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ARHODEOPORUS (ACARI: HALACARIDAE) FROM ROTTNEST ISLAND, DESCRIPTION OF THREE NEW SPECIES

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SUMMARY: The three species Arhodeoporus leptopus n. sp., A. wadjemupis n. sp. and A. disparilis n. sp. are described. They belong to different natural species groups: A. leptopus is a member of the eclogarius group, while A. wadjemupis and A. disparilis belong to the closely related bucculentus and bonairensis groups, respectively.

INTRODUCTION

The genus Arhodeoporus is known from all oceans, but at present only one species, A. psammophilus Bartsch, is recorded from the Australian coast of the Indian Ocean, from intertidal and shallow subtidal sandy deposits (BARTSCH, 1993). Another three western Australian species were found in subtidal substrata rich in interstitia. The three species, new to science, belong to species groups which are recorded from tropical and warm waters of the Indian, Atlantic and Pacific Oceans.

MATERIAL AND METHODS

In January 1991 the halacarid fauna of shores and shallows of Rottnest Island, Western Australia, was surveyed. Halacarid mites were extracted from various substrata, cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared using a camera lucida. Holotypes and paratypes are deposited in the Western Australian Museum (WAM) and in the author's halacarid collection.

Abbreviations used in the descriptions: AD, anterior dorsal plate; AE, anterior epimeral plate; ds, dorsal setae of idiosoma, ds-1, first pair of dorsal

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Genus *Arhodeoporus* Newell, 1947

**Diagnosis:** Dorsum with *AD*, *OC*, *PD*, and five pairs of dorsal setae. Gland pores often enlarged. Adanal setae on anal cone. *AE* with epimeral pores. Female *GA* with three pairs of perigenital setae and one to two pairs of subgenital setae. Male *GA* with 5-20 pairs of *pgs* and four to five pairs of *sgs*. Basal pair of maxillary setae inserted either on gnathosomal base or near basis of rostrum, apical pair of maxillary setae on rostrum. Palps attached laterally to gnathosomal base. *P-2* with one seta; *P-3* lacks setae; *P-4* with three setae in basal whorl. Legs slender. Tibia I with two pairs of ventral setae. Tibiae II with two ventromedial bipectinate bristles and one or two smooth ventral setae. Tibiae III and IV each with two ventral setae. Tarsi I-IV with 3, 3, 3-4, 3 dorsal setae and 3, 0-1, 0-1, 0-1 ventral setae. Solenidion on tarsus I in dorsolateral, that on tarsus II in dorsomedial position. One larval and two nymphal stages during ontogenetic development.

*Arhodeoporus leptopus* n. sp.

(Figs 1-12)

**Material examined:** Holotype female (WAM), off Rottnest Island, Roe Reef, amongst algae, sponges and corals from 30 m depth, 10 January 1991.

**Description:** Female. Idiosoma 290 μm long. Dorsal plates with reticulate sculpturing. Pores of glands on raised cones. *AD* 79 μm long, 80 μm wide; frontal spine lamellar; cones 30 μm long and raised above the plate for 12 μm; gland opens to exterior at tip of cone; small areola immediately posterior to gland pore with porose integument. *OC* 125 μm long, 42 μm wide; posterior portion elongate, tail-like. Both anterior and posterior corneae subdivided; posterior cornea with three lenses. Gland pore present lateral to posterior cornea, pore canaliculus immediately posterior to small porose areola. A second raised porose areola between the two corneae (Fig. 1). *PD* 187 μm long, 110 μm wide. Plate with pair of abruptly raised narrow costae (Fig. 2). Integument within costae smooth apart from small porose areolae on a level with insertion of leg III and immediately anterior to the two pori of the glands (Figure 5). Anterior pair of cones on a level with insertion of leg IV; distal pair of cones near posterior margin of *PD*; cones raised 10-12 μm above *PD*. Pair of *ds-1* medial to anterior pair of cones, *ds-2* in anterior margin of *OC*, *ds-3* within striated integument between *OC* and *PD*, *ds-4* on *PD* near margin of the plate, *ds-5* immediately posterior to pair of cones.

Ventral plates with small porose areolae (Fig. 3), remainder of plates smooth. *AE* 95 μm long, 138 μm wide. Pair of porose areolae on epimera I 5 μm in diameter. Setae *vs-3* inserted close to posterior margin of the plate. *PE* with one dorsal and three ventral setae, and porose areolae anterior to insertions of leg III and leg IV. *GA* 152 μm long, 97 μm wide; its anterior margin truncate. *GO* 50 μm long. Interval between anterior margin of *GA* and *GO* same as 1.4 times length of *GO*. Pair of ovipore porose areolae lateral to *GO*. Ovipositor extending beyond *GO* and beyond anterior pair of *pgs*. Genital sclerites with two pairs of *sgs*.

Gnathosoma 100 μm long, 50 μm wide. On either side of pharyngeal plate an ovate, 35 μm long and 12 μm wide areola with porose and reticulate integument (Fig. 4). Dorsum reticulate. Tectum truncate. Rostrum slender, triangular, 48 μm long, 25 μm wide; tip of rostrum extending beyond *P-2*. Distal pair of maxillary setae inserted at 0.5 relative to length of rostrum. Rostral sulcus extending to this pair of maxillary setae. Rostral setae at tip of rostrum minute. *P-4*, with the slender apical spurs included, as long as *P-2*. Three long setae in basal whorl.

Legs very slender; legs I and IV longer than idiosoma, leg III as long and leg II shorter than idiosoma. Tibiae I-IV 1.1, 1.0, 1.3, and 1.3 times longer than telofemora. Telofemora 4-5 times longer than high. Leg chaetotaxy, from trochanter to tarsus (solenidion excluded): leg I, 1, 2, 5, 4, 8, 10; leg II, 1, 2, 5, 4, 8, 8; leg III, 1, 2, 3, 3, 5, 6; leg IV, 0, 2, 3, 3, 5, 5. Tibia I with
FIGS 1-12: *Arhodeosorus leptopus* n. sp., female

four smooth and slender ventral setae (Fig. 6); tibia II with two bluntly ending biplicate ventromedial and two slender and tapering ventral setae (Fig. 7); ventromedial seta of tibia III biplicate and blunt, ventrolateral seta long, smooth and tapering (Fig. 8); both ventral and ventromedial seta of tibia IV smooth, long and tapering (Fig. 9). Tarsus I with three ventral setae (Fig. 10), succeeding tarsi each with one bristle-like ventral seta. Claw fossa of tarsi I with small lateral membrane with 16 μm long, setal-like solenidion and lamellar famulus (Fig. 11). Solenidion of tarsus II dorsomedial in position, seta-like, 20 μm long (Fig. 12). All tarsi with three dorsal setae; setae of tarsi I longer and wider than setae of tarsi II - IV. Tarsus I laterally and medially with long, doubled eupathid pas. Pair of pas on tarsi II doubled, too, but dorsal one of these setae eupathid and ventral one short and solid. Tarsus III with a single eupathid pas medially but none laterally. Tarsus IV with that medial pas inserted almost on a level with pair of dorsal setae.

Claws with long accessory process. Claws II - IV with pecten; tines of pecten small. All tarsi with minute, bidentate median claw; this claw with small dorsal and long and slender ventral tooth.

Remarks: Arhodeoporus leptopus is a member of the eclogarius group, a natural group that includes A. eclogarius (André, 1959), A. mammillifer Newell, 1971, A. mirabilis Bartsch, 1983, and A. mooreus Bartsch, 1992. These species are characterized by their reticulate dorsal plates, the gland pores opening at the tip of raised cones, the posteriorly tail-like ocular plates, the demarcated porose areolae on the ventral plates, the slender legs, the two biplicate ventromedial and two smooth and slender ventrolateral setae on tibia II, the long ventral seta on each tarsi II - IV, and absence of lateral pas on tarsi III and IV. A. leptopus is distinguished from the other species by the narrow longitudinal pair of costae on the PD and the small porose areolae on the AE.

Representatives of this species group live in warm water areas. A. eclogarius was found on sponges in the Gulf of Suez (André, 1959), A. mooreus in a sample with coral blocks collected on the shores of Moorea, Society Islands (Bartsch, 1992b), another similar species extracted from coral blocks was collected on a shore of eastern Malaysia (unpublished record); A. mammillifer is recorded from the southeastern Pacific, from 160-170 m depth (Newell, 1971), and A. mirabilis from the Gulf of Honduras (Bartsch, 1983).

With their reticulate dorsal plates and the long, slender legs, representatives of the eclogarius group resemble in general facies species of the Copidognathus tricorneatus group. C. longipes Bartsch, 1973, a member of the tricorneatus group that lives in the northeastern Atlantic (Bartsch, 1973a), demonstrates a striking similarity to members of the Arhodeoporus eclogarius group. Tarsi III and IV of C. longipes each bear—uniquely within the genus Copidognathus—a conspicuously long ventral seta and apically a small medial pas. The long ventral seta is thought to represent the lateral parambulacral seta, which is enlarged and has moved to ventral position (Bartsch, 1991).

**Arhodeoporus disparilis** n. sp.  
(Figs 13-22)

**Material examined:** Holotype male (WAM), Rottnest Island, Nancy Cove, 3-4 cm high corallines, lower tidal area, 20 January 1991.

**Description:** Male. Idiosoma 200 μm long. Dorsal plates with raised costae, remainder of plate reticulate; reticulation with a mesh size of about 2 μm. Porose foveae within costae with canaliculi which are remnants of rosette pores (Fig. 15). AD 78 μm long, 48 μm wide, anterior margin faintly rounded. Crest-like costae in form of an inverted wine-glass (Fig. 13), small porose areolae (foveae) as figured. First pair of gland pores immediately anterior to pair of porose areolae, i.e. somewhat anterior to level with insertion of leg II. OC 72 μm long, 24 μm wide; with two corneae, and a small porose areola between; gland pore lateral to posterior cornea. Major parts of OC rather uniformly reticulate. PD 118 μm long, 80 μm wide. Pair of longitudinal medial costae narrowed in posterior third of PD; costae 0-1 rosette pores wide. Lateral costae lacking. Dorsal setae small; ds-1 in middle of AD and level with first pair of gland pores; ds-2 in anterior OC; ds-3, ds-4 and ds-5 adjacent to costae of PD, ds-3 near anterior margin of PD, ds-4 posterior to level with insertion of leg III, ds-5 posterior to that of leg IV.
FIGS 13-22: Arhodeoporus disparilis n. sp., male


AE and GA fused, PE separate (Fig. 14). Ventral shield 186 μm long. Area correspondent to AE 98 μm wide, anterior portion of AE prolonged; together with cervical epimera and AD forming an about 15 μm long collar. Integument of collar-like part and of that of marginal portions of ventral plates slightly reticulate; pair of marginal porose areolae anterior to insertion of leg I and anterior to legs III and IV; a small pair lateral to vs-3 and within posterolateral portion of genital plate; remainder of plate smooth. Area representing the AE with three pairs of slender setae. Epimeral pores small. PE with one dorsal and
three ventral setae. Area correspondent to GA 77 μm wide. GO 30 μm long, 30 μm wide. Spermatopositor twice length of GO and extending beyond GO for more than length of GO. Eight pairs of perigenital setae, five to six of them anterolateral to GO, two to three pairs distolateral to GO. Narrow genital sclerites with five pairs of subgenital setae.

Gnathosoma 52 μm long. Base of gnathosoma reticulate, marginally with pair of 7 μm wide porose areola. Rostrum 22 μm long, extending to end of P-2 (Fig. 16). Tectum reticulate, slightly arched. Palps slender, 37 μm long; P-3 5 μm long, P-4 10 μm long (apical spurs included). P-2 with one seta; P-4 with three setae in basal whorl, and a setula and two spurs apically.

Legs shorter than idiosoma. All segments slender; with the tibiae being the longest segment. Number of setae, from trochanter to tarsus (solenidia excluded): leg I, 1, 2, 4, 3, 7, 9; leg II, 1, 2, 3, 6, 5; leg III, 1, 2, 2, 3, 5, 5; leg IV, 0, 2, 2, 3, 5, 5. Four ventral setae of tibia I slender (Fig. 17). Tibia II with a slender ventrolateral and two bipicate ventromedial setae; apicalmost bipicate seta 20 μm long, reaching distinctly beyond mid-line of tarsus II, basal pectinate seta 11 μm long (Fig. 18). Ventromedial seta of tibia III bipicate (Fig. 19), that of tibia IV smooth (Fig. 20). Tarsus I ventrally with two ventral setae (distal seta not paired); dorsally with three setae; solenidion 4 μm long, 1 μm wide; famulus within cap-like membrane; paramulacral setae doubled and eupathid (Fig. 21). Tarsus II lack ventral setae; dorsomedial solenidion 5 μm long, 1 μm wide (Fig. 22). Tarsi III and IV each with three dorsal setae; lateral pas on III-6 seta-like, medial pas slightly wider, bristle-like. Both pas of tarsus IV short and bristle-like.

Paired claws on tip of tarsi slender; accessory process with delicate tines. Median claw minute.

Remarks: Arhodeoporus disparilis is a member of the bonairesis group. Species belonging to this group are A. bonairesis (Vieits, 1936) and A. thyreophorus (Andrè, 1959). The most marked difference between A. disparilis and the two other species is that the ventral shield of A. disparilis does not include the posterior epimeral plates. Other distinguishing characters are, the porose areolae have canaliculi from rosette pores, the costae on PD are narrow, not more than one rosette pore wide, and the porose areolae of the ventral plates are small.

Representatives of the bonairesis group are known from tropical and warm-water areas. A. thyreophorus is recorded from Suez (André, 1959), and A. bonairesis from either side of Central America and the Indian Ocean (Vieits, 1936; Newell, 1947; Bartsch, 1977; Sarma & Chatterjee, 1993); the author's halacarid collection includes specimens closely related to, maybe even conspecific with, A. bonairesis from southern China, the Philippines, and the Hawaiian Islands.

Arhodeoporus wadjemupis n. sp.

(Figs 23-37)

Material examined: Holotype male (WAM), off Rottnest Island, Phillip Rock, coarse, unsorted sediment rich in debris, 8 m depth, 21 January 1991.

Paratype female (WAM) and male (author's collection), collecting data same as for holotype.

Description: Male. Holotype 235 μm long, paratype 209 μm. Dorsal plates delicately pitted except for slightly raised porose areolae in which tubules (ostia plus alveoli from rosette pores) traverse the superficial layers of the integument (Fig. 25). AD (holotype) 77 μm long, 80 μm wide. Median porose areola and pair of oblong areolae each with 30-40 such tubules (Fig. 23). Gland pore in anterolateral angle of pair of porose areolae. OC 55 μm long, 27 μm wide; each plate with two corneae, a median porose areola with 10 tubules, gland pore and pore canaliculus. PD 152 μm long, 102 μm wide. Two pairs of longitudinal costae, lateral costae one to two tubules wide, pair of medial costae one to three, rarely four tubules wide; each tubule about 1 μm wide, 3 μm deep, and in deeper integumental layers surrounded by 0-7 canaliculi. Dorsal setae small, ds-1 on AD in anterior edge of paired porose areolae; ds-2 within striated integument between AD and OC; ds-3, ds-4 and ds-5 on PD immediately lateral to medial costae. Adanal setae lateral to anal cone.

Ventral plates with distinctly delimited porose areolae (Fig. 24), remainder of plates very faintly pitted. Porose areolae with 1 μm wide and 3 μm deep
Figs 23-36: Arhodeoporus wadiemupis n. sp.


Fig. 37: Arhodeoporus bucculentus Bartsch. — Posterior portion of male genital area. (gac, enlarged genital acetabulum). Scale = 50 μm.
tubules. \( AE \) 96 \( \mu \text{m} \) long, 124 \( \mu \text{m} \) wide. Anterior \( AE \) collar-like, extending beyond level with insertion of leg I. \( AE \) with two pairs of porose areolae and three pairs of setae. Epimeral vesicles 8 \( \mu \text{m} \) long, 6 \( \mu \text{m} \) wide, each with a posteromedially directed canal and an inner trifoliate structure which is similar to that often present in epimeral pores. Vesicles opening to exterior via crescentic slit (Fig. 29). \( PE \) with one dorsal and three ventral setae, and two pairs of porose areolae. \( GA \) 117 \( \mu \text{m} \) long, 90 \( \mu \text{m} \) wide; \( GO \) 30 \( \mu \text{m} \) long, 25 \( \mu \text{m} \) wide. Lateral to \( GO \) an elongate porose areola present. Twelve \( pgs \) anterior to \( GO \) and two pairs of \( pgs \) level with posterior margin of \( GO \). Spermatopositor 50 \( \mu \text{m} \) long, 37 \( \mu \text{m} \) wide, extending beyond \( GO \) for slightly less than length of \( GO \). Genital sclerites with two anterior and three posterior pairs of \( sgs \).

Gnathosoma 65 \( \mu \text{m} \) long, 50 \( \mu \text{m} \) wide. Gnathosomal base almost globular, rostrum conical, 23 \( \mu \text{m} \) long, 25 \( \mu \text{m} \) wide. Gnathosomal base ventrally with porose areolae (Figs 26, 28); dorsally integument reticulated and with pair of small crests (Fig. 27). Tectum truncate. Basal pair of maxillary setae inserted on the gnathosomal base, distal pair near end of rostrum. Rostral tip with two pairs of rostral setae. Palps slender, 35 \( \mu \text{m} \) long, 7 \( \mu \text{m} \) wide. \( P-3 \) and \( P-4 \) short, 4 and 9 \( \mu \text{m} \) long. \( P-4 \) with three delicate setae in basal whorl; apically with two spurs and a delicate setula.

Legs slender. Tibia I longer than telofemur I. Leg chaetotaxy, from trochanter to tarsus (solenidion excluded): leg I, 1, 2, 3, 4, 7, 10; leg II, 1, 2, 3, 4, 6, 5; leg III, 1, 2, 3, 5, 5; leg IV, 0, 2, 2, 3, 5, 5. Tibiae I and II (Figs 31, 32) each with two wide, bipectinate ventromedial bristles, tibia III and IV (Figs 33, 34) each with one such bipectinate seta. Ventrolateral setae of tibiae slender, tapering. Tarsus I with three dorsal setae; dorsomedial seta distinctly shorter and more slender than large dorsal and dorsolateral seta (Fig. 35). Enlarged dorsolateral membrane of claw fossa with claviform solenidion and short, bud-shaped famulus. Medial membrane of claw fossa lacking. Doubled parambacular setae as long as paired claws. Three dorsal setae of tarsus II slender; solenidion claviform, dorsomedial in position (Fig. 36). Parambacular setae of tarsus II are short singlets. Tarsi III and IV with three dorsal setae; medial \( pas \) of tarsus III seta-like, lateral \( pas \) spine-like; both \( pas \) of tarsus IV spur-like.

All tarsi with slender paired claws and minute median claw. Accessory process of paired claws with few delicate tines.

**FEMALE.** Idiosomal length 224 \( \mu \text{m} \). Dorsal aspect same as that of male. Genital plate 107 \( \mu \text{m} \) long, 81 \( \mu \text{m} \) wide, slightly more slender than that of male. \( GO \) larger than in male, 40 \( \mu \text{m} \) long, 26 \( \mu \text{m} \) wide. Distance from anterior margin of \( GA \) to that of \( GO \) 1.3 times length of \( GO \). Arrangement of three pairs of genital setae as shown in Fig. 30. One of the genital sclerites with one the other with two subgenital setae. Ovipositor short, in rest hardly extending beyond anterior margin of \( GO \).

**Remarks:** *Arhodeoporus wadjemupis* is very similar to *A. bucculentus* Bartsch, 1977 and *A. labronicus* (Morselli, 1981). *A. wadjemupis* is characterized by the combination of: medial costae of \( PD \) one to two, rarely four tubules wide, and \( AE \) with two pairs of porose areolae. *A. labronicus* has a pair of posterior sclerites between dorsal portion of \( PE \) and \( PD \), the \( PD \) has two pairs of porose areolae. The costae of the \( PD \) of *A. bucculentus* are three to four tubules wide, the \( AE \) has three pairs of porose areolae. *A. labronicus* is recorded from the Mediterranean (Morselli, 1981), *A. bucculentus* from the Galapagos Archipelago (Bartsch, 1977). A female, almost identical with that of Rottnest Island, was present in a sample taken from coarse sediment and coral debris in Kawaihae harbour, Hawaii (unpublished record).

*Arhodeoporus bucculentus*, *A. labronicus* and *A. wadjemupis* belong to a natural species group, the *bucculentus* group; the three species have epimeral vesicles instead of pores; dorsal and ventral plates have delimited porose areolae; the porose areolae include tubules instead of rosette pores; rostrum and palps are short. The *bucculentus* group is closely related to the *bonairensis* group, in both groups the gland pores are not on raised cones; \( PE \) bears a single dorsal seta; the ventral plates have demarcated porose areolae; the legs are shorter than the idiosoma; tibia II bears three ventral setae; and tarsi II, III and IV lack ventral setae. The two groups are separated on the basis of the epimeral vesicles and the setae on tibia I; representatives of the *bucculentus* group have enlar-
ged epimeral vesicles and the setae of tibia I are bipectinate, members of the bonairensis group have small epimeral pores and the setae of tibia I are smooth.

The male of A. bucculentus has a pair of enlarged genital acetabula (Fig. 37); such enlarged acetabula have not been found in the males of A. wadjemupis. Enlarged acetabula are known from some few tidally and subtidally living representatives of the genus Copidognathus, e.g. C. acnemus Bartsch, 1986, and C. mirus Bartsch, 1984, both recorded from the Philippines (BARTSCH, 1984, 1986), C. cephalocanthus Bartsch, 1992, taken in the Hong Kong area (BARTSCH, 1992a), and C. laeviusculus Bartsch, 1993, and C. majorinus Bartsch, 1993, inhabitants of sediments off Rottnest Island, Western Australia (BARTSCH, 1993).

**DISCUSSION**

The genus Arhodeoporus is known from all oceans. Out of the 23 species described, four are recorded from western Australia. Representatives of Arhodeoporus live within microcaverns, in rather coarse sandy deposits, amongst scrub-like algae, colonies of sponges, hydrozoans and bryozoans and within coral blocks. Collections of halacarids have mainly been carried out in coastal waters and thus it is not surprising that the majority of findings of Arhodeoporus are from tidal and subtidal habitats. The deepest record of an Arhodeoporus is that of an undescribed juvenile, extracted from a sample taken at 755-770 m depth (BARTSCH, 1982). Other species known to live in sublittoral waters are A. longirostris Bartsch, found in samples taken in the Mozambique Channel from 26 to 440 m depth (BARTSCH, 1981, 1982), A. brevocularis Bartsch and A. lineatus Bartsch, inhabitants of sediments of the sea-mounts Josephine Bank and Great Meteor Bank, northeastern Atlantic, 206-325 m depth (BARTSCH, 1973b), and A. mammillifer Newell, taken in the southeastern Pacific at 160-170 m depth (NEWELL, 1971). Further investigations will certainly result in records of more species, also from depths beyond 1000 m.

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**REFERENCES**


