S. tener* Bartsch, 2003 and *S. uniscutatus*. *Simognathus uniscutatus* differs from the first three in the number of the ventral setae on tarsi III and IV; in *S. uniscutatus* there is one ventral seta and a single pas; in the other species one ventral seta and both lateral and medial pas.

Distribution and ecology

Western Australia, Rottneest Island and Esperance. Psammophilous. All present records are from shallow water areas.

BIOGEOGRAPHICAL REMARKS

The non-copidognathines to date recorded from the three Western Australian localities Esperance, Rottneest Island and Dampier are summarized in Table 1 with notes on records from in and outside Australia. The data are based on three week stays in each area. The species mentioned by Lohmann (1909) from Geraldton and Shark Bay are not included in the list because of their unverified identity.

More than 40 halacarid species have been collected in shallow water marine habitats of Esperance Bay and surroundings, more than a quarter belongs to the subfamily Copidognathinae, 30 are non-copidognathines. More than 80 halacarid species are recorded from the warm-temperate Rottneest Island, viz. 52 named and another five undescribed or unidentified non-copidognathines and 30 copidognathines, the latter represented by the genera *Copidognathus* (28 named species), *Phacacarus* (one species) and *Werthella* (one species). The tropical Dampier fauna is known to include 28 species, 25 non-copidognathines and three *Copidognathus* species. From other regions of Australia, from the the south-eastern and eastern coast, from Victoria, New South Wales and Queensland, slightly more than 100 species are recorded, but this number is incomplete, as that from the tropical Western Australia, as a large part of the halacarid fauna is still undescribed.

The number of non-copidognathines from Esperance is somewhat more than half that

collected around Rottnest Island. About half of the number of species from Esperance, 16 species or 53%, are shared with the fauna of Rottnest Island, three species, or 10%, are shared with the faunas of Victoria and/or New South Wales. The latter number is much to low as the knowledge of the faunas of those areas is restricted to scattered records of Lohmann (1893), Otto (1993, 1994) and Bartsch and Gwyther (2004). In some of the wide-spread species, individuals from different regions showed small discrepancies in their external morphology, but these assumedly are no evidence for presence of cryptic species. None of the halacarid genera present in the fauna of Esperance is endemic to Australia, all are distributed worldwide. At the species level, 11, more than one-third of the non-copidognathines, are currently not known from outside the Esperance Bay. The number is not evidence for a high halacarid endemicity in this part of Australia, because most of these species are expected to be found outside the south-western coast of Australia once more parts of the Australian coastline are studied thoroughly. Halacarid mites are exclusively benthic, resting or planktonic stages are not known, the fecundity is low, hence they are poor dispersers and slow colonizers (Bartsch, 2004b). Esperance receives water masses from both the western (Leeuwin Current) and eastern (Flinders Current) edge of Australia (Middleton and Cirano, 2002; Cirano and Middleton, 2004), and faunal input of passively transported mites should be possible from both directions. In contrast to the halacarid fauna of southern Australia that of benthic peracarid crustaceans (Tanaidacea, Isopoda) includes genera not known from outside southern Australia. Of the 21 genera and 26 species of tanaidaceans (Crustacea: Peracarida: Tanaidacea) of Esperance, two genera and 24 species proved to be new to science (Bamber, 2005). Amongst the anthurideans (Crustacea: Peracarida: Isopoda: Anthuridea) two out of 57 genera are known only from southern Australia (Poore, 2001).

Compared with the halacarid fauna of Rottnest Island, that of Esperance is sparse. A reason may be the hydrology and geomorphology of the coast-line. Unpredictable disturbance due to extreme swell and wave action may seriously affect or destroy halacarid populations and the large and fine-grained high-energy beaches and swell-exposed almost bare granite rocks (Sanderson *et al.*, 2000; Short, 2006) offer only few habitats for a permanent or temporary colonization and hence stepping stones to isolated or defaunated areas.

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