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PARABOMOLOCHUS GLOBICEPS NOV. SPEC. (COPEPODA,
CYCLOPOIDA) FROM THE GILLS OF AUSTRATHERINA
SMITTI (LAHILLE) (PISCES, ATHERINIDAE)

by

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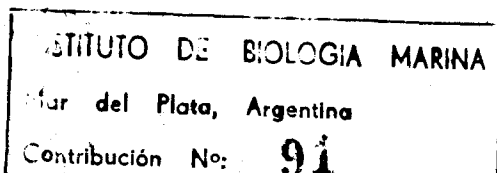
With six text-figures

The material on which the following note is based was collected by the second author from the gill cavities of *Austroatherina smitti* (Lahille, 1929) from Mar del Plata, Argentine coastal waters, in the course of 1966 and consists of a number of female and male Bomolochid Copepods. In the course of the process of identification the copepods turned out to represent a new species, closely allied to but probably different from *Parabomolochus xenomelanirisi* (Carvalho, 1955), the only species of Bomolochidae so far known to occur along the Atlantic coast of South America. It was decided to draw up the description jointly; the drawings have been made after the dissected holo- and allotype by the first author, using Dr. Ramirez' sketches.

Parabomolochus globiceps nov. spec. (figs. 1-6)

Material examined. — Mar del Plata, Atlantic coast of Argentina, 1966. A fair number of specimens, consisting of ovigerous and non-ovigerous females and adult males, were taken from the gills and gill cavities of *Austroatherina smitti* (Lahille) (= *Basilichthys smitti* Lahille), local name "corno").

The following description is largely based on the 1.56 mm long holotype



COPEPODOS - PARASITOLÓGICA - SISTEMÁTICA
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(non-ovigerous female) and the 0.80 mm long allotype (male); both have been dissected and the appendages mounted. Holo- and allotype are preserved in the Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands, along with 6 female paratypes (total length 1.55-1.80 mm, mean 1.66 mm) and one male paratype (total length 0.81 mm). Additional paratypes have been deposited in the Museum of Natural Sciences, La Plata, Argentina.

Description of the female. — Total length, measured from the frontal part of the rostral plate to the end of the furca, 1.56 mm; greatest diameter, at the cephalic somite, 900 μ . The length of the cephalic somite, measured from the frontal end of the rostral plate to the articulation with the second thoracic somite, is 572 μ ; the diameter is 902 μ . The length of the second thoracic somite is 209 μ , the greatest diameter 704 μ . For the remaining thoracic somites these figures are: 143 and 473 μ for the third, 132 and 330 μ for the fourth and 80 and 286 μ for the (visible) part of the fifth thoracic somite. The genital complex is 187 μ long and has a maximum width of 297 μ . The remaining abdominal somites have the following lengths and widths: 99 and 198 μ for the third abdominal somite, 66 and 176 μ for the fourth abdominal somite, and 77 and 154 μ for the anal somite. The width of each abdominal somite has been measured at its articulation with the preceding somite. The furca is 72 μ long and 44 μ wide at its articulation with the anal somite; the longest furcal seta is 385 μ long. The eggs sacs are 880 μ long and have a maximal diameter of 275 μ .

The general appearance of the female is characterized by the broadly rounded, swollen cephalic somite, the slightly backward produced fourth thoracic somite, the gradual decrease in diameter of the thoracic somites and the slender abdomen (fig. 1a).

The head and the first thoracic somite are completely fused so as to form the cephalic somite; this, in dorsal view, has a very broadly rounded frontal outline; the lateral parts too, are rounded in dorsal view. There is a moderately deep longitudinal furrow on the cephalic somite, widening and deepening frontally and exposing the rostral plate between the fully visible proximal parts of the antennules. Internally the longitudinal furrow is marked by the presence of a chitinized longitudinal carina, serving the attachment of muscles. The shape of the cephalic somite in lateral aspect can best be judged from figure 1 b, c; it is very smoothly curved, with an almost straight ventral border. In ventral view the rostral plate appears to be sharply curved backward with the free, rounded border strongly chitinized and medially produced in a short, two-pointed rostrum, with the sharp points strongly diverging (fig. 1 f).

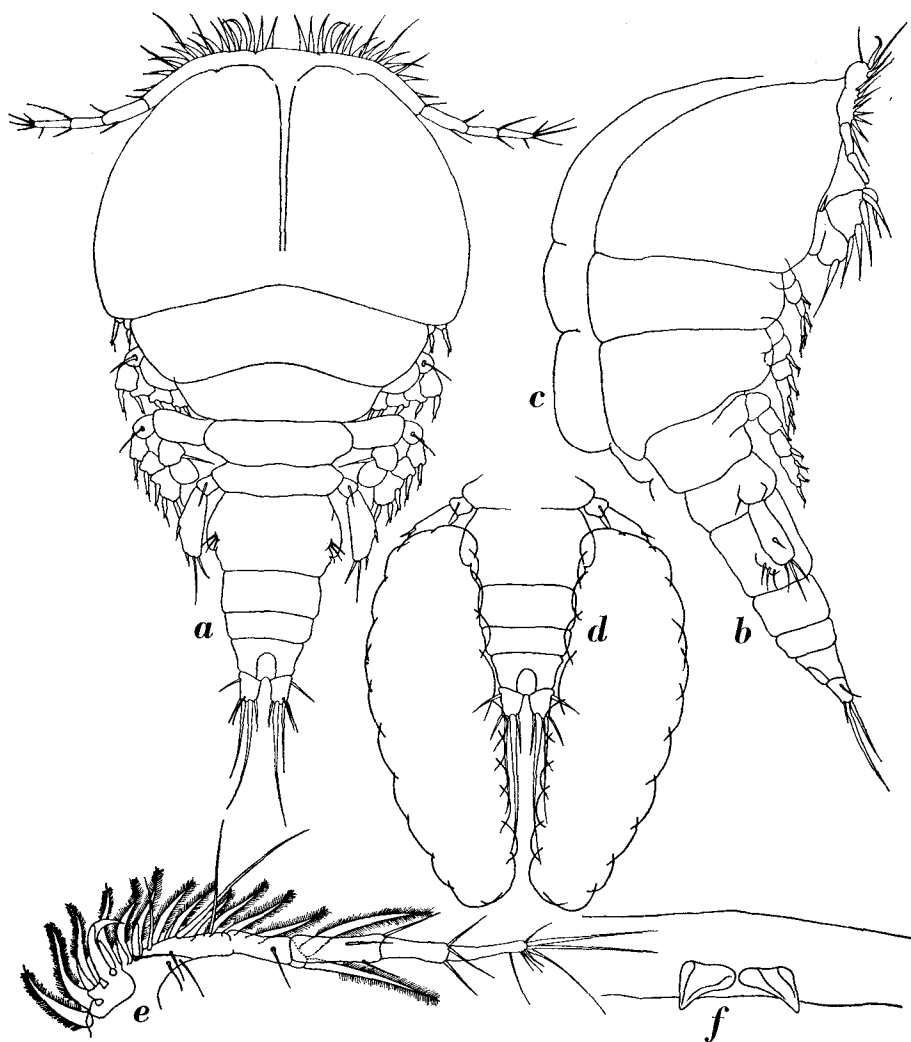


Fig. 1. *Parabomolochus globiceps* nov. spec., adult ♀, from *Austroatherina smitti*. a, b, e, f, holotype; c, d, paratype. a, whole animal, dorsal view; b, whole animal, lateral view from right side; c, outline of back in lateral view; d, abdomen with egg-sacs, dorsal view; e, right antennule, dorsal view; f, rostrum, ventral view. a-e, $\times 135$; f, $\times 395$.

The thoracic somites 2 to 5 are all distinctly visible from above. Because of the poor development of the epimeral plates the coxae of the second to fifth pairs of legs are distinctly visible. All lateral parts of the thoracic somites are smoothly rounded in dorsal view. The third thoracic somite is

slightly though distinctly produced backward, the mode of production being largely dependent upon the condition of the ovaria. In the holotype, which is a non-ovigerous female, the production is only very slight and the fourth thoracic somite, in dorsal view, is nearly completely visible (fig. 1a). In the ovigerous females the third thoracic somite is distinctly swollen and slightly produced backward, consequently a smaller portion of the fourth thoracic somite is visible (fig. 1c). The fifth thoracic somite is distinctly visible dorsally; the fifth pair of legs is also visible from above.

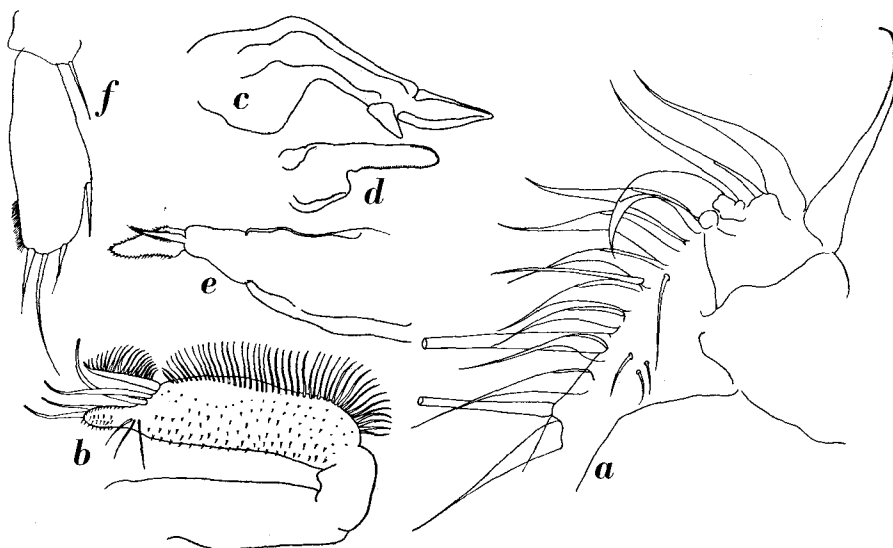


Fig. 2. *Parabomolochus globiceps* nov. spec., from *Austroatherina smitti*. a, c-f, adult ♀, holotype; a, basal part of right antennule, ventral view; c, right mandible; d, right paragnath; e, left maxilla, slightly turned; f, right fifth leg. b, adult ♂, allotype, antenna. a, × 220; b, × 395; c-e, × 240; f, × 135.

The first and second abdominal somites are fused so as to form the genital complex, which is distinctly wider than long, with the sides broadly rounded. The laterally placed genital openings are visible from above. In the non-ovigerous holotype they are closed by small, rounded flaps. Three setae protrude from each opening. The third and fourth abdominal somites have nearly parallel sides; those of the fifth (anal) somite taper slightly. The fourth abdominal somite is nearly 1.5 times as long as the third. The anal plate on the fifth abdominal somite is distinct and rounded.

The furcal rami are slightly longer than wide and taper slightly. Each ramus has 5 marginal setae and an appendicular seta. Setae 1, 4, 5, and the appendicular seta are short and fine; setae 2 and 3 are lengthened and thickened, with slightly swollen basal parts (fig. 1d).

The antennules are composed of a strongly chitinized, flattened proximal part, to which the sensory setae are attached, and a 3-segmented flagellum (fig. 1 e). The ventral part of the proximal portion (fig. 2 a) is reinforced with chitinized plates, fused to the rostral plate and the free anterior edge of the cephalic somite; its structure greatly resembles the condition found in *P. cuneatus* (Vervoort, 1964: 297) and *P. psettobius* (Vervoort, 1962: 51). There are 15 plumose sensory setae on the proximal part of the antennule; in addition there are 3 normal marginal setae and 4 small setae on the ventral aspect of the proximal part. The plumose setae 3 to 11 each have a finger-shaped prolongation of the chitinized ventral plates of the antennule, continuing in the frontal part of the seta. That of the fourth seta is strongly developed and shaped like a curved hook; the seta itself is a curved, pointed structure. The chitinized strips gradually obscure in the distal setae, that of the eleventh being scarcely visible. The plumose setae 14 and 15 are placed on a more or less separate part of the proximal antennular portion, separated, on the ventral side, from the rest of that portion by a distinct line. The setation of the antennule appears best from figures 1 e and 2 a.

The antennae (fig. 1 b) have the structure also found in *P. bellones*, *P. cuneatus* and *P. psettobius*. The 2-segmented endopodite is folded over the coxa; the basis is very short and has a single plumose seta. Both endopodal segments have longitudinal rows of fairly strong, blunt spines. The number of rows is seven on the first endopodal segment; on the second endopodal segment there are five. In addition there is a pectiniform, longitudinal row of slender, pointed spines, running along the frontal edge of the first endopodal segment and continuing on the lamelliform process. There are four geniculate, strong setae, inserting at the articulation of first and second endopodal segments, and 2 fine, hairy setae.

The free, posterior edge of the labrum is set with fine teeth; it covers a part of the mandibles (fig. 3 a). Each mandible (fig. 2 c) consists of a swollen basal part and an elongated median part, bearing a flattened, strong tooth and a much smaller additional tooth. The maxillule is a rounded structure with 4 setae, decreasing in length laterally. The paragnaths (fig. 2 d) are clavate structures, consisting of a finger-shaped median portion with a sharp, corrugated edge and a swollen basal portion. The maxilla (fig. 2 e) gradually tapers from base to apex; it has a strong, triangular, hairy tooth at its apex; a finely setose seta inserts at the base of the afore-mentioned tooth. The claw of the maxillipede (fig. 3 c) is strongly sigmoid and has a triangular auxiliary tooth. In addition there are three setose setae, the position of which appears best from figure 3 c.

The legs 1 to 4 are nearly identical with those of *P. cuneatus* and have

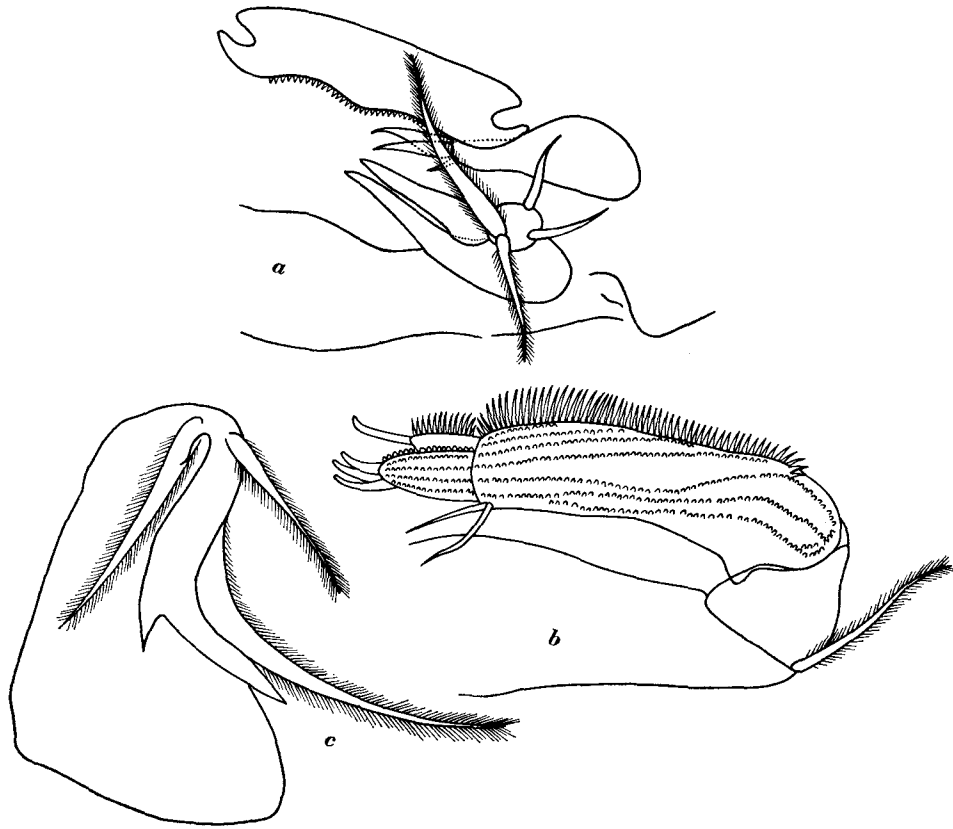


Fig. 3. *Parabomolochus globiceps* nov. spec., adult ♀, holotype, from *Austroatherina smitti*. a, ventral view of the left part of the oral field; b, right antenna; c, left maxillipede. a, $\times 265$; b, c, $\times 440$.

the following setal and spinal formulae (setae in arabic, spines in roman numerals):

	endopodite	exopodite
leg 1	1 + 0 . 1 + 0 . 5	0 + I . 6 + I
leg 2	1 + 0 . 2 + 0 . 3 + II	0 + I . 1 + I . 5 + IV
leg 3	1 + 0 . 1 + 0 . 2 + II	0 + I . 1 + I . 5 + III
leg 4	1 + 0 . 1 + 0 . 1 + I + I	0 + I . 1 + I . 4 + III

The endo- and exopodites of leg 1 (fig. 4 a) are strongly flattened. The coxae of left and right sides are united by means of a strongly developed intercoxal plate. In addition each coxa has an internally directed, hairy flap.

The exopodite consists of three partly fused segments. There is an external marginal spine, borne on the first exopodal segment and a small spine at the end of the external margin of the third exopodal segment. There is a total of 6 strongly plumose setae. All setae of the endopodite are hairy.

The coxae of legs 2 to 4 are elongated and externally directed; the bases are short. There is an internal, plumose seta at the coxae of legs 2 and 3; the bases of legs 2 to 4 have a fine, short external seta. The spines at the external margins of the exopodites all have a fine flagellum; the hairy external margin of each spine terminates in a distinct spur. The third exopodal segment is deeply incised but has no extra segmentation.

The endopodite of leg 2 (fig. 4 b-e) is strongly flattened; the second segment has 2 plumose, internal setae. The third endopodal segment has 3 plumose setae and two short flagellated spines. The external margin of the endopodite is hairy.

The third endopodal segment of leg 3 (fig. 4 f) has two plumose setae and 2 short spines; the internal margin of the endopodite is hairy.

The third endopodal segment of leg 4 (fig. 4 g) has two short, terminal spines, flanking a longer, spiniform seta.

The fifth legs (fig. 2 f) consist of a short intermediate segment and a spatulate terminal segment. The intermediate segment has a single external seta. The terminal segment has a single spine at two-thirds of the external margin; apically there are two short spines flanking a spiniform seta. The end of the internal margin is set with spiniform hairs.

Description of the male. — Total length, measured from the frontal end of the rostral plate to the end of the furcal ramus, 805 μ ; greatest diameter, at the cephalic somite, 352 μ . The cephalic somite has a total length of 248 μ and a diameter of 352 μ . For the remaining somites these figures are 55 and 242 μ for the second thoracic somite, 44 and 182 μ for the third thoracic somite; 66 and 138 μ for the fourth thoracic somite, and 28 and 121 μ for the fifth thoracic somite. The genital complex, including the second abdominal somite, is 160 μ long and 149 μ wide. For the remaining somites these figures are 61 and 77 μ for the third abdominal somite; 66 and 72 μ for the fourth thoracic somite, and 61 and 72 μ for the fifth (anal) somite. The furcal rami are 50 μ long and 28 μ wide at the articulation with the anal somite. The longest furcal seta is 413 μ long.

The general appearance is very different from that of the female; the shape of the body is cyclopid, with the somites of the cephalothorax gradually narrowing in width (fig. 5 a).

The cephalic somite, resulting from fusion between the head and the first

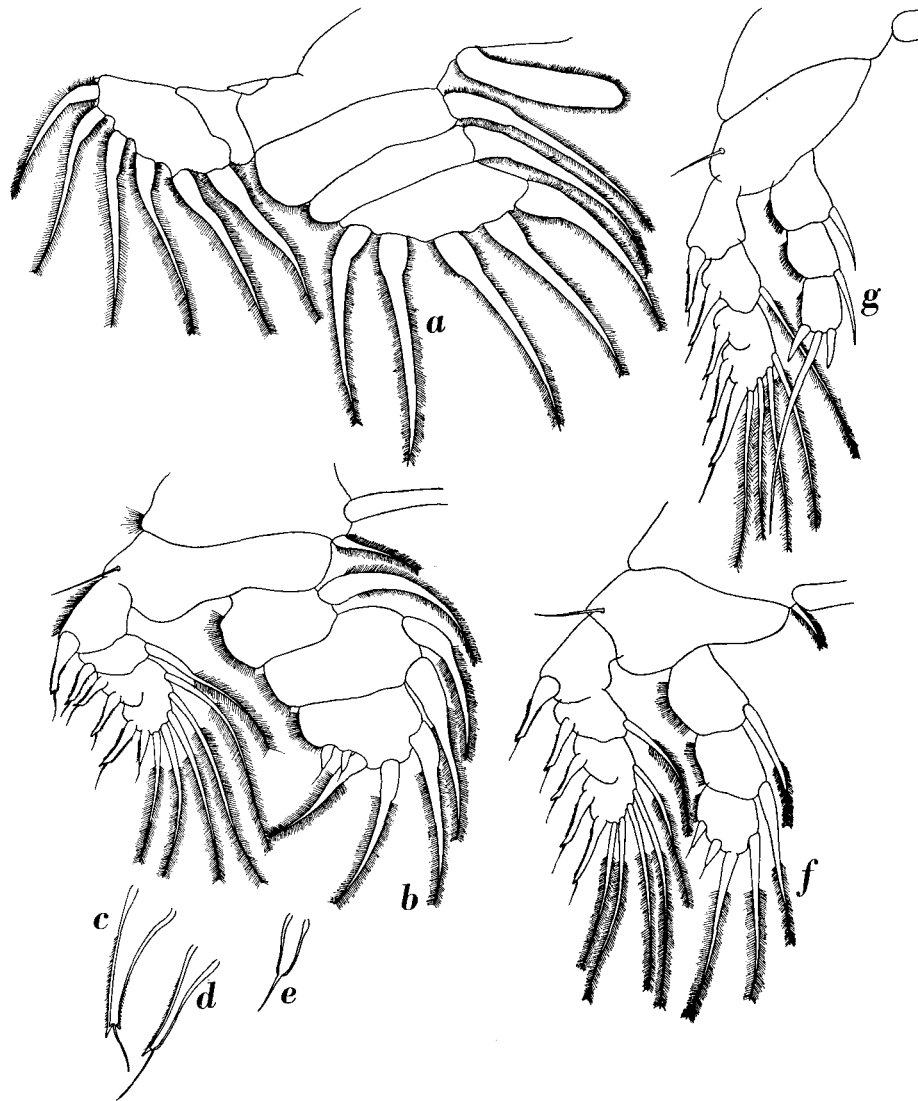


Fig. 4. *Parabomolochus globiceps* nov. spec., adult ♀, holotype, from *Austroatherina smitti*. a, leg 1; b, leg 2; c, tip of external marginal spine of first exopodal segment of leg 2; d, tip of external marginal spine of second exopodal segment of leg 2; e, terminal spine of third exopodal segment of leg 2; f, leg 3; g, leg 4. a, b, f, g, $\times 135$; c-e, $\times 395$.

thoracic somite, is almost circular in outline. The antennules are completely visible from above; between the proximal parts of the antennules the broadly rounded frontal edge of the rostral plate is visible; laterally of the rostral plate there is a rounded, plate-like structure, covering a part of the proximal portion of each antennule (fig. 5 a).

The rostral plate is strongly curved ventrally and backward; its margin is thickened but has no rostral points. The thoracic somites 2 to 4 gradually decrease in width; the epimeral plates of these somites are much reduced; the coxae of the legs of the second to fourth pairs are distinctly visible. In dorsal view the lateral parts of each thoracic somite are rounded. The fifth thoracic somite is almost as wide as somite 4; it has distinct, rounded shoulders resulting from the fusion of that somite with the intermediate segment of leg 5.

The shape of the genital complex can best be judged from figure 6 e; the second abdominal somite is apparently completely fused with the genital somite as no line of fusion could be observed. The genital slits are visible as semicircular structures in the latero-caudal part of the complex; the caudal corners of the complex are rounded. The third abdominal somite is completely telescoped into the genital complex, the caudal border only being visible. The fourth and fifth (anal) somites are of about the same length; the anal somite tapers slightly and has a distinct, rounded anal operculum. The furcal rami are distinctly more slender than in the female; they are slightly more than twice as long as wide. The arrangement and number of setae are as in the female.

The antennules are visible from above; in dorsal aspect of the whole animal a rounded portion of the cephalic somite is seen to cover the proximal part of each antennule without being actually fused to it. The number of plumose (sensory?) setae, compared with that of the female, is increased; a total of 20 has been observed. The arrangement of these setae can best be judged from figure 5 b, representing the ventral aspect of the antennule. The antennule itself is apparently 6-segmented, though the third segment, which is large, may have resulted from the fusion of several smaller segments. The distribution of the setae over the various segments is as follows: first segment, 5 plumose setae; second segment, 9 plumose setae and 2 normal setae; third segment, 5 plumose setae and 1 normal seta; fourth segment, 1 plumose seta and 3 normal setae; fifth segment, 3 normal setae; sixth segment, 6 normal setae.

The antenna (fig. 2 b) is smaller than in the female, though its structure is more or less identical. The pectiniform row of spinules on the endopodite is composed of more slender spinules; the smaller spinules of the endopodite

are less distinctly arranged in longitudinal rows, whilst 4 hooked and 3 fine setae are present at the line of articulation between both endopodal segments.

The structure of the mouth parts (with the exception of the maxillipedes) is as in the female, though the various parts are correspondingly smaller.

The maxillipede (fig. 5 d) is a strong, chelate structure; the coxa is small

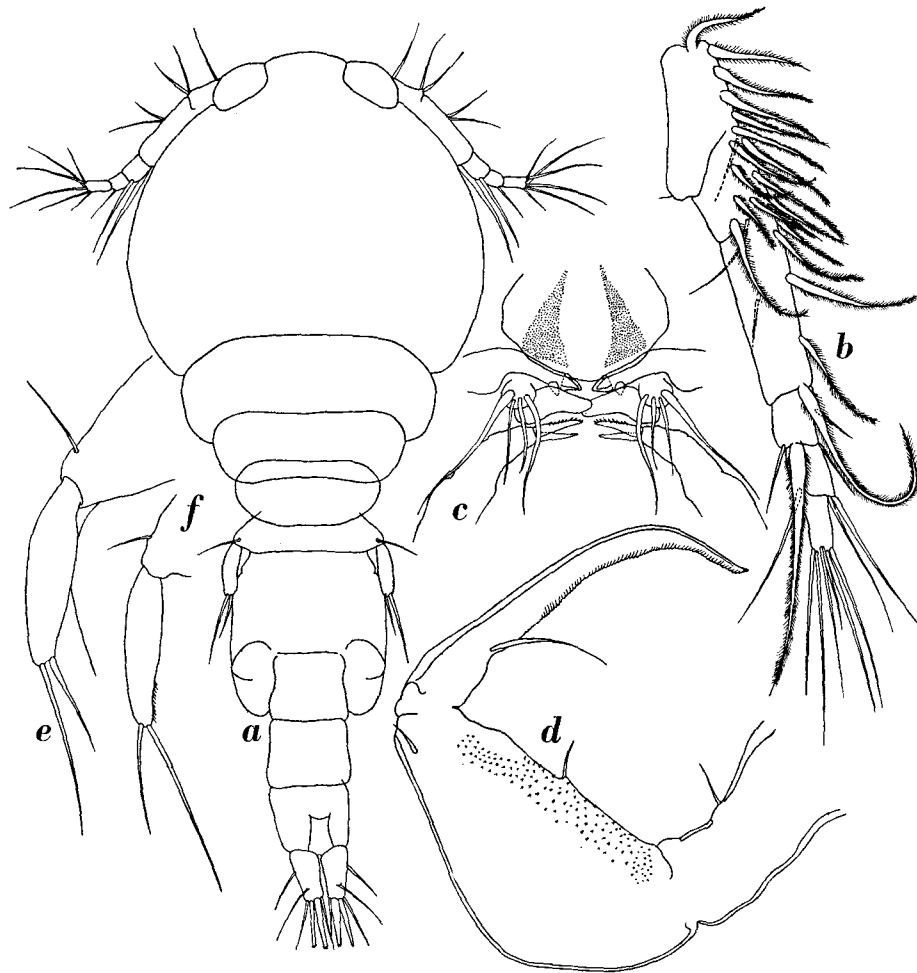


Fig. 5. *Parabomolochus globiceps* nov. spec., adult ♂, allotype, from *Austroatherina smitti*. a, whole animal, dorsal view; b, left antenna, ventral view; c, oral field, ventral view; d, left maxillipede; e, fifth leg, dorsal view; f, fifth leg, ventral view.
a, $\times 135$; b, d-f, $\times 395$; c, $\times 240$.

and has one short, internal seta. The basal is large and strongly swollen; the internal surface (palm) is set with fine spinules and carries a short seta. The endopodite is shaped like a large, curved claw, with a single, strong seta at the proximal part of the internal margin. The rest of the internal margin is set with densely packed, lamelliform teeth.

The structure of legs 1 to 4 appears from the setal and spinal formulae, figure 6 a-d, and the following notes:

	endopodite	exopodite
leg 1	1 + 0 . 1 + 0 . 5 + I	0 + I . 5 + IV
leg 2	1 + 0 . 1 + 0 . 3 + II	0 + I . 1 + I . 5 + III
leg 3	1 + 0 . 1 + 0 . 2 + II	0 + I . 1 + 0 . 5 + III
leg 4	1 + 0 . 1 + 1 + I	0 + I . 1 + 0 . 5 + II

All legs are characterized by strongly spinulose intercoxal plates.

Leg 1 (fig. 6 a) has a strongly spinulose basal internal corner; in addition there is a spinulose seta at the external corner of the basis. The external coxal margin is set with a row of spiniform hairs. Second and third exopodal segments are fused, though a line of fusion is still visible.

Legs 2 and 3 (fig. 6 b, c) have the external margin of the coxa set with fine, spiniform hairs; there is a seta at the internal coxal border. The seta at the external border of the basis is fine and short. The exo- and endopodites are 3-segmented.

The coxa of leg 4 (fig. 6 d) has a spinulose external corner and no seta at its internal margin. The exopodite is 3-segmented and the endopodite 2-segmented.

The external marginal teeth of all exopodites are conical structures with a distinct, fine flagellum.

The intermediate segment of leg 5 (fig. 5 e, f) is fused with the fifth thoracic somite, which carries a fine seta near the articulation with leg 5. The leg itself consists of a short, reniform segment with two apical setae of unequal length; it reaches one-third of the length of the genital complex.

Discussion of the species. — *Parabomolochus globiceps* belongs to a group of species of *Parabomolochus* Vervoort (1962: 31) represented by *P. bellones* (Burmeister, 1835), *P. cuneatus* (Fraser, 1920), *P. hyporhamphi* (Yamaguti & Yamasu, 1959), *P. psettobius* Vervoort, 1962, and *P. tumidulus* (Shiino, 1957). In addition there is one ill-defined species, *P. xenomelanirisi* (Carvalho, 1955) which also comes rather near to the above described new species. The differences with the well-defined species will first be discussed.

All species, with the exception of *P. psettobius*, have a more or less trapezoid cephalic somite. *P. tumidulus* has a strongly swollen third thoracic somite,

almost completely covering the fourth; the fifth thoracic somite and the genital somite are fused. The structure of the antenna in *P. tumidulus* is almost identical with that of *P. bellones* and different from that observed

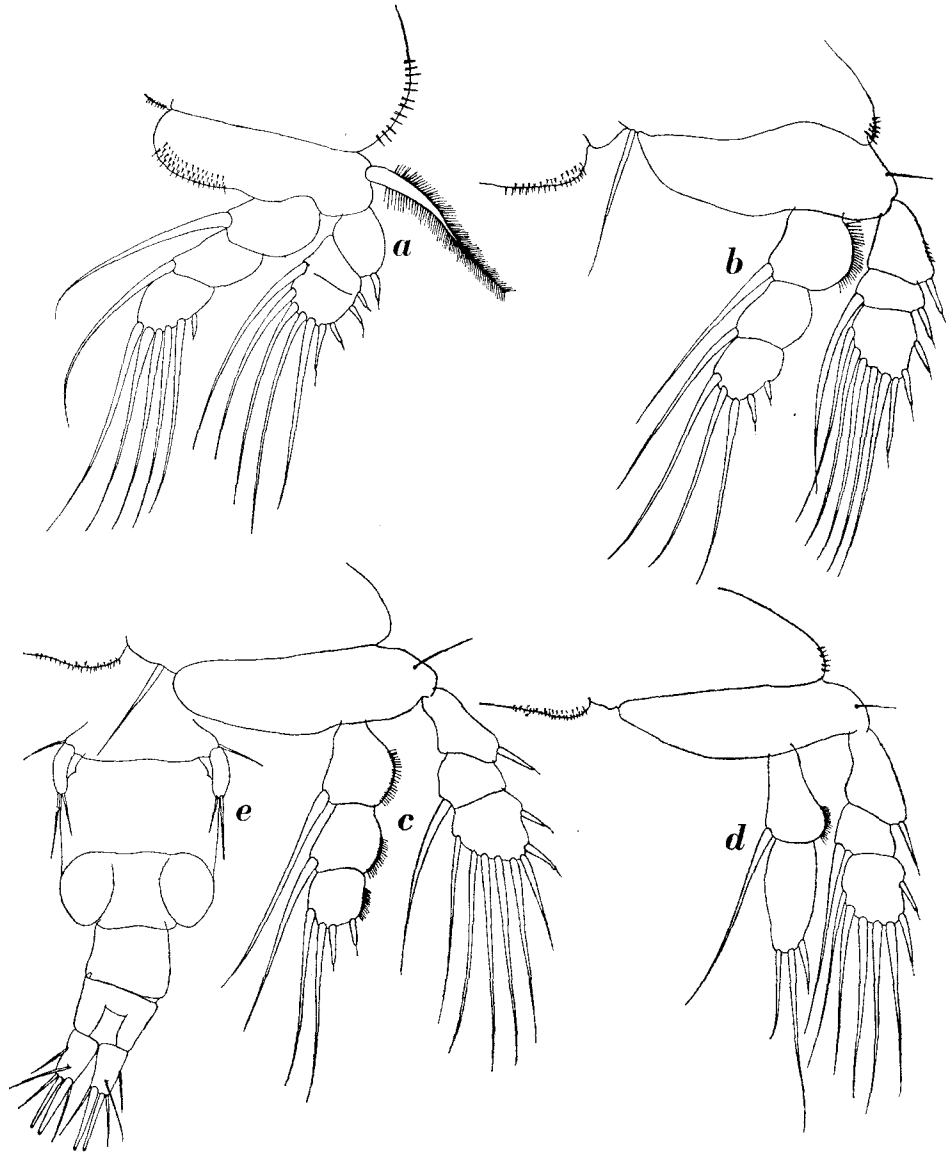


Fig. 6. *Parabomolochus globiceps* nov. spec., adult ♂, allotype, from *Austroatherina smitti*. a, leg 1; b, leg 2; c, leg 3; d, leg 4; e, abdomen and fifth thoracic somite, carrying the fifth pair of legs. a-d, $\times 395$; e, $\times 135$.

in *P. globiceps* by the large number of longitudinal rows of fine spiniform teeth on the endopodite.

The antennular structure of *P. hyporhamphi* is unknown, but the distinctly trapezoid cephalic somite differs markedly from that observed in *P. globiceps*.

P. cuneatus differs from *P. globiceps* in the general outline of the cephalic somite, which is distinctly trapezoid in *P. cuneatus*; moreover the third thoracic somite, if swollen, has two laterally directed, rounded swellings, in lateral view quite different from the condition observed in *P. globiceps*.

P. psettobius, which is very near to our new species in the structure of the appendages, has a differently shaped cephalothorax, particularly the cephalic somite. Additional small differences are present in the structure of the antennae (four rows of endopodal spinules in *P. psettobius*, seven in *P. globiceps*) and paragnaths (dagger-shaped in *P. psettobius*, finger-shaped in *P. globiceps*).

P. psettobius is the only species of the afore-mentioned group of which the male is known. The male of *P. globiceps* differs from the male of *P. psettobius* by the flattened, rounded cephalic somite, the shape of the genital complex, the partial fusion of the second and third exopodal segments of leg 1 and the increased number (20) of plumose setae on the antennule. In *P. psettobius* the number of plumose setae on the antennule is as in the female, viz., 15.

Parabomolochus xenomelanirisi (Carvalho, 1955) was described from the Atherinid *Thyrina brasiliensis* (Quoy & Gaimard) (= *Xenomelaniris brasiliensis* (Quoy & Gaimard)), captured in Brazilian coastal waters off São Paulo. This species is undoubtedly closely allied to *P. globiceps*; but unfortunately both description and drawings by Carvalho are inadequate and show several dubious points. The shape of the cephalic somite in *P. xenomelanirisi*, judging from Carvalho's plate 1 figure 1, is more trapezoid, whilst the epimeral plates of thoracic somites 2 to 4 are pointed (pl. 1 fig. 2). There are apparently no rostral points (pl. 1 figs. 3, 8). The endopodal segments of the antenna have interrupted rows of small spinules (pl. 1 fig. 13). The most noticeable point of difference in the structure of the legs is the presence of a well-developed articulation in the third exopodal segment of legs 2 to 4.

There are also noticeable differences between Carvalho's description and his drawings. The fifth thoracic somite is described as exhibiting the same length and width as the fourth somite (p. 145); this is in contradiction with the drawing, pl. 1 fig. 1. When referring to the first leg, Carvalho mentions an unsegmented exopodite (p. 146), the drawing, pl. 1 fig. 7, shows a slight but distinct division of the exopodite. The "posterior" margin of the exo-

podite is said to be armed with 6 strong setae; the drawing (pl. 1 fig. 7) shows a tooth on segment 1 and 5 setae on segment 2. The endopodite of the same leg is described as being 2- and 3-segmented on the same page (p. 146); in the drawing (pl. 1 fig. 7) it is represented as being 3-segmented. The exopodite of leg 3 is described as being 4-segmented; the first segment with a tooth at the external margin; the second with a tooth both at the external and the internal margins (p. 146). The drawing (pl. 1 fig. 5) shows that fourth segment as having a tooth at the external margin and a seta at the internal margin.

In the male of *P. xenomelanirisi* the endopodite of the antenna also has interrupted rows of fine spinules (pl. 2 fig. 7). The antennule (pl. 2 fig. 1) is certainly incorrectly figured, whilst the second endopodal segment of leg 1 is figured with 2 internal setae (one seta being the normal condition).

Efforts to locate some of Carvalho's material proved to be unsuccessful. Dr. T. K. S. Björnberg informed us that no specimens of Carvalho's species are present in the collections of the Oceanographic Institute of the University of São Paulo, Brazil. Though *P. xenomelanirisi* is undoubtedly closely allied to *P. globiceps* we have thought it advisable to separate our specimens from this inadequately characterized species, pending the examination of material from its type host, *Thyrina brasiliensis*.

It seems worth while to mention here that *P. cuneatus*, referred to above, is parasitic on the Pacific Atherinid *Leuresthes tenuis* (Ayres) (Vervoort, 1964).

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