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SPHAEROMATIDAE FROM THE WATAMU AREA, KENYA  
DESCRIPTION OF A NEW GENUS AND FOUR NEW SPECIES  
(ISOPODA, FLABELLIFERA)

BY

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ABSTRACT

The present contribution on sphaeromatid isopods from shallow water coral reef locations in Kenya reports on four new species in the genera *Afrocerceis* n.gen., *Paracilicea* Stebbing, 1910 and *Paradella* Harrison & Holdich, 1982. They are described in detail, with remarks on their inter-specific affinities, habitat preference and biogeography. A description is further provided for *Dynamenella scaptocephala* Messana, 1990. *Paracassinopsis perlata* (Roman, 1974) is first recorded from the African continent.

ZUSAMMENFASSUNG

Vorliegender Beitrag über die Isopoden-Familie Sphaeromatidae von Korallenriff-Habitaten in Kenia berichtet über vier für die Wissenschaft neue Arten der Gattungen *Afrocerceis* n.gen., *Paracilicea* Stebbing, 1910 und *Paradella* Harrison & Holdich, 1982. Es werden ausführliche Artbeschreibungen gegeben, mit Bemerkungen über Verwandtschaftsbeziehungen, Habitatpräferenz und Biogeographie. *Dynamenella scaptocephala* Messana, 1990 wird ergänzend beschrieben und *Paracassinopsis perlata* (Roman, 1974) erstmals von dem Afrikanischen Kontinent nachgewiesen.

INTRODUCTION

This report treats a small collection of Sphaeromatid isopods from Kenya, comprising two named species, four species new to science and a new genus. The material was taken by the author in July and August 1989 from coral reef locations in the Watamu area, south of Malindi. Specimens were collected over a coastline of about 2 km, just north of Turtle Bay. The area investigated is bordered to the south by raised limestone cliffs, while to the north several champignon islets are found on the reef flats. Some detailed information of the area studied is given by Brander, McLeod & Humphreys (1971: 406), who compared the reef-inhabiting invertebrates from the Watamu area and Aldabra Atoll.

This contribution is the second on Sphaeromatidae from Kenya, the first being the description of a new genus and species of sand beach isopod (*Sphaeromopsis amathitis*) by Holdich & Jones (1973), a species not present in the material treated here. The knowledge of Sphaeromatidae from other nearby

tropical areas is also very incomplete. The first report on this family from Somalia came from Nobili (1906), followed by two short papers by Messana (1988, 1990). Altogether seven species are so far known from this country. The tropical areas south and south-east of Kenya, including Madagascar and the Mascarene Archipelago were studied by Stebbing (1910; Zanzibar), Barnard (1914, 1955; Mozambique), Monod (1971; Madagascar, 1975; La Réunion), Müller (1990; La Réunion), Ortiz (1990, Mozambique: Inhaca Island) and Roman (1970, 1974; Madagascar). A compilation of the species recorded from Mozambique is found in Kensley (1978). The sphaeromatid fauna of the mainland of Tanzania is completely unknown. Altogether 16 nominal species of Sphaeromatidae are mentioned from the above listed areas south of Kenya. From all this it becomes obvious, that in the tropical western Indian Ocean, along the African coast (Somalia south to Mozambique), including Madagascar and the Mascarene Archipelago, the Sphaeromatidae are least known from the mainland of Tanzania (no species) and Kenya (one species). This contribution therefore is an important step to fill a gap in our knowledge of this common group in marine ecosystems and provides information for biogeographic considerations and relationships of the Sphaeromatidae from the Indo-Pacific area.

The material available was obtained while skin diving and wading on the reef flat. Because the tidal range in the area studied is about 3 m, all samples were taken at low tide to facilitate collecting. The substrate was transported in fine mesh cloth bags and plastic bags. It was stored in 5% formalin/sea water for some hours, then washed with fresh water over a 0.5 mm sieve and preserved in 70% ethanol. Appendages of dissected specimens were mounted on slides in glycerin and sealed with hot paraffin.

Specimens are deposited in the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH), The Netherlands; Queensland Museum in Brisbane (QM), Australia and in the author's private collection.

#### SYSTEMATIC ACCOUNT

##### **Afrocerceis** n. gen.

Type species: *Afrocerceis kenyensis* n.sp.

Diagnosis (♂). — Body smooth, dorsoventrally flattened. Cephalon with posterodorsal, well pigmented eyes. Antennae covered by flattened cephalon. Second article of antenna 1 with robust, lateral tooth-shaped tubercles, proximal article lacking lateral projections. A distinct suture line present between pereonites 2-7 and laterally expanded coxae; first coxae fused with pereonite. Pleon with one free pleonite between posterolateral margins of 7th pereonite; two pairs of suture lines of fused pleonite section extending to posterior margin.



Pleotelson triangular, with semicircular distal ventilation slit. Second peduncular article of antennules with short lateral, tooth-shaped tubercles. Pereopods barely setose; posterior claw of biunguiculate dactylus of pereopods 1, 2, 3 and 7 pectinate. Pereopods 1, 4 and 5 much more robust than remaining pereopods. Elongate-triangular penes separated at base, located at posterior margin of pereonite 7. Exopodite of 2nd pleopod markedly smaller than endopodite, appendix masculina with narrow lamella along mediodistal margin. Uropodal rami flattened and well developed.

Derivatio nominis: The name of the new genus refers to its occurrence at the African continent and its systematic position within the *Cerceis*-like genera.

### **Afrocerceis kenyensis** n. sp. (figs. 1-22)

Holotype: ♂ (RMNH); from *Sargassum* on reef-flat, 0.5 m; 2 August 1989. Paratypes: 2 immature adults (HGM); collected together with holotype. 1 manca (RMNH); seagrass beds on reef-flat, 0-1 m, 24 July - 7 August 1989. 2 immature adults, 1 manca, deposited as follows. — 1 immature adult (HGM), 1 immature adult, 1 manca (QM 18243); reef-flat, dead corals covered with brown algae, intertidal; 24 July - 7 August 1989.

Derivatio nominis: The specific name refers to the country of the type locality, Kenya.

Description, ♂: Total length 4.0 mm (frontal margin of cephalon to tip of pleotelson), maximum width at pereonites 4-7. Body smooth and dorsoventrally flattened, with few setae on appendages. Body of green or green-brown colour, covered with numerous brownish pigment spots; a pair of tiny pigmentations in circular arrangement present on dorsum of pereonite 4. Cephalon 1.4 times wider than long, laterally flattened parts covering antennae; well pigmented eyes located posterodorsally. Pereonite 1 considerably longer than remaining pereonites. Coxae of pereonites 2-7 with distinct suture; these coxae ventrally interlocked by anterior, rounded tubercle, which fits in an excavation of the preceding coxa; first coxae fused with pereonite, an incomplete suture line is visible dorsally. Pleotelson with one free pleonite located between posterolateral margins of pereonite 7; two pairs of suture lines of fused pleonite section extending to posterior margin. Pleotelson triangular, with semicircular distal ventilation slit. Epistome with subacute, roughly triangular distal part, not separating bases of antennules. Elongate-triangular penes separated at base, located at posterior margin of pereonite 7.

Peduncle of first antenna 3-articulate; proximal article longer than peduncular articles 2 and 3 together, with only a feathered sensory seta anterodistally, without lateral projections; 2nd article slightly wider than long, with pair of robust, lateral tooth-shaped processes; slender third peduncular article much more slender than 2nd one, similar in shape to flagellar articles; flagellum of 8 articles, altogether only 3/5 length of peduncle; proximal article very short and much wider than long; articles 3-7 each bearing a posterodistal pair of slender

aesthetascs. Second antenna 5-articulate, with elongate articles 4-5; flagellum of 12 setose articles.

Incisor of left mandible 5-cuspidate; lacinia mobilis 3-cuspidate, spine-row of 8 serrate spines; triturative molar robust. Incisor of right mandible 4-cuspidate, spine-row of 8 serrate spines and a distal spatulate spine; incisor anterior to spine-row with 4 slender fringed setae; molar as for left mandible; 3-articulate palp robust, distally extending beyond distal part of incisor; articles 1 and 3 subequal in length, slightly shorter than 2nd; terminal article bearing row of 14

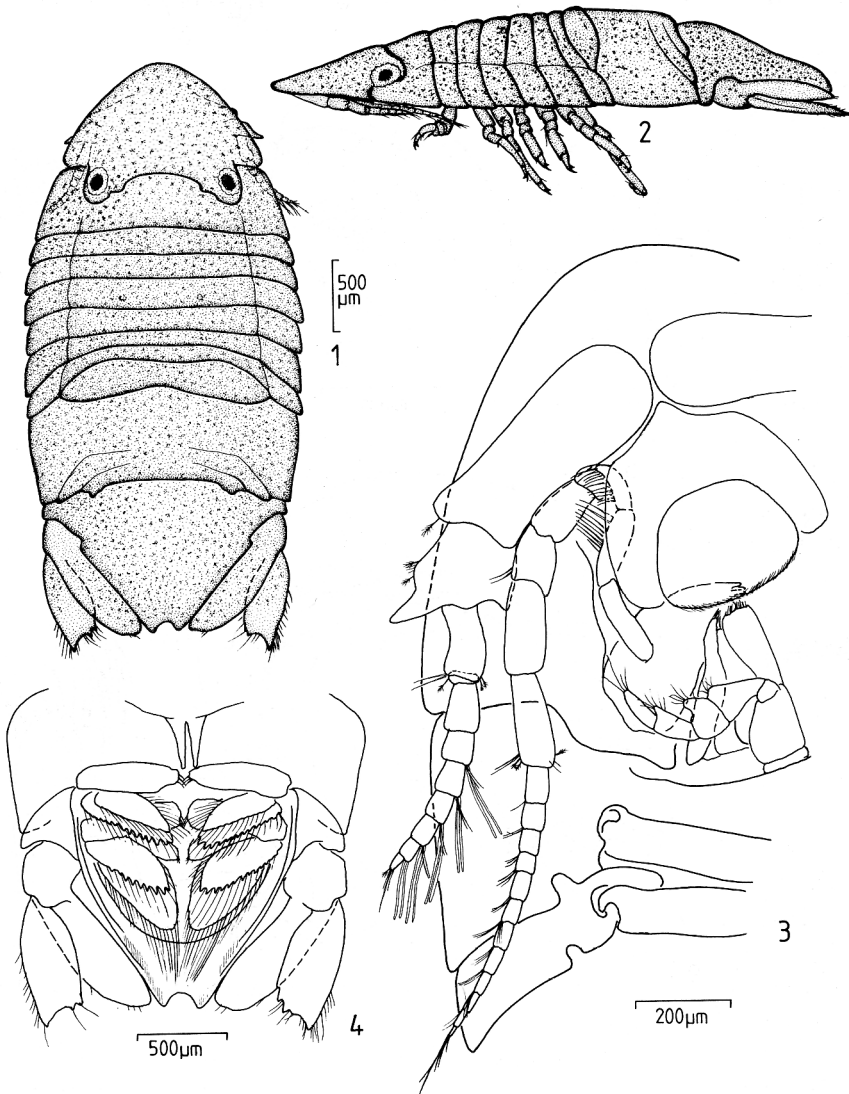
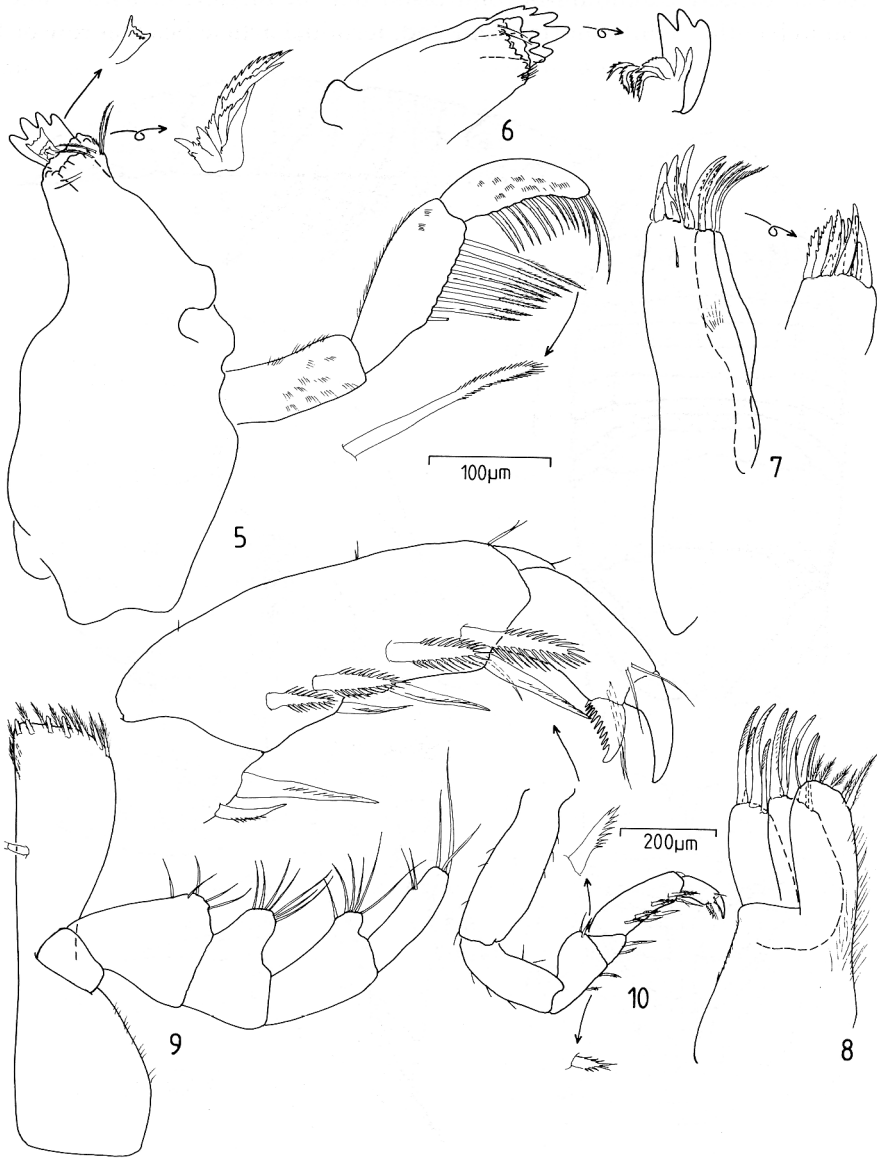


Fig. 1-4. *Afrocerceis kenyensis* n.gen., n.sp., ♂. 1, dorsal view; 2, lateral view; 3, lateral part of cephalon and pereonites 1-2, ventral view; 4, pleon and penes, ventral view.

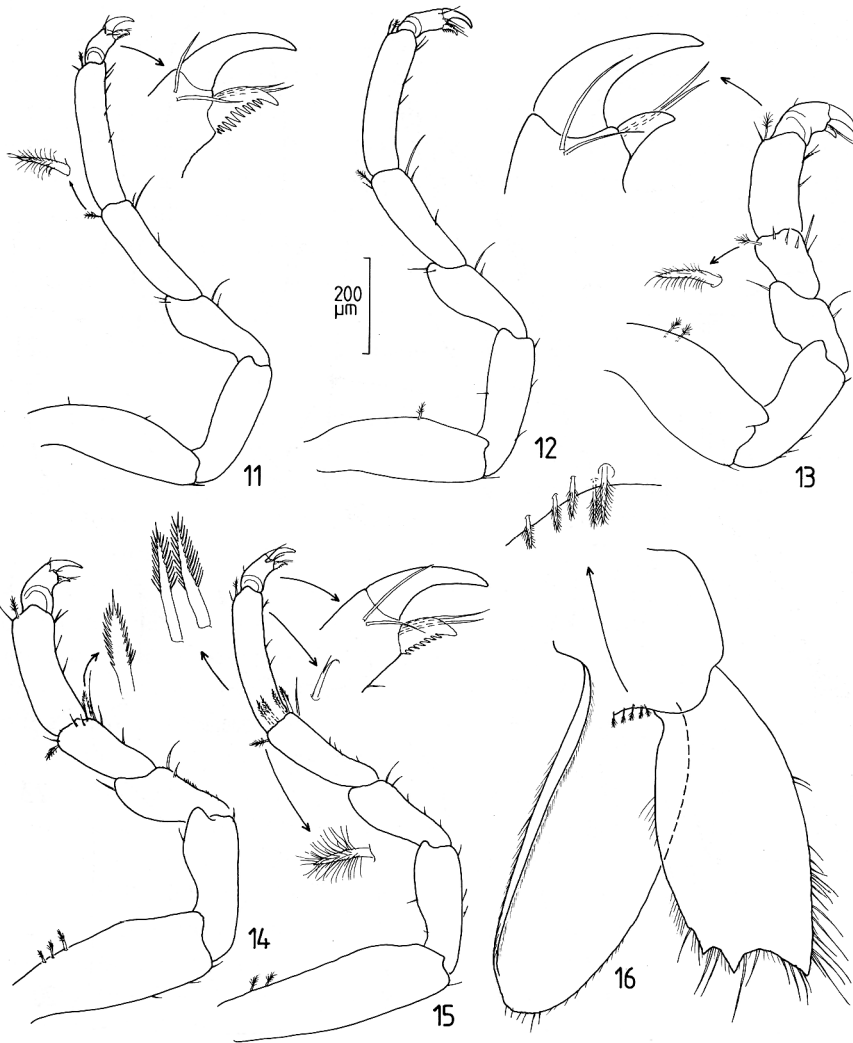
fringed spines; 2nd article with row of 9 fringed spines. Small inner lobe of first maxilla bearing 3 distal plumose spines; broader outer lobe bearing 9 distal, partly denticulate robust spines and a small subapical seta. Second maxilla with robust rami; outer lobe of outer ramus with 4, inner lobe of outer ramus with 5 slender, fringed spines; inner ramus slightly extending beyond outer ramus, bearing 4 small distal plumose setae, a mediobasal plumose spine, and many



Figs. 5-10. *Afrocerceis kenyensis* n.gen., n. sp., ♂. 5, right mandible; 6, distal part of left mandible; 7, maxilla 1; 8, maxilla 2; 9, maxilliped; 10, pereopod 1.

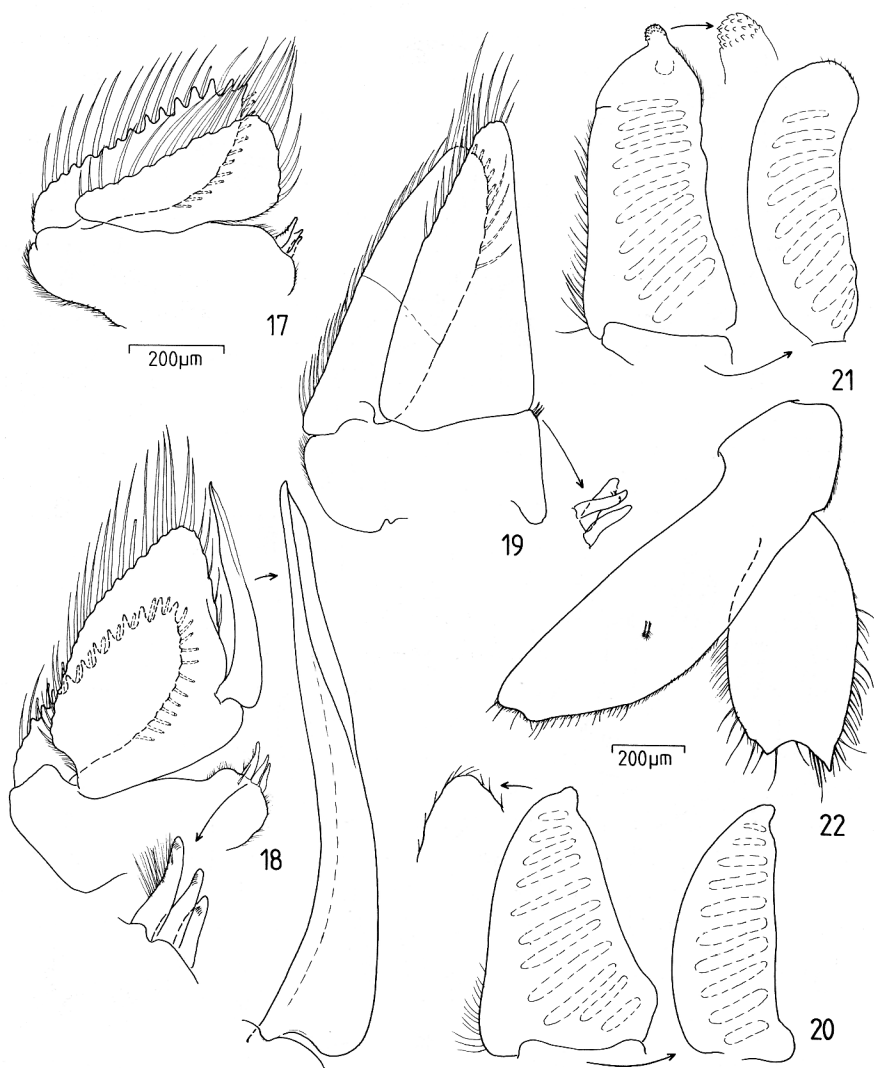
setules along medial margin. Endite of maxilliped with single coupling hook and truncate distal margin, bearing row of 4 robust, rounded spines and 10 slender, plumose spines; articles of 5-articulate palp barely setose (2-5) or non-setose (first): setae of articles 2-4 located on mediobasal, rounded projections.

Pereopods 1, 4 and 5 markedly more robust than remaining pereopods. Propodus of pereopod 1 almost straight, posterior margin bearing 3, mesial surface near posterior margin bearing 4 denticulate spines; dactylus biunguiculate, anterior claw somewhat longer than pectinate posterior claw; carpus triangular, lacking free anterior margin, bearing 2 denticulate spines along



Figs. 11-16. *Afrocercis kenyensis* n.gen. n. sp., ♂. 11, pereopod 2; 12, pereopod 3; 13, pereopod 4; 14, pereopod 6; 15, pereopod 7; 16, right uropod, dorsal view.

posterior margin; merus posteriorly with 2 denticulate spines, anterodistally with single denticulate spine; basis as long as propodus, carpus and merus together. Pereopods 4-5 rather robust, quite similar among one another, without denticulate spines and with few setae; posterior claw of dactylus simple, much smaller than anterior claw; carpus trapezoid, basis shorter than in pereopod 1. Pereopods 2, 3 and 7 most slender, pereopod 6 intermediate in slenderness between pereopods 4-5 and 7; these pereopods bearing few setae; robust spines entirely lacking on pereopods 2-3, few present at distal margin of



Figs. 17-22. *Afrocerceis kenyensis* n.gen., n. sp. 17-21, ♂; 22, immature adult. 17, pleopod 1; 18, pleopod 2; 19, pleopod 3; 20, pleopod 4; 21, pleopod 5; 22, right uropod, dorsal view.



carpus in pereopods 6-7; biungiculate dactylus of pereopods 2, 3 and 7 with pectinate posterior claw; posterior claw simple in pereopod 6; carpus of pereopod 6 with denticulate posterodistal spine, carpus of pereopod 7 with 5 denticulate distal spines; anterodistal margin of pereopods 2-7 bearing robust plumose feathered sensory seta.

Symphodites of pleopods 1-3 with 3 retinacula. Elongate-ovate, distally acute exopodite of pleopod 1 extending beyond distal margin of endopodite, outer distal margin strongly dentate; endopodite broad-triangular, with rounded distal part; exopodite bearing 27, endopodite 20 plumose marginal setae. Endopodite of 2nd pleopod 1.4 times length of exopodite, broadest in proximal third, tapering to narrowly rounded distal margin; slender, slightly curved appendix masculina situated at about midlength of ramus, with elongate medi-odistal, lamella-like flattened part; exopodite similar to that of first pleopod, with strongly dentate outer distal margin; exopodite bearing 24, endopodite 26 plumose marginal setae. Endopodite of 3rd pleopod elongate-triangular, slightly extending beyond distal margin of elongate-ovate, biarticulate exopodite; outer distal margin of endopodite bearing 12 plumose marginal setae; outer distal and distal inner margins of exopodite bearing 33 plumose marginal setae. Rami of pleopod 4 subequal in length, with several transverse ridges; more slender endopodite with rounded medial lobe at base. Pleopod 5 similar to pleopod 4; exopodite with 2 distal denticulate bosses. Plumose marginal setae drawn as simple setae.

Elongate-ovate uropodal endopodite barely setose, fused with sympodite; endopodite somewhat longer than exopodite and reaching to distal margin of pleotelson; dorsal surface in proximal third bearing group of 5 plumose sensory setae; exopodite more robust, distal margin with 2-3 strong dentations.

Immature adult; similar in general features to ♂, total length 5.6-7.5 mm. Distal margin of uropodal exopodite with 2 strong teeth.

Manca: Similar in habitus to ♂, total length 3.3 mm.

Remarks: The new genus *Afrocerceis* with the only species *A. kenyensis* shares with the other *Cerceis*-like genera (sensu Harrison & Ellis, 1991: 924; Messina, 1990: 248) the morphology of the pleopods, with pronounced marginal teeth at the exopodites of pleopods 1-2.

In Harrison & Ellis' (1991) paper *Afrocerceis* keys with its extremely flattened body to the monotypic genus *Platycerceis* Baker, 1926, with as only species *P. hyalina* from Australia. This species has been redescribed by Harrison (1984: 280-282, fig. 8). Besides the dorsoventrally flattened body it shares with the African species a similar shape of the pleotelson. But, several other differences between these genera are apparent: The antennae are apparently not totally covered by the the flattened cephalon in *Platycerceis*. The second article of the first antenna has no tooth-shaped, lateral processes, but the first one shows lateral projections to support the second article. The coxae of pereopods 2-6 are not interlocked and the pereopods are generally more robust. The penes of

*Platycerceis* are much more robust and distally rounded. The endopodite of the 2nd pleopod is distinctly smaller in this genus and the appendix masculina is considerably longer. Finally, the uropodal rami are styliform, not flattened as in *Afrocerceis*. Ignoring the feature of a dorsoventrally flattened body and the lack of tubercles or ridges on the pleotelson, *Afrocerceis* keys to *Cerceis* H. Milne Edwards, 1840, in Harrison & Ellis (1991). Comparing *Afrocerceis* with this genus, the differences are more striking than to *Platycerceis*: The body of *Cerceis*-species is generally more robust and the pleotelson shows tubercles and/or ridges. The incomplete sutures of the fused pleonite section extend to the lateral/posterolateral margin. The eyes are laterally situated and the enlarged proximal article of the first antenna has lateral projections to accommodate the second article. The pereopods 2-3 and 6-7 are generally more robust and the posterior claw of the dactylus is not pectinate (so far as this feature has been described). The penes and pleopod morphology of *Cerceis* is quite similar to that of *Platycerceis* and differs from *Afrocerceis* in the same features mentioned above.

In consideration of all the comparisons made, it becomes obvious that *Afrocerceis* is most similar to *Cerceis* and *Platycerceis*. With its dorsoventrally flattened body and similar shape of the pleotelson *Afrocerceis* resembles superficially more closely *Platycerceis*, while the differences to *Cerceis* seem to be more pronounced. All these genera have in common the anteriorly extended cephalon and the well developed uropodal rami, with at least an acute uropodal exopodite. Apart from the habitus, the most striking features separating *Afrocerceis* from both *Cerceis* and *Platycerceis* are the differently shaped antennules, pereopods and the enlarged endopodite of pleopod 2 in the former. For these three reasons it is likely, that *Afrocerceis* and *Platycerceis* represent two different evolutionary lines from an ancestor very similar to *Cerceis*. It is improbable that *Afrocerceis* links the genera *Cerceis* and *Platycerceis*, because this would signify a reduction of the three above mentioned features from *Cerceis* to *Afrocerceis*, then again a development of these characters from *Afrocerceis* to *Platycerceis*.

From the few collecting data available it becomes apparent that the intertidal and shallow subtidal species *A. kenyensis* lives in rather diverse habitats, as dead coral substrate, seagrass and algae. All these areas are influenced by more or less strong wave action during tidal changes. The dorsoventrally flattened body and the differently shaped pereopods with denticulate posterior claws on pereopods 1-3 and pereopod 7 may be adaptations to live on the surface of substrate in these environments. The pectinate claws could serve to attach the animal to the substrate, by grasping filamentous algae. The dorsoventrally flattened body reduces the lateral pressure of strong waves in the tidal zone. In contrast to *Afrocerceis*, the monotypic Australian genus *Platycerceis* has been collected in deeper water (dredged 3 miles offshore according to Harrison & Holdich, 1982, in 7 m depth according to Harrison & Ellis, 1991), so its flattened body cannot be explained as an adaptation to an environment under strong wave action. It is imaginable, that *Platycerceis hyalina* inhabits the surface layer of bottom sedi-

ments, similar to members of the family Serolidae. Analogous features to species in the family Serolidae are the flattened body, the straddled coxae which are not united at the anterior and posterior margins, as well as slender uropods.

Distribution: Kenya, Watamu area.

**Dynamenella** Hansen, 1905

**Dynamenella scaptocephala** Messana, 1990 (figs. 23-52)

*Dynamenella scaptocephala* Messana, 1990. Tropical Zool., **3**: 244-248, figs. 1-2.

Material: 3 ♂♂, deposited as follows. — 1 ♂ (QM 18244), 1 ♂ (RMNH), 1 ♂ (HGM); dead corals covered with algae on outer reef-flat; exposed location, 0-0.5 m, 24 July - 7 August 1989. 3 ♀♀ (RMNH): dead corals covered with brown algae, sheltered reef-location, intertidal; 24 July - 7 August 1989. 2 ♂♂, 2 ♀♀ (HGM); seagrass beds, 0-1 m; 24 July - 7 August 1989.

Supplementary description, ♂: Dorsum of body with rather irregular black pigmentation, more strongly pronounced on anterolateral part of pleotelson. Total length 2.0 mm. Posterior margins of pereonites vaulted. Pleotelson with 4 narrow longitudinal ridges, ventilation slit simple.

Pereopod 1 the most robust, pereopod 3 the most slender leg. Propodus of first pereopod with 2 posterodistal pectinate spines; carpus with a pectinate spine at posterodistal margin, merus with such a spine at anterodistal margin. Remaining pereopods lacking pectinate spines. Carpus of pereopod 1 triangular, lacking free anterior margin. Posterior margin of propodus, carpus and merus, as well as margins of basis in pereopods rather densely setulose.

Both rami of pleopod 4 pleated and subequal in length: exopodite apically tapering with oblique suture in distal fourth. Pleopod 5, both rami pleated and subequal in length; exopodite with oblique suture in distal third and with 2 distal denticulate bosses.

Uropodal rami subequal in length and elongate ovate, exopodite somewhat curved; apical margin of endopodite and margin in distal half of exopodite with shallow indentations; dorsal surface of endopodite bearing 7 feathered sensory setae.

♀: Total length 1.7 mm, pigmentation of body similar to that of ♂. Vaultings along posterior margins of pereonites poorly pronounced and pleotelsonic ridges much shallower than in ♂.

Pereopods less setose than in ♂; ovate uropodal exopodite straight and only 3/4 length of endopodite.

Remarks: This species has recently been described from Somalia (Messana, 1990: 248). A supplementary description is presented herein, to show certain features in more detail.

The interspecific relationships of *D. scaptocephala* have been briefly discussed by Messana, who correctly states that it is closely allied with *Dynamenella quadrilirata* Kensley, 1984, from Belize in the Caribbean Sea. The two species can be easily distinguished by the much shallower pleotelsonic ridges in the

male of *D. scaptocephala*, its longer appendix masculina in the second pleopod, a longer exopodite of pleopod 3 and more slender uropodal rami (cf. Kensley, 1984; 23-26, figs. 15-16).

Distribution: Kenya and Somalia.

### **Paracassidinopsis** Nobili, 1906

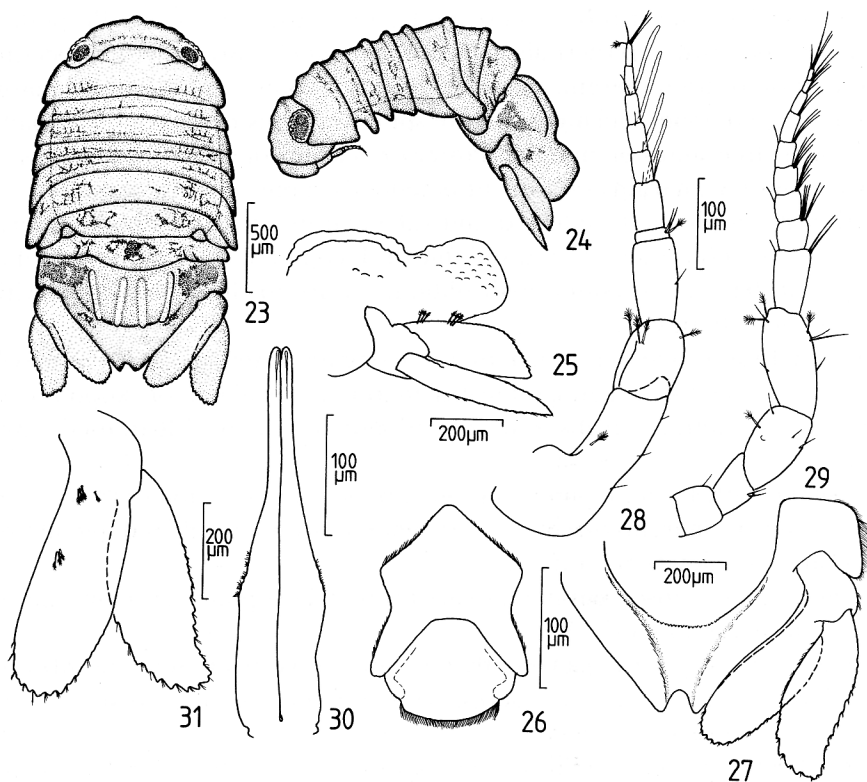
#### **Paracassidinopsis perlata** (Roman, 1974)

*Neocassidina perlata* Roman, 1974. Tethys, 5 (2-3): 351-360, figs. 1-4.

*Paracassidinopsis perlata*. — Müller, 1991. Cah. Biol. mar., 32: 98.

Material: 1♂ (RMNH); *Halimeda* on reef-flat, lower intertidal; 2 August 1989.

Remarks: This species was so far known only from coral reef locations in Madagascar. It has been described in the new genus *Neocassidina* Roman, 1974, which was later considered a synonym of *Paracassidinopsis* by Müller (1991: 91-98).



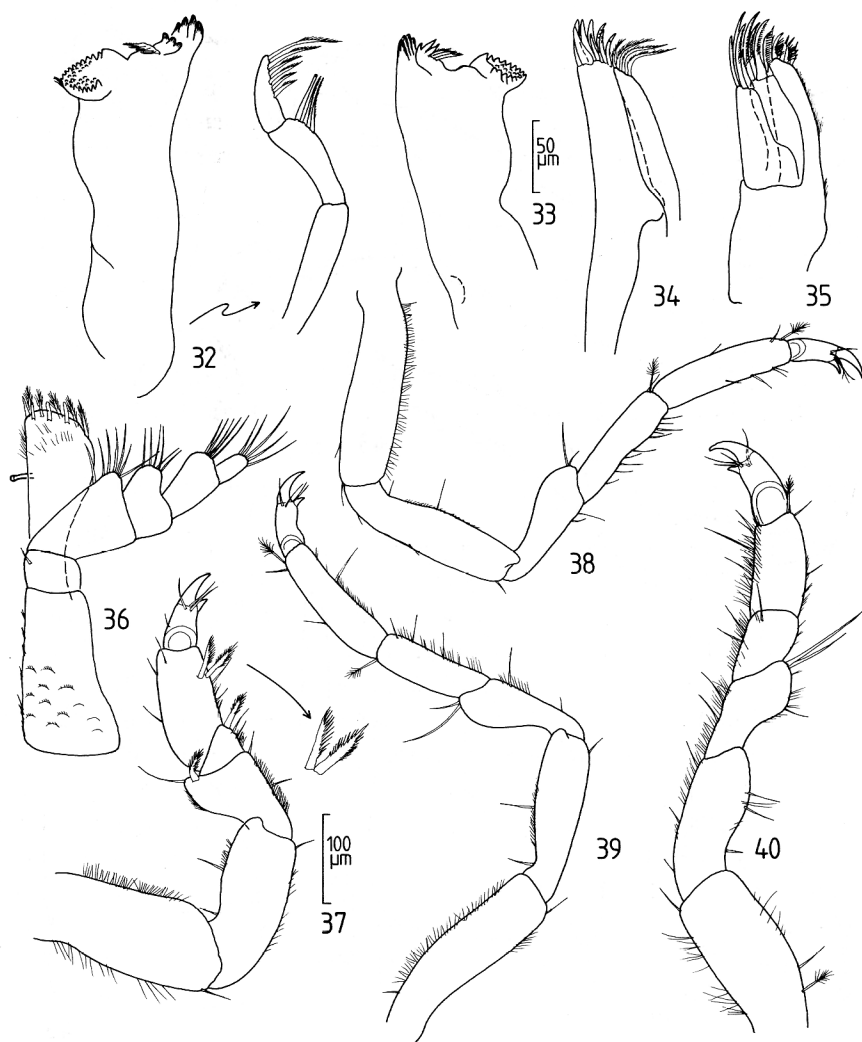
Figs. 23-31. *Dynamenella scaptocephala* Messina, 1990, ♂. 23, dorsal view; 24, lateral view; 25, pleotelson and left uropod, lateral view; 26, clypeal region; 27, pleotelson and left uropod, ventral view; 28, antenna 1; 29, antenna 2; 30, penes; 31, right uropod, dorsal view.

**Paracilicea** Stebbing, 1910**Paracilicea setosa** n. sp. (figs. 53-82)

Holotype: ♂ (RMNH); dead corals covered with brown algae, sheltered reef-location, intertidal; 24 July - 7 August 1989. Paratypes: 1 manca, postmanca, deposited as follows. — 1 manca (HGM), 1 postmanca (RMNH); collected together with holotype.

Derivatio nominis: The specific name refers to the densely setose body.

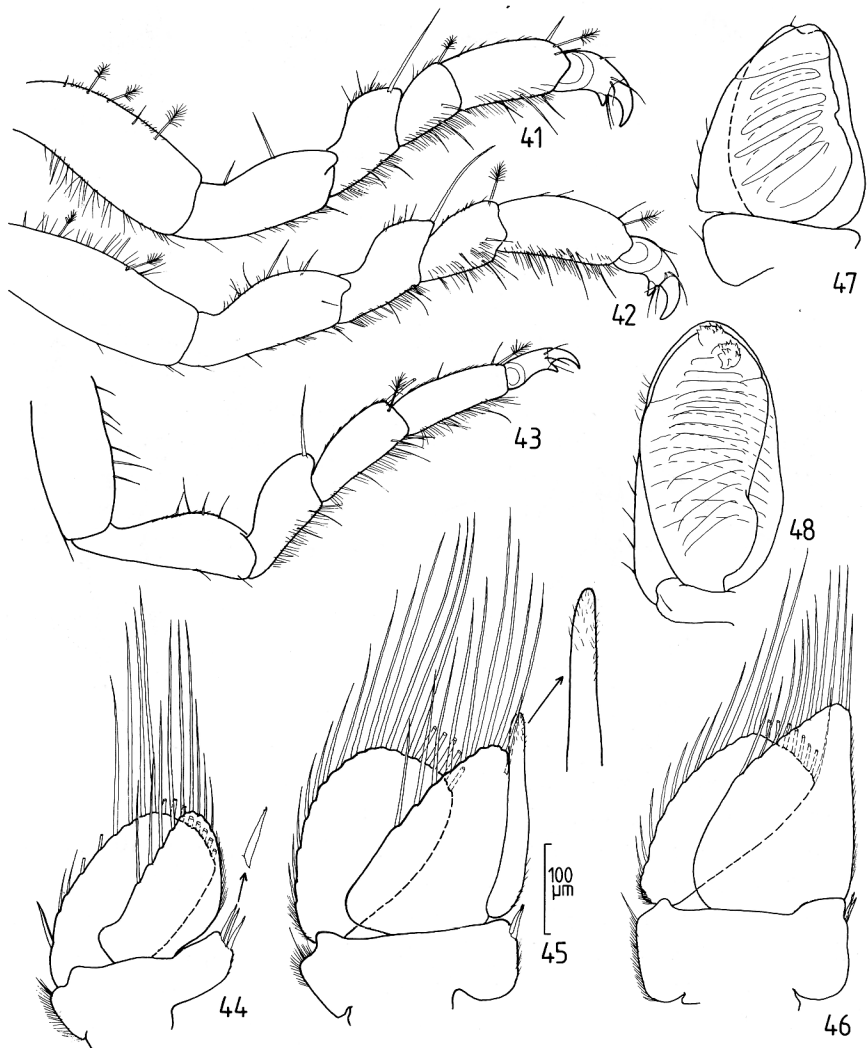
Description, ♂: Body laterally densely setose, almost parallel-sided, total length 3.5 mm. Cephalon almost twice wider than long, with well developed



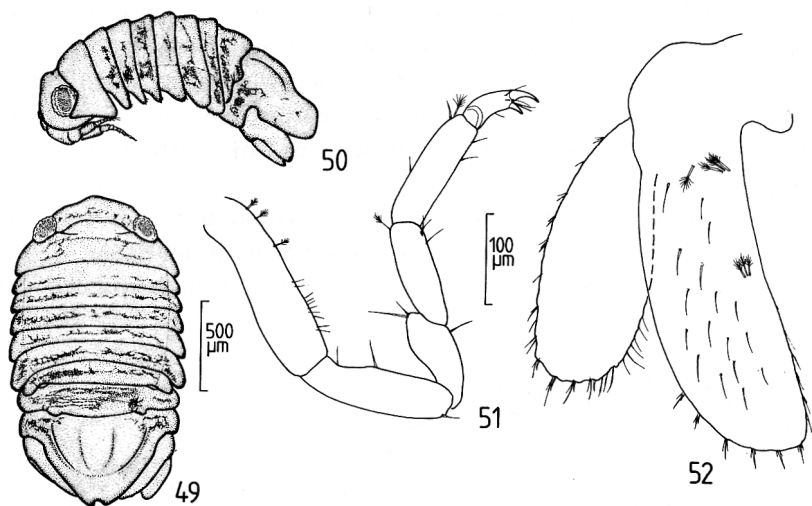
Figs. 32-40. *Dynamenella scaptocephala* Messana, 1990, ♂. 32, left mandible; 33, right mandible, palp omitted; 34, maxilla 1; 35, maxilla 2; 36, maxilliped; 37, pereopod 1; 38, pereopod 2; 39, pereopod 3; 40, pereopod 4.



setose rostral point; a pair of rounded setose tubercles present in anterior and posterior half, respectively; eyes large and well pigmented, posterolaterally situated. Posterior margins of pereonites vaulted. Pereonite 1 longer than pereonites 2 and 3 together, pereonites 2-7 subequal in length, pereonite 7 somewhat longer. Pereonites 1-4 with transverse row of 4 rounded setose tubercles, pereonites 5-6 with row of 6 setose tubercles. Seventh pereonite with posterior pair of small setose tubercles. Fused pleonite section subequal in length to 7th pereonite, anterolateral pairs of incomplete sutures extending to lateral margins; posterior margin of fused pleonite section with 4 ovate, setose



Figs. 41-48. *Dynamenella scaptocephala* Messana, 1990, ♂. 41, pereopod 5; 42, pereopod 6; 43, pereopod 7; 44, pleopod 1; 45, pleopod 2; 46, pleopod 3; 47, pleopod 4; 48, pleopod 5.



Figs. 49-52. *Dynamenella scaptocephala* Messina, 1990, ♂. 49, dorsal view; 50, lateral view; 51, pereopod 2; 52, left uropod, dorsal view.

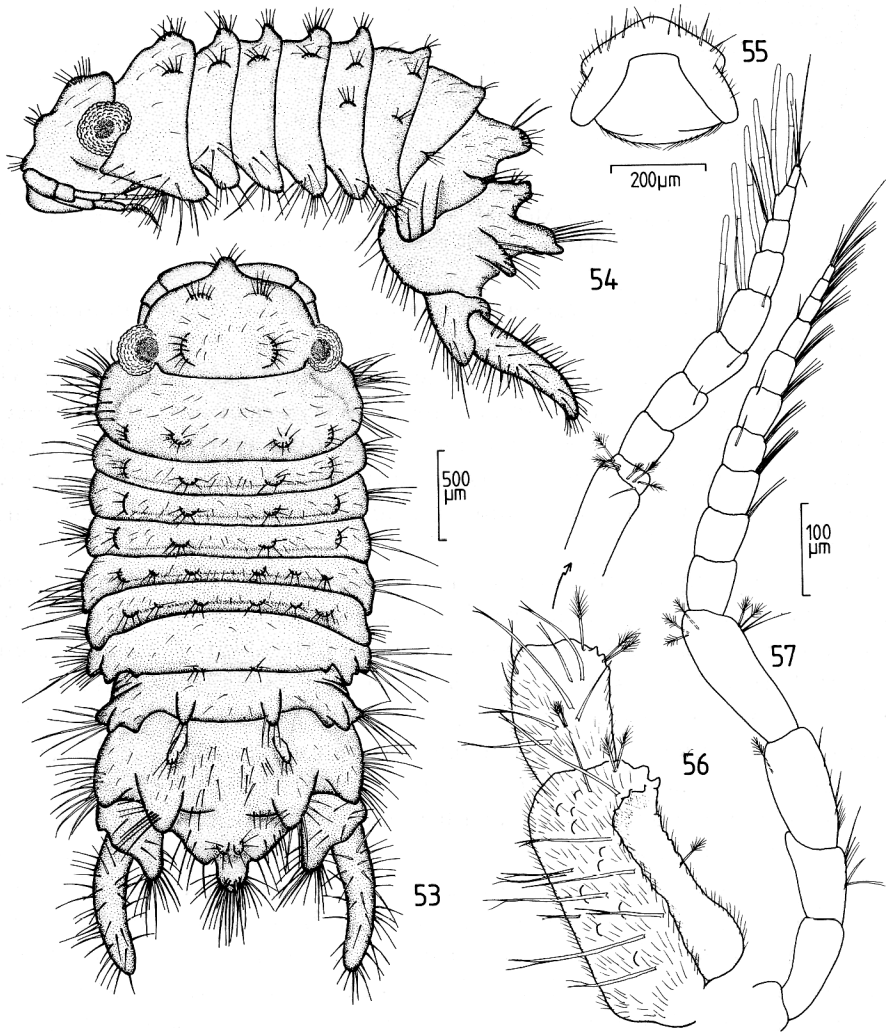
projections. Pleotelson 1.5 times wider than long, dorsal surface in anteromedian part with pair of slender dorsad directed setose processes; medial part of pleotelson with 4 large, setose ovate projections; distal part of pleotelson with cone-shaped process and pair of small setose tubercles near base of this process. Distal part of epistome setose and setulose, broad-triangular. Penes on posterior margin of 7th pereonite elongate, almost parallel-sided with narrowly rounded distal part, separated from one another proximally by  $1/3$  their diameter.

First antenna with 3-articulate peduncle; two proximal articles densely setose and setulose, granular; proximal article twice length and much wider than 2nd article; 3rd the most slender peduncular article, bare of any setae and setules, flagellum 9-articulate; proximal article short and wider than long, bearing several feathered sensory setae; articles 4-8 bearing distal aesthetasc and 1-2 simple setae. Antenna 2 subequal in length to antenna 1, with more slender and by far less setose 5 peduncular articles; flagellum of 10 setose articles.

Mandibles robust; left mandible with unicuspidate incisor and 3-cuspidate lacinia mobilis; spine row of 6 denticulate spines; robust molar with denticulate margin; 3-articulate palp not extending beyond incisor; proximal article longest, articles 2 and 3 subequal in length; first article bare of any setae, 2nd with 5 fringed setae in distal half, 3rd with 7 fringed setae in distal two-thirds. Incisor of right mandible lacking lacinia mobilis and spine row of 7 denticulate, spines, otherwise similar to left mandible. Narrow inner ramus of maxilla 1 bearing 4 distal plumose spines, outer ramus with 7 distal, partly denticulate, robust spines; medial margin of outer ramus bearing several setules. Maxilla 2, both

inner and outer lobes of outer ramus with 6 distal fringed spines; inner ramus of second maxilla bearing 6 distal plumose spines, 2 plumose setae and several setules along medial margin. Endite of maxilliped with single coupling hook; endite expanded in distal half, distal margin bearing 7 plumose spines and a simple mediiodistal spine; 5-articulate palp with narrow, distally setose mediiodistal lobes on articles 2-4.

Pereopod 1 more robust than remaining, subequal pereopods; unguis of pereopod 1 slightly shorter than dactylus; propodus with denticulate spine on mesial surface and 2 denticulate spines at posterior margin; triangular carpus

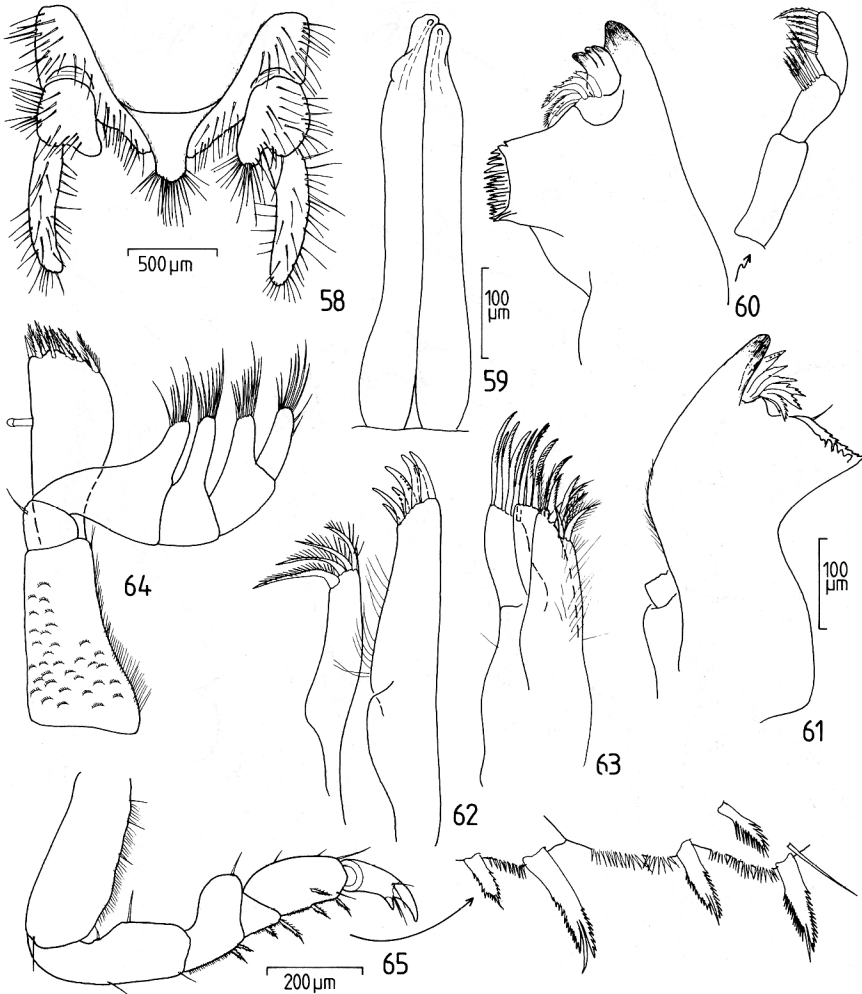


Figs. 53-57. *Paracilicea setosa* n. sp., ♂. 53, dorsal view; 54, lateral view; 55, clypeal region; 56, antenna 1; 57, antenna 2.

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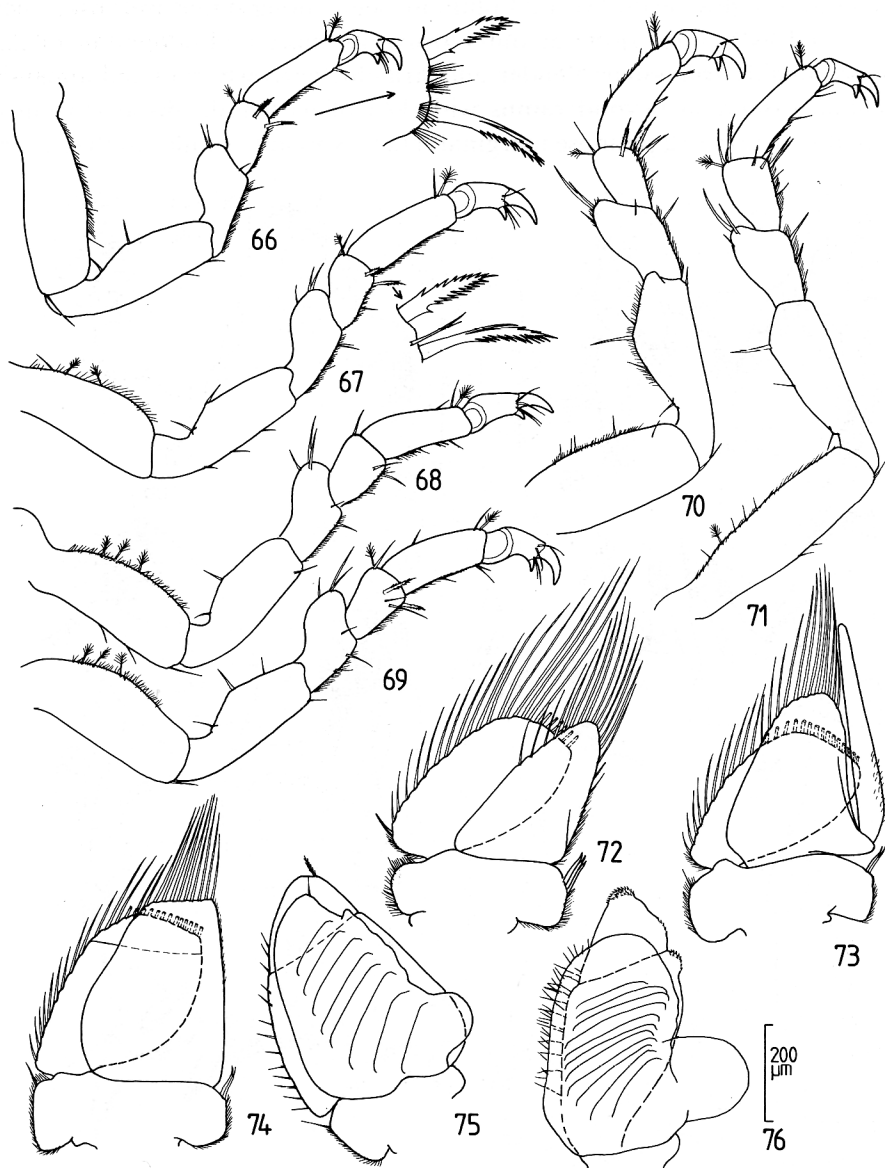
lacking free anterior margin, posterior margin bearing 2 denticulate spines; merus anterodistally expanded, posterior margin with 2 denticulate spines. Pereopods 2-3 and 5-6, only trapezoid carpus bearing 1-2 denticulate spines.

Symphodite of pleopods 1-3 bearing 2-3 retinacula. Elongate triangular endopodite of first pleopod bearing 15 plumose marginal setae in distal half; endopodite roughly ovate, with 23 plumose setae along outer and distal margin, as well as slender spine at outer proximal margin. Endopodite of 2nd pleopod roughly triangular; slender and straight, narrowly rounded appendix masculina extending beyond ramus with 1/3 of its length; distal margin of endopodite bearing 12 plumose marginal setae; exopodite similar to that of first



Figs. 58-65. *Paracilicea setosa* n. sp., ♂. 58, pleotelson and uropods, ventral view; 59, penes; 60, left mandible; 61, right mandible, palp omitted; 62, maxilla 1; 63, maxilla 2; 64, maxilliped; 65, pereopod 1.

pleopod, slightly wider, with 25 plumose marginal setae. Pleopod 3, endopodite slightly longer than ovate exopodite; medial margin of endopodite straight, blunt distal margin bearing 11 plumose setae; exopodite with transverse suture in distal fourth, outer and distal margin bearing 25 plumose setae. Both endopodites of pleopods 4-5 pleated, with rounded mediobasal lobe, this lobe



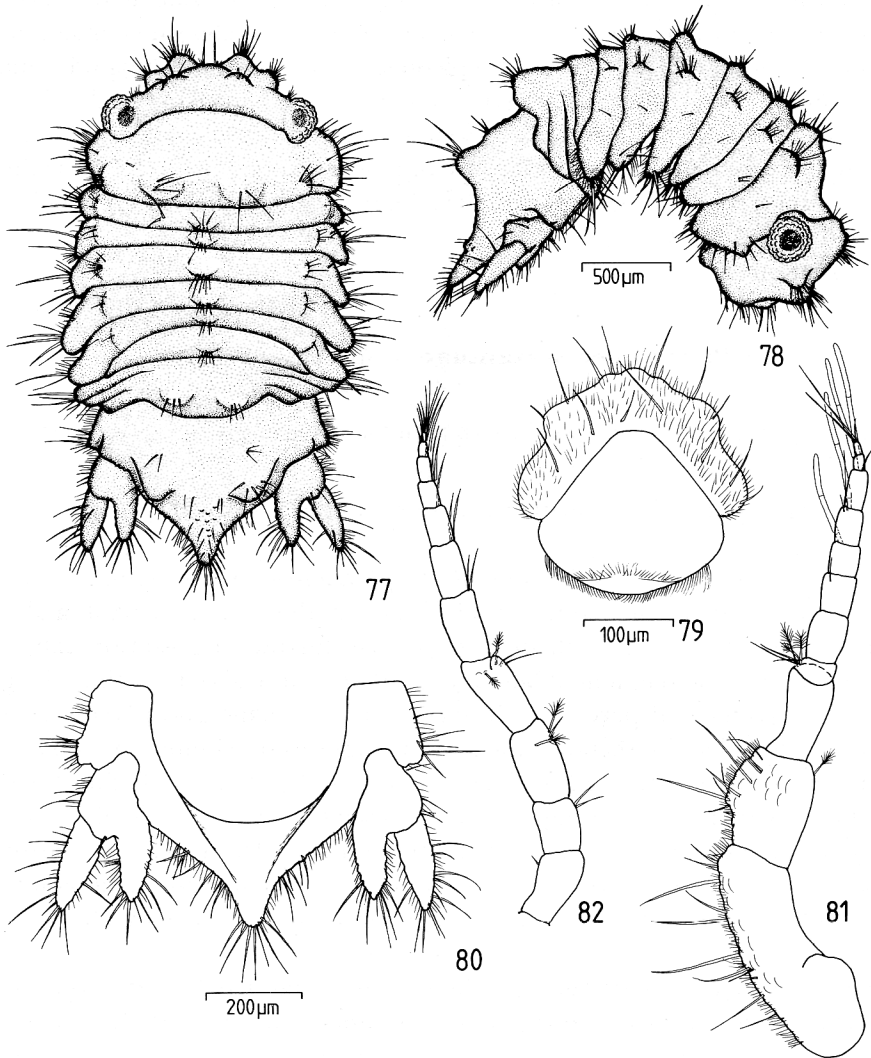
Figs. 66-76. *Paracilicea setosa* n. sp., ♂. 66, pereopod 2; 67, pereopod 3; 68, pereopod 4; 69, pereopod 5; 70, pereopod 6; 71, pereopod 7; 72, pleopod 1; 73, pleopod 2; 74, pleopod 3; 75, pleopod 4; 76, pleopod 5.



larger in pleopod 5; exopodites of pleopods 4-5 slightly longer than endopodites, with transverse suture in distal third; mediobasal part of exopodite of pleopod 5 with 2 denticulate bosses.

Uropods densely setose; endopodite fused with sympodite, greatly reduced, less than 1/3 length of slender, curved exopodite.

Postmanca: More robust than ♂, total length 2.8 mm. Tubercles of pereopods on dorsum of body less numerous and pleotelson with only one pair of setose dorsal tubercles. Pleotelson tapering to slender, narrowly rounded setose apex.



Figs. 77-82. *Paracilicea setosa* n. sp., postmanca. 77, dorsal view; 78, lateral view; 79, clypeal region; 80, pleotelson, ventral view; 81, antenna 1; 82, antenna 2.

Proximal article of antenna 1 relatively slender, slightly longer than articles 2 and 3 together; flagellum 8-articulate, articles 4-7 bearing aesthetasc. Antenna 2 shorter than first antenna, flagellum of 7 setose articles.

Endopodite of uropod longer and exopodite considerably shorter than in ♂.

Manca: In all features and in size quite similar to postmanca.

Remarks: *Paracilicea setosa* n. sp. is easily distinguishable from all other members assigned to this genus by its tuberculate, densely setose body and the presence of a robust, cone-shaped distal pleotelsonic projection. In the setose body it resembles *Paracilicea asiatica* Kussakin, Malyutina & Rostomov, 1990 from southeast Asia and *P. hanseni* Stebbing, 1910 from Zanzibar. Several features in the former, like the lack of small, setose tubercles on cephalon and pereonites, the varying shape of the pleotelson, uropods and appendix masculina reveal, that close affinities cannot exist (cf. Kussakin, Malyutina & Rostomov, 1990: 81-87, figs. 1-3). *P. hanseni* seems to be the nearest relative of the new species, but differs by its curved and more slender appendix masculina, as well as by the non-projected mediodistal part of the pleotelson (cf. Stebbing, 1910: 107, pl. 9 fig. C).

Distribution: Kenya.

### ***Paracilicea watamuae* n. sp. (figs. 83-107)**

Holotype: ♂ (RMNH); from *Sargassum* on reef-flat, 0.5 m; 2 August 1989. Paratype: ♀ (RMNH); collected together with holotype.

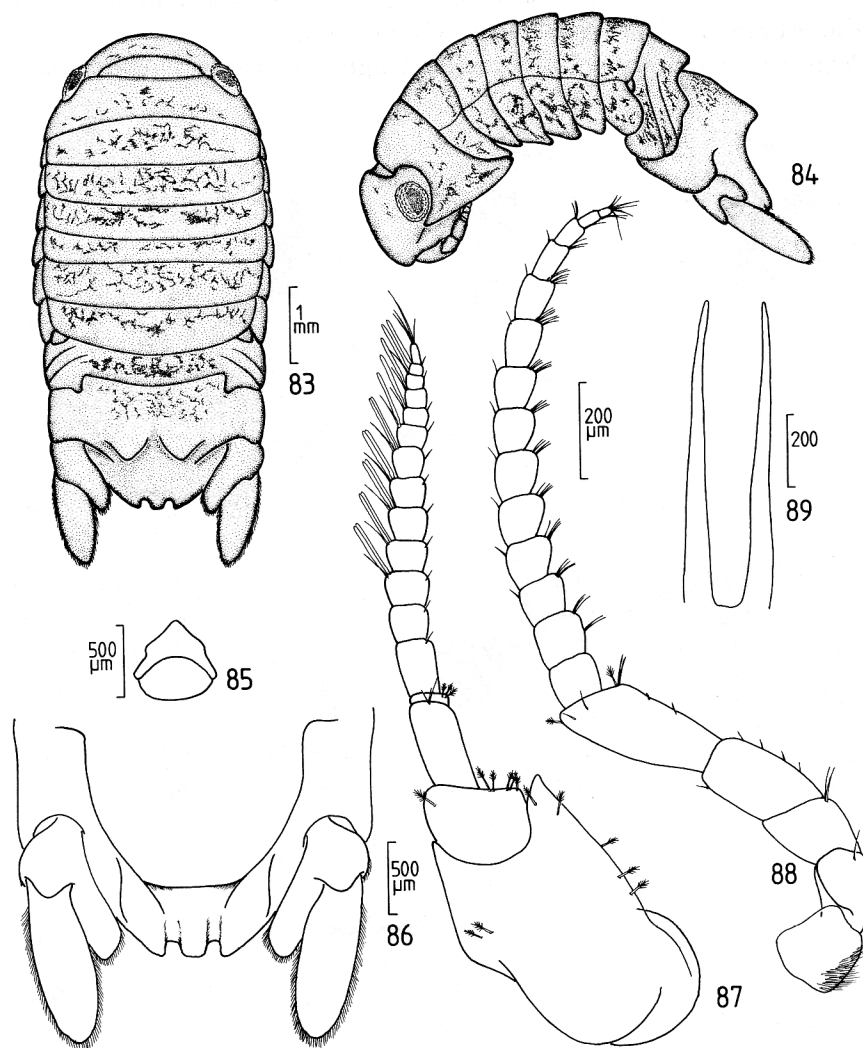
Derivatio nominis: The specific name refers to the type locality, the Watamu area.

Description, ♂: Body smooth and almost parallel-sided, non-setose, covered with a scattered denticular pigmentation. Total length 6.3 mm. Cephalon about 4 times wider than long, with deep transverse furrow in posterior half and relatively large, well pigmented lateral eyes. Pereonite 1 about 1.3 times length of remaining subequal pereonites; sutures between coxae and pereonites 2-7 distinct. Fused pleonite section subequal in length to pereonite 7, two pairs of incomplete sutures extending to lateral margins. Pleotelson 1.8 times wider than long, with pair of strong conical tubercles at about midlength; distal margin of pleotelson with 2 narrow ventilation slits. Distal part of epistome non-setose and broadly triangular. Penes on posterior margin of pereonite 7 very slender, tapering to almost acute apex, separated at base by about their diameter.

First antenna with 3-articulate peduncle; proximal article very large, with tooth-shaped lateral projections partly accommodating 2nd article; articles 2 and 3 subequal in length, 2nd 2.3 times wider than 3rd; two proximal peduncular articles bearing several feathered sensory setae; flagellum 14-articulate; proximal article shortest and much wider than long; articles 4-8 bearing two

distal aesthetascs each, articles 9-13 with single aesthetasc. Antenna 2 slightly longer than antenna 1; peduncle 5-articulate, 3 proximal articles subequal in length; 5th peduncular article 1.4 times length of 4th; flagellum of 14 setose articles.

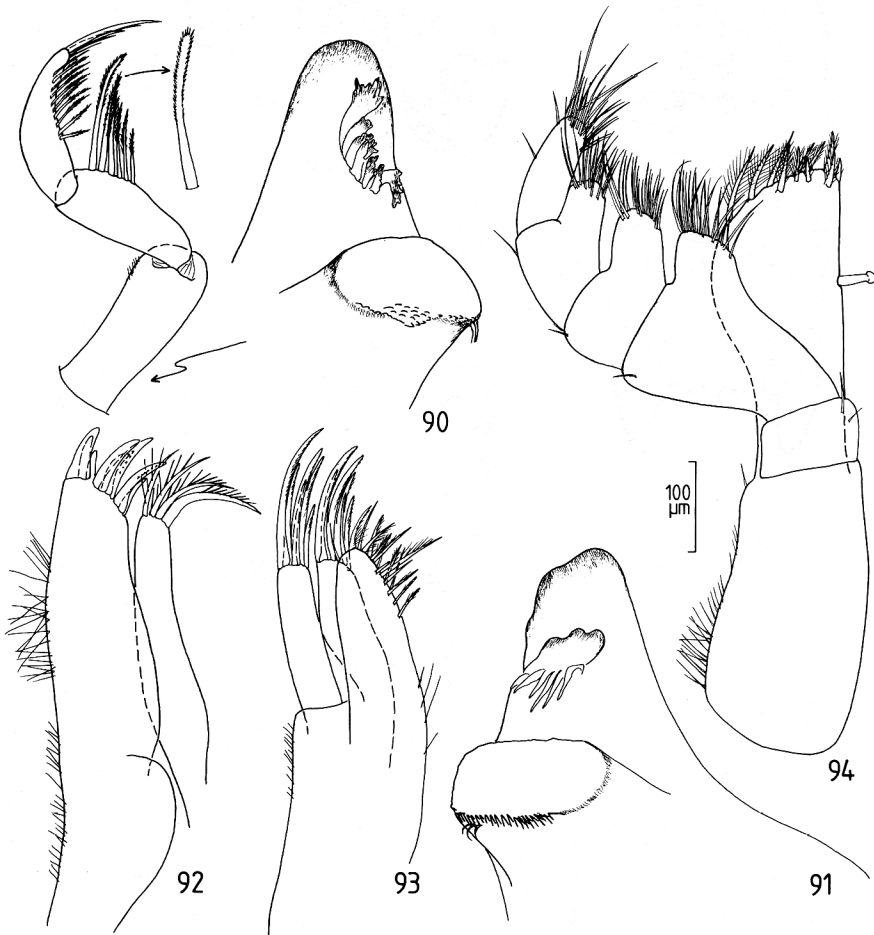
Mandibles very robust. Right mandible with broadly rounded incisor; lacinia mobilis lacking, spine row of 7 denticulate spines; triturative molar with some denticles and 3 short setae along proximal margin; 3-articulate palp robust, articles somewhat decreasing in length distally; 2nd article with 6 fringed setae in distal half, 3rd with 15 fringed setae in distal two thirds. Left mandible with



Figs. 83-89. *Paracilicea watamuae* n. sp., ♂. 83, dorsal view; 84, lateral view; 85, clypeal region; 86, pleotelson and uropods, ventral view; 87, antenna 1; 88, antenna 2; 89, penes.

broad unicuspidate incisor and shallowly 3-cuspidate lacinia mobilis; spine row of 6 non-denticulate spines; triturative molar with row of denticles and 3 short setae along proximal margin. Narrow inner ramus of maxilla 1 bearing 4 distal, sparsely plumose spines; outer ramus with 8 distal, partly denticulate robust spines; moreover, outer margin of outer ramus bearing several setules. Maxilla 2, both inner and outer lobe of outer ramus bearing 6 slender, fringed spines; inner ramus slightly extending beyond outer lobes, bearing 15 mediobasal fringed setae. Endite of maxilliped with single coupling hook; endite somewhat widening in distal half, obliquely rounded distal margin bearing 12 plumose setae of different lengths; 5-articulate palp with robust, broadly rounded, mediobasal setose lobes on articles 2-4.

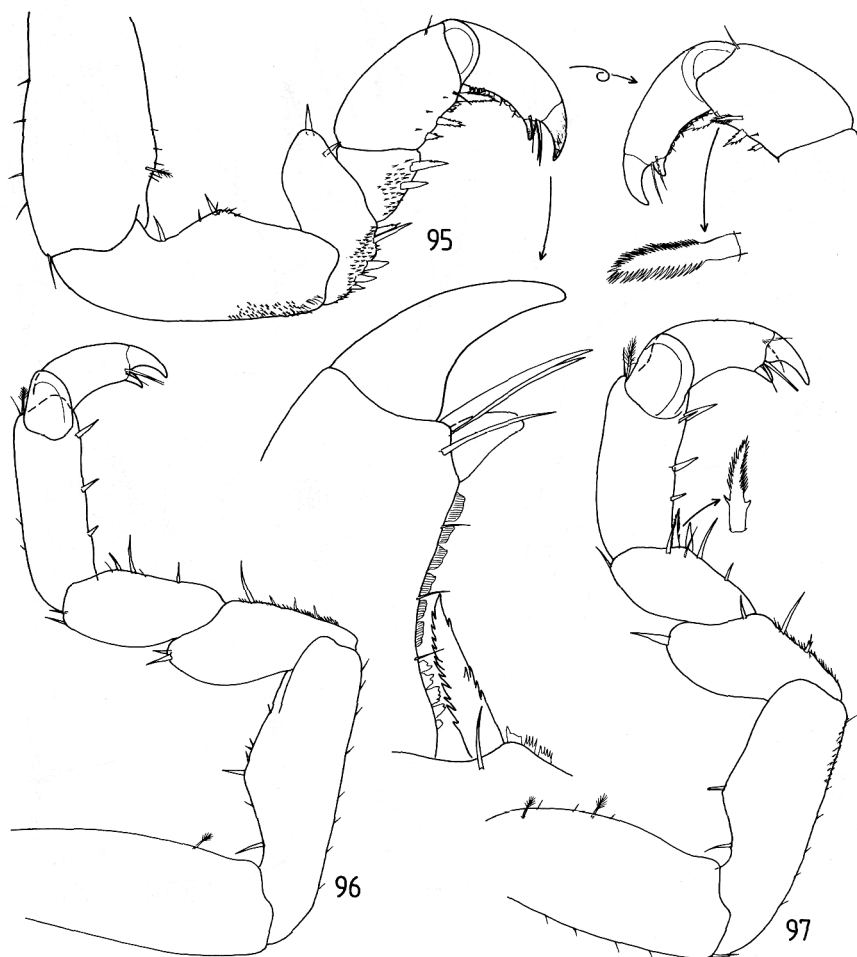
Pereopods barely setose, increasing in length posteriorly. Unguis of pereopod



Figs. 90-94. *Paracilicea watamuae* n. sp., ♂. 90, incisor, molar and palp of right mandible; 91, incisor and molar of left mandible; 92, maxilla 1; 93, maxilla 2; 94, maxilliped.

1 robust,  $2/5$  length of dactylus; mesial surface of propodus bearing densely fringed spine near posterior margin; posterior margin of propodus bearing row of 3, carpus 2 and merus row of 5 partly denticulate spines; carpus with very short, free anterior margin; posterior margin of carpus and merus, as well as posterodistal margin of ischium with many tiny denticulations; anterior margin of merus and ischium bearing few short, acute spines. Spination of pereopods 2-7 similar to that of pereopod 1; carpus of pereopod 7 with 11 spines of different shape along distal and posterior margin.

Symphodite of pleopods 1-2 with 3, of pleopod 3 with 2 retinacula. Endopodite of pleopod 1 subequal in length to exopodite, elongate-triangular, with slightly convex medial margin; exopodite roughly ovate, with almost blunt distal margin; endopodite bearing 22 plumose marginal setae in distal half,



Figs. 95-97. *Paracilicea watamuae* n. sp., ♂. 95, pereopod 1; 96, pereopod 2; 97, pereopod 3.

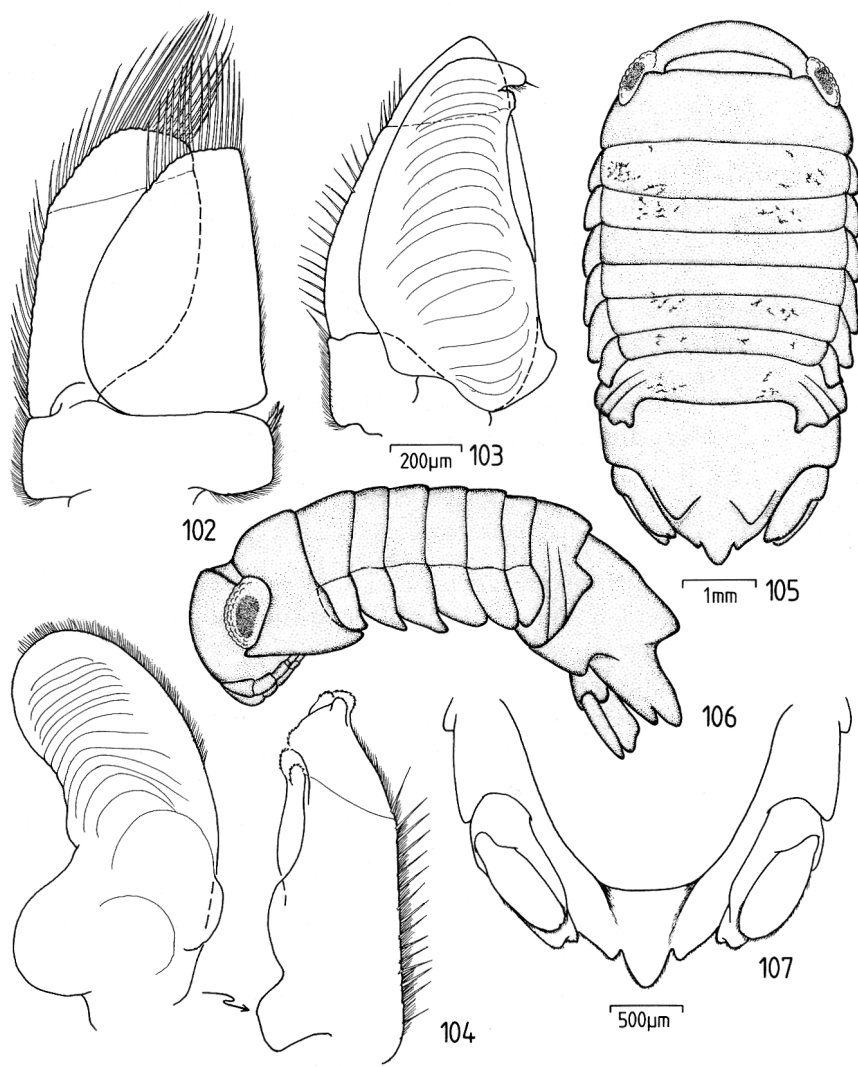


exopodite 34 plumose marginal setae along outer and distal margin, as well as an acute spine at outer proximal margin. Triangular endopodite of 2nd pleopod slightly extending beyond exopodite, its distal margin narrowly rounded; proximally articulating appendix masculina slender, tapering to subacute apex, extending beyond distal margin of ramus with  $1/4$  of its length; distal part of endopodite bearing 17 plumose marginal setae; exopodite similar to that of first pleopod, outer and distal margin bearing 38 plumose setae. Endopodite of 3rd pleopod slightly shorter than exopodite; medial margin of



Figs. 98-101. *Paracilicea watamuae* n. sp., ♂. 98, pereopod 6; 99, pereopod 7; 100, pleopod 1; 101, pleopod 2.

endopodite almost straight, distal margin bearing 15 plumose setae; ovate exopodite with oblique suture in distal third, outer and distal margin bearing 37 plumose setae. Both endopodites of pleopods 4 and 5 pleated. Endopodite of 4th pleopod with short tooth-shaped medioproximal lobe; distal part of endopodite medially directed and bilobate; triangular exopodite bearing 21 short plumose setae along outer margin, a transverse suture line present in distal third. Endopodite of pleopod 5 with broadly rounded medioproximal lobe, its outer distal margin densely setulose; exopodite with oblique suture in distal third, two mediodistal and three distal denticulate bosses; outer margin of



Figs. 102-107. *Paracilicea watamuae* n. sp. 102-104, ♂; 105-107♀. 102, pleopod 3; 103, pleopod 4; 104, pleopod 5; 105, dorsal view; 106, lateral view; 107, pleotelson and uropods, ventral view.

exopodite bearing 15 short plumose setae and many setules. Plumose marginal setae of pleopodal rami drawn as simple setae.

Uropodal rami relatively slender; endopodite fused with sympodite, 3/5 length of freely articulating exopodite; margins of both uropodal rami densely setulose.

♀: Total length 7.2 mm. Habitus similar to ♂, except for shape of pleotelson and uropods. Pleotelson with distal triangular projection and a narrow marginal notch on either side of it.

Uropodal endopodite slightly extending beyond short, freely articulating exopodite; endopodite with distinct distal notch.

Remarks: This species appears to be closely allied to the superficially described *Paracilicea eupyga* (Nobili, 1906) from the Gulf of Aden. The outline of its body is very similar to that of *P. watamuae* n. sp., but it is rather densely granulate and setose. Moreover, the dorsal surface of the pleotelson shows a pair of rounded dorsal projections and a small dorsodistal tubercle at midline. The distal pleotelsonic notches of *P. eupyga* are deeper than in the new species. Females are distinguishable through the distinctly longer mediiodistal pleotelsonic tubercle of *P. watamuae* (cf. Nobili, 1906: 1-3, pl. 7 figs. 1-18).

Distribution: Kenya.

### **Paradella** Harrison & Holdich, 1982

#### **Paradella harrisoni** n. sp. (figs. 108-136)

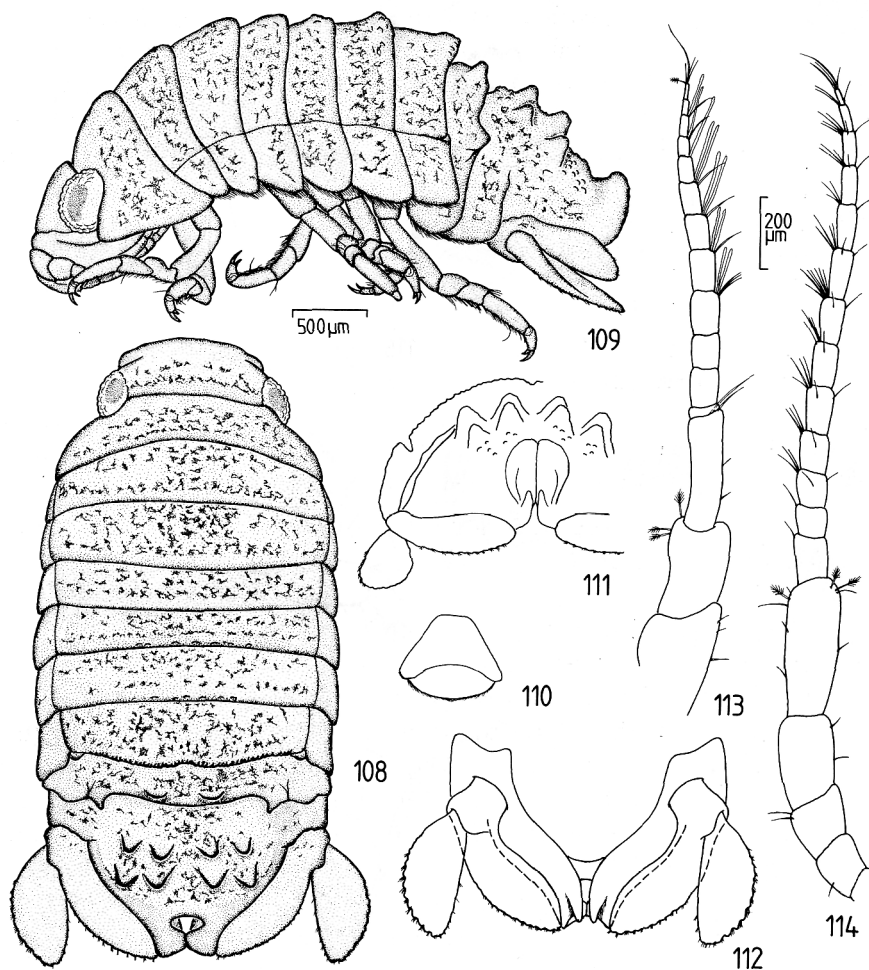
Holotype: ♂ (RMNH); from barnacles on reef-flat, intertidal; 4 August 1989. Paratypes: 7♂♂, 6♀♀ (1 ovigerous), deposited as follows. — 2♂♂, 2♀♀ (1 ovigerous) (HGM), 1♂, 1♀ (QM 18245), 4♂♂, 3♀♀ (RMNH); collected together with holotype.

Derivatio nominis: The species is dedicated to Dr. K. Harrison, The Natural History Museum, London, for his valuable contributions to Sphaeromatid taxonomy.

Description, ♂: Total length 4.1 mm, body covered with many brownish pigment spots and reticulations. Cephalon 3 times wider than long, anterior margin broadly rounded; laterally situated large eyes well pigmented. Pereonites subequal in length, sutures between coxae and pereonites 2-7 distinct; posterior margins of pereonites 5-7 vaulted, with granules which are markedly numerous on pereonite 7. Fused pleonite section shorter than pereonite 7, with pair of rounded tubercles in posterior half; a pair of suture lines merging posteriorly to one line of Y-shaped appearance. Pleotelson 1.8 times wider than long, dorsal surface with scattered granules and 8 prominent tubercles in 2 transverse rows of 4. Distal part of pleotelson expanded, with dorsal broad-ovate ventilation slit. Each side of ventral pleotelsonic margins with ridge extending to apex. These ridges not touching in midline and with deep distal notch. Epistome with blunt distal margin. Elongate penes fused at base, tapering to acute apex.

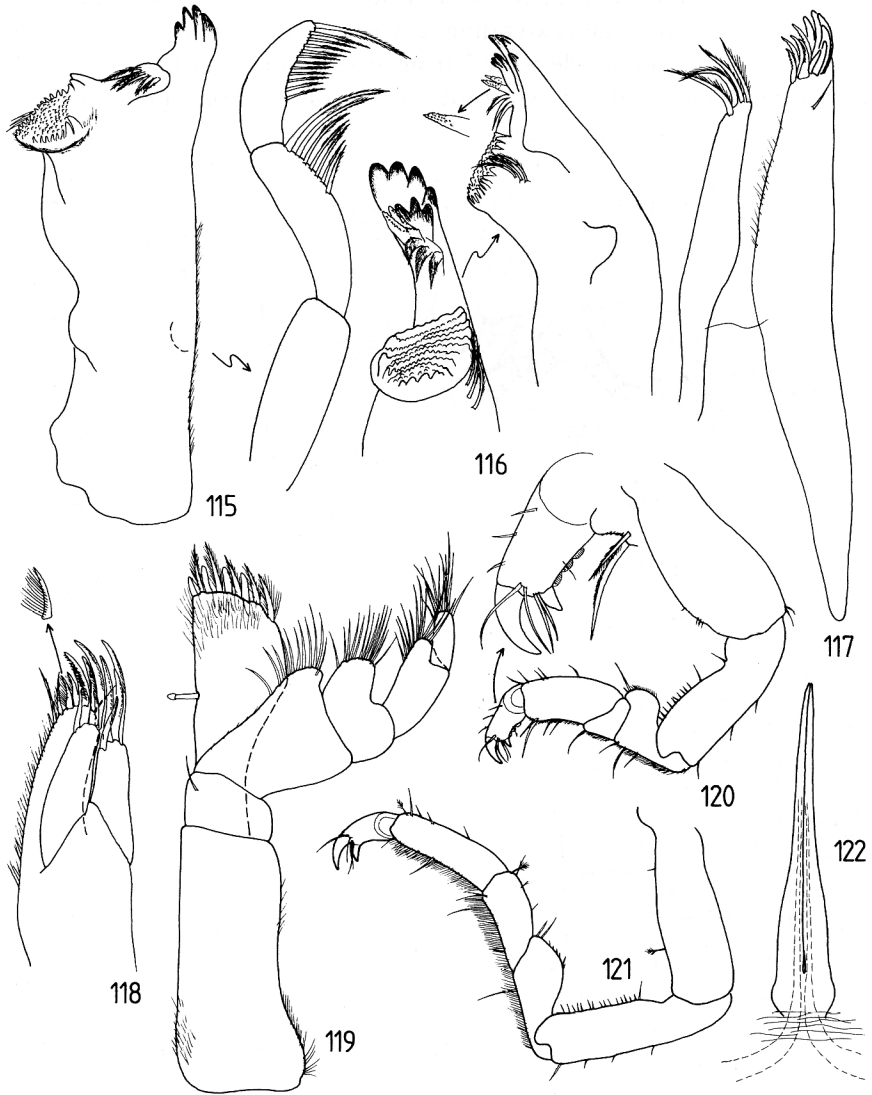
Antenna 1 with 3-articulate, barely setose peduncle; two proximal articles wider than 3rd article; flagellum 12-articulate; proximal article shortest and much wider than long; articles 4-7 bearing 2 distal aesthetascs, articles 8-10 with single aesthetasc. Antenna 2, peduncle 5-articulate, with 3 short, subequal proximal articles and 2 longer distal articles; 5th article 1.7 times length of 4th; flagellum of 13 setose articles.

Incisor of right mandible 4-cuspidate; lacinia mobilis lacking, spine row of 5 slender fringed spines; triturative molar with denticulate margins and 3 short marginal setae; palp large, extending beyond incisor, articles decreasing in length posteriorly; 2nd article with 7 fringed setae in distal half, terminal one with 12 fringed setae in distal two-thirds. Small inner ramus of maxilla 1 with 4



Figs. 108-114. *Paradella harrisoni* n. sp., ♂. 108, dorsal view; 109, lateral view; 110, clypeal region; 111, pleon, posterior view; 112, pleotelson and uropods, ventral view; 113, antenna 1; 114, antenna 2.

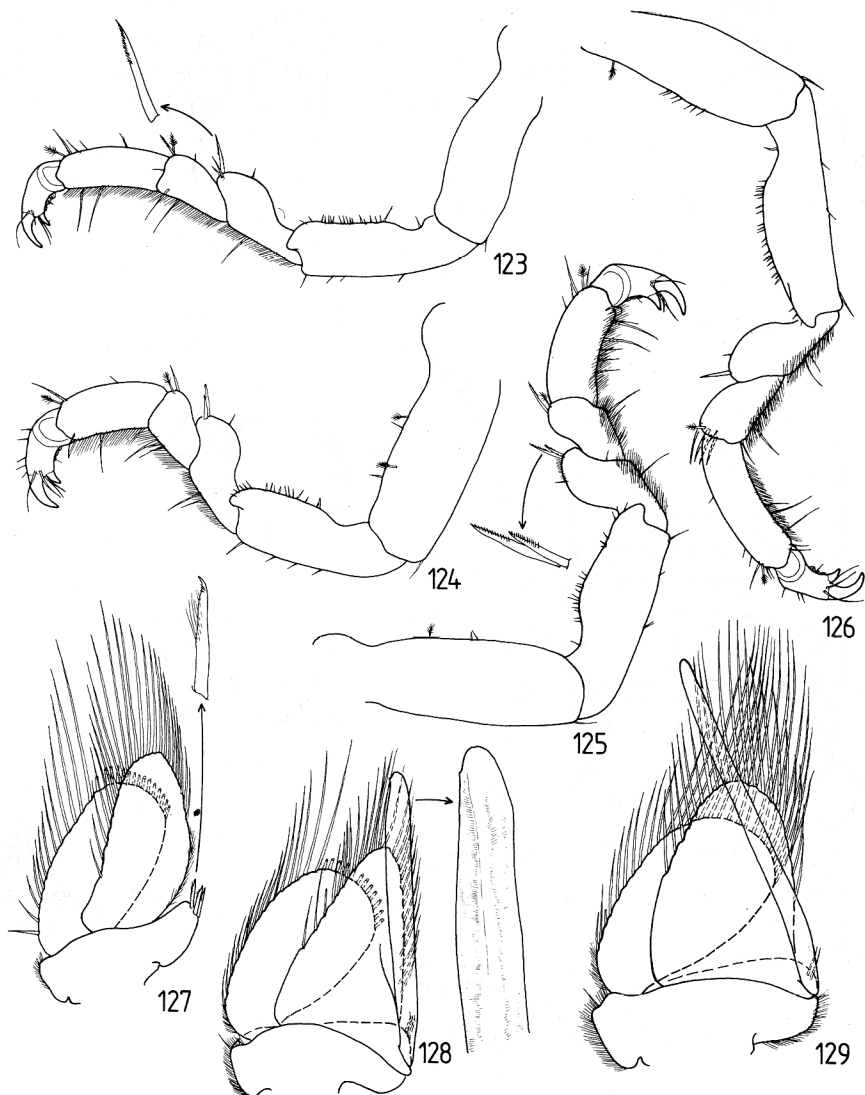
distal plumose setae; outer ramus bearing 11 distal, partly denticulate spines, a subapical seta and several setules along medial margin. Maxilla 2, both inner and outer lobe of outer ramus with 4 slender distal fringed spines; inner ramus slightly extending beyond outer lobe, rounded distal margin with 7 fringed spines; medial margin of inner ramus setulose. Endite of maxilliped with single coupling hook; distal part of endite widening, bearing several distal setules, 6 fringed spines and 4 apically rounded spines.



Figs. 115-122. *Paradella harrisoni* n. sp., ♂. 115, right mandible; 116, incisor and molar of left mandible; 117, maxilla 1; 118, maxilla 2; 119, maxilliped; 120, pereopod 1; 121, pereopod 2; 122, penes.

Pereopod 1 more robust than remaining pereopods, with very short carpus. Propodus, carpus and merus of all pereopods densely setulose and ischium with many spinules.

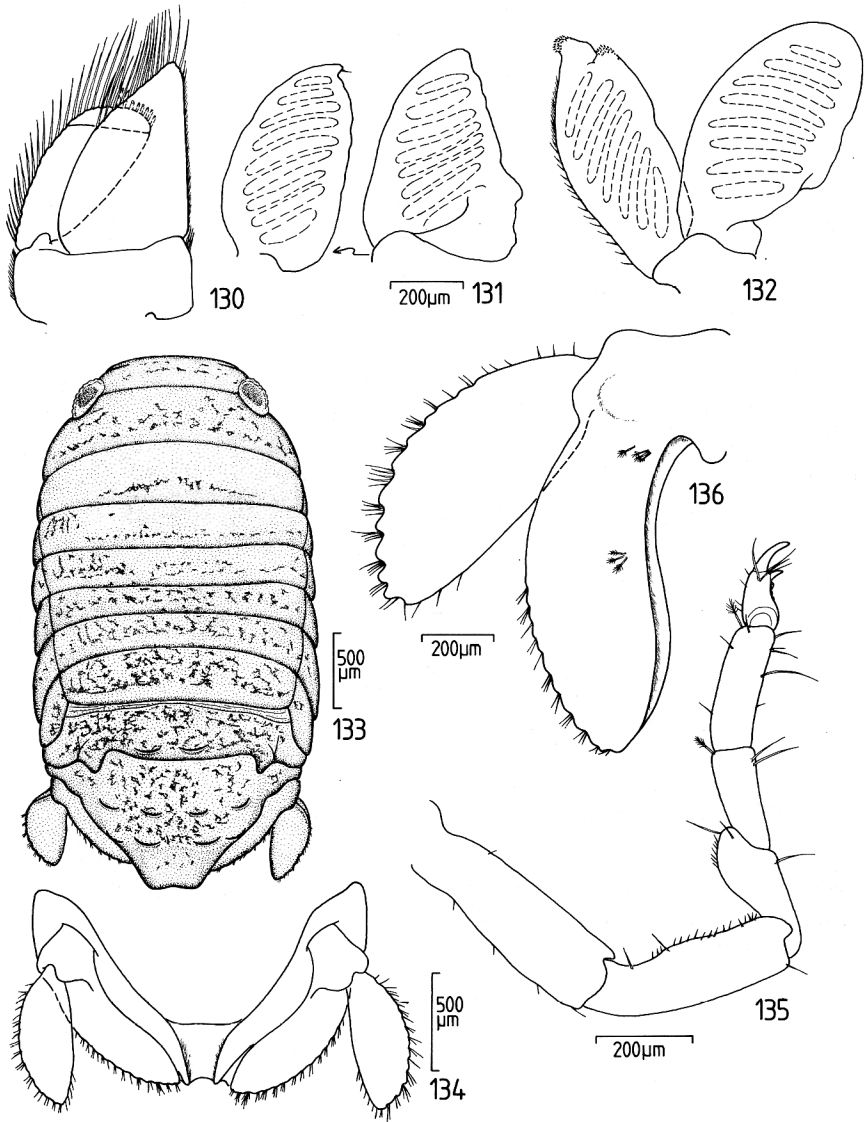
Symphodite of pleopods 1-3 with 3 retinacula. Rami of pleopod 1 roughly ovate in outline, endopodite well extending beyond exopodite; distal part of endopodite bearing 25 plumose marginal setae; outer and distal margin of exopodite bearing 26 plumose setae. Endopodite of 2nd pleopod triangular;



Figs. 123-128. *Paradella harrisoni* n. sp., ♂. 123, pereopod 3; 124, pereopod 4; 125, pereopod 6; 126, pereopod 7; 127, pleopod 1; 128, pleopod 2.

Fig. 129. *Paradella octaphymata* Harrison & Holdich, 1982, ♂, paratype (Queensland Museum, reference-number W 7926), pleopod 2.

proximally articulating appendix masculina with subapical denticle, extending beyond ramus with  $1/4$  of its length; distal part of endopodite with 26 plumose marginal setae; exopodite similar to that of pleopod 1, outer and distal margin bearing 28 plumose setae. Triangular endopodite of pleopod 3 well extending beyond exopodite, with straight medial and narrowly rounded distal margin; outer distal and distal margin bearing 14 plumose setae; elongate-ovate exp-



Figs. 130-136. *Paradella harrisoni* n. sp. 130-132, ♂; 133-136, ♀. 130, pleopod 3; 131, pleopod 4; 132, pleopod 5; 133, dorsal view; 134, pleotelson and uropods, ventral view; 135, pereopod 2; 136, left uropod, dorsal view.

odite with transverse suture in distal fourth, outer and distal margin bearing 28 plumose setae. Both rami of pleopods 4 and 5 pleated and subequal in length; endopodite of pleopod 4 wider than exopodite, exopodite bearing minute terminal seta; exopodite of pleopod 5 with 2 distal denticulate bosses and 14 short setae along outer proximal two-thirds. Plumose marginal setae of pleopodal rami drawn as simple setae.

Uropodal rami elongate-ovate; endopodite of uropod fused with sympodite, slightly longer than exopodite; both outer distal margins of uropodal rami with several rounded indentations bearing tufts of short setae; medial margin of endopodite with deep furrow over entire length that fits into the ventral pleotelsonic margin; dorsal surface of endopodite bearing 7 feathered sensory setae.

♀: Total length 3.5 mm. Similar in habitus to ♂, but posterior margins of pereonites without granules and dorsal surface of fused pleonite section and pleotelson with much shallower tubercles. Ventilation slit distally directed and distal pleotelsonic margin not so strongly expanded as in ♂. Ventral pleotelsonic margins without distal notch.

Pereopods less setose and setulose than in ♂.

Remarks: *Paradella octaphymata* Harrison & Holdich, 1982, from Australia is most closely allied to *P. harrisoni* n. sp. They are almost identical in their habitus, but can be distinguished by the following features:

The posterior margins of pereonites 5-7 in *P. octaphymata* are more strongly vaulted and granular than in the new species. The ventral pleotelsonic margin of the Australian species shows no distal notch. The most striking difference is in the shape of the second pleopod: the appendix masculina is considerably longer in *P. octaphymata* and the endopodite is distally wider, with a broadly rounded margin (fig. 129; Harrison & Holdich, 1982: 100, fig. 5). Another species with exactly the same arrangement of pleonal tubercles is *Paradella tuberculata* Müller, 1991, from Moorea, Society Islands. It is easily distinguishable from both *P. harrisoni* n. sp. and *P. octaphymata* by the shallower, apically more broadly rounded and granular tubercles on the pleon (Müller, 1991: 100, fig. 13A).

The new species has only been found associated with barnacles. This habitat is also mentioned at least for some of the samples available of the Australian *P. octaphymata*.

Distribution: Kenya.

#### CONCLUSIONS

Fifty percent of the shallow water Sphaeromatid genera of the Watamu area in Kenya are restricted to the Indo-Pacific area: the monotypic genus *Afrocerceis* n. gen. is known only from Kenya. The genus *Paracassidinopsis* with worldwide two species has been reported from the Western Indian Ocean and French



Polynesia. Several species have been assigned to the Indo-West Pacific genus *Paracilicea*, but few of them are described in some detail, viz., by Harrison & Holdich (1984), Kussakin, Malyutina & Rostomov (1990) and Monod (1975).

The other genera, *Dynamenella*, *Paradella* and *Sphaeromopsis* (the latter not reported on here; see Holdich & Jones, 1973) show a wide distributional range in the tropical and temperate areas of the Indo-Pacific and Western Atlantic.

In the present study with four new species from altogether six species it became obvious that the knowledge of the shallow water Sphaeromatidae along the East African shores is scanty. The scattered information on this family from nearby areas is inadequate and mainly based on superficial descriptions, which makes it impossible to discuss interspecific relationships in detail and to estimate certainly existing faunal provinces. On species level it can be seen that the Kenyan Sphaeromatid fauna overlaps with those of other areas with all three species already described: northward with Somalia (*Dynamenella scaptocephala*, *Sphaeromopsis amathitis*) and southward with Madagascar (*Paracassidinopsis perlata*), i.e. only the latter has been recorded outside the mainland of East Africa. The Sphaeromatidae from the mainland of Tanzania are unknown and there is no species in common with the Sphaeromatidae from Mozambique.

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