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CUMACEA (CRUSTACEA) FROM THE RED SEA AND THE MALDIVES (INDIAN OCEAN)  
IN THE COLLECTION OF THE ZOOLOGICAL MUSEUM, HAMBURG, WITH THE  
DESCRIPTION OF SEVEN NEW SPECIES AND A NEW GENUS.

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## ABSTRACT

Eleven species of the families Bodotriidae, Nannastacidae and Diastylidae from the Red Sea and Maldive Islands (Indian Ocean) were identified and partly redescribed. Six new species were described for the genera *Eocuma*, *Iphinoe*, *Nannastacus*, *Schizotrema*, *Makrokyllindrus* and *Dimorphostylis*. A new genus, *Bathycampylaspis*, with one new species was established.

## INTRODUCTION

The Cumacean crustacea from the Indian Ocean and adjacent seas are well known from Indian coastal waters (Kurian, 1954, Radhadevi and Kurian, 1989) and the African coast south of 20° S (Day, 1978, 1980). These include the families Bodotriidae, Lampropidae, Gynodiastylidae and Diastylidae. While Cumacea from the shallow waters of the Red Sea have been described by Bacescu and Muradian (1973, 1975), hardly anything is known about species from deeper benthic environments. Most of the island regions of the Indian Ocean are little known concerning their Cumacea fauna and even shallow waters have mostly been poorly sampled.

The present contribution dealing with collections from the shallow waters of the Maldives (South Male- and Ari Atoll), as well as a few deep sea samples of the Red Sea gave species new to science. For a synonymy list see Bacescu 1988 and 1992.

## MATERIAL AND METHOD

Collections of the Red Sea benthos were carried out with a box corer 0.25 m<sup>2</sup> during the Meteor cruise M5 in 1987. The stations are:

Me 5-85: Red Sea, N Sudan. 22° 25.2' N 36° 45.9' E - 22° 34.8' N 35° 46.2' E, 772 - 779 m depth, date: 7.2.1987.

Me 5-268: Red Sea, Gulf of Aden, 13° 11.2' N

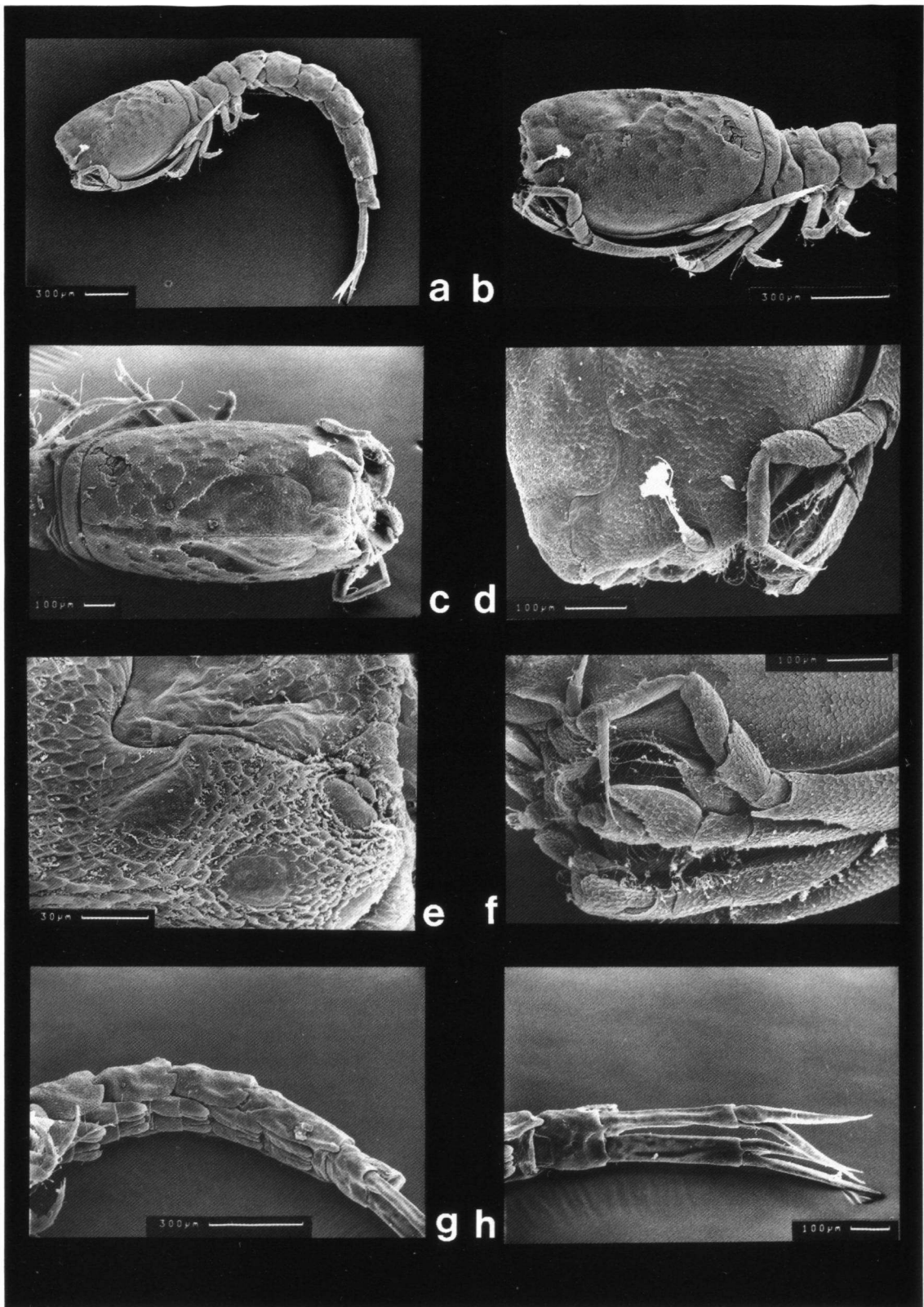


Fig.1. *Cyclaspis herdmani*, subadult male; a. habitus; b. carapace; c. dorsal view of carapace; d. anterolateral part of carapace; e. ocellar lobe; f. pereopod 1 and maxilliped 3; g. pleon, ventral view; h. uropods.

47° 10.9' E-13° 10.7' N 47° 09.2'E, 1654-1686m depth, date: 13.2.1987.

The collections at the Maldives were carried out qualitatively with a handnet during Scuba-diving or in lagoons near the beach at low tide. The description of the locations are as follows:

Embudu, South Male Atoll, 1994:

Station 1: 2.3.1994, 21 m depth, south of the island's jetty, on sandy bottom within a sandeel colony of the sandeel *Gorgasia* sp.,

Station 2: 5.3.1994, 7 m depth, silty sand between corals,

Station 3: 5.3.1994, 1 m depth, lagoon, silty sand Ellaidhoo, Ari Atoll, 1995:

Station 4: 25.8.1995, WSW lagoon, 0.5 m depth, silty sand

Station 5: 26.8.1995, NW lagoon, 0.5 m depth, silty sand

Station 6: 30.8.1995, E lagoon, 0.5 m depth, sand, coarser than at stations 4 and 5.

The types and paratypes have been deposited at the Zoological Museum, University of Hamburg (ZMH) and the Zoölogisch Museum, Universiteit Amsterdam (ZMA) respectively. Extremities of each species were dissected and stored in glycerine on a microscope slide covered with cover glasses. When only a single specimen of a species was available, the dissection was stopped before the specimen became unduly damaged. Usually the maxilliped 3 was dissected. The maxilliped 2 could not always be extracted. Whenever more than one specimen in good condition was available, a paratype was prepared for SEM photography.

## RESULTS

The following 11 species were identified from the Maldives and the Red Sea samples:

Family Bodotriidae Scott 1901

Subfamily Bodotriinae Scott 1901

Genus *Cyclaspis* Sars 1865

***Cyclaspis herdmani*** Calman 1904

## MATERIAL

Maldives station 2 (Embudu): 2 adult females, 1 subadult male ZMHK 38054.

## REMARKS

The specimens from the Maldives fit well into the description of Calman (1904). The shape of the carapace, with a faint pitting over the whole surface, the dorsal keel in the anterior and the double keel in the posterior part can be recognized as well as the ocellar lobe and the narrow antennal notch of the subadult male resembling that of the female. The pleonites with well developed lateral articular processes, the shape of the distal processes of the base of pereopod 1 and the length of this leg left no doubt in the identification. The main character according to Calman - the uropod's peduncle being longer than the last somite - is well developed in the Maldives specimens, only the armature of the uropods is nearly missing, probable because of the subadult stage of the male (Fig. 1 a-h). The syntypes *Cyclaspis herdmani* var. *annamensis* from Fage's collection from Indochina do not have the pitted carapace surface of the present specimen (Fig. 1a-c).

Distribution: India, Sri Lanka, Vietnam, 0-13 m depth.

Genus *Eocuma* Marcusen 1894

***Eocuma gorgasiae*** n.sp.

## MATERIAL

Holotype: an adult female ZMHK 38046

Paratypes: 1 female, 1 juvenile (same station and date as holotype) ZMA Cu. 202.080.

## TYPE LOCALITY

Station 1: 21 m depth, south of the island's jetty, on sandy bottom within a sandeel colony of the sandeel *Gorgasia* sp., Embudu, South Male Atoll,

Table 1  
 Characters to distinguish the species of *Iphinoe* from the Indian Ocean

Species Author	<i>I. brevipes</i> Hansen 1895	<i>I. calmani</i> Fage 1945	<i>I. capensis</i> (Zimmer 1921)	<i>I. crassipes</i> Hansen 1895	<i>I. dayi</i> Jones 1960	<i>I. fagei</i> Jones 1955
Distribution	W Africa, India	Vietnam, Thai	S-SW Africa	W+S Africa	S Africa	S-SW Africa
Depth range	8-60 m	4-18 m	1-3 m	6-103 m	23-87m	11-172 m
Sex of holotype	male	male				
Carapax proportions: at least 2.25 times as long as high	+	+				
maximal 1.6 as long as high				+		
about 2 times as long as high			+		+	+
Serrated dorsomedian crest: in anterior quarter						+
up to anterior half		+		double row	+	
3/4 or more towards posterior						
none	+		+			
Pseudorostrum: long	+	+			+	
short			+	+		+
directed upward						
straight	+	+	+	+	+	
Uropods: peduncle longer than rami	+	+	+	exopod	+	+
peduncle as long as rami				endopod		
peduncle shorter than rami						
Uropod's rami: Equal in length	+				+	+
exopod longer						
endopod longer		+	+	+		
Endopod's 2 articles: equal in length						
basal article longer			+	+		
basal article shorter	+	+			+	+
Antenna 1: number of aesthetascs	2	2	1	0	3	1
only slender spines				+		
Pleonit 6 proportion length to width:	1.3	1.3	1.3	1.4	1.3	1.1

Table 1 (continued)  
 Characters to distinguish the species of *Iphinoe* from the Indian Ocean

<i>I. ischnura</i> Zimmer 1952	<i>I. pigmenta</i> Kurian 1961	<i>I. sanguinea</i> Kemp 1916	<i>I. stebbingi</i> Jones 1956	<i>I. tenella</i> Sars 1878	<i>I. truncata</i> Hale 1953	<i>I. zimmeri</i> Stebbing 1910	<i>I. marisrubrae</i> n.sp.
Vietnam	India	India	S. Africa	NE Atlantic India	S+E Africa	S. Africa	Red Sea
female	female	female	17-100 m	0-30 m	female	15-80 m male	779 m female
+			+	+	+	+	
	+	+					+
+		+		+			+
	+		+		+	+	
+		+		+			+
+	+	+	+	+	+	+	+
+	+	+	+	+	+	+	+
+	exopod	+	+	+	+	+	exopod
+		+	+	+	+	+	
	+					+	+
		+			+		+
+	+		+	+		+	
1	no detail	2	2	no detail	2	2	1
1.5	no detail	1.3	1.5	1.4	1.3	1.7	1.9

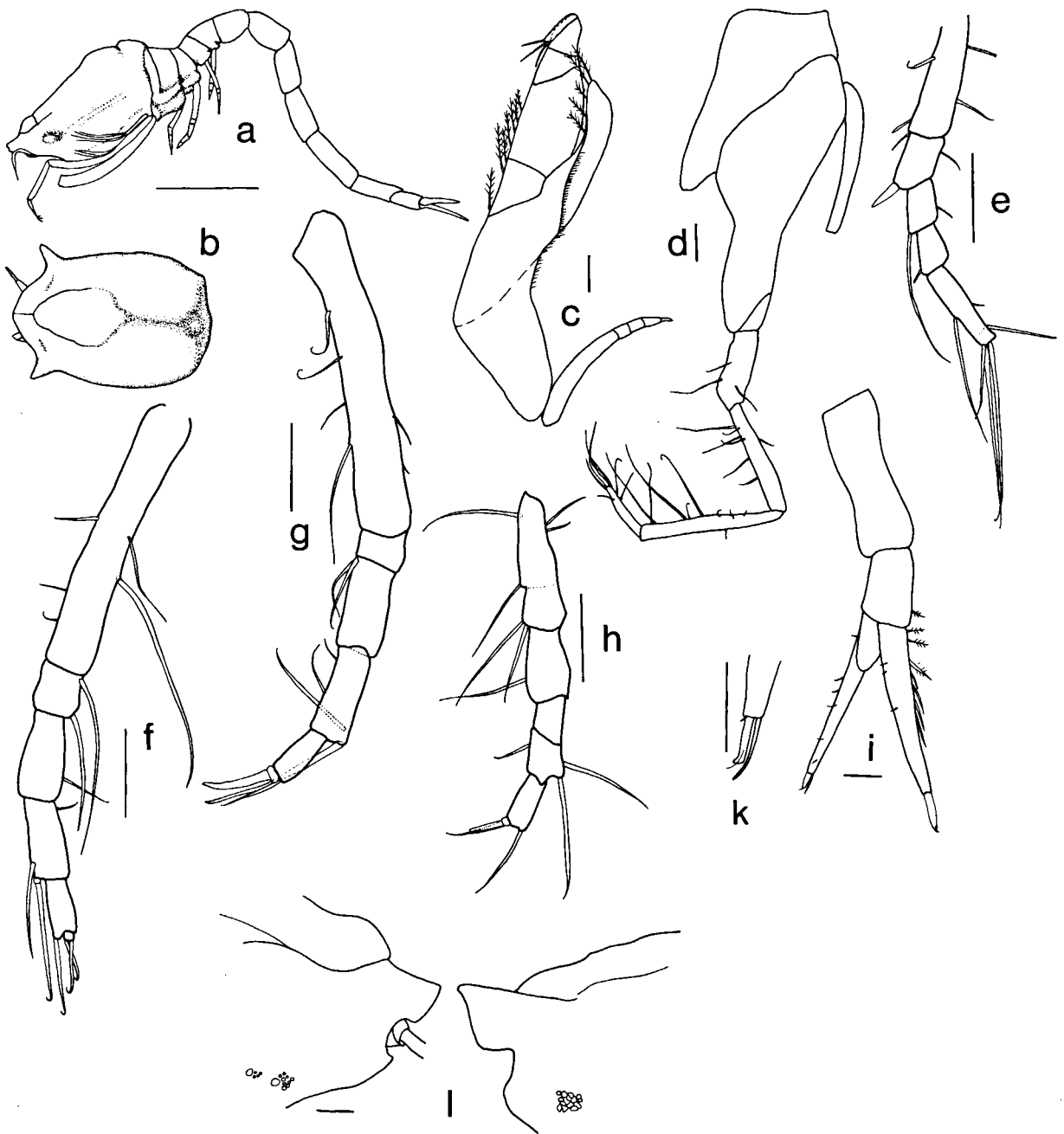


Fig. 2. *Eocuma gorgasiae* n.sp., female; a. habitus, scale bar: 1 mm; b. dorsal view, same scale as 2a; c. maxilliped 3; d. pereopod 1; e. pereopod 2; f. pereopod 3; g. pereopod 4; h. pereopod 5; i. left uropod; k. terminal spine of uropod's exopod; l. comparison of anterolateral margin of *Eocuma aculeatum* (right) and *Eocuma gorgasiae* n.sp. (left). If not otherwise indicated the scale bar is 0.1 mm.

Maldives, leg. U. Mühlenhardt-Siegel and V. Siegel, 2 March 1994.

#### DIAGNOSIS

Carapace: 1.5 times as long as high, no lateral carina, 1 horn at each side in the anterior third of the carapace, an elevation on the middorsal carapace at the posterior margin.

Pseudorostrum short and straight. Dorsomedian line without carina. Antennal notch narrow.

#### DESCRIPTION

Based on the holotype, an adult female with developing oostegits.

Length: 5.4 mm

Ocellar lobe oval; eyes confluent median; integument texture granulated, hairy setae few.

Carapace 1.7 mm long, 1.1 mm wide including the horns, 1.5 times as long as wide, 0.8 mm high, 1 lateral horn at each side in the anterior third, the horns projecting slightly forward.

Pseudorostral plates meeting in front of the ocellar lobe, straight (Fig. 2 a,b).

Siphonal tubes very short; antennal notch rounded, narrow; anteroventral margin of carapace smooth; anteroventral corner of carapace subacute. Pedigerous somites 0.8 mm; abdomen: 2.9 mm; telson not free.

Maxilliped 3 very stout distal projection of base, merus large (Fig. 2 c); pereopod 1 exopod present, base of endopod as long as last three articles, appears to be divided, proximal part wider than distal, ischium short, merus and carpus combined and as long as propodus and dactylus (Fig. 2 d). Pereopod 2 base of endopod longest article, ischium not discernable, merus distal with toothlike seta, carpus short, subequal in length to propodus, dactylus longer (Fig. 2 e). Pereopod 3 base of endopod longest article, dactylus very short (Fig. 2 f).

Pereopod 4 base of endopod longest article, subequal in length to rest of the extremity, dactylus very short with claw like seta (Fig. 2 g). Pereopod 5 shorter than pereopod 4, base of endopod relatively short, dactylus very short (Fig. 2 h).

Uropods: peduncle with 1 plumose seta at the inner margin, half as long as pleonit 6, uropod's rami slightly longer than pleonit 6, endopod unsegmented, longer than exopod which is in 2 segments, terminal setae stout, basal segment 0.4 times as long as distal segment (Fig. 2 i, k).

#### ETYMOLOGY

The new species is named after the sandeel *Gorgasia* sp.

#### REMARKS

Carapace similar to *E. aculeatum* Day, 1978, but the proportions of cephalothorax and free thoracic segments to abdomen are different, *E. aculeatum*'s pleon is much longer. This species is described on the base of a manca stage but it is larger than the specimens of *E. n.sp.* Comparisons with the holotype of *E. aculeatum* show the following differences:

The shape of the antennal notch is different (Fig. 2 l) and the direction of the horns of the carapace is not the same.

According to Day's key for *Eocuma* species known until 1978, the new species is similar to *E. ferox* (Fischer, 1872) from the Mediterranean because of the first pereopod's carpus which is longer than ischium + merus in *E. aculeatum* and equal in length in *E. gorgasia* n.sp. and *E. ferox*. Otherwise *E. ferox* carries spines at the carapace which are absent in *E. gorgasiae* n.sp.. The length ratio between the uropod's peduncle and pleonit 6 is 1.5 in *E. ferox* and 1.9 in *E. gorgasiae* n.sp., and the uropod's rami are equal in length in *E. ferox* while the uropod's endopod is longer than the exopod in *E. gorgasiae* n.sp.

Three other species have been described: *E. spiniferum* Gamo, 1976 for Japanese waters, *E. striata* Kurian & Radhadevi, 1983 and *E. sanguineum* Kurian & Radhadevi, 1983 from the coast of India. *E. spiniferum*'s carapace is covered with spines, the proportions of pereopod 1 arti-

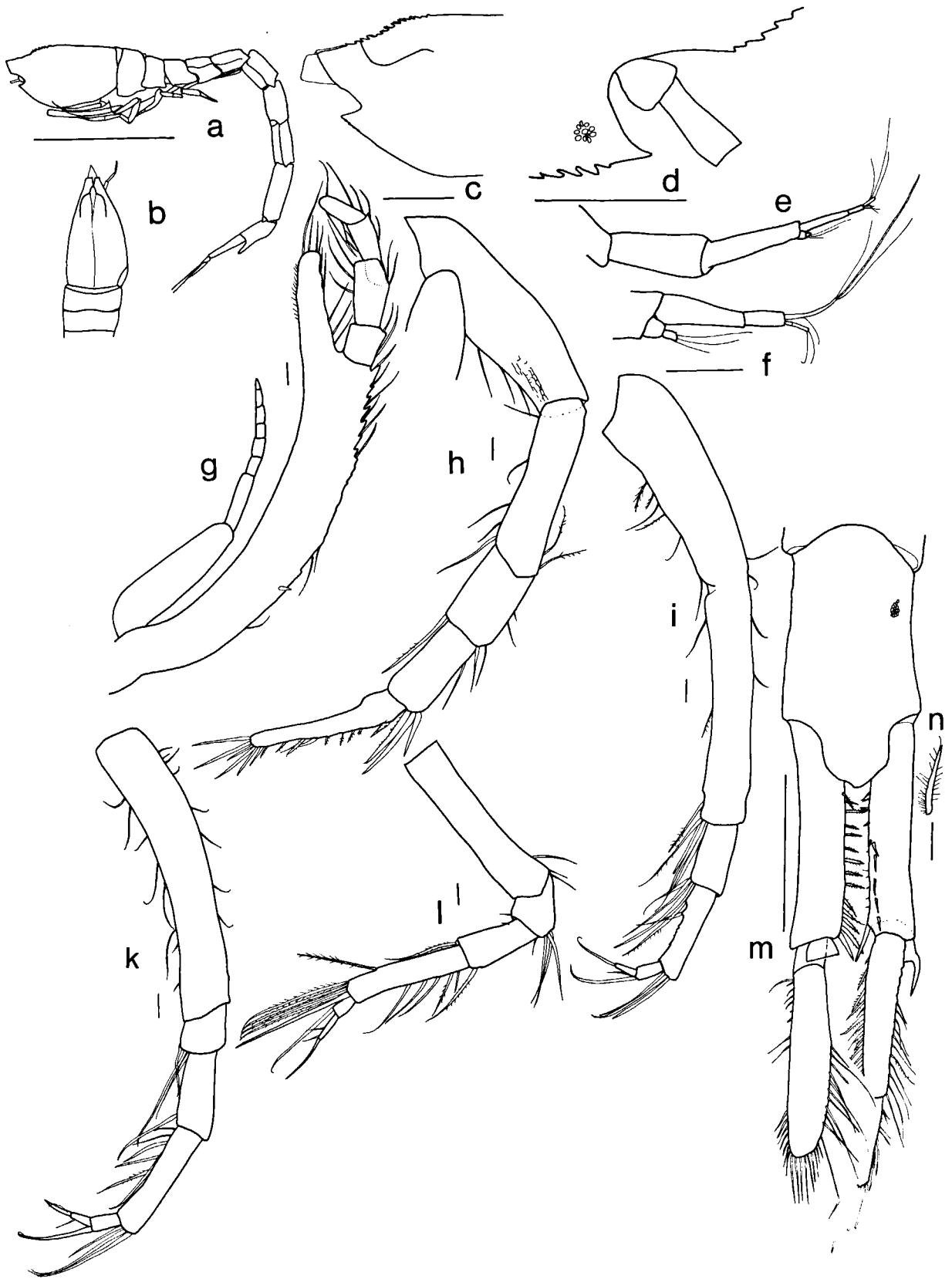




Fig. 3. *Iphinoe marisrubrae* n.sp., adult female; a. habitus, scale bar: 5 mm; b. dorsal view, same scale as in 3a; c. antennal notch and integument structure, scale bar: 1 mm; d. antennal notch at higher magnification, scale bar: 0.5 mm; e. first antenna, scale bar: as in 3 d; f. first antenna; g. maxilliped 3; h. pereopod 1; i. pereopod 2; k. pereopod 3; l. pereopod 4; m. pleonit 6 and uropods, left uropod exopod and right uropod endopod only figured, integument structure of pleonit 6, scale bar: 1 mm; n. spine of inner margin of peduncle. If not otherwise indicated the scale bar is 0.1 mm.

cles are different and the lateral horns are directed more forward than in *E. gorgasiae* n.sp. The species from India both are flattened dorsoventrally.

Genus *Iphinoe* Bate 1856

***Iphinoe marisrubrae* n.sp.**

#### MATERIAL

Holotype: 1 adult female ZMHK 38059

Paratype: 1 juvenile, same station as holotype.

#### TYPE LOCALITY

Me 5-268: Red Sea, Gulf of Aden, 13° 11.2' N 47° 10.9' E-13° 10.7' N 47° 09.2' E, 1654-1686 m depth, date: 13. February 1987.

#### DIAGNOSIS

Pseudorostrum short; dorsomedian line with double row of spines; maxilliped 3 with merus not expanded and base distal prolonged but not widened.

#### DESCRIPTION

Based on a non ovigerous female with developed oostegits (Fig. 3 a)

Length: 16.52 mm

Ocellar lobe slightly longer than wide (Fig. 3 b), eyes not visible; integument smooth, with small ring-like ridges in higher magnification; carapace 3.96 mm long, 2.20 mm high, 2.08 mm wide, 1.8 times as long as high; dorsomedian line with a double row of teeth in anterior third, 2 teeth in

front of the ocellar lobe, 9 to 12 teeth at the frontal lobe in a double row which comes together towards the posterior; pseudorostral lobes truncated, meeting in front of ocellar lobe, shorter than this, ventral margin with 5 teeth; siphonal tube short; antennal notch well developed (Fig. 3 c), reaching backwards as far as frontal end of ocellar lobe; anteroventral corner of carapace acute, anteroventral margin serrated.

Free thoracic segments 3.52 mm, the first can only be seen from above; abdomen 9.04 mm.

Telson not free, linguiform (Fig. 3 m).

First antenna main flagellum with 2 terminal endings, the longer having 1 aesthetasc and 2 long setae at the tip, the shorter with 3 hairy-like setae, accessory flagellum of the basal article of main flagellum (Fig. 3 e, f).

Maxilliped 3 exopod present, base of endopod long, slender, 1.8 times as long as the rest of the extremity, inner margin distally serrated, distal prolongation reaching half of carpus, merus not expanded, dactylus bended (Fig. 3 g). Pereiopod 1 exopod present, endopod lost on the right side, base only present on the left side, base 11 times as long as wide (Fig. 3 h).

Pereiopod 2 exopod present, ischium of endopod not visible, carpus longer than merus and propodus together (Fig. 3 i). Pereiopod 3 exopod present, base of endopod longest article, carpus longer than merus, propodus and dactylus small, subequal in length (Fig. 3 k).

Pereiopod 4 similar to pereiopod 3 (Fig. 3 l), but without exopod. Pereiopod 5 shorter than pereiopod 3 and 4 because of much shorter base, carpus relatively long, propodus and dactylus short but the latter longer than in pereiopod 3 and 4.

Uropods: peduncle shorter than pleonit 6 (by a factor of 0.8), inner margin with 14 setae; endopod subequal in length to pleonit 6, in 2 segments, basal segment 1.8 times longer than distal one, 16 spines at the inner and 11 hair-like setae at the outer margin, longer than exopod, exopod in 2 segments, basal one shorter than distal (by a factor of 0.13), distal segment with numerous slender setae (Fig. 3 m).

#### ETYMOLOGY

The species is named after the type locality, the Red Sea.

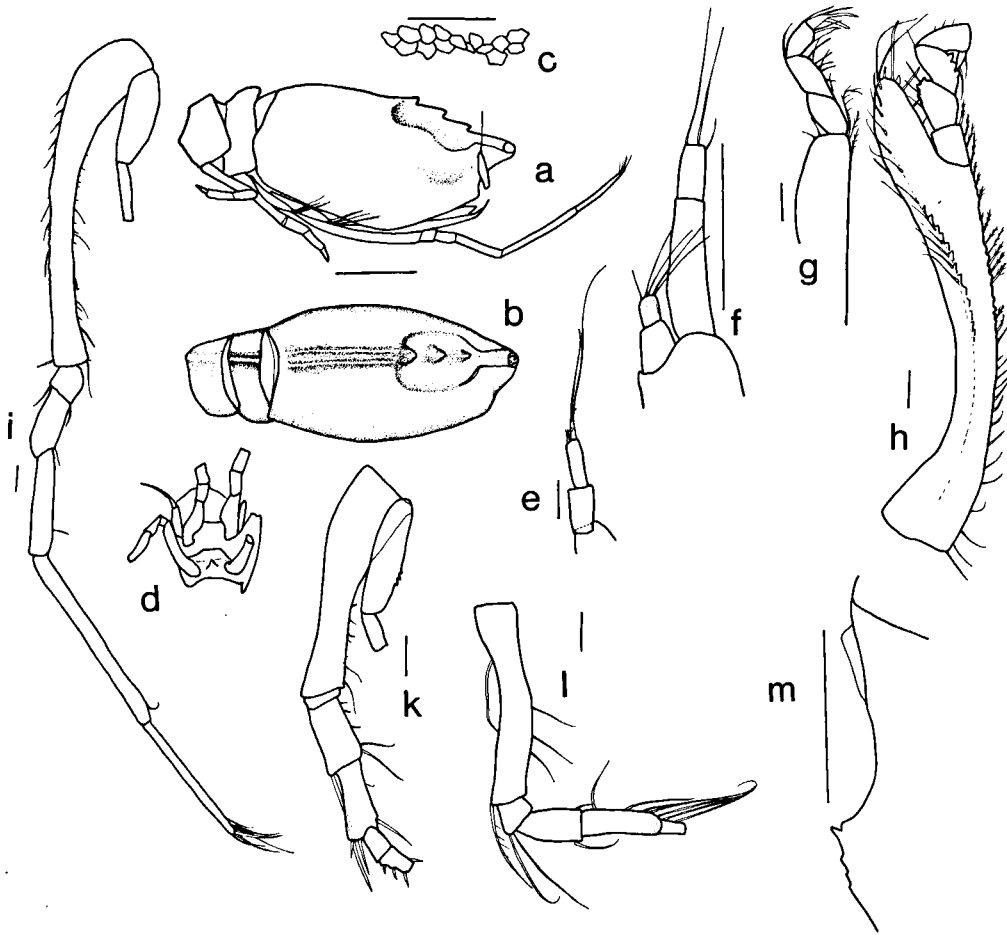


Fig. 4. *Pseudosympodomma* sp.; a. cephalothorax and free thoracic segments, scale bar: 1 mm; b. cephalothorax and free thoracic segments dorsal view, same scale as in 4a; c. integument structure; d. third thoracic segment in ventral view, scale as in 4a; e. first antenna; f. first antenna, detailed; g. maxilliped 2; h. maxilliped 3; i. pereopod 1; k. pereopod 2; l. pereopod 3; m. subrostral part, scale bar: 0.5 mm. If not otherwise indicated the scale bar is 0.1 mm.

#### REMARKS

Day (1978) established an artificial key for African and Indian *Iphinoe* species since they appeared to be linked. The main characters of the *Iphinoe* species from the Indian Ocean are summarised in Table 1. According to Day's key 3 species resemble the Red Sea specimen: *I. dayi* Jones, 1960, *I. sanguinea* Kemp, 1916 and *I. pigmenta* Kurian, 1961. *I. sanguinea* is characterised by an expanded merus of maxilliped 3 which is not present in the Red Sea specimen. In *I. pigmenta*, the pseudorostrum is much longer and more acute, the middorsal serration covers 2/3 of the carapace and the uropod's armature is

much less than that of the Red Sea's specimens. The base of maxilliped 3 is 1.5 times as long as the rest of the leg, but 1.8 times in the specimen here described, while its distal prolongation is widened in *I. pigmenta* but not in *I. marisrubrae* n.sp.. Unfortunately the description of *I. dayi* is based on a male. This species differs from the female from the Red Sea in having 3 aesthetascs at the first antenna and a prolongation of the thoracomer 4 which projects forwards.  
Subfamily Vaunthompsoniinae Sars 1878

***Pseudosympodomma* sp.**

## MATERIAL

Red Sea station 85: incomplete specimen, 1 carapace with 2 thoracic segments (Fig. 4 a)

## DESCRIPTION

Ocellar lobe linguiform, elongate (Fig. 4 b); eyes terminal of the ocellar lobe and the carapace as well (Fig. 4 b); integument smooth, but with reticulated pattern at high magnification (Fig. 4 c); carapace: 3.20 mm long, 1.62 mm high, 1.66 mm wide, dorsomedian furrow behind three dorsomedian teeth which are directed forward (Fig. 4 a); pseudorostral lobes not meeting in front of ocellar lobe (Fig. 4 b), relatively long; siphonal tube short, protruding very little beyond the pseudorostrum. Antennal notch shallow, rounded (Fig. 4 m); anteroventral margin of carapace in the anterior part slightly serrated.

4th and 5th pedigerous segments missing, 3rd pedigerous segment with 1 tooth ventrally on sternit (Fig. 4 d). Abdomen and telson: missing.

First antenna: flagellum 2 segmented with 2 long and 1 short sensoric filaments, accessoric flagellum 2 segmented with 5 filaments, less than half as long as basal segment of flagellum (Fig. 4 e, f). Maxilliped 2 resembling those of *S. africanus* Stebbing, 1912 and *P. indica* Kurian, 1954 base long (Fig. 4 g); maxilliped 3 base very long, distal and proximal end of article broader than middle part, distally elongated, keeled over greater part of its length, a distal flattened keel with teeth at distal part, many plumose setae along inner and outer margin, base distal dilated, with 1 tooth at the outer margin, merus and carpus serrated, merus at the outer, carpus at the inner margin (Fig. 4 h). Pereiopod 1 exopod present, very long endopod, base as long as merus, carpus and propodus combined, dactylus a little shorter than merus and carpus together, propodus a little longer than those (Fig. 4 i); pereiopod 2 exopod present, endopod with dactylus damaged (Fig. 4 k); pereiopod 3: no exopod, dactylus of endopod broken off (Fig. 4 l).

Stebbing (1912) described a subadult male of *Sympodomma africanus* which resembles the present specimen. He compared his species with *Heterocuma diomedea* Calman, 1912 which has a ventral tooth at pedigerous somit 4, but which is missing in *S. africanus* Stebbing, 1912. Kurian (1954) established a new genus *Pseudosympodomma* for those species which have exopods on maxilliped 3, pereiopod 1 and 2 but not on pereiopod 3. He transferred *S. africanus* to this new genus and compared it with his own new species *Pseudosympodomma indicum*. Day (1975) reported *P. africanum* from deeper parts of the sea than Stebbing (1912), extended the depth range to „no more than 400 m“, and described a female with three big teeth at the median carina of the anterior part of the carapace which carries tubercles. The maxilliped 3 with 4 thorns along the outer margin and 2 apical thorns which Stebbing (1912) did not mention, may possibly be characteristic for females only. The subadult males in Day's material carry a ventral tooth directed forward at somit 4 and 5. Day (1975) mentioned the resemblance of *Sympodomma* to *Pseudosympodomma*, especially concerning the three big teeth at the dorsomedian of the carapace and the sternal teeth of the free thoracic segments found in several species and stressed the close relationship of the two genera. The best character to separate them is the presence or absence of exopods at pereiopods 3. Therefore, the species in question here must belong to *Pseudosympodomma*. It is doubtful if it is *P. africanus* because of the absence of tubercles at the carapace and the base, and because merus and carpus of maxilliped 3 are serrated. The specimen is obviously not *P. indicum*, because the base, ischium and merus of pereiopod 1 have no stout spines. On the other hand it does show characters of *P. indicum*, e.g. serrated margins of some articles in maxilliped 3, the narrower distal prolongation of the base and the longer pseudorostral lobes and also characters of *P. africanus* in e.g. the pereiopod 1 not having stout spines, the shorter distal prolongation of the maxilliped's base and the first antenna being 2 segmented. The third character Kurian mentioned to separate both species concerns the uropods. These are missing in the present specimen.

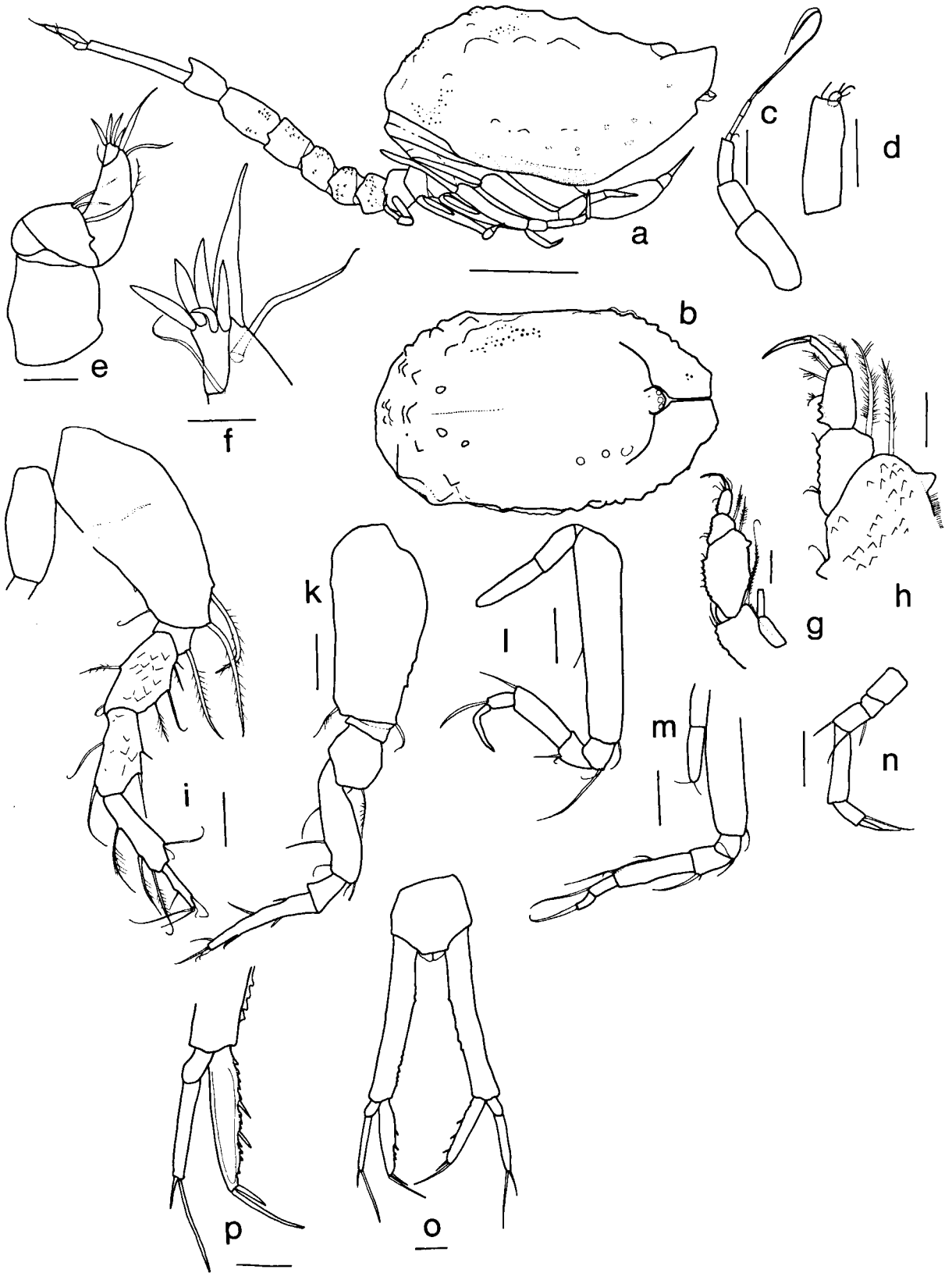


Fig. 5. *Campylaspis* aff. *akabensis*, subadult male; a. habitus, scale bar: 0.5 mm; b. dorsal view, same scale as in 5a; c. first antenna; d. first antenna detail, accessory flagellum, scale bar 0.05 mm; e. maxilliped 2; f. maxilliped 2, detail of tip, scale bar 0.05 mm; g. maxilliped 3; h. maxilliped 3, detail merus to dactylus; i. pereopod 1; k. pereopod 2; l. pereopod 3; m. pereopod 4; n. pereopod 5; o. pleonit 6 and uropods; p. left uropod. If not otherwise indicated the scale bar is 0.1 mm.

Since the specimen of the Red Sea collection has characteristics of both known species of *Pseudosymphodomma*, it cannot be attributed to one or other of these.

Family Nannastacidae Bate 1866

Genus *Campylaspis* Sars 1865

***Campylaspis* aff. *akabensis*** Bacescu & Muradian, 1975

#### MATERIAL

Red Sea station 85: 1 subadult male ZMHK 38060

#### DESCRIPTION

Length 2.81 mm, ocellar lobe wide, eyes with 3 corneal lenses, integument scaly structure at the extremities; carapace: 1.47 mm long, 0.90 mm high, 0.92 mm wide, overlapping the first free thoracic segments, covered with tubercles and small granules (Fig. 5 a, b); pseudorostral lobes meeting in front of ocellar lobe, 0.12 of the total carapace length (Fig. 5 b); siphonal tube relatively short; antennal notch small; anteroventral margin of carapace smooth, anteroventral corner of carapace subacute.

5 Free thoracic segments 0.39 mm in length, the first 3 short; abdomen 1.12 mm; telson not free. First antenna: longest article is peduncles' basal segment, main flagellum 2 segmented with 2 aesthetascs, accessory flagellum very small, 1/3 of the basal segment of main flagellum (Fig. 5 c, d); maxilliped 2 resembling *C. akabensis* (Fig. 5 e, f); maxilliped 3 with exopod, merus of endopod expanded, carpus and propodus subequal in length (Fig. 5 g, h).

Pereopod 1: exopod present, base of endopod longest article, ischium short, merus and carpus subequal in length, propodus longer than carpus (Fig. 5 i); pereopod 2: exopod present, base of endopod longest article, ischium short, merus shorter than in pereopod 1, carpus 1.8 times as long as merus, propodus short, dactylus longer than carpus (Fig. 5 k); pereopod 3: exopod present, base of endopod longest article, as long as rest of the extremity, more slender than in pereopods 1 and 2 (Fig. 5 l); pereopod 4: exopod present, endopod similar to pereopod 3 (Fig. 5 m); pereopod 5: exopod missing, endopod shorter than preceding extremities, carpus longest article (Fig. 5 n).

Uropods peduncle as long as last 3 pleomers, long, slender, 6.6 length/width, no setae but serrated, endopod nearly half (0.47) as long as peduncle, with 2 - 3 long and 12 smaller spines, two terminal spines, exopod 2 segmented, distal article 3.7 times longer than proximal, 2 terminal spines (Fig. 5 o, p).

#### REMARKS

The specimen resembles *C. akabensis* Bacescu and Muradian, 1975. However, following differences were noted: pereopod 1 without an outer depression in the distal third; the base being 0.64 compared to the rest of the extremity; merus not longer than the base; pereopod 2 with base 0.61 compared to the rest of the extremity, without depression at the frontal margin, dactylus ratio width to length 0.13, i.e. much more slender than in *C. akabensis*; relation in length of uropod's endopod and peduncle also differs: 0.42 in *C. akabensis* and 0.47 in *C. aff. akabensis*. The present subadult male preserves some of the female characters regarding the shape of pereopods and uropods.

Genus ***Bathycampylaspis*** gen.nov.

#### DIAGNOSIS

The new genus *Bathycampylaspis* is characterized by females carrying rudimentary exopods at pereopods 3 and 4 and the clubshaped dactylus at pereopod 2.

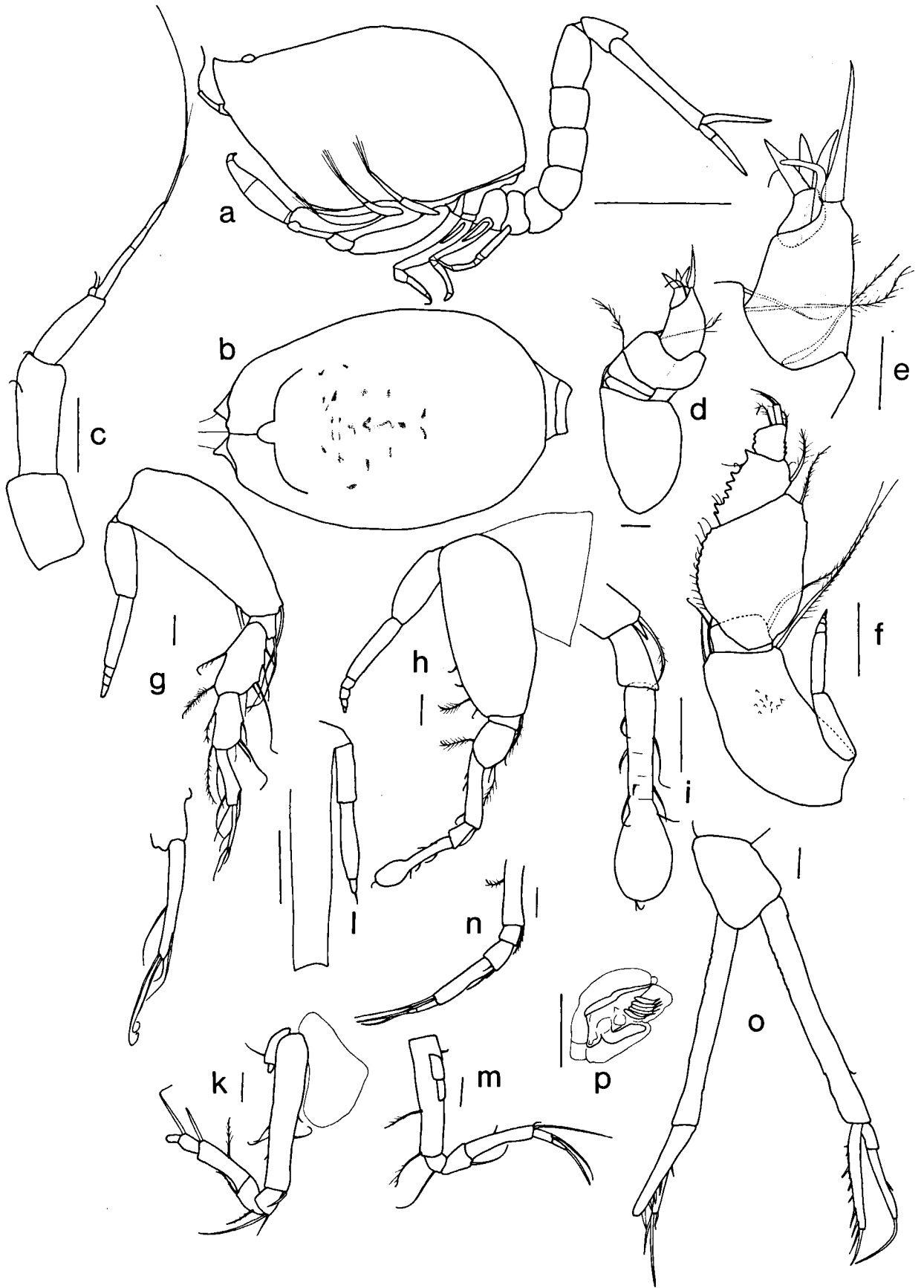


Fig. 6. *Bathycampylaspis dactyloclavata* n.g. et n.sp., ovigerous female; a. habitus, scale bar: 1 mm; b. dorsal view, same scale as in 6a; c. first antenna; d. maxilliped 2; e. maxilliped 2, detail; f. maxilliped 3; g. pereopod 1; h. pereopod 2; i. pereopod 2, detail of dactylus; k. pereopod 3; l. exopod of pereopod 3; m. pereopod 4; n. pereopod 5; o. pleonit 6 and uropod; p. embryo. If not otherwise indicated the scale bar is 0.1 mm.

## ***Bathycampylaspis dactyloclavata* n.sp.**

### MATERIAL

Holotype: 1 ovigerous female ZMHK 38058

### TYPE LOCALITY

Red Sea, 22° 25.2' N 36° 45.9' E - 22° 34.8' N 35° 46.2' E, 772 - 779 m depth; date: 7. February 1987

### DIAGNOSIS

Habitus resembling *Campylaspis* but ovigerous female having rudimentary exopods at pereopod 3 and 4 (Fig. 6 a) and a clubshaped dactylus at pereopod 2.

### DESCRIPTION

Length: 4.76 mm; ocellar lobe as wide as long; frontal lobe broadly rounded; eyes dorsomedian; integument: calcificated, white in colour, with hyaline patches on carapace (Fig. 6b), scaly structure at the extremities. Carapace smooth, length 2.38 mm, height 1.28 mm, width 1.60 mm; pseudorostrum short; siphonal tube relatively long; antennal notch: small, narrow; anteroventral margin of carapace smooth; anteroventral corner of carapace rounded, not prominent. Free thoracic segments 0.51 mm in length, the first two very short; abdominal length 1.87 mm; telson not free.

Antenna 1 second article of peduncle longest, main flagellum 2 segmented with 2 long sensoric filaments, accessory flagellum small, less than 1/7 of basal article of main flagellum (Fig. 6 c); maxilliped 2: merus-carpus geniculate, carpus broad, large propodus, longer than wide, articu-

lated straight, dactylus as for species of *Campylaspis* (Fig. 6 d, e); maxilliped 3: merus subequal in length than base, at the inner margin serrated, with setae, carpus' inner margin serrated, slightly shorter than merus, propodus smaller than the former, serrated at the outer margin (Fig. 6 f). Pereiopod 1 exopod present, endopod relatively short, not extending to tip of pseudorostrum, base longest article, subequal in length to the following 4 articles, ischium short, merus stout, propodus slender, dactylus long and slender (Fig. 6 g); pereiopod 2 exopod present, base of endopod slightly thickend, longest article, dactylus clubshaped (Fig. 6 h, i); pereiopod 3 and 4 exopod rudimentary, base of endopod long and slender base, longer than the rest of the extremity (Fig. 6 k, l, m); pereiopod 5 shorter than preceding extremities because of shorter base (Fig. 6 n). Uropods peduncle without setae, 2.5 times as long as pleonit 6; endopod 1 segmented, with 5 setae at the inner margin and 1 terminal; exopod subequal in length to endopod, 2 segments, distal article as long as terminal seta, 1 long and 2 shorter terminal setae (Fig. 6 o).

### ETYMOLOGY

The new species is named after the clubshaped dactylus of the pereiopod 2.

### REMARKS

Bacescu and Muradian (1974) erected a new genus (*Floridocuma*) on the basis of material from the deep Atlantic near Florida with the following characters: habit similar to *Campylaspis*, but female with exopods at maxilliped 3, pereiopod 1 and 2 and rudimentary ones at pereiopod 3 and 4 and a special organ, a clublike seta, at the infero-lateral corner of the base of maxilliped 2. Jones (1984) thought this genus not to be valid and included it in *Campylaspis*, assuming the holotype of *Floridocuma* to be a male. Bacescu (1992) rejected this and stressed to have an ovigerous females in his collection. He transferred all species of *Campylaspis* having a clublike seta at the base of maxilliped 2 to his genus *Floridocuma*.

The new genus *Bathycampylaspis* has the same characters as *Floridocuma* for females in having rudimentary exopods at pereiopods 3 and 4, but

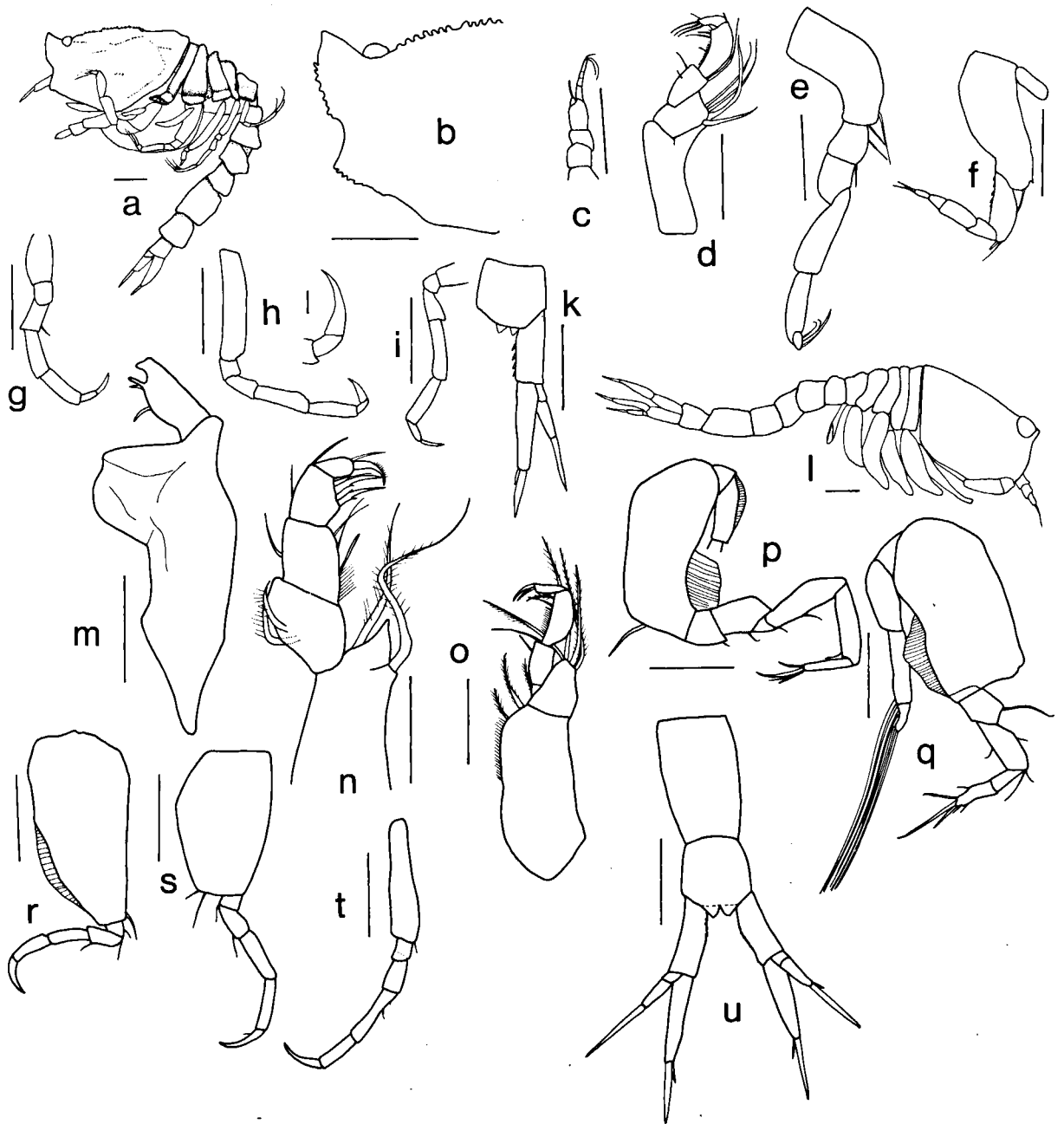




Table 2

Morphometric characters of *Scherocumella micronodosus* n.sp.

	female	female	female	female, holotype	female, used for SEM	male	male	male, used for SEM
Carapace length	0.36 mm	0.32 mm	0.38 mm	0.39 mm	0.32 mm	0.39 mm	0.32 mm	0.45 mm
Free thoracic segments, length	0.21 mm	0.27 mm	0.21 mm	0.24 mm	0.18 mm	0.21 mm	0.20 mm	0.28 mm
Abdomen, length	0.53 mm	0.43 mm	0.48 mm	0.49 mm	0.32 mm	0.50 mm	0.42 mm	damaged
Total length	1.10 mm	1.02 mm	1.07 mm	1.12 mm	0.82 mm	1.10 mm	0.94 mm	

not the special organ at the base of maxilliped 2. On the other hand a peculiar type of clubshaped dactylus is present at pereopod 2. This is the basis for erecting a new genus, that is thought to be closely related to *Floridocuma*, although, only a single specimen, a female carrying embryos (Fig. 6 p), is so far known.

Genus *Scherocumella* Watling 1991

### ***Scherocumella micronodosus* n.sp.**

#### MATERIAL

Holotype: adult female ZMHK 38041

Paratypes: 3 males, 6 females; same station as holotype; ZMHK 38042

10 adult females, 2 males, 5 juveniles; Maldives station 4, WSW lagoon, silty sand, 0.5 m depth, Ellaidhoo, Ari Atoll, Maldives; 25. August 1995; 44 ovigerous and 20 adult females, 41 males, 1 ind. broken; Maldives station 5, NW lagoon, 0.5 m depth, silty sand, Ellaidhoo, Ari Atoll, Maldives; 26. August 1995; ZMHK 38044

25 males, 33 females; Maldives station 6, E

Fig. 7. *Nannastacus micronodosus* n.sp.; a. female habitus; b. anteroventral margin of carapace; c. female first antenna; d. female maxilliped 3; e. female pereopod 1; f. female pereopod 2; g. female pereopod 3; h. female pereopod 4, detailed, scale bar : 0.01 mm; i. female pereopod 5; k. female pleonit 6 and uropod; l. male habitus; m. male mandible, scale bar: 0.05 mm; n. male maxilliped 2, scale bar: 0.05 mm; o. male maxilliped 3; p. male pereopod 1; q. male pereopod 2; r. male pereopod 3; s. male pereopod 4; t. male pereopod 5; u. male pleopod 5 and 6, uropod. If not otherwise indicated the scale bar is 0.1 mm.

lagoon, 0.5 m depth, sand, coarser than at stations 4 and 5, Ellaidhoo, Ari Atoll, Maldives; 30.8.1995; ZMA Cu. 202.083

#### TYPE LOCALITY

Lagoon, silty sand, 1 m depth, Maldives station 3: Embudu, South Male Atoll, Maldives, 5. March 1994, U. Mühlenhardt-Siegel and V. Siegel leg.

#### DIAGNOSIS

Carapace: with minute nodules and few tubercles; pseudorostrum: short, turned upwards; dorsomedian line stressed because of the nodules; antennal notch narrow, not accentuated; anterolateral margin serrated because of the nodules; subrostral tooth little projecting.

#### DESCRIPTION

Based on the holotype, a spawned female with well developed oostegits (Fig. 7 a).

Length: 1.12 mm; ocellar lobe divided; frontal lobe rectangular; eyes in pairs, dorsolateral; integument: nodules made of tiny white organs on the entire surface including the extremities, special structures at the frontal lobe, 2 different types of setae over the surface of the carapace. Special organs at the frontal lobe (Fig. 8 e, 9), and the granules seems to be chemoreceptoric organs. Two different types of setae at the carapace are to distinguish: plumose (Fig. 9 d) and clublike ones (Fig. 9 d and e).

Carapace 0.39 mm length, 0.25 mm height, longer than free thoracic segments; dorsomedian line stressed because of the nodules; pseudo-rostrum short, turned upwards, pseudorostral lobes

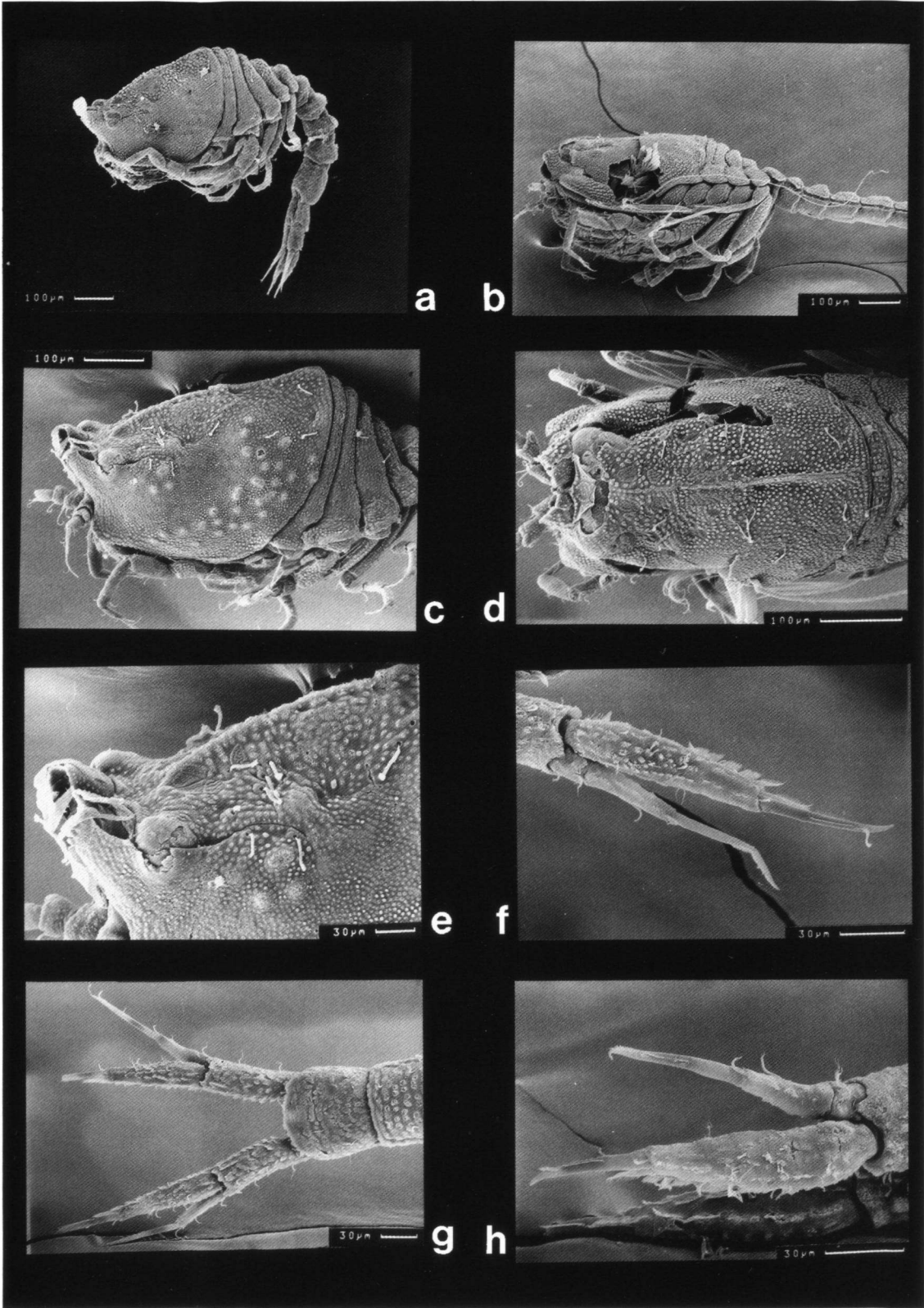


Fig. 8. *Nannastacus micronodosus* n.sp., SEM photos; a. female habitus; b. male habitus; c. female carapace; d. male carapace dorsal view; e. female, frontal lobe with tubercles and granules; f. male left uropod seen from ventral; g. female uropods; h. male left uropods seen from above.

meeting in front of the ocellar lobe; siphonal tube short; antennal notch narrow, not accentuated; anteroventral margin of carapace serrated because of the nodules (Fig. 7 b); anteroventral corner of carapace subacute, little projecting; 5 free thoracic segments 0.24 mm in length being shorter than carapace; abdomen 0.49 mm in length; telson not free.

The description of the extremities is based on the paratype, a female.

First antenna (antennula) minute accessory flagellum, main flagellum with 2 aesthetascs (Fig. 7 c, 8 c); second antenna (antenna) not visible; maxilliped 3 base with projection, ischium and merus of endopod not separated clearly, propodus longer than carpus, carpus longer than dactylus (Fig. 7 d); pereiopod 1 longest extremity, not reaching tip of pseudorostrum, base of endopod longest segment, carpus next longest (Fig. 7 e); pereiopod 2 base of endopod broadend, ischium prolonged with teeth, carpus third longest segment (Fig. 7 f); pereiopod 3, 4 and 5 each other similar in length and proportions, clawlike dactylus (Fig. 7 g, h, i). Uropod's peduncle as long as pleonit 6, with 4 tiny setae at the inner margin (Fig. 7 k, 8 g), endopod stout, with tiny setae at the inner margin, longer than peduncle and exopod as well, terminal spine stout, exopod small basal segment, terminal seta as long as exopod.

Males: Fig. 7 m-u, similar to female except sexual differences: pereiopods 1-4 with exopods, anteroventral notch even less accentuated than in females, anteroventral tooth rounded, not projecting, comb-like setae at the uropod's endopod (Fig. 7 l, 8 b, d, f, h).

#### ETYMOLOGY

The new species was named *S. micronodosus* because of the very small nodules covering the integument.

#### REMARKS

The species resembles most closely is *S. sheardi* Hale, 1945 according to Hale's key (1945), but differs in having a shorter uropod's peduncle and a longer pseudorostrum. The anteroventral margin of the carapace of *S. sheardi* is not serrated as in *S. micronodosus*, while the surface of the carapace is covered with granules, tubercles and hair-like setae, that of *S. sheardi* is not.

Genus *Nannastacus* Bate 1865

***Nannastacus* aff. *lima*** (Hale, 1936)

#### MATERIAL

Maldives station 5 (Ellaidhoo): 1 female ZMHK 38061

#### DESCRIPTION

Length: 1.5 mm, ocellar lobe as long as wide; 2 dorsolateral eyes, only narrowly separated; integument smooth, in higher magnification slightly granulated; carapace oval as seen from above, 0.51 mm long, 0.23 mm high, 0.32 mm wide, with a few hairs (Fig. 10 a and b); pseudorostral lobes relatively long, turned a little upwards; siphonal tube shorter than pseudorostrum; antennal notch not pronounced; anteroventral margin of carapace slightly serrated; anteroventral corner of carapace rounded; 5 free thoracic segments 0.27 mm in length; abdomen: 0.72 mm, shorter than cephalothorax and free thoracic segments, slightly damaged between pleonit 3 and 4; telson not free.

First antenna: main flagellum with 3 aesthetascs (Fig. 10 c); maxilliped 3 exopod present, base of endopod short, oval, proximal with fine hairy setae, merus prolonged distal, nearly reaching end of carpus, propodus dilated, dactylus with 2 stout setae (Fig. 10 d); pereiopod 1 exopod present, base of endopod less than half as long as rest of the extremity, carpus more than twice as long as merus (Fig. 10 e); pereiopod 2 exopod present, base of endopod broadened, relatively short (Fig. 10 f); pereiopod 3 to 5 similar to each other, in pereiopod 4 and 5 the dactylus clawlike (Fig. 10 g, h, i). Uropod's peduncle factor 0.69 to

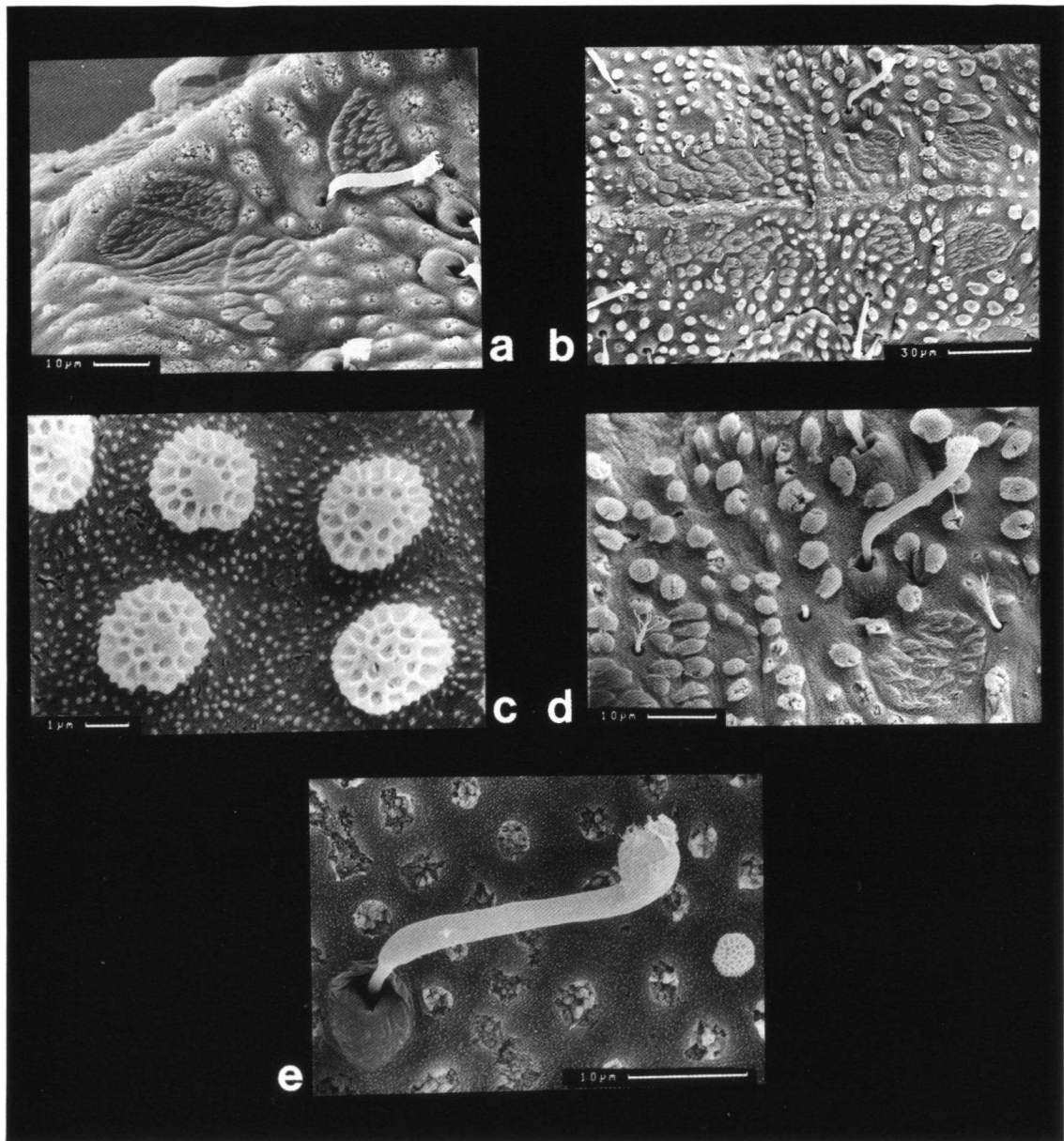


Fig. 9. *Nannastacus micronodosus* n.sp., SEM photos; a. organ of frontal lobe; b. structure of carapace; c. tubercles and granule organs; d. two different types of setae: plumose and clublike setae; e. close-up of clublike seta.

telsonic somite, 1.9 times as long as wide, with 1 stout tooth-like seta at the inner margin, endopod including terminal spine 1.9 times longer than peduncle, unsegmented, longer than exopod, exopod 2 segmented, distal article 3 times as long as basal one, terminal seta as long as distal article (Fig. 10 k).

#### REMARKS

The specimen resembles *N. lima* (Hale, 1936) from South Australia and Tasmania in that the pereopod 2 has a stout base and an ischium which is not distinct, while the pereopod 3 is slender. However, in *N. lima* the base is as long as

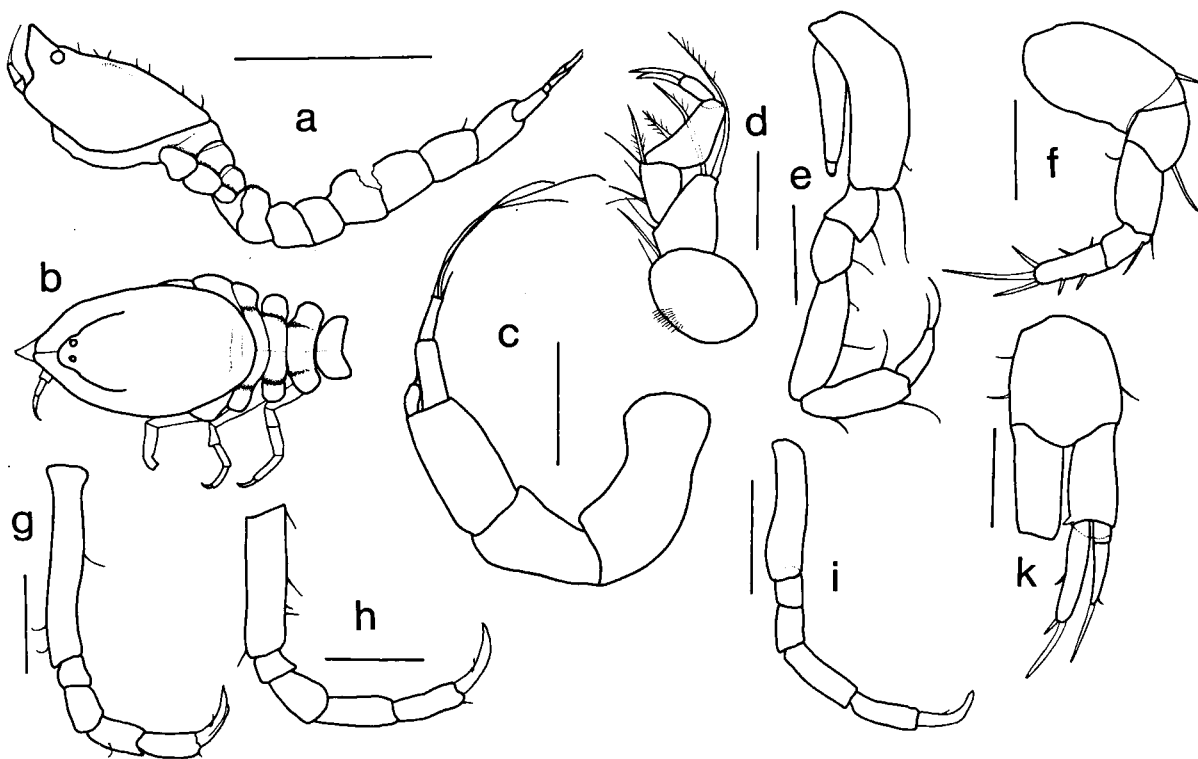


Fig. 10. *Nannastacus* aff. *lima*, female; a. habitus, scale bar: 0.5 mm; b. dorsal view of carapace, to same scale as 10a; c. first antenna, scale bar: 0.05 mm; d. maxilliped 3; e. pereiopod 1; f. pereiopod 2; g. pereiopod 3; h. pereiopod 4; i. pereiopod 5; k. pleonit 6 and uropods. If not otherwise indicated the scale bar is 0.1 mm.

the rest of the extremity, while in *N. aff. lima* the base is little longer than rest. In both pereiopods 4 and 5 are shorter than the proceeding legs. Pereiopod 5 with carpus twice as long as merus. In *N. lima* the carpus is 0.8 times of base, in *N. aff. lima* it is only 0.6 times of base. The uropod's endopod (including terminal spine) is  $1 \frac{2}{3}$  to 2 times as long as the uropod's peduncle in *N. lima*, while it is almost the same in *N. aff. lima*.

The real difference between the two forms is in the armature of the uropods. In *N. aff. lima* they do not carry the 6 - 7 thornlike spines at the inner margin of the endopod nor the 6 thornlike spines at the inner margin of the peduncle as they do in *N. lima*.

Hale (1936) compared his species with *Cumella*

*hispidata* Calman, 1911 and gave the main character to distinguish the two in the first antenna's third joint, this being 2 to  $2 \frac{1}{3}$  times as long as wide in *N. lima* and 3 times as long as wide in *C. hispidata*. In *N. aff. lima* it is 1.9 times as long as wide. Not only are the proportions of the extremities different in *C. hispidata* and *N. lima* (Hale, 1936), but and the armature of the uropods is also different.

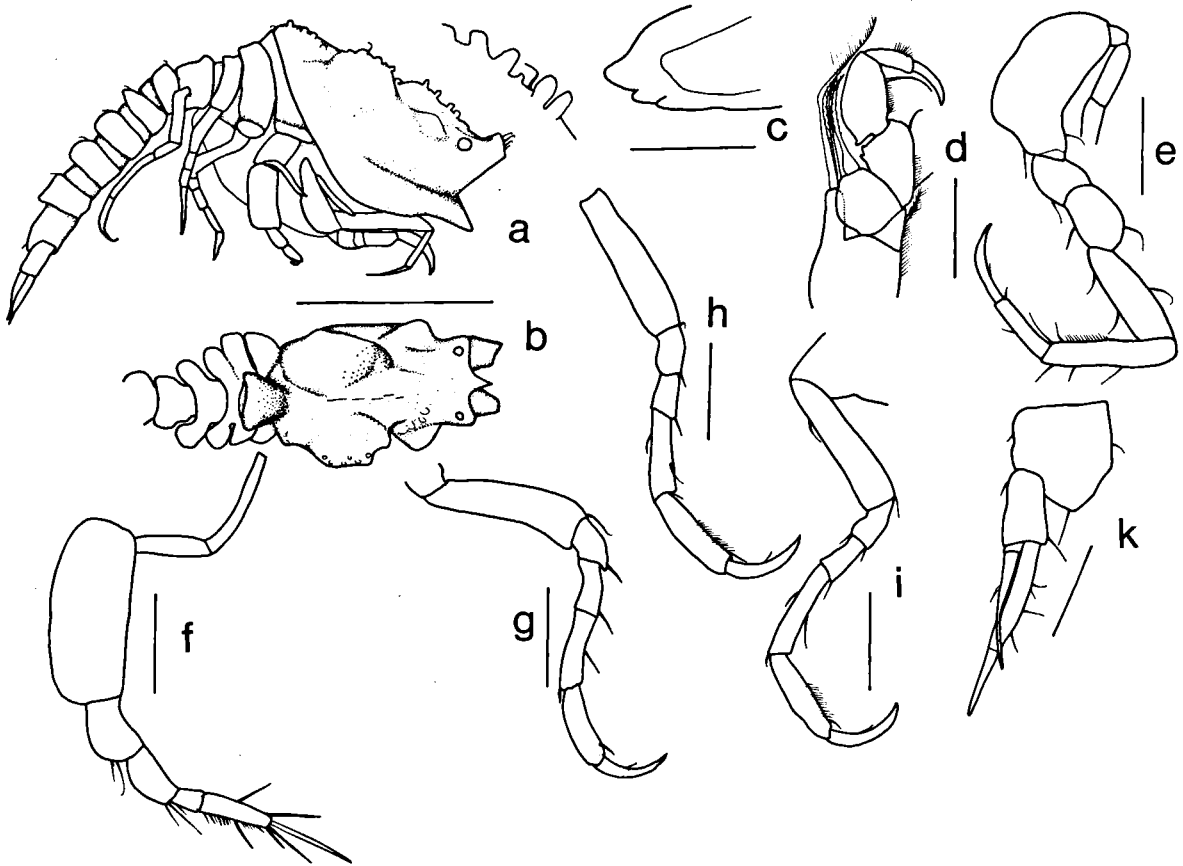


Fig. 11. *Schizotrema gibbera* n.sp., female; a. habitus, scale bar: 0.5 mm, dorsal margin in higher magnification; b. dorsal view, same scale as in 11a; c. anteroventral corner, scale bar: 0.05 mm; d. maxilliped 3; e. pereiopod 1; f. pereiopod 2; g. pereiopod 3; h. pereiopod 4; i. pereiopod 5; k. pleonit 6 and left uropod. If not otherwise indicated the scale bar is 0.1 mm.

Genus *Schizotrema* Calman 1911

***Schizotrema gibbera* n.sp.**

**MATERIAL**

Holotype: a female ZMHK 38049

**TYPE LOCALITY**

Maldives station 5, NW lagoon, silty sand, 0.5 m depth, Ellaidhoo, Ari Atoll, Maldives; date: 26.8.1995, U. Mühlenhardt-Siegel and V. Siegel leg.

Paratypes: 1 juvenile

**DIAGNOSIS**

Carapace with 5 protuberances, tubercles and few hairlike setae; pseudorostrum: paired, 2 lobi, turned slightly upwards; dorsomedian line not pronounced; antennal notch: wide

**DESCRIPTION**

Based on the holotype, an adult female (Fig. 11a).

Length 1.39 mm; ocellar lobe divided; frontal lobe rectangular, with a „tooth“ at dorsomedian front (Fig. 11 b); eyes small, paired; integument pitted, with tiny tubercles and a few hairy setae; carapace 0.57 mm in length, 0.38 mm height,

0.34 mm width; 5 protuberances, 1 pair at the anterior lateral part of the carapace, 1 pair dorsolateral and 1 single dorsomedian at the backwards margin of carapace (Fig. 11 a, b); pseudo-rostrum: paired, turned upwards; siphonal tube short; antennal notch wide; subrostral tooth acute, long, reaching nearly as far as the tip of the pseudorostrum; anteroventral margin of carapace smooth, at high magnification with 3 teeth close to the margin (Fig. 11 c). First pedigerous segment under carapace, 2 to 5 pedigerous segments 0.26 mm; abdomen shorter than carapace, 0.56 mm, 5th pleon segment not clearly longer than the other; telson not free, with hairy seta at tip.

Maxilliped 3 base of endopod with protuberances of distance to merus, ischium short, carpus with 2 denticles, propodus with 1 denticle and relatively narrow connection to carpus, propodus and dactylus subequal in length (Fig. 11d); pereopod 1 with exopod, base of endopod largest segment, propodus longest article, dactylus with clawlike seta (Fig. 11e); pereopod 2 with exopod, base of endopod longest article (Fig. 11 f); pereopod 3 to 5 similar in shape, base longest article, dactylus claw like, pereopods 3 to 5 subequal in length, pereopod 5 slightly shorter (Fig. 11 g, h, i). Uropods as long as pleonit 5 and 6 combined, peduncle shorter than pleonit 6, few hairy setae, endopod unsegmented, with 4 hair-like setae, terminal seta stout, 0.6 times as long as endopod, endopod slightly longer than exopod, which is slender, in 2 segments, the basal one 1/10 as long as the distal (Fig. 11 k).

#### ETYMOLOGY

The species is named *gibbera* because of its protuberances at the carapace.

#### REMARKS

8 out of 10 described *Schizotrema* species have been reported from the Indian Ocean: *S. aculeatum* Hale, 1936 (Queensland, South Australia, West Australia; 2 m depth) a female with strong spines at pleonit 6, uropod's exopod much shorter than endopod; *S. bidens* Fage, 1945 (Vietnam, surface water) a male, uropod's exopod very short, subrostral tooth directed downwards; *S.*

*bifrons* Calman, 1911 (India, 2-9 m depth) uropod' exopod very short, anterolateral margin serrated, no protuberances on carapace; *S. depressum* Calman, 1911 (Thailand, South Australia; 1-2 m depth) uropod's exopod subequal in length to endopod, carapace depress, no protuberances, large teeth at the lateral margin of carapace as seen from above; *S. leopardinum* Hale, 1949 (West Australia; 3-5 m depth) a male described, uropod's exopod much shorter than endopod; *S. macrodactylum* Fage, 1945 (Vietnam; surface water) a male described, uropod's exopod much shorter than endopod; *S. resimum* Hale, 1949 (West Australia; 5-6 m depth) uropod's exopod much shorter than endopod, frontal carapace margin very much serrated, rather large spines with brush of setae at carapace; *S. sordidum* Calman, 1911 (Thailand, Vietnam; 0-2 m depth) uropod's exopod much shorter than endopod, protuberances on carapace rather flat. The species *S. atlanticum* Bacescu and Muradian, 1972 (West Africa; 227-286 m depth) from the Atlantic and *S. sakaii* Gamo, 1964 from Japanese waters both have uropod's exopod much shorter than endopod, among other characteristics e.g. shape of carapace, spiny integument. Only *S. depressum* has the uropod's rami of subequal length, as has *S. gibbera* n.sp. also. However, the latter differs from *S. depressum* in the shape of its carapace which is not depress, and has 5 protuberances and tubercles. For comparison of all *Schizotrema* species see Table 3.

Family Diastylidae Bate 1856

Genus *Makrokylindrus* Stebbing 1912

#### GENERIC DIAGNOSIS

Telson well developed and with 2 apical spines, pseudorostrum less than 1/3 of total carapax, pedigerous segments 3 and 4 free, not coalescent; antenna 1 long; uropod's endopod 2 or 3 segmented.

Day (1980) discussed the problems of distinguishing *Makrokylindrus* from *Diastylis*. Since then only 2 new species have been described from Japan: *M. jubatus* Gamo 1988 and *M. hystrix* Gamo, 1985. Bacescu (1961, 1962) defined three





subgenera *Makrokyllindrus* s.s. and *Coalescuma*, differing in the coalescence of thoracic segments 3 and 4, and *Vemakylindrus* with very long pseudo-rostral lobes. Bacescu (1992) defined the subgenera *Makrokyllindrus* s.s. in having thoracic segments 3 and 4 coalesced (the former subgenus *Coalescuma*) and *Adiastylis* with thoracic segments 3 and 4 separated. He followed Jones (1969) in raising *Vemakylindrus* to generic rank.

**Makrokyllindrus declivifrons** n.sp.

**MATERIAL**

Holotype: a subadult female ZMHK 38056  
Paratypes: 1 subadult female ZMA Cu. 202.081,  
1 damaged adult male ZMHK 38057; same station as holotype.

**TYPE LOCALITY**

Red Sea, N Sudan. 22° 25.2' N 36° 45.9' E -  
22° 34.8' N 35° 46.2' E, 772 - 779 m.

**DIAGNOSIS**

Carapace slightly depress, frontal 2/3 sloping, 3 to 4 longitudinal ridges from the anterolateral third to the back of the carapace, the dorsad ridge bending downwards in the frontal part confining the other 2 or 3 ridges to the front (Fig. 12 a, b); antennal notch poorly marked.

**DESCRIPTION**

Based on a subadult female, the holotype.  
Length from tip of pseudorostrum to the end of telson 4.2 mm; carapace anterior part sloping, 3 to 4 ridges in posterior 2/3, the dorsal ridge directed antero ventrally in anterior part, thus limiting the other ridges; carapace 1.61 mm long as seen laterally, but 1.30 mm long seen from above, because of the lateral, posteriorly directed elongation of the carapace, 0.85 mm high, 1.17 mm wide. Pseudorostral lobes meeting in front of ocellar lobe, straight; siphonal tube short; antennal notch barely indicated; Anteroventral margin of carapace smooth. Free thoracic segments 0.74 mm in length as seen from above, the first two thoracic segments just visible from above, 3rd

and 4th thoracic segments coalesced, length of cephalothorax and free thoracic segments: 2.0 mm (shorter than abdomen). Abdomen 2.19 mm including telson, pleonit 6 as long as pleonit 5, uropods inserting in last quarter of pleonit 6; telson long, subequal in length to last 3 pleon somites, 2.4 times as long as telsonic segment, cylindrical, 0.83 mm long, 2 terminal spines, postanal part short, 1/12 the length of preanal part.

First antenna long, slender, peduncle's basal segment stout, 0.26 mm long, second segment with 0.29 mm the longest, distal article 0.16 mm; flagellum 2 segmented, distal article 2.4 times as long as basal article, 7 distal filaments; accessory flagellum 2 segmented, as long as basal article of flagellum (Fig. 12 c); maxilliped 3 exopod not seen, base of endopod proximal slender, dilated distal, outer margin undulate, distal extended up to half of carpus; carpus, propodus and dactylus subequal in length, tapering (Fig. 12 d).

Pereiopod 1 exopod present, base of endopod present only, the remainder of the limb broken off (Fig. 12 e); pereiopod 2 exopod present, ischium of endopod not visible, base longest part, carpus second longest, propodus shorter than dactylus (Fig. 12 f); pereiopod 3 merus longest article, dactylus short with special seta (Fig. 12 g); pereiopod 4 base longest part, merus slightly shorter than base but longer than carpus, propodus and dactylus combined, dactylus with special seta (Fig. 12 h); pereiopod 5 shorter than the preceding limbs, carpus short, dactylus long (Fig. 12 i); pleopods missing in females. Uropods peduncle with 5 spiny setae, subequal in length to telson without pleonit 6; exopod shorter than endopod, in 2 segments, basal one shorter than distal one, a terminal seta which is longer than distal article, endopod 3 segmented, the basal article being the longest, longer than 2 and 3 combined (Fig. 12 k, l).

Male: (Fig. 12 m to v) in very poor condition. Integument soft, with scaly structure, in parts broken, length 6 mm. Total length of cephalothorax and free thoracic segments 3 mm, of carapax 2 mm. Thoracic segments 1 and 2 only visible from above, thoracic segment 3 and 4 coalesced. Length of abdomen 2 mm; telson 1 mm, a little longer than pleonit 5 and 6 together, 2 terminal and 1 pair of lateral, spines, postanal

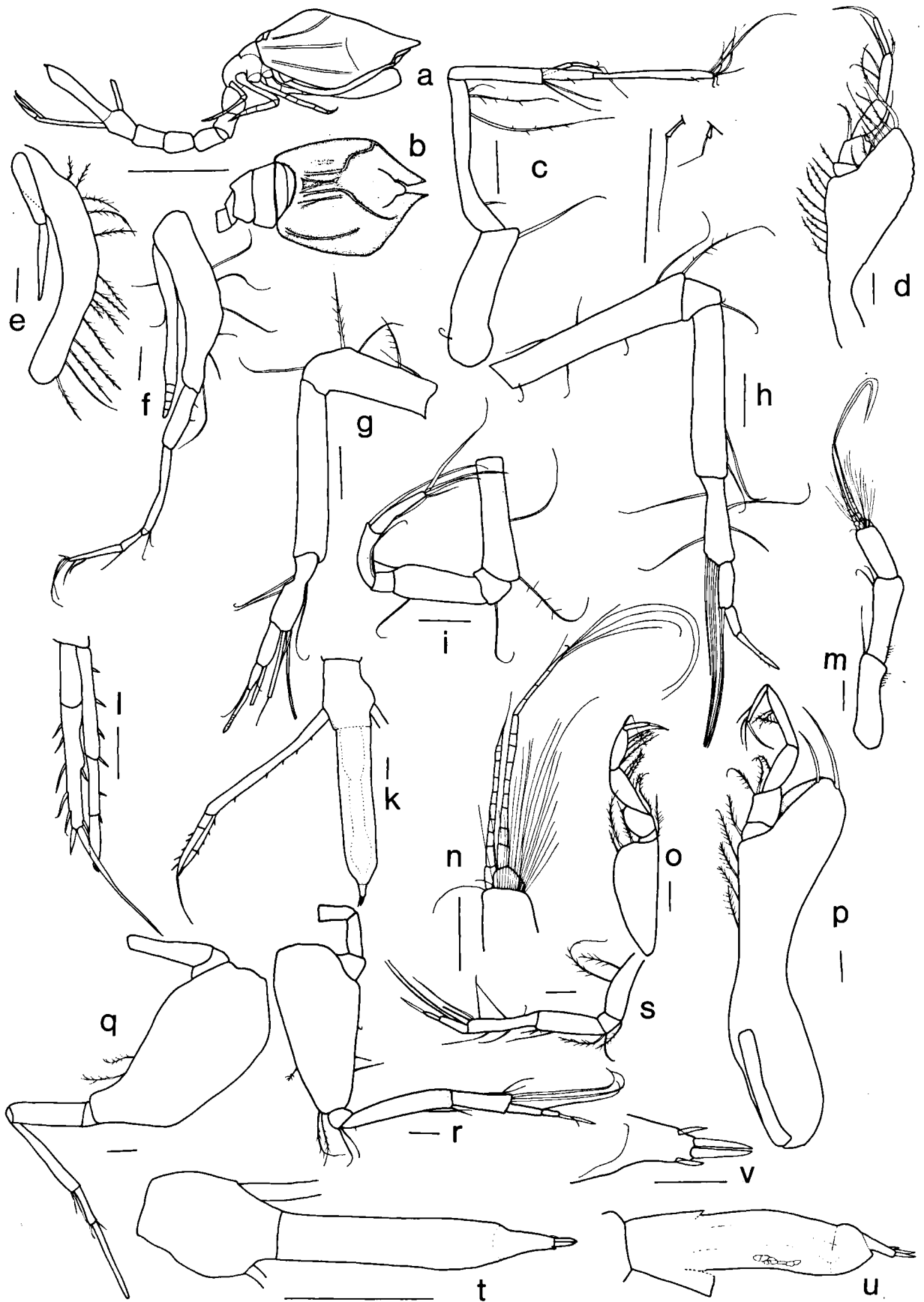


Fig. 12. *Makrokylindrus declivifrons* n.sp., subadult female; a. female habitus, scale bar: 1 mm; b. female dorsal view, same scale as in 12a; c. female first antenna, articulated setae; d. female maxilliped 3; e. female pereopod 1; f. female pereopod 2; g. female pereopod 3; h. female pereopod 4; i. female pereopod 5; k. female pleonit 6 and telson, uropods; l. female left uropod; m. *Makrokylindrus declivifrons* n.sp., male, first antenna; n. male, first antenna, detailed; o. male, maxilliped 3; p. male, maxilliped 3; q. male, pereopod 2; r. male, pereopod 4; s. male, pereopod 5; t. male, telson; u. male, telson, scale bar: as in 12 t; v. male, telson detailed. If not otherwise indicated the scale bar is 0.1 mm.

part short. Basal article of antenna 1 longest, main and accessory flagellum not clearly discernable; 2 aesthetascs and numerous fine filaments at tip. Maxilliped 2 similar to the maxilliped 3, with base as long as ischium, merus, carpus and propodus combined, merus short but widened. Maxilliped 3: exopod present, base very long, 1.5 times as long as rest of extremity, even excluding distal elongation of base, which reaches half the length of carpus, distal part of base wider than proximal part. Pereiopod 1 broken off, pereiopod 2 exopod present, proximal part of base broad, 2 times longer than wide, shorter than rest of extremity, merus slender, 0.8 in length of carpus, propodus short, 0.4 of length of carpus, dactylus long and slender, about as long as merus. Uropods broken off, inserted at distal quarter of telsonic segment.

#### ETYMOLOGY

The new species is named after its sloping front of the carapace.

#### REMARKS

Day (1980) set up an artificial key for all *Makrokylindrus* species known at that time. 12 species were from the Indian Ocean. From these the new species resembles *M. fistularis* (Calman, 1912) from Thailand most closely. All other species differ extremely from *M. declivifrons* n.sp. The characters separating the new species from *M. fistularis* are the absence of exopods at maxilliped 3, a telson subequal in length to the uropods and

a short postanal part with 2 terminal spines. Bacescu (1992) erected two subgenera for *Makrokylindrus*: *Makrokylindrus* s.s. and *Adiastylis* and defined *Makrokylindrus* (*Makrokylindrus*) as having the thoracic segments 3 and 4 coalesced, while these are free in *Makrokylindrus* (*Adiastylis*). Bacescu (1992) was obviously wrong in placing *M. fistularis* into *Adiastylis*, since Calman (1911) reported that „ .. the third and fourth (thoracic somits) are not distinctly separated at the dorsal surface“ as he also figured. Bacescu (1961) placed *M. fistularis* in his new genus *Coalescuma*.

Although the male is in very poor condition and larger than the females, it nevertheless resembles them in shape of telson, insertion of uropods, shape of maxilliped 3 and pereiopod 2 although the base is more widened. This is a feature common in cumacean males. Different from the females are the first antenna which is stouter but carries more sensoric filaments. For these reasons the male specimen has been placed in the same species as the female specimens.

Genus *Dimorphostylis* Zimmer 1921

#### ***Dimorphostylis maledivensis* n.sp.**

#### MATERIAL

Holotype: a male ZMHK 38055

Paratype: 1 male, (same station as holotype) ZMA Cu. 202.082

Both specimens are very soft, maybe due to insufficient preservation or incomplete calcification, because they are freshly molted.

#### TYPE LOCALITY

Maldives station 1, 21 m depth, south of the island's jetty, on sandy bottom within a sandeel colony of the sandeel *Gorgasia* sp., Embudu, South Male Atoll, Maldives; date: 2. March 1994, U. Mühlenhardt-Siegel and V. Siegel leg.

#### DIAGNOSIS

Telson relatively short comparing to uropod's peduncle, with two pairs of lateral spines; uropod's exopod shorter than endopod; accessory flagellum of antenna 1 rather long.



Fig. 13. *Dimorphostylis maledivensis* n.sp., subadult male; a. habitus, scale bar: 1 mm; b. first antenna and detailed seta; c. maxilliped 3; d. pereopod 1; e. pereopod 2; f. pereopod 3 and exopod; g. pereopod 4; h. pereopod 5; i. pleonit 6 and telson, uropods; k. telson, dorsal view; l. telson, seen from the side; m. right uropod's rami. If not otherwise indicated the scale bar is 0.1 mm.

## DESCRIPTION

Based on the holotype, an adult male (Fig. 13 a). Length: 3.06 mm; ocellar lobe rounded; eyes present, dorsomedially, with 4 lenses; integument appears smooth, but at high magnifications with very fine granulated surface.

Carapace with 3 low ridges, without discernable prominences, 1.06 mm in length, 0.66 mm wide, 0.50 mm high; pseudorostrum straight, meeting in front of ocellar lobus; siphonal tube short; antennal notch little developed; anteroventral margin of carapace smooth;

Free thoracic segments 0.47 mm in length; abdomen 0.97 mm as measured from first pleonit to tip telson. Telson: 6th pleonit + telson: 0.56 mm, telson 1/3 to 1/4 as long as uropod's peduncle, 3 terminal spines, the middle one thickened, one pair of lateral setae (Fig. 13 k, l).

First antenna (antennula): base longest article, terminal one with numerous fine setae, main flagellum consisting of 4 articles with 2 long aesthetascs, accessory flagellum more than half as long as main flagellum (Fig. 13 b); second antenna: long, reaching further than tip of uropods. Maxilliped 3 with exopod, base of endopod broken, only distal prolongation at outer margin still present, ischium well developed and 1.8 times as wide as long, merus as long as wide, subequal in length to carpus, which is 1.2 times longer than wide, propodus longer than merus, 2.5 times longer than wide, dactylus 3 times as long as wide, with numerous plumose setae (Fig. 13 c). Pereiopod 1 exopod present; long endopod, base very stout (Fig. 13 d), articulation of carpus with propodus reaching beginning of pseudorostrum (Fig. 13 a). Pereiopod 2, with exopod, base of endopod stout, the rest of the limb weakly developed (Fig. 13 e). Pereiopod 3 and 4 with exopods (Fig. 13 f, g). Pereiopod 3 base of endopod stout, 1.7 times as long as wide, ischium 0.6 times as

long as wide, merus 0.3 of base in length, merus 1.9 times as long as wide, carpus 0.2 of base in length, 2.1 times as long as wide, propodus 0.1 of base in length, 1.7 times as long as wide, propodus 0.1 of base in length, 2.3 times as long as wide. Pereiopod 4 similar to pereiopod 3, articulation of ischium to base geniculated and displaced. Pereiopod 5 base short, merus as long as carpus, propodus half as long as carpus (Fig. 13 h). Uropods peduncle three times as long as telson (Fig. 13 i), length subequal to pleonit 5 + 6 + telson, 2.5 times as long as pleonit 6. Exopod 2 segmented, shorter than 3 segmented endopod, the exopod reaching articulation from endopod's segment 2 and 3 but including the terminal spines the exopod is longer than the endopod. The exopod's terminal spine is equal in length to the exopod (Fig. 13 m).

## ETYMOLOGY

The new species is named after the type locality, the Maldives.

## REMARKS

Only 6 species of the genus *Dimorphostylis* have been described for the Indian Ocean. All differ from the two specimens in the Maldives collection.

In *D. australis* Foxon, 1932, from West Australia and Queensland, the male's telson is different from the present specimens in that it is more than half as long as the uropod's peduncle and formed like a spatula.

In *D. cottoni* Hale, 1936, described from South Australia, Tasmania and New South Wales, the male's telson is similar in shape to that of the present specimens but the spines differ in that *D. cottoni* has 2 terminal spines and 3 pairs of lateral setae. Furthermore the accessory flagellum of antenna 1 is very short in *D. cottoni* and the basal article of the uropod's endopod is 2 times as long as article 2 and 3 combined.

*D. horai* Kurian, 1954, described for the Andaman Islands, has a telson longer than the uropod's peduncle.

The Indian *D. longitelson* Kurian, 1965 has a telson subequal in length to uropod's peduncle.

*D. tribulis* Hale, 1945 is based on a female

from South Australia, and has a triangular telson.

*D. vieta* (Hale, 1936), based on material from West Australia and South Australia, has a relatively short telson, 2 terminal spines and uropod's exo- and endopod that are equal in length.

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