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Tardigrades of the Australian Antarctic: description of two new species from Macquarie Island, Subantarctica

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(With 7 figures)

Abstract

Two new species of tardigrades, *Echiniscus darienae* sp. n. and *Ramajendas heatwolei* sp. n., are described from samples collected during the 1977-78 Australian Museum Expedition to Macquarie Island in the Subantarctic.

Introduction

Only a few records exist of tardigrades from Macquarie Island. The 1907-1909 British Antarctic Expedition (Murray 1910) collected on the island and reported *Macrobiotus nodosus* Murray, 1907 and *Macrobiotus* sp.?. Sixty years later, only *Hypsibius (Isohypsibius) augusti* Murray, 1907 was reported by Watson (1967) in a terrestrial arthropod study on the island. The preliminary report of the 1977-1978 Australian Museum Expedition to Macquarie Island listed tardigrades present in 72% of the invertebrate samples (Lowery *et al.* 1978) but identified none. In their book on Macquarie Island, Selkirk *et. al* (1990) mentioned that 40 or more species of tardigrades had been collected, yet only *Pseudobiotus (Isohypsibius) augusti* (Murray, 1907) was named.

Located at 54° 45' S, 158° 40' E, Subantarctic Macquarie Island is in the Southern Ocean about 1300 km south-east of Tasmania, 1450 km north of Antarctica, and just above of the Antarctic Convergence (Selkirk *et al.* 1990). Oceanic in origin, Macquarie Island is a 34 km long by 5.5 km wide emergent portion of the crest of the Macquarie Ridge (Hayes & Talwani 1972). The island is low (400 m above see level) and has neither volcanoes nor glaciers.

This is the first in a series of reports on the tardigrades collected by D. S. Horning while on the 1977-78 Australian Museum Expedition. The field work was carried out by walking treks. The samples were soaked for 24 hours in Baermann funnels, decanted and preserved in absolute ethanol. The unsorted samples were stored in bottles for nearly 20 years before they were processed. The specimens have recently been found and we have started to complete this project.

The measurements given are those of the holotype, unless otherwise indicated. All were taken from specimens mounted in Hoyer's medium. The mouth tube length is measured from the dorso-anterior apophyse up to the proximal end of the tube, excluding pharyngeal apophyses.

Description of species

Echiniscus darienae nov. sp
(Figs 1, 3, 5, 6)

DIAGNOSIS: Medium to large sized, red *Echiniscus* with small, sparsely arranged single pores. Filamentous appendages *A, E,* C_2, tooth-like D_2. Internal claws with unique spurs at claw tips.

HOLOTYPE (Fig. 1): female, 213 µm long, 9 December, 1977. Coll. D. S. Horning, Jr.; deposited at The Australian National Insect Collection, CSIRO Division of Entomology, Canberra, ACT, Australia (ANIC).

TYPE LOCALITY: Subantarctic, Macquarie Island, Scoble Lake, 200 m south. Collected from the lichen *Cladonia fimbriata* on exposed rock outcrop.

PARATYPES: Data same as for holotype; 16 individuals collected at the same locality. Paratypes are also deposited in ANIC and two of them in the Zoological Museum Hamburg (ZMH, Reg. No. A36/95).

DESCRIPTION: Body 125 - 238 µm long, red, no ventral plates. Dorsal plates sculptured with small, sparcely and irregularly distributed pits and pores of diameter 0.5 - 1.25 µm (Fig. 1B, 5). Area between pores smooth. In some specimens pores constitute more or less polygonal-like pattern on terminal plate (Fig. 1C), somehow similar to that in *E. maucci* Ramazzotti, 1956. Under the cuticle surface occurs tiny, dense granulation, with the granules of about 0.2 µm in diameter. External surface of legs I-III with tiny pores. Paired plates I and II with narrow transverse bands without sculpturing. Median plate III poorly marked, with the sculpturing similar in size and shape to that on the remaining plates. Terminal plate with two distinct deep incisions, relatively wide at the bases and marking a kind of faceting by their long curving slits.

The head segment has external cirri (27 µm) slightly longer than internal ones (22 µm), papilla cephalica (= secondary clava: 8 µm long) is located near the external cirrus (Figs 1A, 3). The trunk appendages are represented by lateral appendages *A, E* and dorsal appendages C_2 and D_2. Appendages *A* are thin and relatively short (75 µm), appendages *E* are much thicker, particularly at their base, and long (213 µm). Primary clava is medium sized and 7 µm long. The head and *A* appendages with distinct cirrophores. The dorsal appendages C_2 filamentous and shorter than *A* (62 µm). The appendages D_2 are formed by cuticular folds as small, wide teeth pointed to the center of body. They are often poorly developed and even absent on one side of body in one specimen.

Legs I have distinct spine-like sensory organ, legs IV with a small sensory papilla. Dentate collar on legs IV is composed of 8-9 large teeth. External claws smooth, with relatively wide main part, that being even slightly wider in the internal

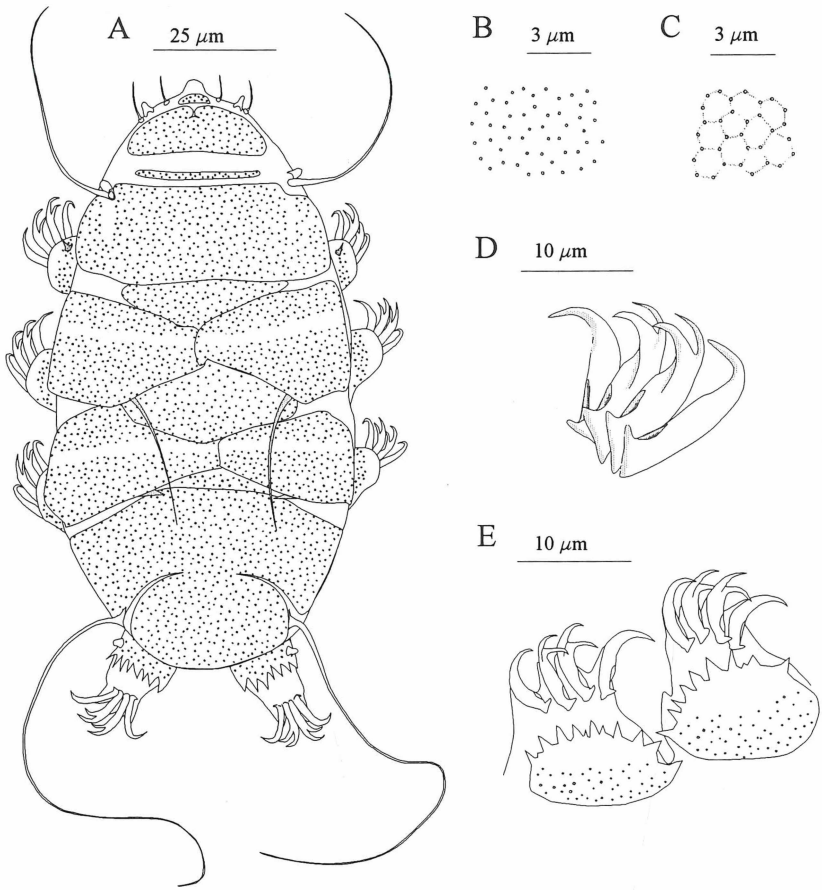

Fig. 1. *Echiniscus darienae* sp. n., holotype: A - dorsal view, B, C - sculpture on cuticle, D - claws of legs II, E - dentate collar and claws of legs IV.

claws. Each internal claw without usual spur located either at the claw base or in the middle of the claw, but with a unique large spur at the claw tip (Figs 1D, E, 6). Spur on claws I-III is lying close to the main claw tip (Fig. 1D), on the claw IV it is standing away from the claw main tip, being distinctly directed upwards (Fig. 1E). The outer claws IV are 19 µm long, the internal ones 18 µm in length.

ETYMOLOGY: We dedicate this species to Darien Horning, wife of Dr. D. S. Horning, recently retired Director of the Macleay Museum.

COMMENTS: The new species can easily be separated from all members of the family Echiniscidae by its unique spurs on the tips of the internal claws. Similar spurs on the claw tips are known also in the marine genera *Mesostigarctides, Coronarctus* and *Tetrakentron* (see Renaud Mornant 1982).

Ramajendas heatwolei nov. sp.
(Figs 2, 4, 7)

DIAGNOSIS: Medium sized *Ramajendas* with distinct dorsal granulation posterior of legs I. Pharynx with large apophyses and two macroplacoids. External claws with long thin primary branch and small accessory spines.

HOLOTYPE (Fig. 1): sex undet. 262 µm long, 6 December 1977, Coll. D. S. Horning; deposited at ANIC, Canberra.

TYPE LOCALITY: Subantarctic, Macquarie Island, north side of Aerial Cove. Collected from the perennial herb *Colobanthus muscoides* (Caryophyllaceae), found in rock crevices in low supralittoral zone, exposed to heavy salt spray, 6 December 1977.

PARATYPES: Data same as for holotype; 8 individuals collected at the same locality. Six specimens deposited at ANIC and two in ZMH (A37/95).

DESCRIPTION: Body, as preserved in ethanol, yellow-whitish and 187 - 275 µm long. Eyes present, composed usually of numerous dark pigmented granules.

The cuticle of anterior 1/4 of the body smooth, the reminder (excluding ventral side) covered with granulation increasing posteriorly (Fig. 2A). The granulation is composed of variable sized and shaped bumps, ranging from 0.5 up to 4.0 µm in rough diameter and up to 2.0 µm in height. The bumps, mostly irregular in shape and often elongated, form no obvious pattern (Fig. 2C). Sculpturing extends down posteriorly to legs IV but not laterally to other legs.

Mouth opening anterio-ventral. Mouth cavity medium sized, without internal sculpturing. Anterior unit of the mouth tube is slightly thickened dorsally, the tube 3 µm wide (external diameter 3.75 µm) and 27.5 µm long. Length of the mouth tube between the dorso-anterior apophyse and stylet supports 17.5 µm, hence the "pt index" = 63.6%. Pharynx spherical or slightly oval (37 x 34 µm), pharyngeal apophyses large (3 µm). Two macroplacoids, microplacoid absent (Fig. 2B). First macroplacoid almost twice as long as second (6.5 and 3.5 µm, respectively), both

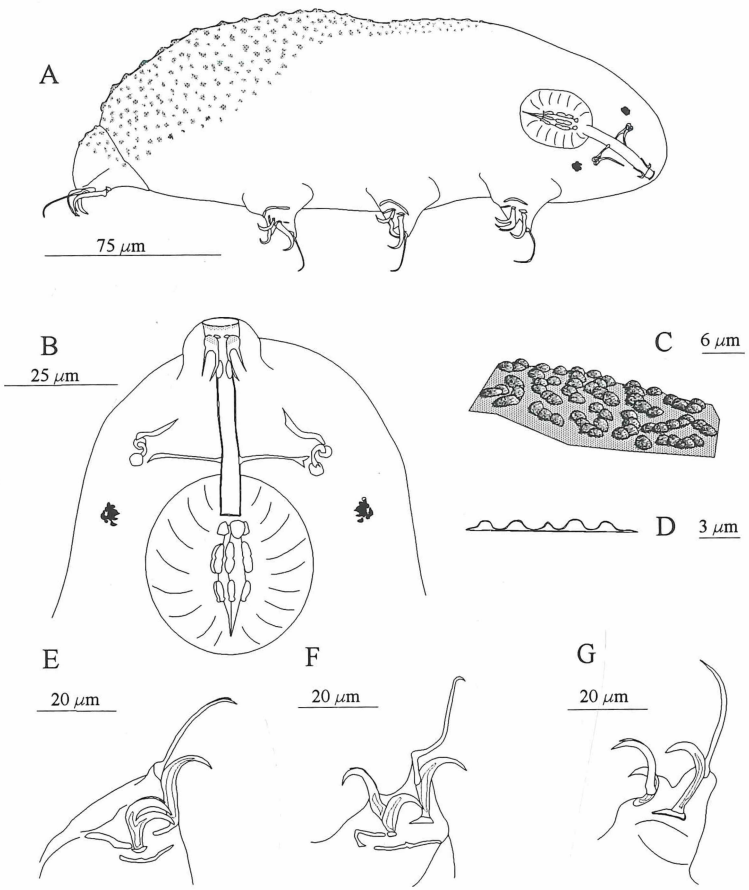

Fig. 2. *Ramajendas heatwolei* sp. n., holotype: A - lateral view, B - buccal apparatus, C - granulation, D - profile of granulation, E - claws of legs II, F - claws of legs III, G - claws of legs IV.

with distinct constrictions. First constricted in its middle, second constricted 1µm from posterior end. Whole buccal apparatus 64 µm long.

Claws are relatively large, increasing in size posteriorly (Fig. 4) and with small accessory spines on primary branches of both internal and external claws. Transversal cuticular bar occurs below both claws I-III (Figs 2A, E, F) and a shorter oblique bar is present from internal claws I-III (Figs 2E, 7). All claws with distinct internal sculpturing. Internal claws stout and with wide branches arising from a narrow base. Accessory spines on main branches of all internal claws small and lying close to main branch. External claws with a long, thin and flexible main branch (Fig. 7), which is provided with small accessory spines. Internal claws I-III with small, smooth lunules, on claws IV lunules are bigger and usually with several irregularly shaped tiny teeth. Lunules on external claws are wider, bigger and asymmerically located towards the claw base, as compared to these on internal claws. The proximal edge of these lunules is uneven in shape, but without teeth. Length of posterior (= primarily external) claws IV, excluding lunulae, is 28.7 µm, its flexible main branch has 17.5 µm in length.

ETYMOLOGY: We dedicate this species to Dr. Harold F. Heatwole (North Carolina State University, U.S.A.), a zoologist, explorer and educator, for his passion for the Antarctic.

COMMENTS: The genus *Ramajendas* has been recently estabilished by Pilato & Binda (1990) for *R. renaudi*, described from marine interstitial in Kerguelen Islands (Ramazzotti 1972) and terrestrial *R. frigidus* Pilato & Binda, 1990 recorded from the Maritime Antarctic (then as *Isohypsibius renaudi*: see Jennings 1976, Dastych 1984, Usher & Dastych 1987), Victoria Land (Pilato & Binda, *op. cit.*) and Wilkes Land at Casey (Miller *et al.*, in press). *Ramajendas* represents a rare genus among the Tardigrada which includes both true marine and terrestrrial forms.

Ramajendas heatwolei sp. n. resembles closely *R. renaudi* due to similar shape of its claws and placoids (particularly the presence of the constricted second macroplacoid) but it can be easily distinguished by its distinct cuticular granulation, absent in the two other members of the genus.

Acknowledgements

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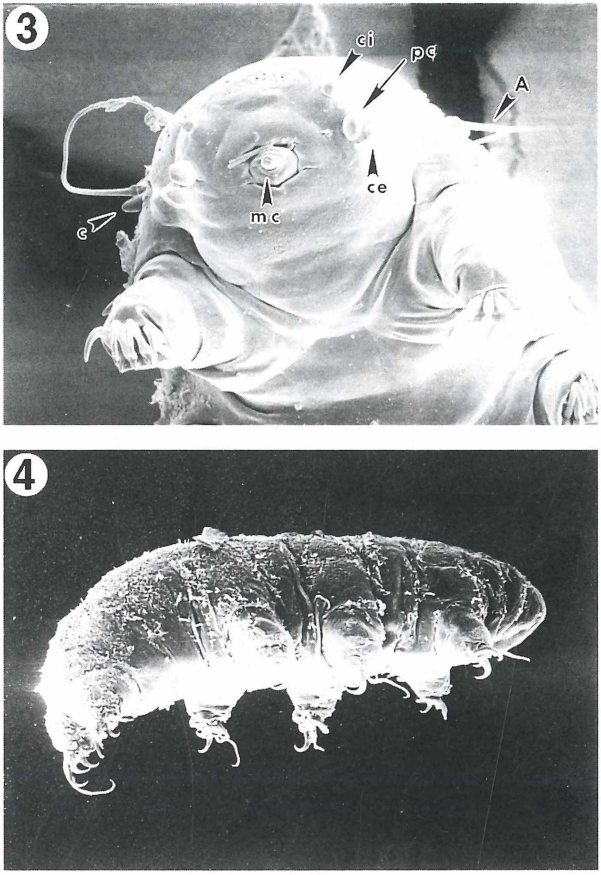
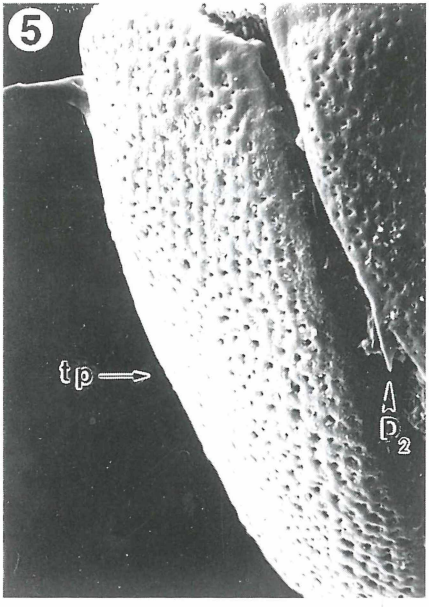
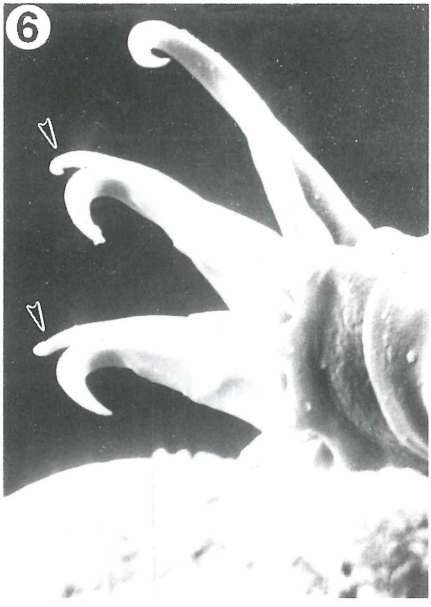
Zusammenfassung

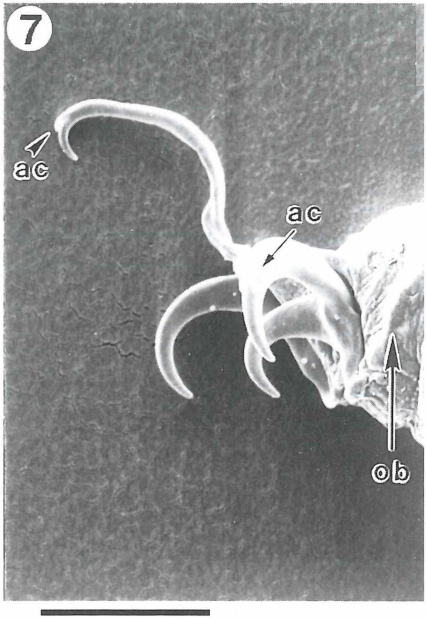
Zwei neue Tardigradenarten, *Echiniscus darienae* sp. n. und *Ramajendas heatwolei* sp. n., werden von der subantarktischen Insel Macquarie beschrieben. Das erste Taxon unterscheidet sich von allen bekannten terrestrischen Heterotardigraden durch das Vorhandensein von eigenartigen Nebenhaken auf der Spitze der Innenkrallen. Für die Eutardigradenart *R. heatwolei* sp. n. ist die kutikulare Skulptur charakteristisch, die die Art von zwei anderen Taxa dieser Gattung leicht unterscheidet.



Figs 3-4. 3 - *Echiniscus darinae* sp. n., frontal view; 4 - *Ramajendas heatwolei* sp. n., lateral view (A - appendage A; C - primary clava, ci - cirrus internus, ce - cirrus externus, mc - mouth cone, pc - papilla cephalica; bars equal 25 and 20 µm, respectively).







Figs 5-7. *Echiniscus darinae* sp. n. (5-6): 5 - sculpture of dorsal plates; 6 - claws of leg III; *Ramajendas heatwolei* sp. n. (7): 7 - claws of leg III [ac - accessory spines, D_2 - dorsal appendage, ob - oblique bar, tp - terminal plate, arrowheads (Fig. 6) - spurs on the claw tips; bars equal 15, 10 and 15 µm, respectively].

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