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AXIOPSIS BRUCEI SP.NOV., A NEW SPONGE-INHABITING AXIID (CRUSTACEA: DECAPODA: THALASSINIDEA), FROM NORTH-WEST AUSTRALIA

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ABSTRACT

A new axiid, *Axiopsis brucei* sp. nov. of the family Axiidae is described and illustrated from specimens obtained from a hexactinellid sponge host, from North-west Australia at 296-456 m depth.

KEYWORDS: Crustacea, Decapoda, Thalassinidea, Axiidae, Axiopsis, new species, hexactinellid sponge, North-west Australia.

INTRODUCTION

In January and February 1984, the R.V. "Soela" (CSIRO) undertook a survey of the benthic fauna of the Australian North-west Shelf. Amongst the material collected were specimens of an axiid that shows similarities to *Axius (Axius) novaezealandiae* Borradaile from New Zealand and *Axius (Eiconaxius) caribbaeus* (Faxon) from the West Indies, but is distinct from them. This animal, which lives as a commensal in a hexactinellid sponge, is defined as a new species of the genus *Axiopsis* Borradaile. This association with a hexactinellid sponge is the first record for a member of the genus *Axiopsis*, though four species of *Eiconaxius s. str.*, viz. *acutifrons* (Bate) and *weberi* (De Man) from Indonesian Waters, *farreae* (Ortmann) from Japan, and *caribbaeus* (Faxon) from the West Indies are known to be commensal in hexactinellid sponges (De Man 1925:10). This new species is the eleventh species of the family Axiidae recorded from Australian Waters (Poore and Griffin 1979).

The following abbreviations are used: AM Australian Museum, Sydney; BM (NH) British Museum (Natural History), London; MP Museum national d'Histoire naturelle, Paris; NTM Northern Territory Museum, Darwin; RML Rijksmuseum van Natuurlijke Historie, Leiden; USNM U.S. National Museum, Washington, D.C.; ZLKU Zoological Laboratory, Kyushu University, Fukuoka, Japan. E epipod; TL total body length.

SYSTEMATICS

Genus *Axiopsis* Borradaile

Axiopsis Borradaile, 1903: 538 (type species *A. serratifrons* A. Milne-Edwards, 1837, designated by De Man 1925:72).

Definition. Suture on uropod exopod. Antennal acicle of segment 3 large or medium in size. Maxilliped 2 with podobranch, but without arthrobranch. Pereiopod 4 without podobranch. No pleurobranchs. Pleopods 2-5 similar.

Discussion. Confusion exists over the precise definition of the genus *Axiopsis* (Miyake and Sakai 1967; Boesch and Smalley 1972; Saint-Laurent 1972; Williams 1974; Poore and Griffin 1979; Kensley and Gore 1981). However, a provisional definition of *Axiopsis sensu* Borradaile is given above for description of the present new species.

In the family Axiidae four genera, *Axiopsis, Calocaris* Bell, *Calastacus* Faxon and *Oxyrhynchaxius* Parisi are defined by the presence of a suture on the uropod exopod.

Axiopsis differs from *Calocaris* and *Calastacus* in the arrangement of its gill-formula (see Kensley and Gore 1981). In the type species of *Axiopsis, A. serratifrons*, the 2nd maxilliped bears an epipod with a podobranch, but no arthrobranch (Kensley 1981), while in the type species of *Calocaris, C. macandreae* Bell, the 2nd maxilliped has an epipod with a podobranch and an arthrobranch (Saint-Laurent 1972), and in the type species of *Calastacus, C. stilirostris* Faxon, the 2nd maxilliped has only an epipod with-

out a podobranch and no arthrobranch (Faxon 1893). The genus *Oxyrhynchaxius,* represented by the type species, *O. japonica* Parisi, is different from *Axiopsis*. That is, the specimens (ZLKU 7367-8, 8237) from Kii, Japan, show almost the same gill-formula as that of *Calocaris* except that there is a rudimentary arthrobranch on the 5th pereiopod.

The genus *Axiopsis* is defined by characters including the absence of a keel on the carapace behind the cervical groove. However since Boesch and Smalley (1972) considered that "the presence or absence of a middorsal keel is not a character at the generic level", this feature is considered not to be available as a defining character. De Man (1925) considered *Axiopsis habereri* (Balss), as an exceptional species of the present genus, though it bears a middorsal carina throughout the cardiac region. However, the present new species is not always defined by this generic character of *Axiopsis,* because a middorsal carina was present on only the anterior half of the cardiac region of even the smallest specimen examined, TL 38mm.

It seems that the status of the first pleopod of males and females has some importance at the generic level. However this character is also not associated with the present axiid taxon as summarized for the Australian axiid species described by Poore and Griffin (1979): in *Axiopsis (Paraxiopsis) appendiculis* Poore and Griffin, *Axiopsis (Axiopsis) australiensis* De Man, *Axiopsis (Axiopsis) werribee* Poore and Griffin, and *Axius (Neaxius) glyptocerus* von Martens the first pleopod of males is absent; in *Axiopsis (Paraxiopsis) brocki* (De Man) and *Axiopsis (Axiopsis) consobrina* De Man the first pleopod is a single small ovate segment; in *Axius (Neaxius) waroona* Poore and Griffin, *Axius (Neaxius) plectrorhynchus* Strahl, and *Scytoleptus serripes* Gerstaecker it is a single narrow curved segment; while in *A. brucei* the first pleopod is two-segmented, the distal segment being spatulate. On the other hand, in *Axiopsis (Paraxiopsis) appendiculis, Axiopsis (Axiopsis) australiensis, Axiopsis (Paraxiopsis) brocki, Axius (Neaxius) waroona, Axius (Neaxius) plectrorhynchus, Scytoleptus serripes,* and the present species, *Axiopsis brucei*, the first pleopod of females is two-segmented, the distal segment being a multiarticulate flagellum; in *Axiopsis (Axiopsis) consobrina* and *Axius (Neaxius) glyptocerus*, it is two-segmented, the distal segment being lanceolate; and in *Axiopsis (Axiopsis) werribee* it is two-segmented, the distal segment being medially lobed.

Axiopsis brucei sp. nov.

(Figs 1-6)

Type material. HOLOTYPE - ♂, NTM Cr. 000610A, TL 77 mm, RV "Soela", Station NWS-43, T/18, 18°43.7′S 117°02.2′E, trawl, 454 m, 31 January 1984, A.J. Bruce. ALLOTYPE - ♀, NTM Cr. 00610B, TL 83 mm, data as for holotype. PARATYPES - 1 ovig. ♀, NTM Cr. 000605, TL 71 mm, 3 ♀, TL 56 mm, 65 mm, 77 mm, RV "Soela", Station NWS-29, T/3, 17°55.5′S 118°19.5′E, trawl, 450-454 m, 27 January 1984, A.J. Bruce; 1 ovig. ♀, NTM Cr. 000606, TL 72 mm, RV "Soela", Station NWS-30, T/4, 17°59.7′S 118°19.0′E, trawl, 400 m, 27 January 1984, A.J. Bruce; 1 ♂, NTM Cr. 000607, TL 74 mm, RV "Soela", Station NWS-31, T/5, 18°00.8′S 118°17.0′E trawl, 296-412 m, 28 January 1984, A.J. Bruce; 1 ♂, NTM Cr. 000608, TL 86 mm, RV "Soela", Station NWS-32, T/6, 18°03.8′S 118°14.0′E, trawl, 402-408 m, 28 January 1984, A.J. Bruce; 1 ♂, AM P.34217, TL 51 mm, 1 ♂, BM (NH) 1986:300, TL 68 mm, 1 ovig. ♀, MP TL. 897, TL 67 mm, 1 ♀, RML D. 36516, TL 63 mm, 1 ♀, USNM 228682, TL 76 mm, RV "Soela", Station NWS-38, T/12, 18°52.5′S 116°11.1′E, trawl, 455-456 m, 30 January 1984, A.J. Bruce; 1 ♀, NTM Cr. 000611, TL 38 mm, RV "Soela", Station NWS-64, T/45, 16°24.0′S 120°20.4′E, trawl, 452-456 m, 5 February 1984, A.J. Bruce.

Diagnosis. Rostrum elongate triangular, dorsal surface concave, margins serrated with 8-10 spines. Gastric region gradually decending to base of rostrum; five carinae with rows of prominent horny spines. Cardiac region with median carina on anterior half. Scaphocerite long. Pereiopod 1 chelate, unequal and robust; chela thick, tuberculate on both surfaces, and crenulate on margin, dactylus high, sickle-shaped. Pleopod 1 of males two-segmented, distal segment being spatulate; that of females also two-segmented, distal being multiarticulate flagellum. Uropod exopod with transverse suture in outer half. Living in hexactinellid sponges.

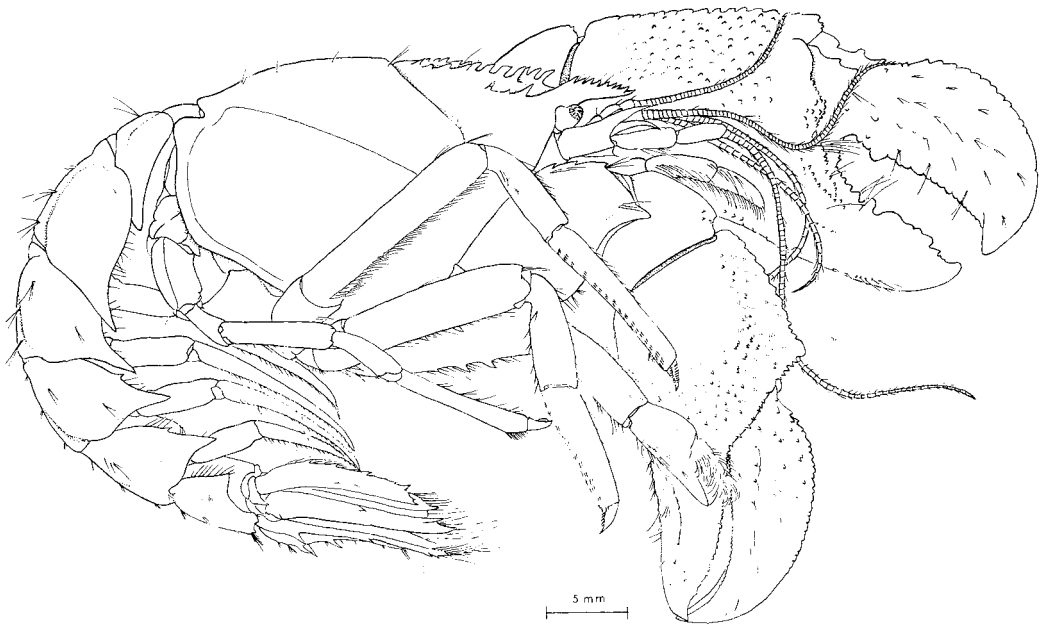

Fig. 1. *Axiopsis brucei* holotype Total body length 77 mm

Description. Rostrum (Figs 2A, 2B) elongate, triangular, almost twice as long as broad at base; dorsal surface largely concave, with median carina extending forwards halfway; tip acute, upturned, lateral margins with close-set series of eight to ten spines. Gastric region with five longitudinal carinae; median carina gradually descending to base of rostrum, with four prominent horny spines on anterior half, posterior spine posteriorly bearing small spine, with median tubercle, and with four sharp spines on posterior half; each submedian carina with seven to eight prominent horny spines, additional medial secondary row of two horny spines posteriorly; each outer lateral carina existing only on anterior half, with two to four horny spines, anterior spine conspicuous but remote from rostral base. Cardiac region with median carina extending backwards from cervical groove for half length. Anterior margin of carapace smooth, oblique ventrally; posterior margin dorsally sinuous with median convexity.

Abdominal somites (Fig. 1) smooth: first somite 2/3 length of second, dorsally with paired tufts of setae; second to fourth somites of sub-equal length along the mid-line, and dorsally with three paired tufts of setae; fifth somite slightly shorter than fourth, dorsally again with three tufts of setae but with an extra pair of distinct tufts of setae on posterior margin; sixth somite slightly shorter than fifth, with pair of oblique depressions extending posteriorly from anterior margin to median pit, dorsally with two paired tufts of setae on anterior half, and another pair of distinct tufts of setae on posterior margin, each with a small tooth on either side of its base.

First to fifth pleura distinctly pronounced on surface and extending posteroventrally into sharp narrow teeth; sixth pleuron smooth on surface and extending into a triangular tooth; fore margins of fourth and fifth pleura with a small tooth.

Eyestalk (Fig. 2A) subglobose, one third length of rostrum; cornea faintly pigmented, brown in alcohol. Antennular peduncle three-segmented, extending slightly beyond rostrum; basal segment clearly overreaching eyestalk; second segment about half length of first and slightly longer than third; flagellum about 3/4 length of carapace excluding rostrum. Antennal peduncle five-segmented; basal segment short and unarmed; second segment dorsally carinate, distally ending in a narrow acicle; scaphocerite slender, incurved, extending beyond acicle of second segment but shorter than fourth segment; third segment compressed, ventrally carinate, terminating in a triangular acicle.

Mandibular palp (Figs 3A, 3B) three-segmented, two proximal segments of subequal length, terminal segment sickle-shaped and about twice as long as second segment, bearing setae on anterior margin; cutting edge irregularly denticulated. Maxillule (Fig. 3C) bilobed; lower endite short and broad, and upper endite longer and more slender; palp two-segmented, ultimate half directed backwards ending in two slender spines. Maxilla (Fig. 3D) well developed; upper and lower endites bilobed, heavily armed with numerous setae; palp slender, distally directed mesially, ending in about ten long setae; scaphognathite well developed, posterior lobe bearing elongate seta with setules.

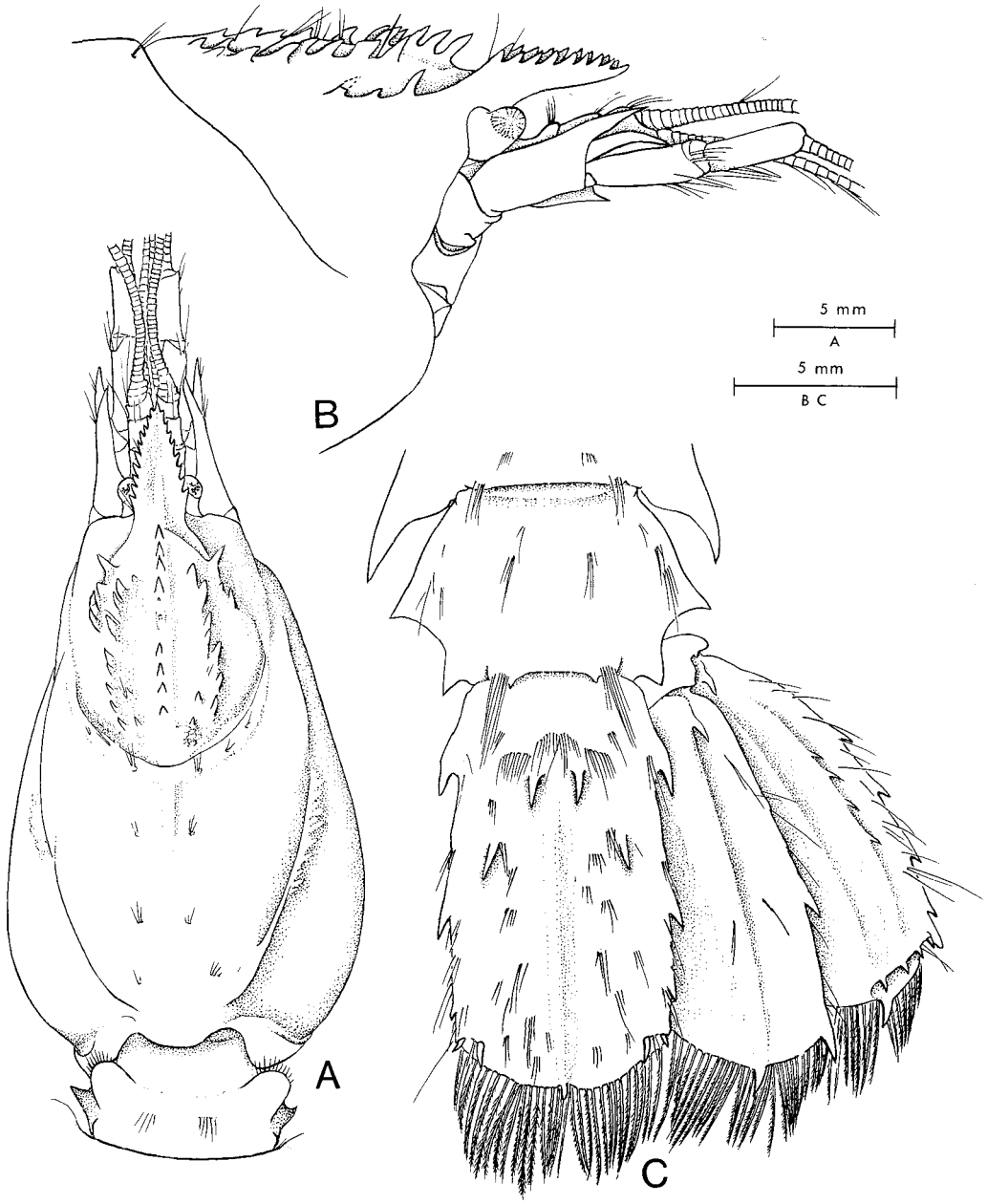

Fig. 2. *Axiopsis brucei* holotype: **A**, carapace and antennae, dorsal aspect; **B**, anterior carapace and antennae, lateral aspect; **C**, sixth abdominal segment and tail-fan, dorsal aspect.

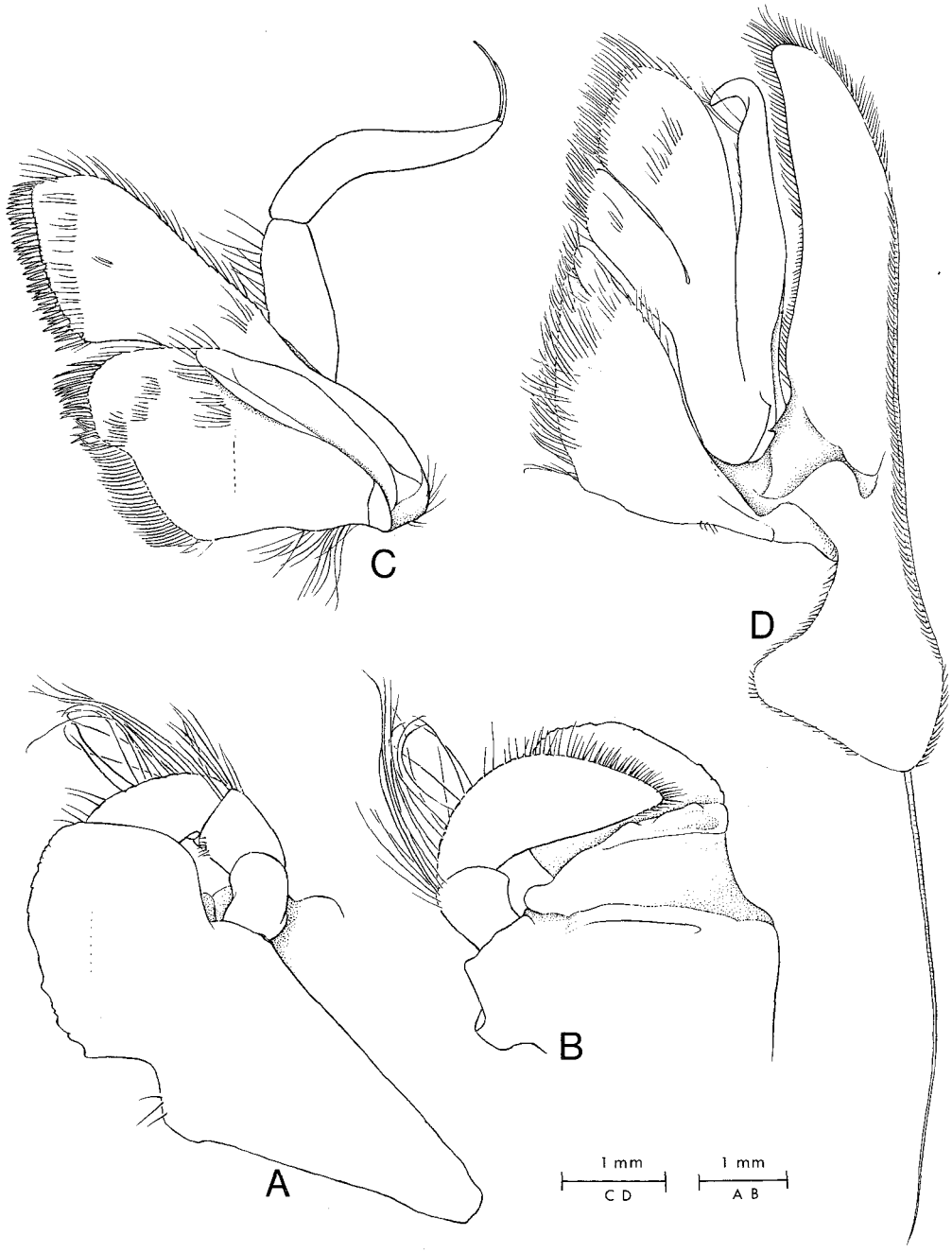

Fig. 3. *Axiopsis brucei* paratype, NTM Cr. 000605: **A**, mandible, outer aspect; **B**, same, inner aspect; **C**, maxillule, outer aspect; **D**, maxilla, inner aspect

First maxilliped (Figs 4A, 4B) with large deflected epipod; exopod elongate, distally armed with segmented slender process tipped with plumose setae; palp two-segmented; endites of coxa and basis separated by notch. Second maxilliped (Fig. 5A) with leaf-like epipod bearing podobranch; exopod elongate, fringed with marginal setae, and endopod setose. Third maxilliped (Fig. 5B) with leaf-like epipod, with podobranch, and pair of arthrobranchs; endopod pediform, coxa mesiodistally with large

tooth, basis unarmed, ischium bearing high serrated crest (Fig. 5C) on interior mesial margin widely separated by broad concavity from exterior mesial margin, largely extending beyond distal joint at tip; merus about as long as ischium, with large and small spine along inner margin; carpus with small spine at inner distal angle; propodus about as long as merus and slightly longer than dactylus.

First pereiopod large, chelate and asymmetrical.

In larger cheliped (Fig. 6A), coxa mesially forming rounded lower lobe with spine and setae on posterodistal margin. Basis small and unarmed. Ischium with small subdistal and distinct distal spines on ventral margin. Merus about 1.6 times as long as broad; dorsal margin carinate, subdistally deflected; ventral margin setose and with row of roughly interspersed spinules, distal spinule sharp, lying subdistally. Carpus inflated, about half meral length, and about 1.8 times as high as long, dorsal margin with smooth crest, ventral margin with subdistal denticle plus some small denticles; outer surface with some tubercles around dorsodistal part. Palm about 2.5 times carpal length on mid-line, and about 1.2 times as long as broad; outer and inner surfaces provided with numerous rounded tubercles; dorsal margin crenulate with rounded tubercles; lower external margin also crenulate with tubercles extending to tip of fixed finger. Fixed finger thin, outer and inner surfaces with numerous tubercles proximally; cutting edge crenulate with rough tubercles. Dactylus sickle-shaped, slightly shorter than palm, extending slightly beyond fixed finger; outer and inner surfaces flattened, and each with some tufts of setae; dorsal margin incurved, broadened proximally; cutting edge crenulate with rounded tubercles, tubercle in proximal third large.

Smaller cheliped (Fig. 6B) similar in shape to larger one. Merus distally with three inconspicuous denticles on dorsal margin. Carpus and chela slightly shorter and much narrower than larger chela; carpus 1.5 times as high as long, and palm about 1.5 times as long as carpus in mid-line; dactylus more than 1.5 times as long as palm.

Second pereiopod (Fig. 1) chelate, almost reaching distal margin of carpus of first pereiopod, coxa bearing mesial spinule and setae on posterodistal margin; basis small and unarmed; ischium with distroventral spine; merus with three interspaced acute spines plus subterminal spine on ventral margin, and with row of setae thicker on inner ventral margin than on outer; carpus unarmed, many long setae on internal surface; chela about 1.3 timeas as long as carpus, fingers thickly covered with setae on outer surface, each terminated by a transparent tooth, and serrated with fine transparent spinules on cutting edge; dactylus slightly overreaching fixed finger.

Third pereiopod chelate, coxa with a blunt mesial spine and spinule on posterodistal margin; basis and ischium similar to those of second pereiopod; merus with two interspaced spines plus subterminal spine on ventral margin; carpus unarmed; propodus with transverse rows of spinules on outer ventral surface, distal row being located on distal margin; dactylus short, terminated by acute translucent spine, with row of translucent spinules on cutting edge and also medially on outer surface.

Fourth pereiopod simple, coxa bearing a blunt mesial spine on posterodistal margin; merus unarmed on ventral margin, and propodus subterminally with cluster of long setae on interior surface. Fifth pereiopod subchelate, unarmed and more cylindrical than others; propodus terminated by row of transparent spines, and subterminally with cluster of long setae on outer surface; dactylus twisted, cutting edge with row of fine spinules on ventral margin, and with row of six sharp transparent spines on truncate distal margin.

Branchial formula shown in Table 1.

First pleopod of males (Fig. 6C) thin, two-segmented; distal segment about as long as basal segment, spatulate with truncate lobe on proximal half of mesial margin. First pleopod of females thin, two-segmented; distal segment two-thirds length of basal segment, showing multiarticulate flagellum curving backward distally. Second to fifth pleopods of both sexes biramous, each endopod with rod-like appendix interna ending in a cluster of small tubercles. Second pleopod of males with rod-like appendix masculina.

Caudal-fan (Fig. 2C) spinose and setose. Uropod exopod with proximal spine, and with three to four spines plus large distal spine on outer lateral margin; transverse

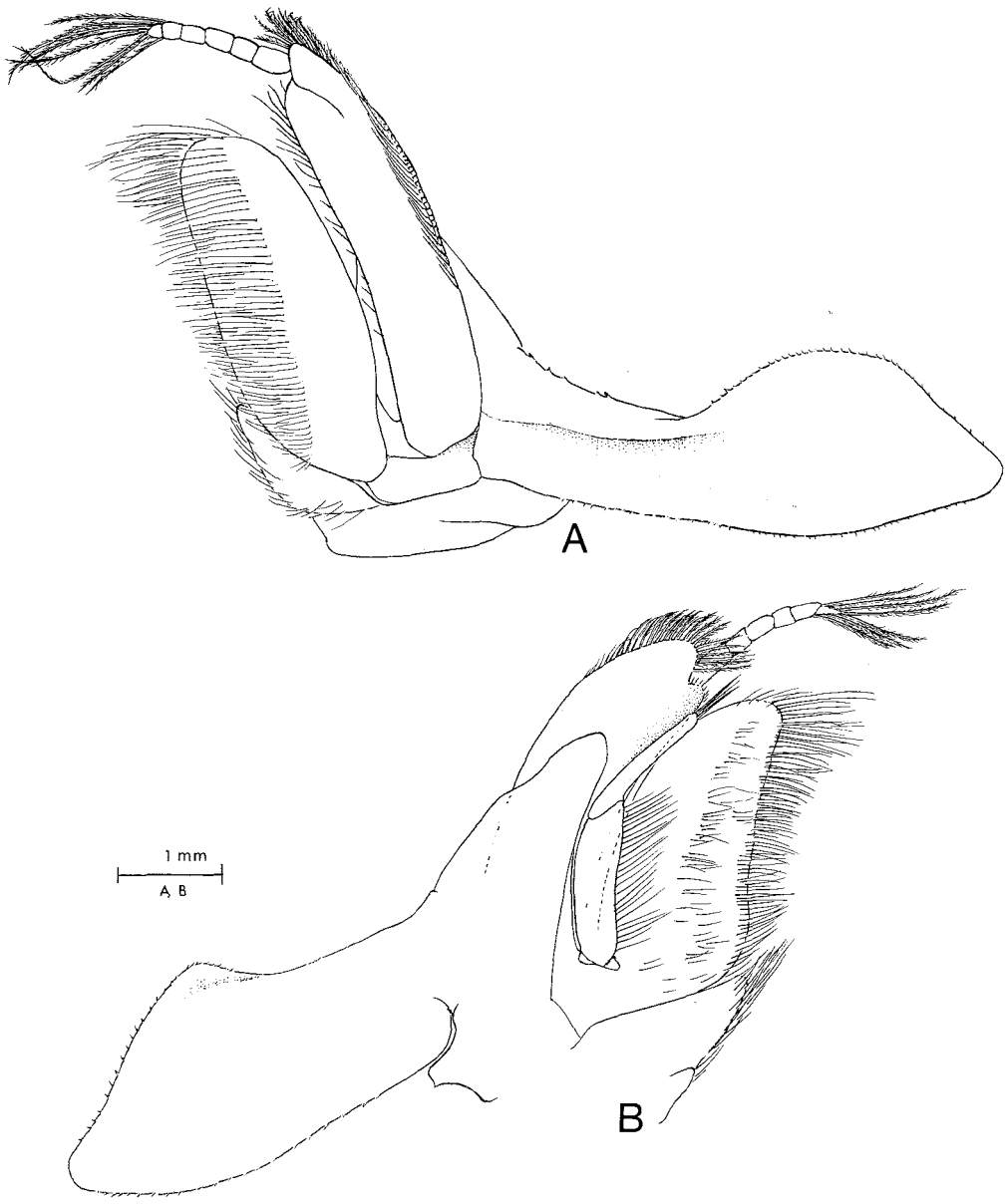

Fig. 4. *Axiopsis brucei* paratype, NTM Cr. 000605: **A**, first maxilliped, outer aspect; **B**, same, inner aspect.

suture defined only in outer half, bearing four interspaced spinules, outer spinule located at base of distal spine on outer margin; distal lobe with acute distal spine; dorsal surface with two rounded longitudinal ridges, outer ridge more distinct than inner, with row of four acute spinules. Uropod endopod with two to three spines on outer margin including outer distal spine; dorsal surface with single median ridge bearing proximal spine and distal marginal spine. Telson rectangular, about 1.8 times as long as broad, more than twice length of sixth somite, extending slightly beyond uropod, each lateral margin with three spines, proximal spine distinct, and with transverse ridge with two acute spinules at posterior angle; distal margin largely convex with median spine; proximal half of dorsal surface bearing two pairs of spines.

Etymology. This species is named after Dr A.J. Bruce of Darwin, Australia, who collected the specimens.

Remarks. The present species is most similar to *Axius (Axius) novaezealandiae* Borradaile, obtained from 70 miles east of North Cape, New Zealand, at 128 m and also from the Tasmanian Sea, 39°52′S 171°01′E, at 732 m (Balss 1933) especially in that each pleuron terminates by a sharp point, and the third to sixth each bear a spine on the fore edge. In the present species, however, the spine on the fore edge of each pleuron is found in both males and females, although it is weak in females, while in *A. novaezealandiae* it is present only in males. Other features also shown only by *A. novaezealandiae* are a flat gastric region with an elongate triangular patch of granules, the chela of the 1st pereiopods without marginal crenulation, the uropod endopod with about half a dozen spines on the median carina, and the uropod exopod without a transverse suture.

Concerning the form of the pleura, *Calocaris (Calastacus) oxypleura* Williams, obtained from the Straits of Florida, west of

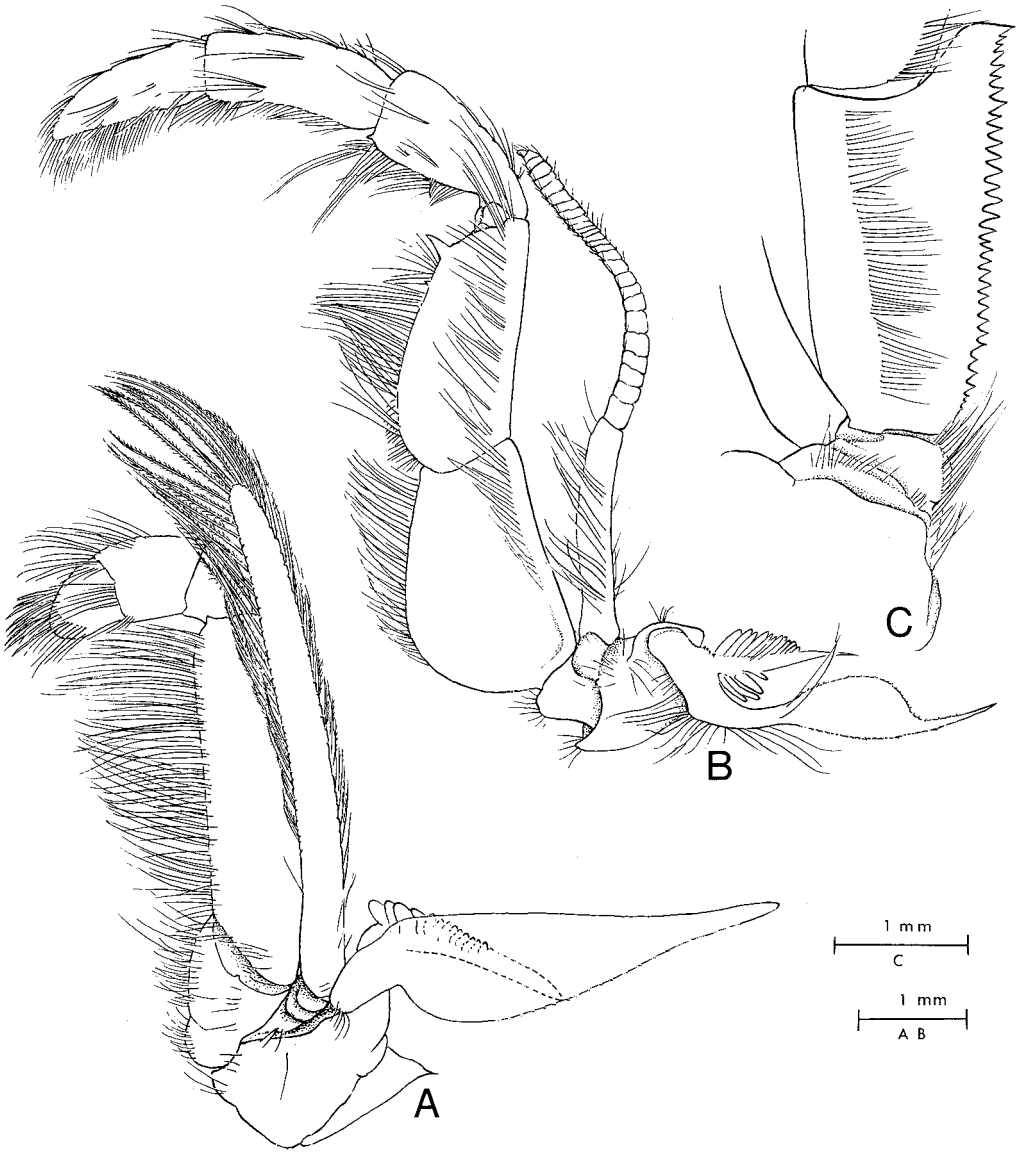

Fig. 5. *Axiopsis brucei* paratype, NTM Cr. 000605; **A**, second maxilliped, outer aspect; **B**, third maxilliped, outer aspect; **C**, ischium of third maxilliped, inner aspect.

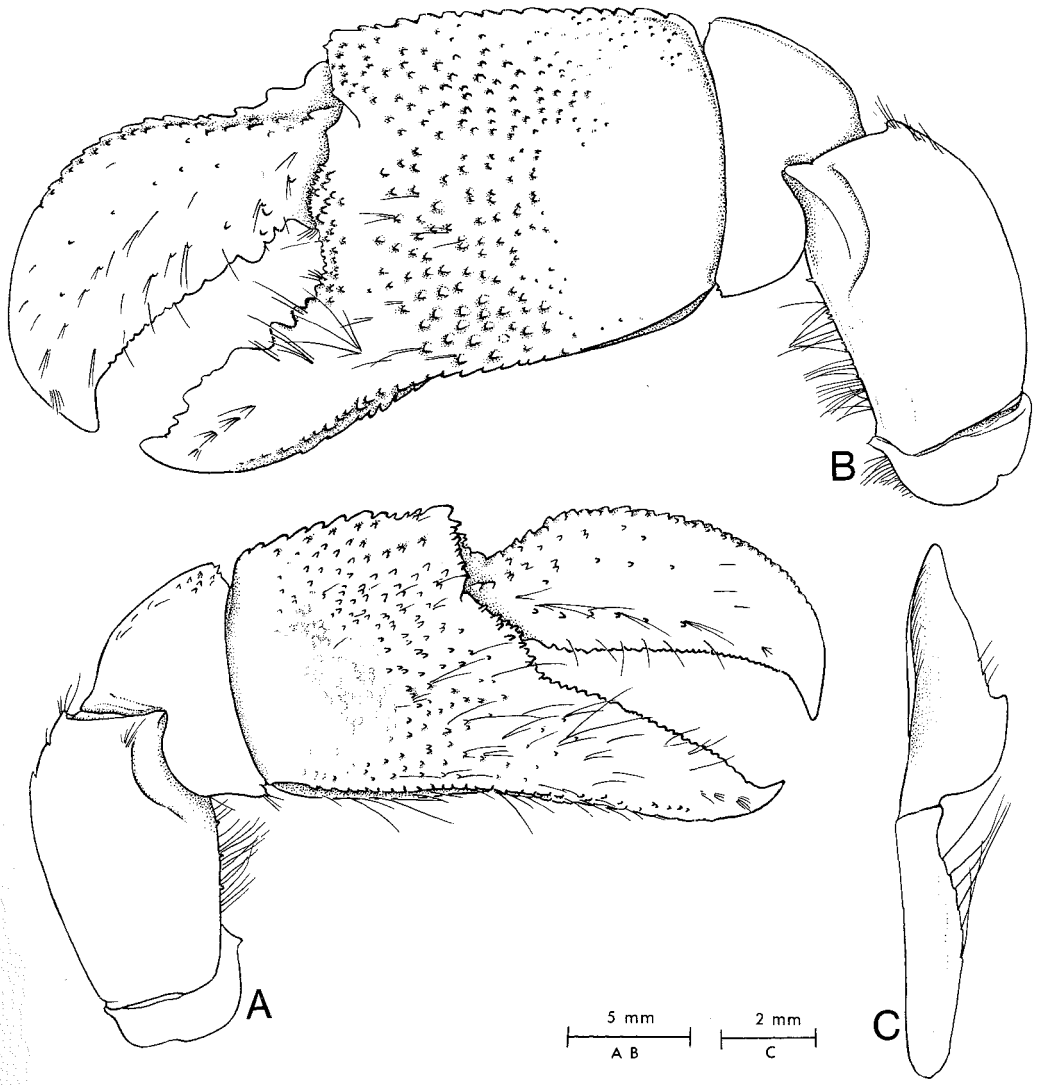

Fig. 6. *Axiopsis brucei* holotype: **A**, larger cheliped, outer aspect; **B**, smaller cheliped, outer aspect; **C**, first pleopod of male, posterior aspect

Table 1. Branchial formula in *Axiopsis brucei*

	Maxillipeds			*Pereiopods*				
	1	*2*	*3*	*1*	*2*	*3*	*4*	*5*
Epipods and podobranchs	E	E+1	E+1	E+1	E+1	E+1	E	-
Arthrobranchs	-	-	2	2	2	2	2	-
Pleurobranchs	-	-	-	-	-	-	-	-

Riding Rocks at 365 m has similar pleura. However, the first to fifth pleura extend less posteroventrally to acuminate tips than in the present species and *A. novaezealandiae*.

The present species is superficially also related to *Axius (Eiconaxius) caribbaeus* (Faxon) from the West Indies, in being commensal with a hexactinellid sponge, and in

the outlines of the 1st pereiopod and the pleura, but it readily distinguishable from the latter by such features as that in *A. (E.) caribbaeus* the rostrum is broadly rounded at the anterior end; the 1st pereiopod has no tubercles on its surfaces; the palm of the 2nd pereiopod is elongated; the pleura have no spine on the fore edge, and the uropod exopod has no transverse suture.

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