similar, except in pleopod structure. *A. mediterranea* has an undifferentiated pleopod 1, while the copulatory stylet of pleopod 2 is a single robust cylindrical structure. (There is a possibility that the recent Mediterranean material examined is immature, in which case this comparison is invalid). *A. corniger* possesses a modified endopod of pleopod 1, while the copulatory stylet of pleopod 2 is a slender apically trifid structure. Similar pleopodal structure is seen in *A. longispina* and *A. eminentia*.

Astacilla eminentia sp. nov.

Figs 7–8

Material

Zululand to Transkei area. Holotype SAM–A15673, SM 232, 32°14′S 29°10′E, 560–620 m, 1 ♂, TL 6,7 mm. Paratypes SAM–A15674, SM 103, 28°31′S 32°34′E, 680 m, 1 ♂, TL 6,0 mm, 3 juvs. Paratype SAM–A15675, SM 109, 28°41′S 32°36′E, 1 300 m, 1 ♂, TL 6,3 mm. Paratypes SAM–A15676, SM 232, 560–620 m, 1 ♂, TL 3,5 mm, 2 ♀, (damaged). Paratypes SAM–A17791, SM 250, 31°59′S 29°22′E, 150–200 m, 2 ♂, TL 5,1 mm, 5,3 mm. Paratypes USNM 189069, SM 226, 32°28′S 28°58′E, 710–775 m, 2 ♂, TL 7,1 mm, 7,0 mm.

Description

Male

Integument smooth, body elongate, especially pereonite 4, cylindrical. Head fused with pereonite 1, with lateral incision and dorsolateral groove indicating area of fusion; anterior margin strongly concave, with tiny rostral point; anterolateral and ventrolateral margin forming rim of buccal cavity; anteroventral margin projecting, trilobed. Eyes circular, barely pigmented. Pereonites 2–3 subequal; pereonite 4 elongate-cylindrical; pereonites 5–7 similar, becoming shorter posteriorly. Pleon consisting of three fused pleonites, each indicated by shallow grooves, plus narrowly triangular pleotelson; latter with posterior half dorsally flexed.

Antennule of three short peduncular articles and uniarticulate flagellum bearing nine aesthetascs distally. Antennal peduncle of two short proximal articles and three more elongate articles, fourth longest; flagellum of three or four articles. Mouth-parts typical of genus. Pereopod 1 within buccal rim, shorter than pereopods 2–4, four distal articles bearing elongate fringed setae; strong terminal spine present on dactylus, strong serrate spine on propodus. Pereopods 2–4 increasing in length posteriorly, dactyli absent; four distal articles bearing very elongate fringed setae. Pereopods 5–7 robust, with fine setules on posterior margins of five distal articles. Penis distally bifid, curved. Pleopod 2 with exopod shorter than endopod, both rami bearing elongate plumose setae; copulatory stylet attached near base of endopod, proximally inflated, distally tapering to trifid apex, extending to ends of endopodal setae. Uropod widest at midlength,

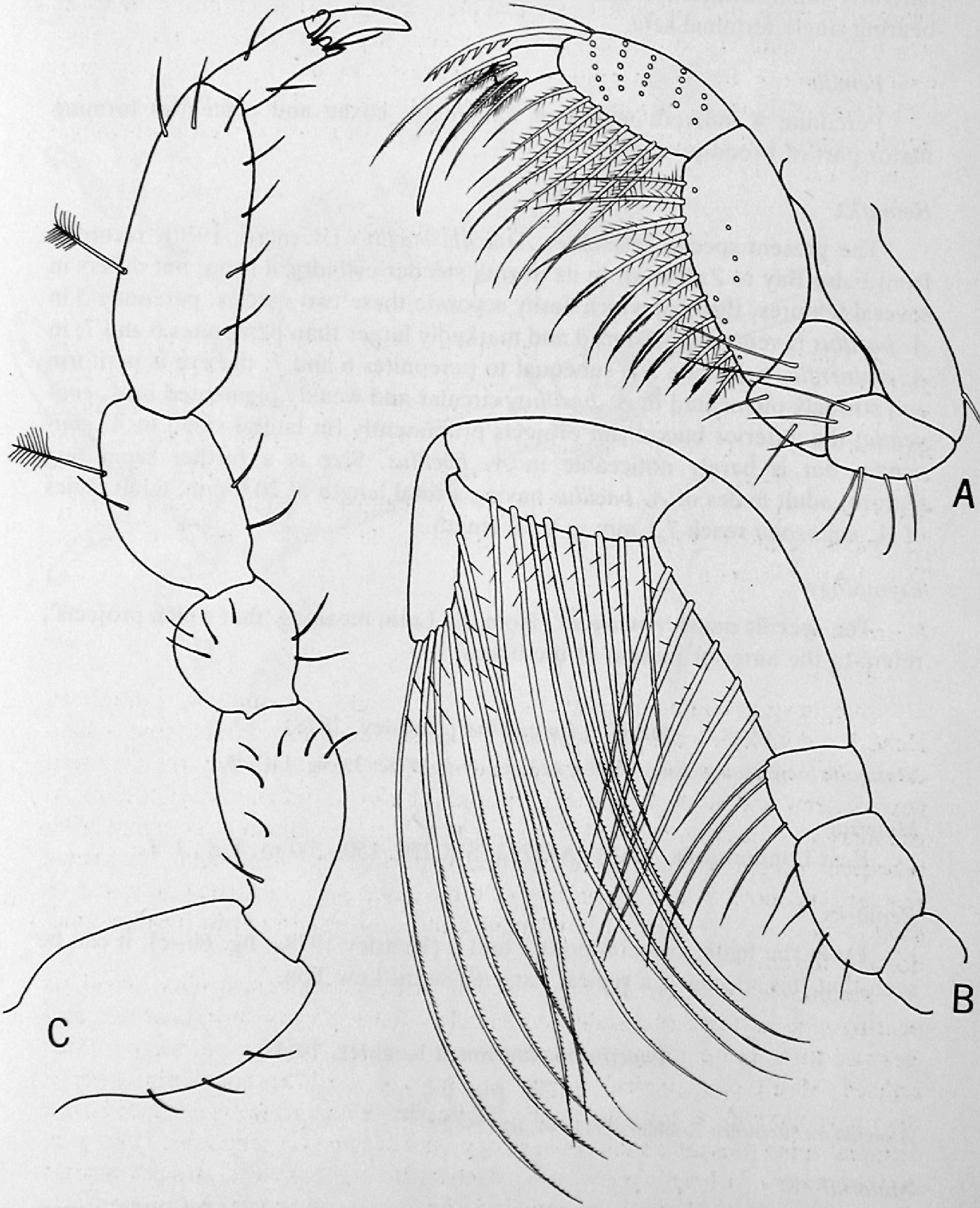

Fig. 8. *Astacilla eminentia* sp. nov. A. Pereopod 1. B. Pereopod 2. C. Pereopod 7.

narrowly tapered distally, outer ramus narrowly triangular, inner ramus tiny, bearing single terminal seta.

Female

Pereonite 4 inflated, widest at midlength; coxae and oostegites forming major part of brood-pouch.

Remarks

The present species resembles *Astacilla bacillus* (Barnard, 1920), recorded from False Bay to Zululand, in its overall slender-cylindrical form, but differs in several features, three of which easily separate these two species: pereonite 5 in *A. bacillus* is ventrally produced and markedly larger than pereonites 6 and 7; in *A. eminentia*, pereonite 5 is subequal to pereonites 6 and 7; the eye is pyriform and strongly pigmented in *A. bacillus*, circular and weakly pigmented in *A. eminentia*; the anterior buccal rim projects prominently (in lateral view) in *A. eminentia*, but is barely noticeable in *A. bacillus*. Size is a further separating feature, adult males of *A. bacillus* having a total length of 20,0 mm; adult males of *A. eminentia* reach 7,1 mm in total length.

Etymology

The specific name '*eminentia*', from the Latin meaning 'that which projects', refers to the anterior margin of the buccal rim.

Astacilla longispina (Kensley, 1978)

Neastacilla longispina Kensley, 1978*a*: 133, figs 5–6; 1978*e*: 33, fig. 14C–D.

Material

East London area. SAM–A17792, SM 250, 150–200 m, 1 ♂, 1 ♀.

Remarks

From the figure of pereopods 1 and 2 (Kensley 1978*a*, fig. 6b–c), it can be seen that this species is a typical *Astacilla sensu* Lew Ton.

Astacilla mediterranea Koehler, 1911

Fig. 9

Astacilla mediterranea Koehler, 1911: 44, figs 25–29.

Material

USNM 211346, Marseille, 75 m, 7 ♂, 2 ovig. ♀, taken from the gorgonacean *Lophogorgia sarmentosa*.

Previous records

Villefranche, Mediterranean Sea.

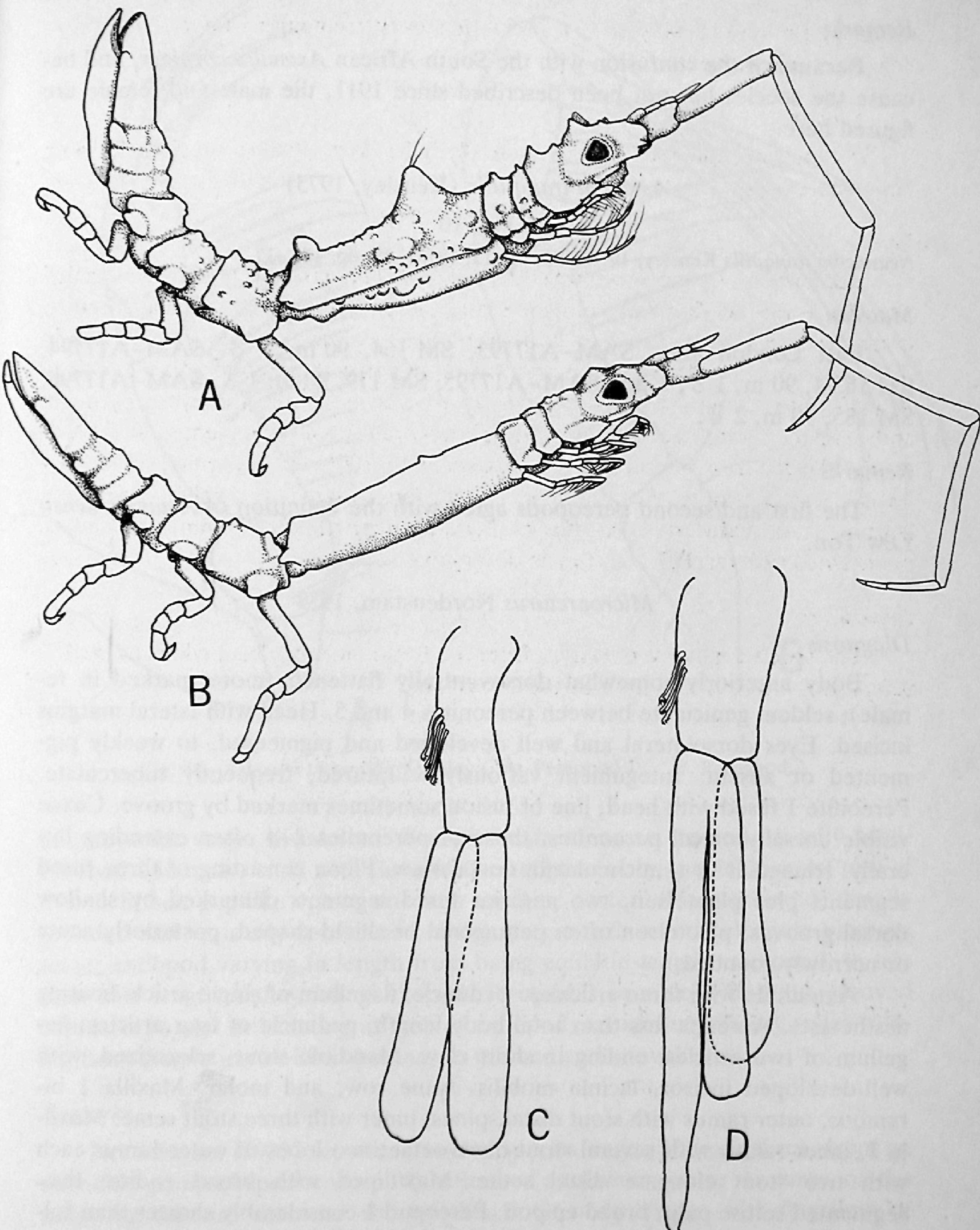

Fig. 9. *Astacilla mediterranea* Koehler A. Female, lateral view. B. Male, lateral view. C. Pleopod 1 male. D. Pleopod 2 male (immature).

Remarks

Because of the confusion with the South African *Astacilla corniger*, and because the species has not been described since 1911, the male and female are figured here.

Astacilla tranquilla (Kensley, 1975)

Fig. 10

Neastacilla tranquilla Kensley, 1975*a*: 62, fig. 13; 1978*e*: 33, fig. 15C–D.

Material

East London area. SAM–A17793, SM 164, 90 m, 1 ♂. SAM–A17794, SM 163/4, 90 m, 1 ♂, 1 juv. SAM–A17795, SM 179, 80 m, 1 ♂. SAM–A17796, SM 185, 90 m, 2 ♂.

Remarks

The first and second pereopods agree with the definition of *Astacilla sensu* Lew Ton.

Microarcturus Nordenstam, 1933

Diagnosis

Body anteriorly somewhat dorsoventrally flattened (more marked in female); seldom geniculate between pereonites 4 and 5. Head with lateral margins incised. Eyes dorsolateral and well developed and pigmented, to weakly pigmented or absent. Integument variously sculptured, frequently tuberculate. Pereonite 1 fused with head, line of fusion sometimes marked by groove. Coxae visible dorsally on all pereonites, those of pereonites 2–4 often extending laterally, triangular or semicircular in dorsal view. Pleon consisting of three fused segments plus pleotelson, two anterior fused segments demarked by shallow dorsal grooves; pleotelson often pentagonal or shield-shaped, posteriorly acute or narrowly rounded.

Antennule with three-articulate peduncle; flagellum of single article bearing aesthetascs. Antenna less than total body length; peduncle of four articles; flagellum of two articles, ending in short claw. Mandible stout, sclerotized, with well-developed incisor, lacinia mobilis, spine row, and molar. Maxilla 1 biramous, outer ramus with stout distal spines, inner with three stout setae. Maxilla 2, inner ramus with several stout distal setae; two lobes of outer ramus each with two stout elongate distal setae. Maxilliped with broad endite; five-segmented setose palp; broad epipod. Pereopod 1 considerably shorter than following legs, hidden by lateral flanges of head and pereonite 1, bearing numerous fringed spines. Pereopods 2–4 relatively slender, with elongate setae on posterior margins. Pereopods 5–7 robust, non-setose. Uropods folded ventrally, biramous, hinging with pleotelson at about midlength, basis forming most of operculum; outer ramus short, triangular, tipped with single seta; inner ramus

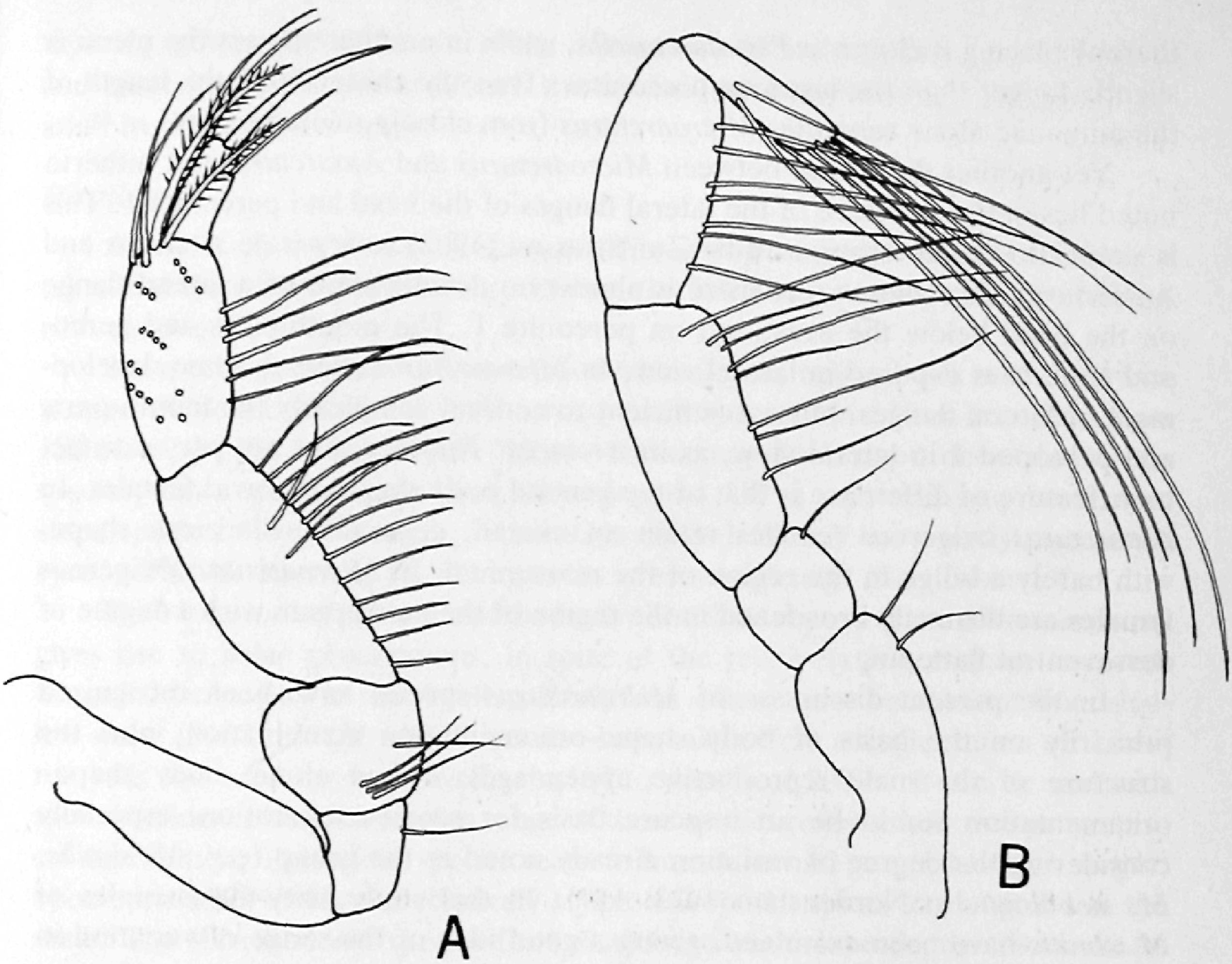

Fig. 10. *Astacilla tranquilla* Kensley A. Pereopod 1. B. Pereopod 2.

minute, with single distal seta. Penis in male elongate, curved, distally bifid. Pleopod 1 in male, basis with three to five retinaculae on medial margin, row of five to fifteen peg-like spines on outer margin, posterior face grooved, distally rounded and variously convoluted, distal margin with several elongate plumose setae; endopod varying in length from being equal in length to exopod, to less than half length and width of exopod. Pleopod 2 in male with stout grooved copulatory stylet articulating at base of endopod; apex of copulatory stylet varying from simple gutter-like opening, to bilobed and convoluted.

Remarks

Nordenstam (1933) separated twelve species under *Microarcturus*, from an unwieldy group of species variously described as *Antarcturus* or *Arcturus*, on the following criteria: antennae shorter than total body length, with flagellum of three articles (rarely two or four); abdomen short, never longer than last four pereonites. Nordenstam (1933: 128) also noted that *Microarcturus* contained 'small forms'.

Hale (1946) noted that at least one species mentioned by Nordenstam under *Microarcturus* possesses a longitudinally cleft exopod of pleopod 1 in the male, thereby placing it closer to *Pseudarcturella*, while in another species the pleon is slightly longer than the last four pereonites. Thus the character of the length of the antennae alone separates *Microarcturus* from closely related forms.

Yet another difference between *Microarcturus* and *Antarcturus* not hitherto noted lies in the structure of the lateral flanges of the head and pereonite 1. This is similar to the criterion used by Zur Strassen (1902) to separate *Arcturus* and *Antarcturus*. In *Antarcturus*, there is almost no development of a lateral flange on the head below the eyes, and on pereonite 1. The mouth-parts and pereopod 1 are thus exposed in lateral view. In *Microarcturus* there is some development of lateral flanges, but not sufficient to conceal completely the mouth-parts and pereopod 1 in lateral view, as in *Arcturus*. Another, but not very satisfactory, feature of difference is that of the general body shape of gravid females. In *Antarcturus* ovigerous females retain an overall, generally cylindrical, shape, with barely a bulge in the region of the marsupium. In *Microarcturus* ovigerous females are distinctly broadened in the region of the marsupium with a degree of dorsoventral flattening.

In the present discussion of *Microarcturus* species have been recognized primarily on the basis of body shape–ornamentation combination, plus the structure of the male reproductive appendages. Taken alone, body shape–ornamentation would be an insecure basis for species separation, especially considering the degree of variation already noted in the group (e.g. *M. similis, M. stebbingii*, in Nordenstam 1933: 159). In this study sixty-five samples of *M. similis* have been examined, giving a good idea of the range of variation in body shape and integumental sculpturing. The shape of the epimera of pereonites 2–4, being either triangular and acute, or semicircular, remains constant, regardless of the integumental ornamentation. It is unfortunate that Schultz (1982*b*), in designating new astacillid genera, did not supply information or figures for several, basing them instead on integumental ornamentation and presence or absence of eyes. The former feature, as noted above for *M. similis*, and for *M. halei* (p. 243) (and for *Arcturides cornutus*, in Kensley 1980) can be variable both within and between species. Eyes may be present or absent, as demonstrated in species of *Microarcturus*.

The first and second pleopods of the male provide another set of features considered useful for specific separation. On the outer margin of the bases of pleopod 1 some variation in the number of peg-spines has been noted, but generally not varying by more than one or two spines within a species. The exopod of pleopod 1 in the male is grooved on the posterior face and the distal part generally bears a rounded lobe bearing elongate plumose setae plus a variously shaped finely setulose lobe in the area of the distal end of the groove. There would appear to be a trend in reduction in size and setation of the endopod, being of equal length to the exopod in *M. similis*, and less than half the length and width, and with few plumose setae, in *M. oudops*. This trend may be correlated with depth, the reduction being clearest in the deepest occurring species. The copulatory stylet of pleopod 2 in the male varies from being a simple tapering gutter-like structure to an almost closed tube having a bilobed and convoluted apex. Within a species there would seem to be little variation in the adult in these appendages.

Distribution

As most of the twelve species of *Microarcturus* discussed here have been taken from a very few collecting stations, the following remarks must be treated with caution.

Six species have not been recorded from depths beyond 100 m and may be termed shallow-continental shelf forms; three species have been recorded from 150 m to depths in excess of 700 m—these may be termed deep shelf-slope species; three species have been taken beyond 550 m only and may be termed slope species. Of these latter, *M. oudops* (680–1 500 m) has weakly pigmented eyes, while *M. biserialis* (1 300 m) lacks eyes completely. (See Table 1.)

The evolutionary radiation of the twelve South African species of *Microarcturus* gives rise to some observations, in spite of the relatively few stations involved. From Saldanha Bay to the Agulhas Bank four species have been taken from shallow water (9–88 m). (*M. similis* has also been taken from a single station off Lüderitz.) As this area has been well sampled to depths of 200 m, it can be said with some confidence that the known range of these species reflects their true geographical distribution. These four species seem to form a natural group, having a simple, open copulatory stylet and relatively simple endopodal apices to pleopod 1 in the male. The six east-coast species from shallow to shelf-slope depths also seem to form a natural group, having convoluted apices of the stylet and pleopod 1 in the

TABLE 1

Distribution of southern African *Microarcturus*.

Species	Depth range	Geographic range	Depth category
dayi	9–18	False Bay	shallow shelf
similis	15–88	Saldanha Bay–Still Bay	shallow shelf
quadriconus	22–80	False Bay–Still Bay	shallow shelf
laevis	48–81	False Bay–Agulhas Bank	shallow shelf
nordenstami	90	East London	shallow shelf
ornatus	150–700	Still Bay–Transkei	deep shelf/slope
longispindus	150–775	Transkei	deep shelf/slope
halei	150–1 300	Transkei–Zululand	deep shelf/slope
youngi	550–680	Zululand	slope
oudops	680–1 500	Cape Point–Zululand	slope
biserialis	1 300	Zululand	slope

male. The deeper occurring species (*M. ornatus* and *M. halei*) appear to have relatively wide geographic ranges, while the two shallow species (*M. barnardi* and *M. nordenstami*) appear to have a more restricted range.

On a somewhat restricted scale, this distribution pattern agrees with that of other isopod groups, e.g. the anthuridans, viz. shallow species with high endemicity and narrow ranges, deep species with wide geographic ranges.

As little is known of the distribution of the non-South African species of *Microarcturus*, some of which are taxonomically poorly defined, no further speculation on the history of the genus can be made.

In the following discussion of individual species a diagnosis is given for each, covering only the features used for separation. Figures of whole animals plus relevant appendages are also provided. Only for *M. similis*, the most frequently recorded species, are all the appendages figured.

Microarcturus barnardi sp. nov.

Fig. 11

Material

East London area. Holotype SAM–A17797, SM 163, 33°04′S 28°06′E, 90 m, 1 ovig. ♀, TL 5,0 mm; allotype, 1 ♂, TL 5,0 mm. Paratypes SAM–A17798, SM 163, 90 m, 5 ♂, 1 ovig. ♀, 12 juvs. USNM 189070, SM 163, 90 m, 4 ♂, 2 ovig. ♀.

Diagnosis

Integument with numerous rounded tubercles. Tuberculate supraocular ridges fairly prominent, but not as strong as in *M. nordenstami*. Eyes dorsolateral, well pigmented. Pereonites 2–4 each with central clump of tubercles anterodorsally. Epimera of pereonites 2–3 broadly oval in female, epimeron 4 reduced. Pleotelson apically narrowly rounded, lacking lateral angle, with large elongate tubercles dorsally. Bases of pereopods 2–4 unarmed. First fused pleonite in male with single dorsal row of tubercles; second fused pleonite consisting of two large rounded tuberculate bosses, markedly inflated and convex in lateral view. Third fused pleonite with single middorsal rounded tuberculate boss. Pleopod 1 in male, distal margin rounded, bearing eight short plumose setae, running imperceptibly into finely setulose rounded lobe in area at end of groove; endopod about three-fourths length of and slightly more than half width of exopod. Copulatory stylet of pleopod 2 distally bilobed and convoluted.

Remarks

This species was collected with a single specimen of *M. nordenstami* off East London, in 90 m. These two species may easily be separated by the strong carunculated supraocular ridges, granulate pereonal bosses, and angled pleotelson of *M. nordenstami*, and the swollen fused pleonite 2 and non-angled pleotelson of *M. barnardi*.