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Additions to the mysid fauna (Crustacea: Mysidacea) from coastal waters of Mozambique, with descriptions of two new species

Tris Wooldridge[1] & Jan Mees[2]
[1] *Dept of Zoology, Box 1600, University of Port Elizabeth, South Africa*
[2] *Flanders Marine Institute, Vismijn, Pakhuizen 45-52, B-8400 Oostende, Belgium*
Tel: 41-504-2424. Fax: 41-504-2317. E-mail: zoology@upe.ac.za

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Abstract

Sampling for mysid shrimps in shallow coastal waters of Mozambique provided new distribution records for *Siriella brevicaudata* Paulson, 1875, *Gastrosaccus bispinosa* Wooldridge, 1978, *Gastrosaccus longifissura* Wooldridge, 1978, *Dioptromysis proxima* Nouvel, 1964 and *Anisomysis maris rubri* Băcescu, 1973. *Rhopalophthalmus tropicalis* sp. nov. and *Gastrosaccus mozambicus* sp. nov. are described for the first time. The former species is distinguished from its closest relative *R. terranatalis* O. Tattersall, 1957 by its much smaller size, the lack of serrations on the lateral spines of the telson, the structure and arrangement of the spines on the antennal sympod and the number of subdivisions of the propodus of the thoracic endopod. Adult males of *G. mozambicus* sp. nov. show affinity to G. *bispinosa*, but the two species are separated by the form of the two distal exopod segments on the 3rd pleopod.

Introduction

The mysid fauna from coastal waters (<50 m water depth) of Mozambique is poorly known, with only five species recorded in the literature. *Heteromysis harpax* (Hilgendorf, 1879) is commensal in hermit crabs and is documented from a single specimen (Tattersall, 1962; Müller, 1993). *Mesopodopsis africana* O. Tattersall, 1952 and *Gastrosaccus dunckeri* Zimmer, 1915 are known from the Morrumbene estuary (Tattersall, 1958; Day, 1974), while Ortiz & Wasikete (1992) list *Gastrosaccus psammodytes* O. Tattersall, 1958 from the northern shores of Inhaca Island. More recently, Deprez et al. (2001) described *Idiomysis mozambicus* from Nacala Bay (Fernão Veloso Bay) in Nampula Province in the north.

During recent surveys in Southern and Northern Mozambique, 10 additional species were collected. At least two of these species are undescribed. The collection of a new species of *Rhopalophthalmus* prompted a reappraisal of the genus from the east coast of South Africa, where only one species was previously thought to occur. A list of new distribution records of mysid species collected during the Mozambique surveys is given in Table 1.

Systematics

Rhopalophthalmus tropicalis sp. nov., Figures 1-6.

Material

Holotype (SAM A44970) lodged in the South African Museum, Cape Town. Adult male from Moebase estuary (17° 04′ 43″ S) collected by T. Wooldridge, 10 July 1997. Paratype material (SAM A44971) lodged in the South African Museum, Cape Town. Three adult males and three adult females from the Moebase estuary collected by T. Wooldridge, 10 July 1997. Three adult males from Maputo Bay (26° 59′ 18″ S) collected by T. Wooldridge, 20 June 1992. Additional material lodged with the British Museum of Natural History 2002. 1075–1084.

Table 1. Record of mysid species collected in shallow estuarine and nearshore waters (<20 m water depth) in the Republic of Mozambique. Collections undertaken by the first author in Maputo Bay (26° 59′ 18″ S), Inhaca Island (25° 58′ 20″ S), Moebase estuary (17° 04′ 43″ S), Moebase Beach (17° 04′ 17″ S), Moebase nearshore (17° 04′ 23″ S), Molocue estuary (17° 03′ 11″ S) and Nacala Bay (14° 28′ 54″ S). Sampling with a WP2 plankton net (200 μm mesh) or a small benthic sled

Species	Comments
Siriella brevicaudata	Nacala Bay, 16 October 1997. Collected over low reef and sand, 3 m water depth using a benthic sled, nocturnal sample.
Rhopalophthalmus tropicalis sp. nov.	Maputo Bay, 20 June 1992. General plankton sample collected with a WP2 zooplankton net (200 μm mesh), water depth 5 m. Substrate muddy sand, nocturnal sample. Also present in the Moebase and Molocue estuaries and in adjacent nearshore, collected 9 November 1996 using a benthic sled. Diurnal sample, water depth 2–5 m.
Gastrosaccus bispinosa	Sand-dwelling in the surf and swash-zone of Moebase beach. Collected 9 November 1996 using a benthic sled. Diurnal sample in water depth up to 1.5 m.
Gastrosaccus longifissura	Inhaca Island, Sand-dwelling in the surfzone at North Point beach, 20 June 1992 using a hand-held sieve. Also present in the swash-zone of Moebase beach, 9 November 1996 using a benthic sled. At Moebase, centre of population farther out in the surf zone compared to *G. bispinosa*. Diurnal sample, in water depth up to 1.5 m.
Gastrosaccus mozambicus sp.nov.	Sand-dwelling in the surf and swash-zone of Moebase beach. Collected 9 November 1996 using a benthic sled. Diurnal sample, water depth up to 1.5 m.
Gastrosaccus (?) sp.	A single specimen collected near the tidal inlet of the Molocue Estuary using the benthic sled. Diurnal sample, water depth 1 m.
Dioptromysis proxima	Nacala Bay, 16 October 1997. Collected over low reef and sand, 3 m water depth using a benthic sled, nocturnal sample.
Anisomysis marisrubri	as above.
Mesopodopsis africana	Abundant in the Moebase estuary. Collected 8 October 1997 with the WP2 net and benthic sled. Diurnal samples, water depth 2–3 m.
Idiomysis mozambicus	Nacala Bay, 16 October 1997. Collected over low reef and sand, 3 m water depth using a benthic sled, nocturnal sample.

Description

The morphological characteristics described refer to both sexes, unless otherwise stated. Adult total length, 11.3 – 12.5 mm. Carapace short posteriorly, exposing last three thoracic somites. Anterior margin slightly produced into a short rostrum, the apex bluntly rounded (Fig. 1A). Post-orbital spines prominant, antero-lateral angles pointed. Two small nodules in median line, one immediately behind the cervical sulcus, the other at the posterior margin of the carapace.

First article of antennular peduncle (Fig. 1B) slightly longer than combined length of following two articles; the outer distal margin armed with two or three short plumose setae. Outer margin bearing six or seven short setae set about one-third along length of the article. Dorsal surface with a large depression directly beneath the eye, fringed with 9 long curved setae along outer rim and a similar number of shorter setae along inner edge. Second article short, with plumose setae at both distal angles. Inner margin bears two coiled, non-plumose setae midway along

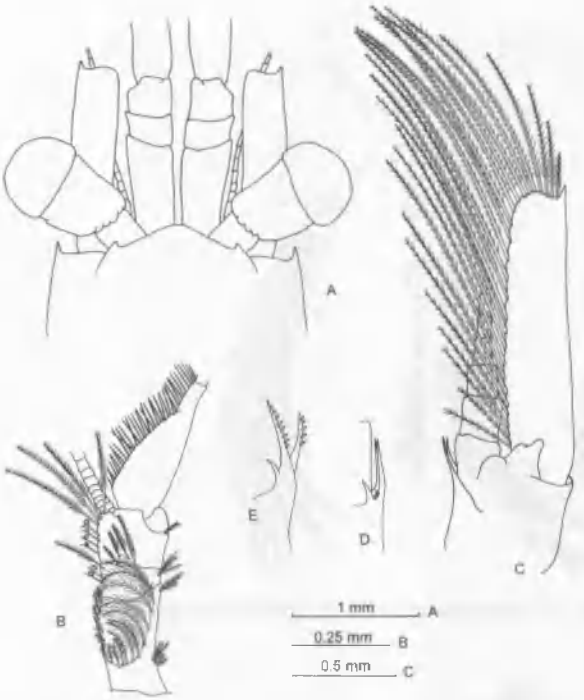

Figure 1. Rhopalophthalmus tropicalis sp. nov. Adult male. (A.) Anterior region of capapace in dorsal view. (B.) Antennule. (C.) Antenna. (D.) Inner distal margin of antennal sympod. *Rhopalophthalmus terranatalis* Adult male. (E.) Inner distal margin of antennal sympod.

Figure 2. Rhopalophthalmus tropicalis sp. nov. Adult male. (A.) Mandible. (B.) Maxillule. (C.) Maxilla. (D.) First thoracic limb.

margin. Third article about as long as broad, with four long plumose setae on inner distal angle and four coiled, nonplumose setae along margin in proximal half. Basal part of outer flagellum hirsute in the male.

Antennal scale (Fig. 1C) extending beyond antennular peduncle, nearly 4.5 times long as broad. Outer margin straight, naked and terminating in a sharp spine extending beyond apex of scale. Internal margin parallel to outer margin almost along entire length, armed with 19–20 long plumose setae. Apex rounded with 6–7 setae. Antennal sympod nearly half the length of scale, armed on the inner margin with two long, strong, equal smooth spines and a shorter more ventral spine (Fig. 1C, D). Three small spines at the base of the ventral spine as illustrated (Fig. 1D).

Mandible (Fig. 2A), maxillule (Fig. 2B) and maxilla (Fig. 2C) typical for the genus.

First thoracic endopod (Fig. 2D) short, with a well-developed inner lobe, articles robust and densely spinose. Endopod of second thoracic limb (Fig. 3A) long and robust, the distal two articles armed with barbed spines; those on the lateral margins distinctly curved as illustrated. Endopod of third to seventh thoracic limbs increase in length posteriorly (Figs 3B and 4A,B), Propodus with three articles in third and fourth limbs, four articles in fifth to seventh pair. Setation as shown. Eighth endopod reduced in both sexes, sexually dimorphic. In the female (Fig. 4C) tapered and slightly shorter than basal plate of exopod, distal end pointed and constricted, without spine. A single seta along midlength of inner margin. In the male (Fig. 5A) the endopod composed of three articles, the terminal article conical with two short spines on inner distal angle. Second article short, bearing a single spine and four or five fine setae that extend beyond the tip of the endopod. First article robust with two distal setae as illustrated.

Female pleopods in the form of simple plates, increasing in size posteriorly. Sympod of first pleopod armed along inner margin with eight plumose setae in the distal half, and three setae on outer margin (Fig. 5B). Two apical plumose setae and three small setae on dorsal margin. Second pleopod bears 15 plumose setae on inner margin (Fig. 5D), five setae on outer margin and two setae at apex. Remaining pleopods similar in form to second pair, with 11 setae along length of article in Pleopod 3, 11 setae along length of article in Pleopod 4 and 14 setae along length of article in Pleopod 5.

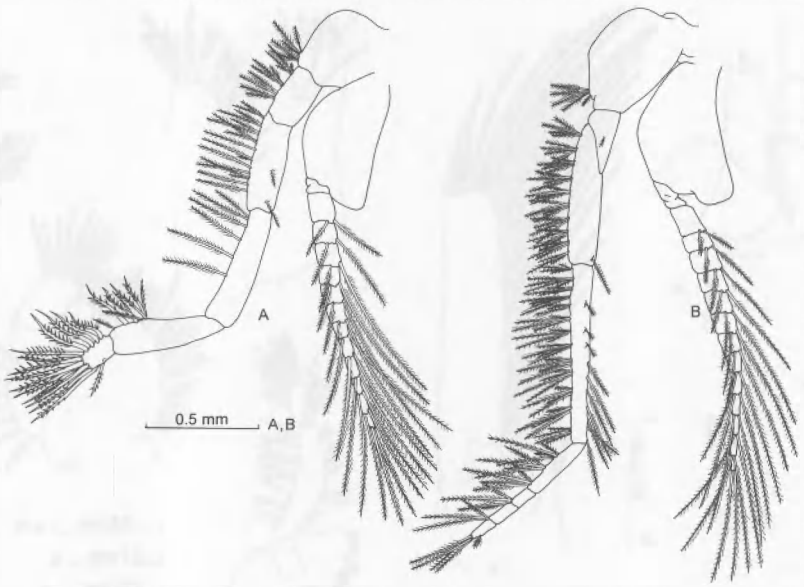

Figure 3. Rhopalophthalmus tropicalis sp. nov. Adult male. (A.) Second thoracic limb. (B.) Third thoracic limb.

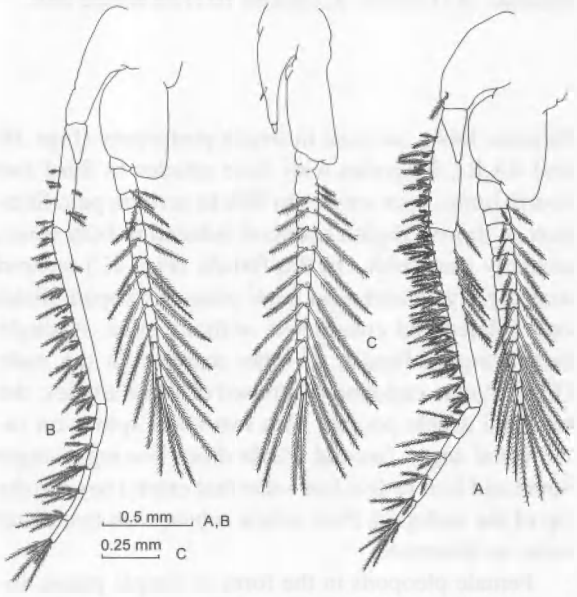

Figure 4. Rhopalophthalmus tropicalis sp. nov. (A.) Fifth thoracic limb of adult male. (B.) Seventh thoracic limb of adult male. (C.) Eighth thoracic limb of adult female.

Male pleopods biramous. Endopod of first pair less than half the length of exopod (Fig. 5C) and reduced to a single article, armed with seven fine, curved plumose setae along inner margin. Exopod with 11 articles. Sympod bearing a row of about 13 short plumose setae along dorsal margin and five plumose setae on

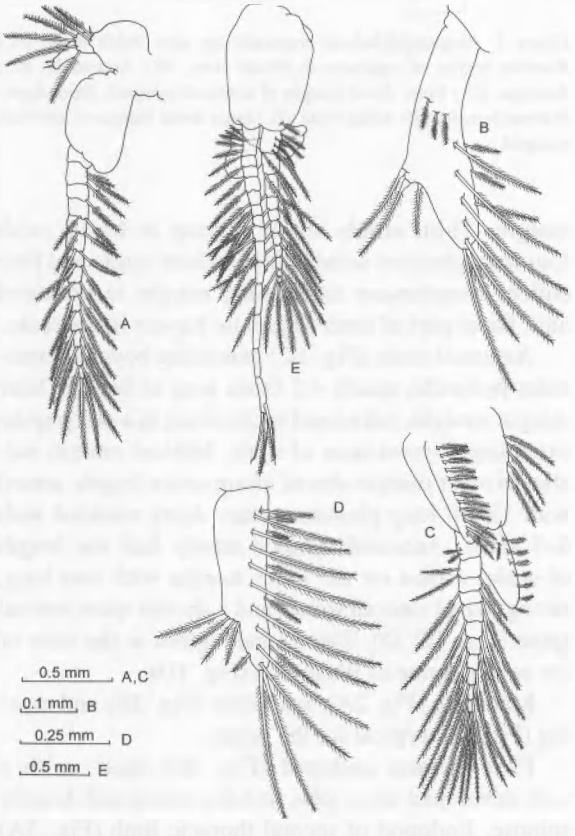

Figure 5. Rhopalophthalmus tropicalis sp. nov. (A.) Eighth thoracic limb of adult male. (B.) First pleopod of adult female. (C.) First pleopod of adult male. (D.) Second pleopod of adult female. (E.) Second pleopod of adult male.

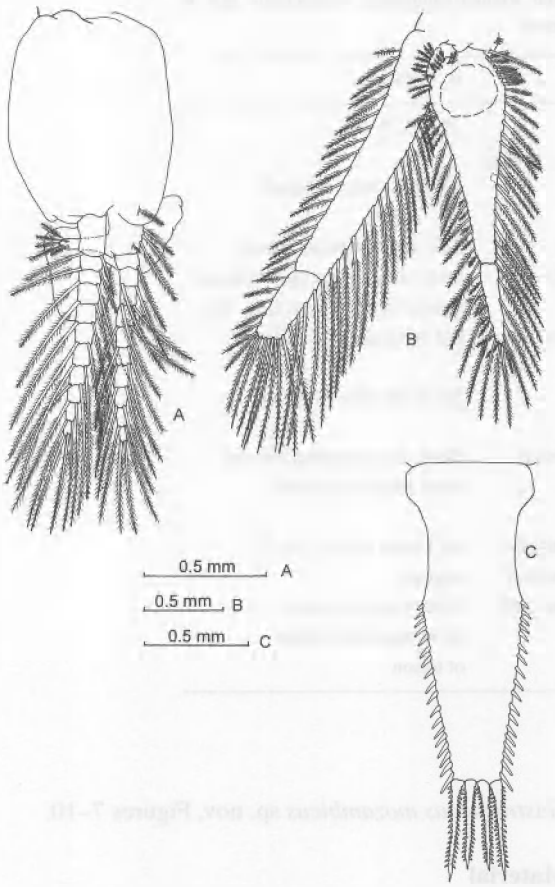

Figure 6. Rhopalophthalmus tropicalis sp. nov. Adult male. (A.) Third pleopod. (B.) Uropod. (C.) Telson.

inner margin. Exopod of second pair (Fig. 5E) with 14 articles, nearly twice as long as endopod. Distal five articles without marginal setae. Terminal article bears one strong barbed seta in distal third on inner margin and one smooth seta and one barbed seta at apex. Endopod with 11 articles and large pseudobranchial lobe. Third (Fig. 6A) to fifth male pleopods with 11 articles on exopod and endopod that are similar in length.

Uropod (Fig. 6B) setose all around, both rami divided at about three-quarters length from base by transverse articulations. Endopod distinctly tapered, armed with strong spine near midlength on inner margin, outer margin with short setae interspersed with longer setae in distal half. Exopod slightly longer than endopod, apex blunt.

Telson 2.5 times as long as basal width (Fig. 6C), distinctly constricted in proximal half. Distal margins tapering towards blunt apex, armed with about 14 – 19 smooth spines on either side. Distal pair of lateral spines slightly longer than preceding spines, in some specimens there is indication of a progressive increase in spinal length along the lateral margins. Apex armed with four long stout spines, the outer pair slightly longer than the inner pair. Apical spines barbed, bearing 17–20 teeth on each side. The longer pair of spines about one-third length of the telson.

Etymology

The specific name refers to the tropical distribution of the species.

Remarks

The genus *Rhopalophthalmus* is largely restricted to nearshore marine waters and estuaries. Of the 17 species recorded to-date, five occur around the African continent. *R. terranatalis* is known from South Africa (Tattersall, 1957; Müller, 1993) and is the only member of the genus until now recorded from the east coast of the continent. *R. terranatalis* is also the only *Rhopalophthalmus* sp. listed in Sector 9 of the World list of Mysidacea (Mauchline & Murano, 1980), although Grabe (1989) has since discussed aspects of the biology of *R. tattersallae* from Arabian Gulf waters, a species previously known only from coastal waters of Kerala State in India.

The occurrence of *R . tropicalis* sp. nov. in southern Mozambique prompted a re-examination of specimens collected in estuaries from subtropical waters of South Africa. Data indicate that *R. tropicalis* sp. nov. extends southwards to about the Umlalazi estuary in the province of KwaZulu-Natal. Consequently, any reference to *R. terranatalis* to the north is more likely to be *R. tropicalis* sp. nov. *R. terranatalis* is therefore mostly temperate in distribution and is replaced by *R. tropicalis* on the northeast coast of South Africa.

Rhopalophthalmus tropicalis sp. nov. is closely allied to *R. terranatalis,* but is readily distinguished by its much smaller size, the lack of serrations on the lateral spines of the telson, the structure and arrangement of the spines on the antennal sympod and the number of subdivisions of the propodus of the thoracic endopod. In *R. terranatalis*, the two long spines on the antennal sympod each bear a row (6–8) of stout barbs, a feature not referred to by Tattersall (1957) in her description of the species. Examination of type material housed in the British Museum of Natural History has confirmed the presence of these barbs. These and other differences between the two closely allied species are summarized in Table 2.

Table 2. Summary of important differences between *Rhopalophthalmus terranatalis* and *R. tropicalis* sp. nov. Characteristics refer to adult specimens

Character	*R. terranatalis*	*R. tropicalis*
Total length	17–25 mm	11.5–12.5 mm
Antennal scale	6–7 times long as broad	4.5 times long as broad
Antennal sympod	Two equal, barbed spines and a short spine (Fig. 1E)	Two equal, smooth spines and a short spine; three minute spines between them (Fig. 1D).
Thoracic endopods:	3rd to 6th pair, 6–8 articles	3rd & 4th pair, 4 articles
Propodus subdivisions	7th pair, 7–8 articles	5th to 7th pair, 5 articles
Endopod on 8th thoracic limb	Long, extending beyond basal article of exopod	Short, not extending beyond basal article of exopod
Telson	First four lateral spines smooth, remaining spines (c. 16) barbed Outer terminal spines <one-fifth length of telson	All lateral spines (14–19) smooth Outer terminal spines about one-third length of telson

Rhopalophthalmus tropicalis sp. nov. also shows morphological affinities to *R. egregius*. The latter species was previously reported over a very wide geographical range, until Tattersall (1957) distinguished a further five species that included *R. terranatalis* from the original type. Major characters used by Tattersall (1957) in her categorization of the species incorporated the relative structure of the three spines on the inner margin of the antennal sympod. These are long and graduated in *R. egregius* (Tattersall, 1957), whereas two of these spines are of equal length in *R. tropicalis* and the third is short. In *R. egregius*, the propodus of thoracic endopods three to five subdivided into three articles (Hansen, 1910; Tattersall, 1957) as opposed to four articles on endopods 3 and 4, and five articles on Endopod 5 in *R. tropicalis*. On Endopod 6, the propodus in the two species is subdivided into four and five articles respectively.

Gastrosaccus mozambicus sp. nov, Figures 7–10.

Material

Holotype (SAM A44968) lodged in the South African Museum, Cape Town. Adult male from Moebase beach (17° 04′ 17″ S) collected by T. Wooldridge, 10 July 1997. Paratype material (SAM A44969) lodged in the South African Museum, Cape Town. Three adult males from Moebase beach collected by T. Wooldridge, 10 July 1997.

Description

The morphological characteristics described refer to males only. Three species of *Gastrosaccus* occur on the edge of the intertidal zone of Moebase beach and it is not possible to separate species based on morphological features of females. Total length of adult males, 11.3–11.5 mm.

Carapace long (Fig. 7A), with anterior margin produced into a blunt rostrum. Posterior border of carapace emarginate, exposing the last three thoracic somites. Posterior part of this emargination split, forming a forward directed lobe that overlaps the anterior part of the carapace on either side. The emargination is also notched near its anterior origin, forming a

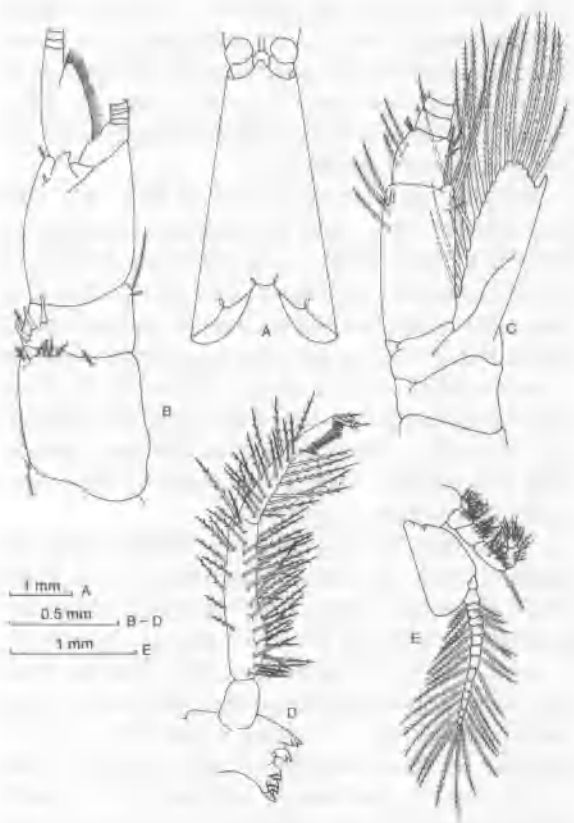

Figure 7. Gastrosaccus mozambicus sp. nov. Adult male. (A.) Capapace in dorsal view. (B.) Antennule. (C.) Antenna. (D.) Mandible. (E.) First thoracic limb.

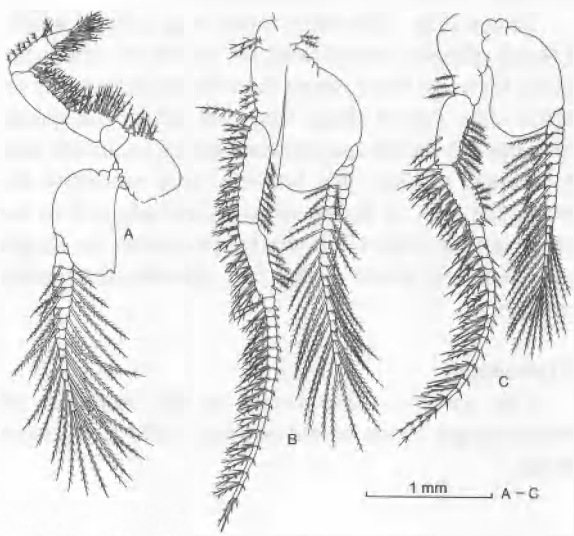

Figure 8. Gastrosaccus mozambicus sp. nov. Adult male. (A.) Second thoracic limb. (B.) Seventh thoracic limb. (C.) Eighth thoracic limb.

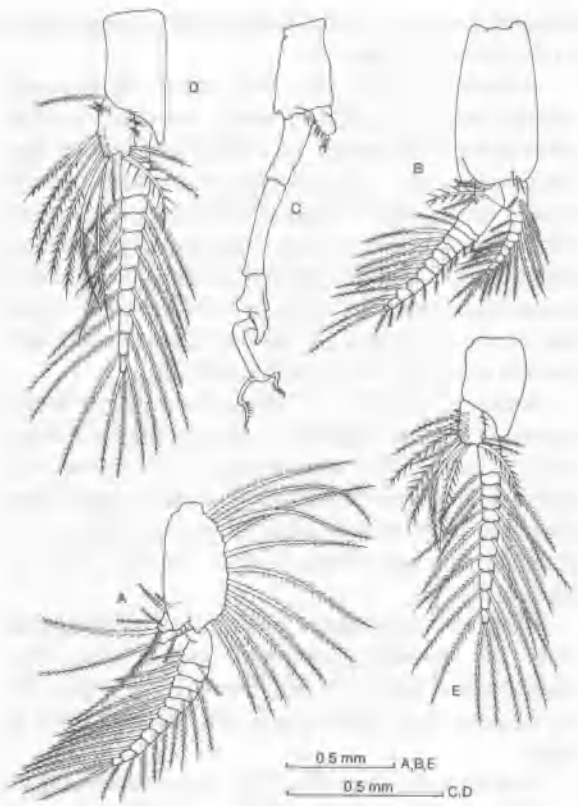

Figure 9. Gastrosaccus mozambicus sp. nov. Adult male. (A.) First pleopod. (B.) Second pleopod. (C.) Third pleopod. (D.) Fourth pleopod. (E.) Fifth pleopod.

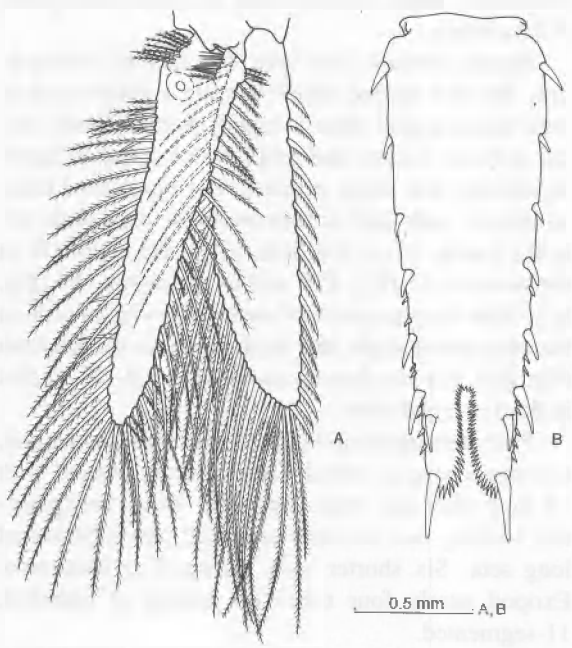

Figure 10. Gastrosaccus mozambicus sp. nov. Adult male. (A.) Uropod. (B.) Telson.

forward directed lobe that overlaps the carapace close to the dorsal midline.

Antennule (Fig. 7B), first article of peduncle slightly longer than broad, nine or ten small plumose setae along distal margin. Second article broader than long, with a fine seta and three short spines set obliquely across outer margin. Inner distal corner armed with a long and a short seta. Third article of peduncle about equal in length to the first article, bearing a short finger-shaped process at the base of the outer flagellum on the dorsal side. A well-developed hirsute lobe present near base of the outer flagellum.

Antennal scale (Fig. 7C) three times long as broad, nearly as long as peduncle. Lateral margins of scale straight, outer distal corner terminating in a prominent spine. Scale armed with about 16 plumose setae along inner and distal margin. Second and third articles of peduncle bearing groups of short plumose setae as illustrated.

Mouthparts typical for the genus, mandibular palp (Fig. 7D) densely covered with spinose setae. First mandibular article unarmed. Third article with a terminal comb-like process and two barbed spines at apex.

First thoracic limb (Fig. 7E) with well-developed endite on basal article. Endopod short, robust, densely setose on inner margin. Outer distal corner of carpus bears a single seta. First exopod article expanded, outer distal angle without tooth. Flagellum composed of 16 articles.

Second thoracic limb (Fig. 8A) similar in form to first, the first exopod article bearing a sharp tooth on outer distal angle. Third to eighth thoracic limbs similar in form. Carpus and propodus of endopod fused, subdivided into many articles. The number of these articles on each limb as follows; in the third limb, 10; in the fourth, 11; in the fifth, 12; in the sixth, 10; in the seventh, 17 (Fig. 8B) and in the eighth, 16 (Fig. 8C). First exopod article of each limb with a tooth on the outer distal angle, this tooth absent in the 8th limb (Fig. 8C). Exopod flagella composed of 16–18 articles in third to eighth limb.

First male pleopod (Fig. 9A) with swollen sympod, two times long as broad. Outer margin fringed with 12 long plumose setae. Endopod short, unsegmented, bearing two terminal setae and one subterminal long seta. Six shorter setae arranged as illustrated. Exopod nearly four times the length of endopod, 11-segmented.

Sympod of second male pleopod two times long as wide (Fig. 9B). Endopod with 9 articles, less than three-quarters length of sympod. A well-developed pseudobranchial lobe on first endopod article, bearing three setae and one spine-like seta. Exopod of 12 articles, nearly two times longer than endopod. Setae on outer border of articles 3–12 distinctly broader and irregular in outline in distal half.

Endopod of third male pleopod (Fig. 9C) with four articles. First article considerably enlarged, the remaining three small, each bearing a fine setae. Pseudobranchial lobe minute. Exopod composed of four articles, the first shorter than the second. Third article shorter than the first, with two lateral swellings in proximal half and extending to a blunt tip. Terminal article originating from lateral margin of the third article, distinctly u-shaped with the midsection relatively long and straight. Apex armed with two bent setae barbed in their distal sections.

Fourth (Fig. 9D) and Fifth (Fig. 9E) male pleopods similar in form, the endopods each reduced to a single article and armed with c. 10 barbed setae as illustrated. Exopods composed of 10 and 11 articles, respectively.

Uropod (Fig. 10A) extending beyond telson. Exopod subequal in length to endopod and armed along outer margin with c. 17 strong spines that are finely plumose on their posterior borders. Endopod more slender than exopod bearing eight irregularly spaced spines interspersed among the plumose setae on inner border. Outer endopod margin bearing c. 27 plumose setae and c. 10 short setae spread among the longer setae as shown. Two rows of 9–10 small setae anterior to, and on either side of the statocyst.

Telson (Fig. 10B) three times long as basal width. Lateral margins armed with six spines of which the distal three are more robust than the preceding pair on either side. Apical spines long and strong, the spaces between the fourth and terminal spines occupied with 1–5 small spinules that become more numerous towards the apex. A strong spine present adjacent to the cleft on either side. Cleft nearly one-quarter the length of telson and armed with c. 25 spinules along each margin.

Etymology

The specific name refers to the Republic of Mozambique from where original collections were made.

Remarks

Three species of *Gastrosaccus* occur in the surfzone of sandy beaches of Northern Mozambique. *Gastrosac-*

cus longifissura was more common in the breaker zone (water depth c.1.5 m) compared to shallower margins where *G. bispinosa* was more abundant. This concurs with the general distribution of the two species in South Africa (Wooldridge, 1978). The centre of distribution of *G. mozambicus* sp. nov. has not yet been confidently determined as the number of male specimens collected was low and females are presumably very similar to those of *G. bispinosa*. *G. mozambicus* sp. nov. males were also present close to the beach as well as the deepest surf zone station. All three species appear to be restricted to the surfzone, as none was collected in diurnal sled samples behind the surfzone in 5 m water depth.

G. longifissura is relatively easy to identify as it is the only species not having the strong dorsal spine on either side of the cleft of the telson. Male *G. bispinosa* and *G. mozambicus* sp. nov. are readily identified by the structure of the 3rd pleopod; in the latter species the third and fourth exopod segments are rectangular in general form, with the two terminal setae exhibiting differences in the structure of the barbs on the two spines. In *G. mozambicus* sp. nov., the exopod is distinct with respect to the structure of the third and terminal segments.

Gastrosaccus psammodytes was previously reported from Inhaca Island (Ortiz & Wasikete 1992), but this is almost certainly a misidentification, as the species is replaced much further to the south by *G. bispinosa* and *G. longifissura* (Wooldridge, 1978). This is supported by collections from Inhaca Island by one of us (TW) on the 20 June 1992 who recorded only *G. longifissura* in relatively high numbers (Table 1).

Acknowledgements

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