

Taxonomic report of some monstrilloids (Copepoda: Monstrilloida) from Brazil with description of four new species

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Summary

During a series of zooplankton surveys carried out during different years (1993-1996) off the coasts of the State of Bahia, Brazil, several monstrilloid copepods were collected. The systematic analysis of this group allowed the identification of four previously unknown species. Two of them belong to the genus *Monstrilla*, one to *Cymbasoma*, and one of the rare genus *Monstrillopsis*. The first species of *Monstrilla* (*M. satchmoi* spec.nov), represented by a female specimen can be readily identified by the bilobed condition of its oral papilla, by the presence of a deep notch on the head, between the antennule bases, and by the structure of the fifth legs. This species has an inner basipodal spine which might have a phylogenetic interest. The second *Monstrilla* species (*M. bahiana* spec.nov) can be identified by its peculiar genital apparatus and by its body proportions. The new species of *Cymbasoma* (*C. rochai* spec.nov.), represented by a male specimen, can be distinguished mainly by a protuberance on the ventral surface of the head, and by its peculiar genital apparatus, with very short lappets. The new *Monstrillopsis*, represented by a badly damaged individual, was assigned to this genus for having a genus-typical antennule morphology with a curved terminal process on the last antennular segment. The species (*M. fosshageni* spec. nov.) is recognized as new mainly by the structure of its genital apparatus and by the cuticular processes on the dorsal surface of the cephalothorax. All the species were described following the new, upgraded standards. The occurrence of these new species in Brazil suggests that there are still many more undescribed monstrilloid copepods in this country.

Key-words: Zooplankton, copepods, Brazil, crustaceans.

Introduction

Monstrilloid copepods have been surveyed for over a century. However, much is still unknown about their taxonomy and biology. Some 100 species have been known to exist, but their peculiar life cycle and the incompleteness and shallowness of their taxonomic descriptions have derived in complex taxonomic problems (see GRYGIER, 1994). Several species have had to be redescribed according to new, more detailed descriptive standards (GRYGIER & OHTSUKA, 1995). Recent studies (SUÁREZ-MORALES, 2000a) have suggested that some species regarded as cosmopolitan (sensu ISAAC, 1975) are not quite so, several species look very much alike to the casual observer, thus leading to taxonomic mistakes. Hence,

the biogeographic trends of these copepods are not fully understood, although some patterns have been suggested (SUÁREZ-MORALES; 2000a). Therefore, the accurate identification of this group is a compulsory process in order to advance in the understanding of their ecology and distributional patterns. Due to their scarciness in the zooplankton samples, the value of each specimen is very high. In this report we offer a detailed report of the monstrilloid copepods collected during a five-year period in several sites of the southwestern tropical Atlantic, particularly in Brazil. Previous reports have shown this area to harbour a rich variety of species (DIAS, 1996; JOHNSON, 1998), several unknown (SUÁREZ-MORALES & DIAS, 2000, 2001). In this paper two new species of *Monstrilla*, one of *Cymbasoma*, and one of *Monstrillopsis* are described following upgraded standards and considerations and descriptions are made for other specimens. The type specimens and additional material are deposited in the Museu Nacional da Universidade Federal do Rio de Janeiro, Brazil (MNRJ) and in the Zooplankton Collection of El Colegio de la Frontera Sur, Chetumal, Mexico (ECO-CH-Z).

Systematics

Order Monstrilloida
Monstrilla satchmoi spec. nov.
(Figs. 1-14)

MATERIAL

One holotype adult female, ethanol-preserved, undissected, left antennule broken, cephalic portion separated from body and right antennule attached to it. Brazil, June 8, 1999. State of Bahia, Brazil. Catalogue number: MNRJ-14437.

TYPE LOCALITY

State of Bahia, Brazil, sta. 5043. Water column (17°54'502"S; 35° 52' 935"W).

ETYMOLOGY

The specific epithet for this species is a diminutive noun derived from the English term satchel, meaning: with a big

mouth/lips. It was used also as a nickname for the American musician Louis ARMSTRONG and it is used here to make reference to the protuberant and bilobed nature of the oral papilla shown by this species.

DESCRIPTIONS

Female. Total body length of single individual 2.5 mm measured from anterior end of cephalic somite to posterior margin of anal somite. Cephalothorax (incorporating first pedigerous somite) accounting for 66% of total body length and measuring 1.56 mm (Figs. 2,8). Anteriormost part of cephalothorax medially and strongly depressed in dorsal view, depression forming a short channel surrounded by small, rounded protuberances (arrowed in Fig. 6). On lateral view, the outer sides of this channel appears as a high rounded protuberance, as shown in Fig. 3. Anteriormost surface of cephalic part with longitudinal striations ending at base of antennules. Dorsal surface with branched cuticular processes as depicted in Fig. 3. Another ventral cuticular process formed by three paired groups of subtriangular bud-like structures each with set of 5-7 elements (see Figs. 4,6). Oral papilla lying midventrally 0.37 of way back along cephalothorax, bilobulated, protuberant, with a set of 14 small hair-like setae near its base (Fig. 5). Nauplius eye present, weakly developed, ocelli with rounded shape.

Antennule measuring 1.3 mm, relatively long, slender, slightly longer than 81% of cephalothorax length, and about 53.5% of total body length (see Fig. 2). Antennule with spots of reddish pigment on its basal segments (Fig. 9). Antennule two-segmented, purported segments 2-5 fused; armed with 1 (broken at base); 11-I setae (Roman numerals) and spines (Arabic numerals) (Fig. 9). In terms of the pattern described by GRYGIER & OHTSUKA (1995) for monstrelloid antennular armature, setae and spines present on purported second segment are: $2d_{1,3}, 2v_1$, and $2v_2$, seta II d is absent on extant antennule. On purported third segment only elements 3 and III d are present and seta III v . On segment four the present elements are $4d_{1,2}$ and $4v_{1,3}$, while setae IV d and IV v , and aesthetasc 4aes are absent. All the other elements common in the fifth segment are absent, probably broken during fixation and handling.

Incorporated first pedigerous somite and three free succeeding pedigerous somites each bearing a pair of biramous swimming legs. Pedigerous somites 2-4 accounting for 21.8% of total length in dorsal view. Swimming legs 1-4 slightly decreasing in size posteriorly. Basis of legs with diagonal division articulating with large, rectangular coxa along diagonal line. Basis with lateral hair-like seta on legs 1-4; on leg 3, this seta at least 2.5 times longer and noticeably thicker than on the others, lightly setulated. Inner margin of basipodite with single spiniform process; present in legs 1-4, as shown in Fig. 7 and detailed in Fig. 14. Endopodites and exopodites of swimming legs 1-4, triarticulated. Ramus setae all biserially plumose except spiniform outer seta on exopod 1 and 3 of each leg. Inner setae of first segment of each exopodal segment, common in most monstrelloids, absent. Outermost exopodal setae with outer margin bearing single row of small spines arranged from the base to tip of setae; inner margin naked (Figs. 12,13). Swimming legs with spots

of reddish pigment. Armature formula of swimming legs as:

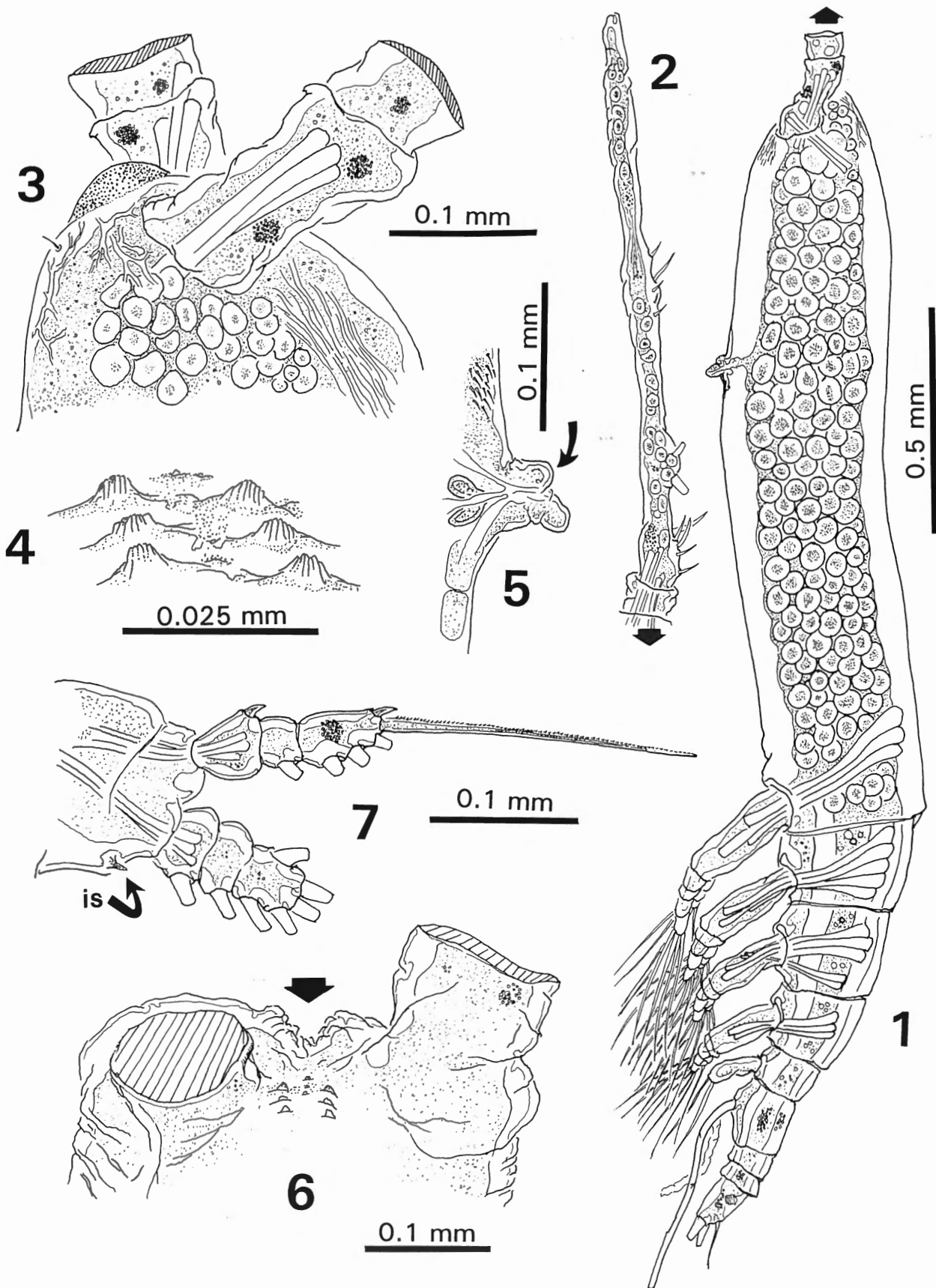
	Basis	endopodite	exopodite
leg 1	1-I	0-1;0-1;1,2,2	1-0;0-1;1,1,3
legs 2-4	1-I	0-1;0-1;1,2,2	1-0;0-1;1,1,2,2

Fifth legs formed by single lobe, fused medially, arising from common plate. Basal portion relatively long, starting from ventral anterior end of bearing somite. Lobe about 1.2 times thicker at base than at distal end. Each lobe armed with two relatively long setae, subequal in length and width, innermost slightly longer (Fig. 8).

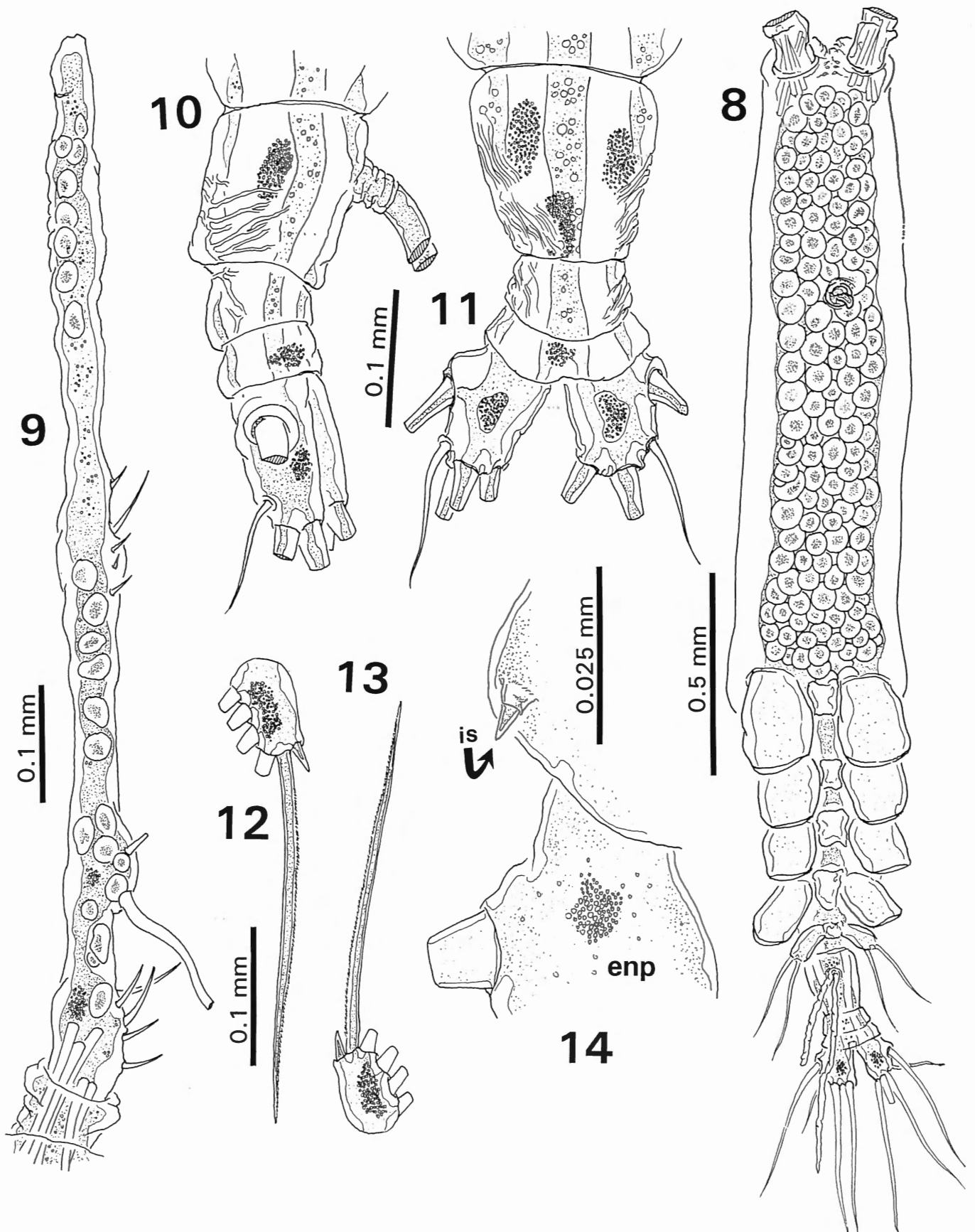
Urosome consisting of fifth pedigerous somite, genital double somite, and two free abdominal somites. Urosome, excluding furcal rami, accounting for 12% of total body length. Genital double somite without intersegmental division; double somite representing about half the length of urosome (51.5%)(Fig. 1). Ratio of length of fifth pedigerous somite, genital double somite and free abdominal somite being: 32.2:51.5:16.3 (=100). Medial portion of genital double somite moderately swollen (Figs. 10, 11), bearing long, basally-joined ovigerous spines which are not swollen but slender distally. Spines incomplete, wrinkled, longest one about 19% of total body length, extending well beyond caudal rami. Caudal rami with pigment spots, about as long as wide, moderately divergent. Caudal rami bearing five setae, three of them terminal, one dorsal, which is slightly shorter than caudal rami, and one outer lateral seta (Fig. 11). Terminal three and outer lateral setae of about the same length.

REMARKS

This species was included in the genus *Monstrilla* due to the presence, in the female, of two free postgenital somites (ISAAC, 1975). The most evident character of this species is the very long antennule, representing more than 53% of total body length. Although the studied specimen has one of them broken at its base, the other antennule is in good shape and its distal end shows the sockets of the two terminal elements common in the groups, so it is considered to be representative of the actual antennular length of this species. Only a few other known species of *Monstrilla* show antennules longer than 40% of the body length. The range measured in females of more than 17 species of *Monstrilla* varied between 17 and 35% (SUÁREZ-MORALES, 2000a). The only species with such a long antennular set as seen in the new species are *M. longiremis* GIESBRECHT, 1892, *M. longicornis* THOMPSON, 1890, and *M. grygieri* SUÁREZ-MORALES, 2000. The species *M. clavata* SARS, 1921, also described as having very long antennules, has been synonymized with *M. longicornis* (ISAAC, 1975). The new species differs from these three congeners in several respects. *Monstrilla longiremis* is readily distinguishable by the extremely long antennules, which equal 60% of the body length (see SARS, 1921; ISAAC, 1974, 1975). This species has the relatively longest antennules within the Monstrellida and this feature alone is most useful to separate it from all the other known species of *Monstrilla*. Hence, both *Monstrilla longicornis* and *M. grygieri* are, among all the known species of *Monstrilla*, the most closely related to *M. satchmoi*. According to the illustrations pre-



Figs. 1-7. *Monstrilla satchmoi* species nov., adult female holotype. 1. habitus, lateral view; 2. left antennule at same scale; 3. head, lateral view; 4. paired processes on ventral surface between antennule bases; 5. oral papilla showing bilobulated condition (arrowed) and patch of spine-like cuticular ornamentation; 6. head, ventral view, showing middle furrow (arrowed) between antennule bases; 7. first swimming leg, anterior view.



Figs. 8-14. *Monstrilla satchmoi* spec. nov., adult female holotype. 8. habitus, ventral view, endopods and exopods of swimming legs 1-4 not shown; 9. left antennule showing remains of armature; 10. last somites of urosome showing striations, lateral view; 11. same, dorsal view; 12. third exopodite of third swimming leg; 13. same of second swimming leg. 14. second basipod and first endopod (enp) of second swimming leg showing internal spine (is, arrowed) on inner margin.

sented by SARS (1921) and ISAAC (1974, 1975), the former (*M. longicornis*) has an antennular length equalling almost 46% of the total body length. This figure is slightly greater than the value reported by SUÁREZ-MORALES (2000a) for *M. grygieri*, 43% of the total body length. Therefore, the new species, with antennules over 53% seems to have, after *M. longiremis*, the second relatively longest antennules in the group.

Antennular setae $b_{1,3}$ are branched in all three species, but are quite short in *M. longiremis* and *M. longicornis*, and longer in *M. grygieri* (see SUÁREZ-MORALES, 2000a). This feature could not be compared with the new species, in which these setae are broken at base.

Another outstanding feature of *M. satchmoi* is the peculiar morphology of the anteriormost part of the cephalothorax, which appears deeply notched, particularly in ventral view (see Figs. 6, 8). This feature is not present in any other species of *Monstrilla*. A slight depression of the head line is present in both *Monstrilla longicornis*, and even in *M. grygieri*, in which there is a true depression on the middle of the frontal surface. However, neither the former nor the latter have the depth shown by the new species. Moreover, the protuberances associated with this notch seem to be yet another striking feature of this species (see Fig. 6).

The structure of the fifth legs is one of the most important taxonomic characters to separate species of *Monstrilloida*. The new species has a single-lobed fifth leg armed with two subequal setae; this pattern diverges from the clearly bilobed structure shown by *M. grygieri* (see SUÁREZ-MORALES, 2000a) and from the pattern shown by *M. longicornis* and *M. longiremis*, with a poorly developed inner lobe represented by a single seta and a well-developed outer lobe armed with three setae (see SARS, 1921; ISAAC, 1975).

A reduced setal pattern such as that shown by the new species is shared with a few other species of *Monstrilla*: *M. conjunctiva* GIESBRECHT, 1902, *M. helgolandica* CLAUS, 1863, *M. wandeli* STEPHENSEN, 1913, and *M. longipes* SCOTT, 1909. *Monstrilla hamatapex* GRYGIER & OHTSUKA, 1995 has a very small spine on the inner margin of the fifth leg, but bears also a basic two distal setae pattern (GRYGIER & OHTSUKA, 1995). However, the combination of characters such as the body proportions, the antennular length, and the deeply notched forehead are characters strong enough to separate the new species from those mentioned above.

The structure of the oral papilla can be very variable throughout the group, it can be long and hanging, short, forward directed, or even very protuberant. However, in the new species the oral papilla is both clearly bilobed and protuberant with an upper, apparently secondary lobe, and a larger lower lobe (see Fig. 5). This is a quite unique feature present in this species. Moreover, the patch of spines near the oral area such as that described for the new species has not been observed before in the *Monstrilloida*.

Another peculiar feature of this species is the set of four paired bud-like structures present between the antennule bases. This kind of structures has been observed previously in *Cymbasoma javense* (ISAAC, 1976) only (SUÁREZ-MORALES, pers. obs.). A single postantennular paired structure is present also in *Monstrilla brasiliensis* (see SUÁREZ-MORALES & DIAS, 2000). The number, position, and paired

condition of these elements suggest that they constitute remains of the otherwise absent postantennular appendages. The lack of oral appendages is a diagnostic character of the *Monstrilloida* (ISAAC, 1975; HUYS & BOXSHALL, 1991). This feature would suggest that the species having this kind of processes, are relatively primitive forms, with the remains of oral appendages still visible. Yet another striking feature of the new species is the presence of an inner basipodal spine on the swimming legs 1-4. So far, this is the only monstrilloid copepod with such an unusual character. The spine and seta formula which is considered to be the ancestral set for *Monstrilloida* (HUYS & BOXSHALL, 1991) shows only an external seta on the outer margin of the basipodite (1-0), which clearly is the typical basipodal armament in the group. The presence of an inner basipodal spiniform seta suggests that the group has at least one representative form with an ancestral character not discovered before. This finding has indeed phylogenetic implications which are to be discussed in detail elsewhere.

Monstrilla bahiana spec. nov.

MATERIAL EXAMINED

One adult holotype male, undissected. Thalassa, State of Bahia, Brazil. Site 3043, June 8, 1999. Specimen undissected, catalog number MNRJ-14438. Paratypes adult male, State of Bahia. Site 3007 (12°46.626S-38°05.144 W), depth 26.4 m, same date. Adult male, State of Bahia, site 3033 (17°00.867S - 37°35.024W), depth 43.6m, deposited in collection of El Colegio de la Frontera Sur, Chetumal, Mexico (ECO-CHZ-01166). Additional material: adult male, State of Bahia, site 5062 (16°35.924S - 38°40.732W), depth 36.8m. Adult male, State of Bahia, site 3108 (20°35.895S - 35°44.999W), depth 942.4 m. Adult male, State of Espírito Santo, site 5108 (20°35.895S - 35°44.999W), depth 942.4 m. ECO-CHZ-01167.

TYPE LOCALITY

Off the coasts of the State of Bahia, Brazil, sta. 3043 (17°54.502'S - 35°52.935'W).

ETYMOLOGY

The specific term refers to the Brazilian state of Bahia. It makes reference to the general geographic area of the type locality.

DESCRIPTION

Body length of analyzed specimens ranged between 1.5 and 2.4 mm, holotype: 1.92 mm, all specimens measured in dorsal view from anterior end of cephalothorax to posterior edge of anal somite, caudal rami excluded. Cephalothorax representing about 54.7% of total body length (Figs. 15, 16). Oral papilla slightly protuberant, located at about 0.28 of way back along ventral surface of cephalothorax (Fig. 15). Anteriormost cephalic region relatively broad near insertion of antennular bases. Middle part of cephalothorax gradually tapering posteriorly; posterior end of cephalothorax widening again to about the same width of anterior part. Dorsal

ocelli present, pigment cups relatively small, located close together to each other, separated by the distance of about one half ocelli diameters, poorly developed, almost unpigmented, rounded in dorsal view (Fig. 16). Cephalic region flat in dorsal view, with low cuticular protuberances on forehead between antennule bases. Two pairs of strongly chitinized, nipple-like cuticular processes are located ventrally anterior to oral papilla. The first pair (anterior nipple: "an" in Figs. 17, 19) is well developed, showing a whirl-like structure and are located halfway between antennule bases and oral papilla (see Fig. 17). The second pair of nipples (posterior nipples: "pn" in Fig. 17) is less developed than the "an" and are closer to the central axis and are located at almost the same level as the oral papilla. Other secondary scars (3) are distributed near the oral area (see Fig. 19). In lateral view, a medial protuberance was observed ("p" in Fig. 17) between the two pairs of nipples along the ventral margin.

Antennules moderately long, with four apparent segments, intersegmental division between purported segments 3-4 marked only by a constriction. Antennular length 0.83 mm, representing close to 39% of total body length, and ca. 74% as long as cephalothorax. Length ratio of antennular segments, from the proximalmost to the distal being: 9.3: 18.6: 46.6 (includes fused third and fourth segments): 25.5 (=100) (Fig. 20). Last -fifth- segment strongly geniculated. Segments (considering purported segments 1-5) armed with 0-I; 1-V; 2-I; 1-V; 4-II+aes setae (in Arabic numbers), spines (in Roman numbers), and aesthetascs (aes). Distal antennular segment with three subequal, dichotomously branched setae aligned near outer distal end (Fig. 20). In terms of the basic setal nomenclature of GRYGIER & OHTSUKA (1995) for female monstrilloid copepod antennules, elements in first (1), second ($2d_{1,2}$, $2v_{1,3}$, IIId), and third (3, IIIv, IIIId) segments, complete. In purported fourth, with elements $4v_{1,3}$, $4d_{1,2}$, IVd, only IVv is missing. In the fifth segment only elements $b_{1,3}$, b_5 , b_6 , $6_1, 6_2$, and $6aes$ were identified.

First pedigerous thoracic somite incorporated into cephalothorax. This and succeeding three pedigers each bearing well developed swimming legs, all with 3-segmented rami and with same armament pattern, except for leg 1 exopod which has one seta less on the distal segment (Fig. 23). Legs 2 and 3 slightly larger than 1 and 4; exopods longer than endopods in all cases. Coxae of each pair unarmed, joined by intercoxal sclerite longer than wide. Anterior surface of intercoxal sclerite with set of longitudinal, irregular rows of very small hair-like spines (see Fig. 22). Basis separated from coxa posteriorly by diagonal articulation in swimming legs 1-4 (Fig. 22). Outer margin of basis of swimming legs 1, 2 and 4 with a small, thin seta (Fig. 22); seta on leg 3 about 2.5 times larger and thicker than in the other legs, lightly plumose. Inner margin of first and second endopodal segments with tuft of stiff hair-like setae (see Fig. 22). Outer distal corner of first and third exopodal segments of legs 1-4 each with short, spinelike slightly curved seta, about half as long as bearing segment (Fig. 24). All natatory setae lightly and biserially plumose except for seta on outer distal corner of third exopodal segments of legs 2-4, these being lightly plumose along inner side, but bearing tight and continuous row of small denticles along outer margin (Fig. 23). The

same seta lacks the inner ornamentation on the first leg only (Fig. 24).

Armament formula of swimming legs as:

	Basis	Exopod	Endopod
Leg 1	0-1	1-0;0-1;1,2,2	0-1;0-1;1,2,2
Legs 2-4	0-1	1-0;0-1;1,2,3	0-1;0-1;1,2,2

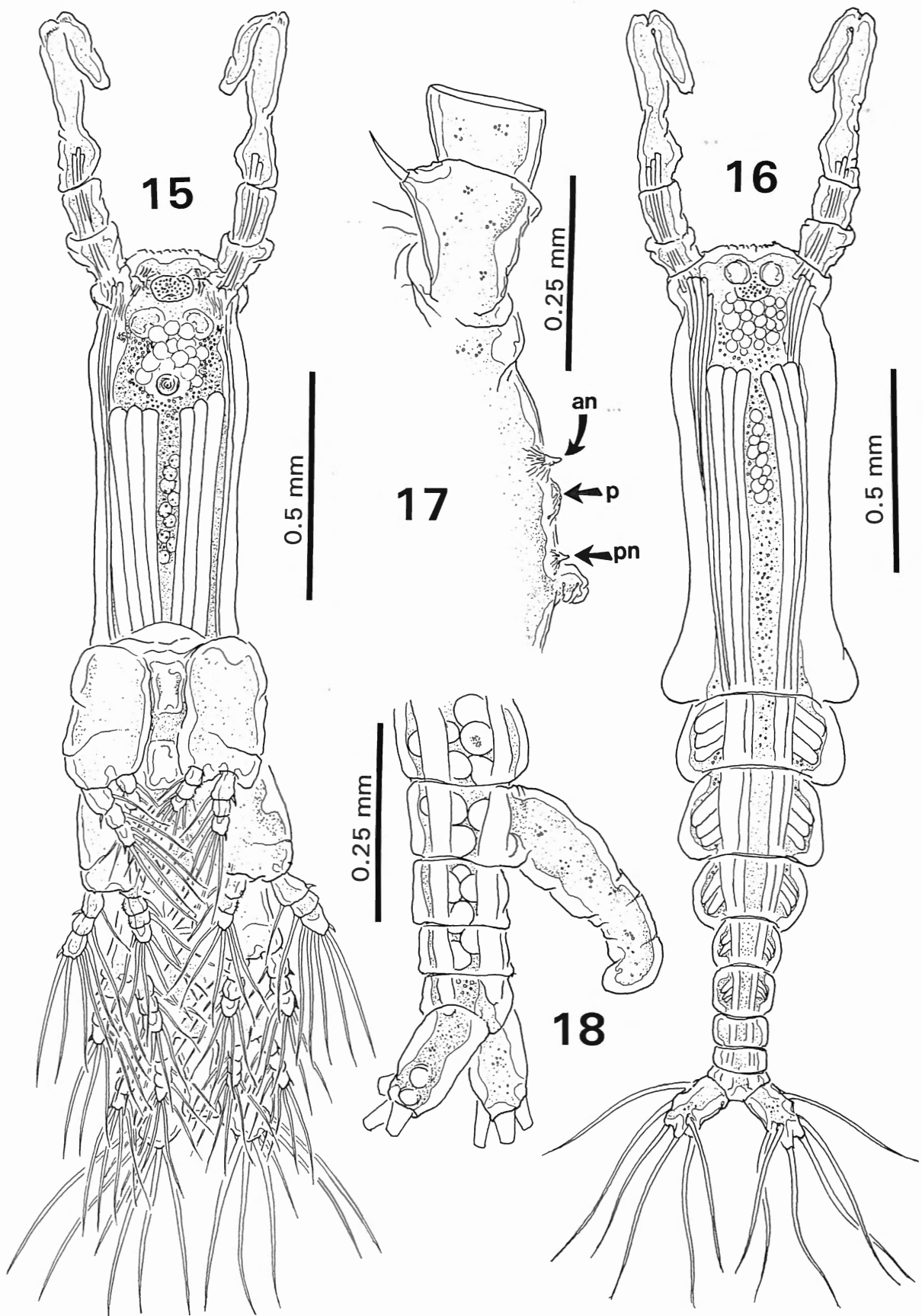
Fifth leg absent. Succeeding somite with genital complex, represented by a genital apparatus protruding ventrally. Apparatus of about the same length -slightly smaller- than the three postgenital somites together (see Fig. 18). Apparatus nearly cylindrical, with cuticular transverse lines on anterior surface (Fig. 21). In lateral view, the entire shaft is curved, distal part slightly globose, directed inwards; in ventral view, tips are broad and end in a flat terminal margin. Also in ventral view, the apparatus is wider near its base (Figs. 18, 21). Its tip reaches, with its curvature, about the distal margin of the anal somite.

Urosome consisting of five segments: fifth pedigerous somite, genital somite (with genital complex/apparatus) and three free somites. From dorsal view, genital somite about as long as two succeeding somites together. Ratio of lengths of genital somite and free posterior somites, starting from genital somite being: 32.2: 24.2: 21: 22.6 (=100).

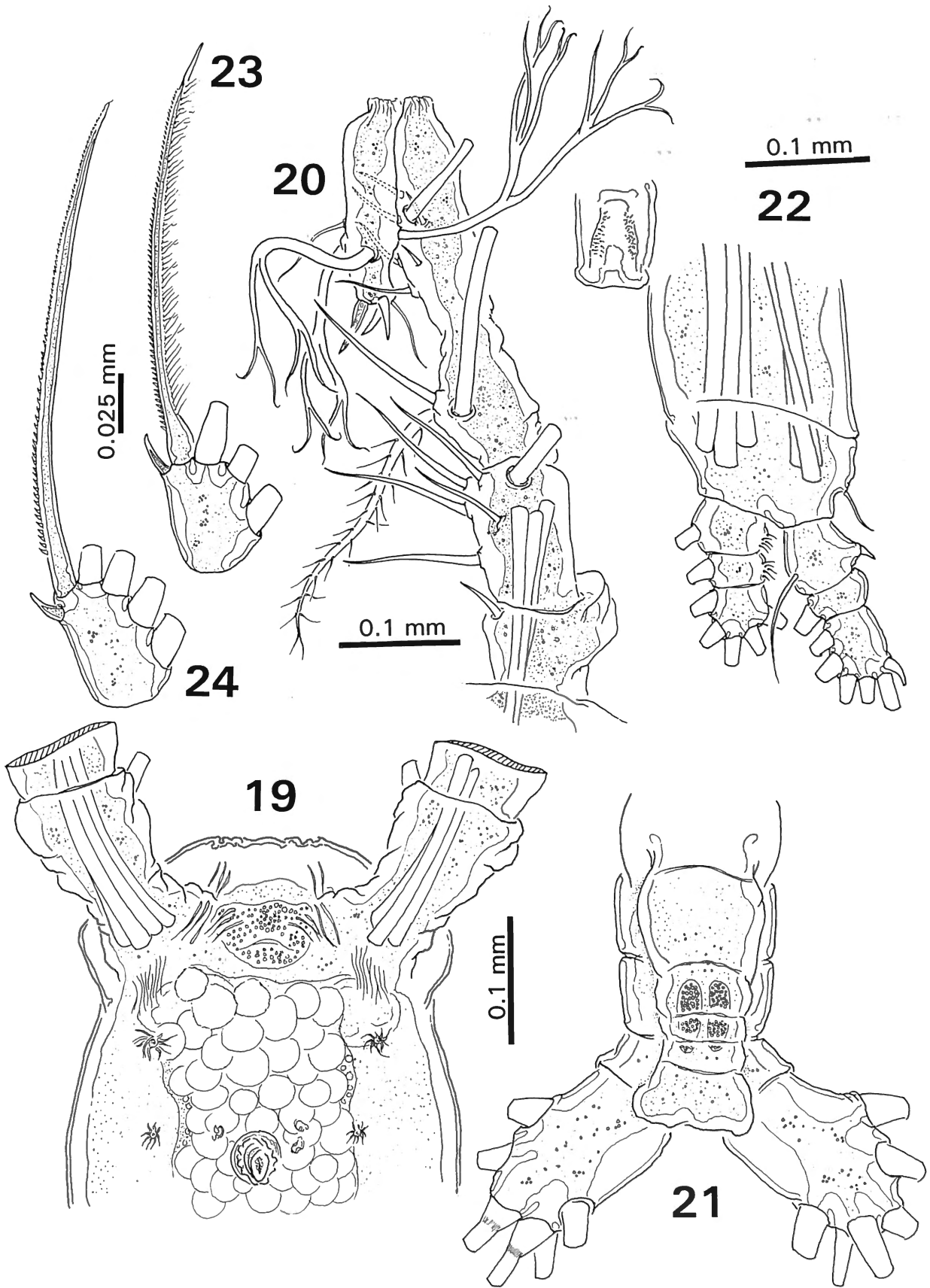
Furcal rami subrectangular, about 1.6 times longer than wide, with terminal margin about as wide as proximal. Caudal rami with six setae, two on outer margin, two terminal, one dorsal, plus one on inner margin (Fig. 21). Dorsal seta relatively long, about 2.5 times the length of the caudal ramus. Remaining setae all subequal in length and breadth.

REMARKS

This male specimen was included in the genus *Monstrilla* because of the presence of three postgenital free somites (ISAAC, 1975). The main taxonomic structures to be evaluated in the study of male monstrilloids are the structure and armature of the antennule and the structure of the genital complex. Males of several species of *Monstrilla* have a genital complex including the presence or absence of a fifth leg, which is commonly a reduced lobe with one pair of setae. However, the genital apparatus is present in all monstrilloids as the structure producing and transferring the male genital material to the females. Its structure is variable, and in *Monstrilla* it can be a distinctly bifurcated apparatus with short or long arms which can be or not divergent. In some species such as *M. wandeli*, it may have accessory structures as depicted by PARK (1967) and SUÁREZ-MORALES (1993). Only one other species of *Monstrilla* (*M. reidae* SUÁREZ-MORALES, 1993 from Bahía de la Ascensión, Mexico, in the western Caribbean Sea) have males with this kind of long, cylindrical, unbranched genital apparatus. However, both differ in several important aspects. In the new species, the long, cylindrical shaft represents about 48% of the cephalothorax length, whereas this figure is slightly over 30% in *M. reidae* (see SUÁREZ-MORALES, 1993). Furthermore, the apparatus in *M. reidae* is completely straight, with a terminal pair of lobules visible in lateral view. In the new species the apparatus is curved and it has no terminal lobes.



Figs. 15-18. *Monstrilla bahiana* spec.nov. adult male holotype. 15. habitus, ventral view; 16. habitus, dorsal view; 17. anterior part of ventral surface of cephalothorax showing different cuticular processes: anterior nipple (an), middle protuberance (p), and posterior nipples (pn); 18. urosome, lateral view.



Figs. 19-24. *Monstrilla bahiana* spec. nov. adult male holotype. 19. anterior part of cephalothorax and head, ventral view; 20. right antennule, dorsal view; 21. genital apparatus and caudal rami, ventral view; 22. third swimming legs, showing ornamentation of intercoxal sclerite, most setae cut short; 23. third exopod of first swimming leg; 24. same of third swimming leg.

The distal margin of the apparatus in *M. reidae* has a depression on the middle, whereas it is flat in *M. bahiana*.

Another difference between both species is in the morphology of the anteriormost part of the head; it is completely flat in *M. reidae* and with protuberances in the new species. Both species differ also in details of the antennular structure; five segments are clearly separated in the antennules of *M. reidae*, diverging from the fused condition of segments 3 and 4 shown by the new species. Moreover, the last segment is strongly geniculated in the new species and this condition is weak in *M. reidae*. This could be considered as a secondary character since the degree of geniculation could be related to fixation and/or preservation. The armature of the antennules shows some differences as well: in general, setae and spines are relatively longer in the new species (mainly $2v_{1-3}$, $2d_{1,2}$; IIIv, IIIId). Setae b_{1-3} are commonly branched in monstrilloid copepods; although in the original description this feature was not noticed by SUÁREZ-MORALES (1993). Later on, the same author reported that these setae are dichotomously branched starting from the distal 1/3 of the setae (SUÁREZ-MORALES, 1994). These setae are also branched in the new species, but it shows a different pattern: branching is dichotomous in the first branching, but it has three branches instead of two, and then, only two of these branches are dichotomous. Furthermore, branching starts at about halfway the length of the seta in *M. bahiana* (see Fig. 20).

There is some difference in the size of both species: 2.3 mm in *M. reidae* vs 1.9 mm in the new species. The oral papilla is located at the same position in the two species. The body proportions show slight differences, antennules represent 38% of the total body length, and 67% of the cephalothorax length, whereas these figures are 39% and 64% in the new species. Representing 48.7% of the body length, the cephalothorax is relatively shorter in *M. reidae* vs a figure of 53.2 in the new species.

The ornamentation of the intercoxal sclerite is a character not described previously in other members of this group of Copepoda. Hence, its taxonomic value has yet to be established.

The caudal rami are subquadrate in *M. reidae* whereas they are longer, subrectangular in the *M. bahiana*. The dorsal seta is much shorter in *M. reidae*, it is 1.8 times the longitudinal length of the caudal ramus whereas this figure is much higher (2.6 times) in the new species.

Cymbasoma rochai spec. nov.

MATERIAL EXAMINED

Four adult females. Holotype from Camburi, State of Espírito Santo, collected December 14, 1996, plankton trawl. Deposited in the Museu Nacional da Universidade Federal do Rio de Janeiro, Brazil. Catalogue number MNRJ-14439. Two undissected paratype specimens from Guanabara bay, Brazil (22°54'04" S - 43°09'00" W), collected September 13, 1995, plankton trawl. Catalogue numbers MNRJ-14440 for one specimen, the other deposited in El Colegio de la Frontera Sur, Chetumal (ECO-CHZ-01127). Paratype specimen from State of Espírito Santo, Brazil, March 18, 1993. Catalogue number: MNRJ-14505.

TYPE LOCALITY

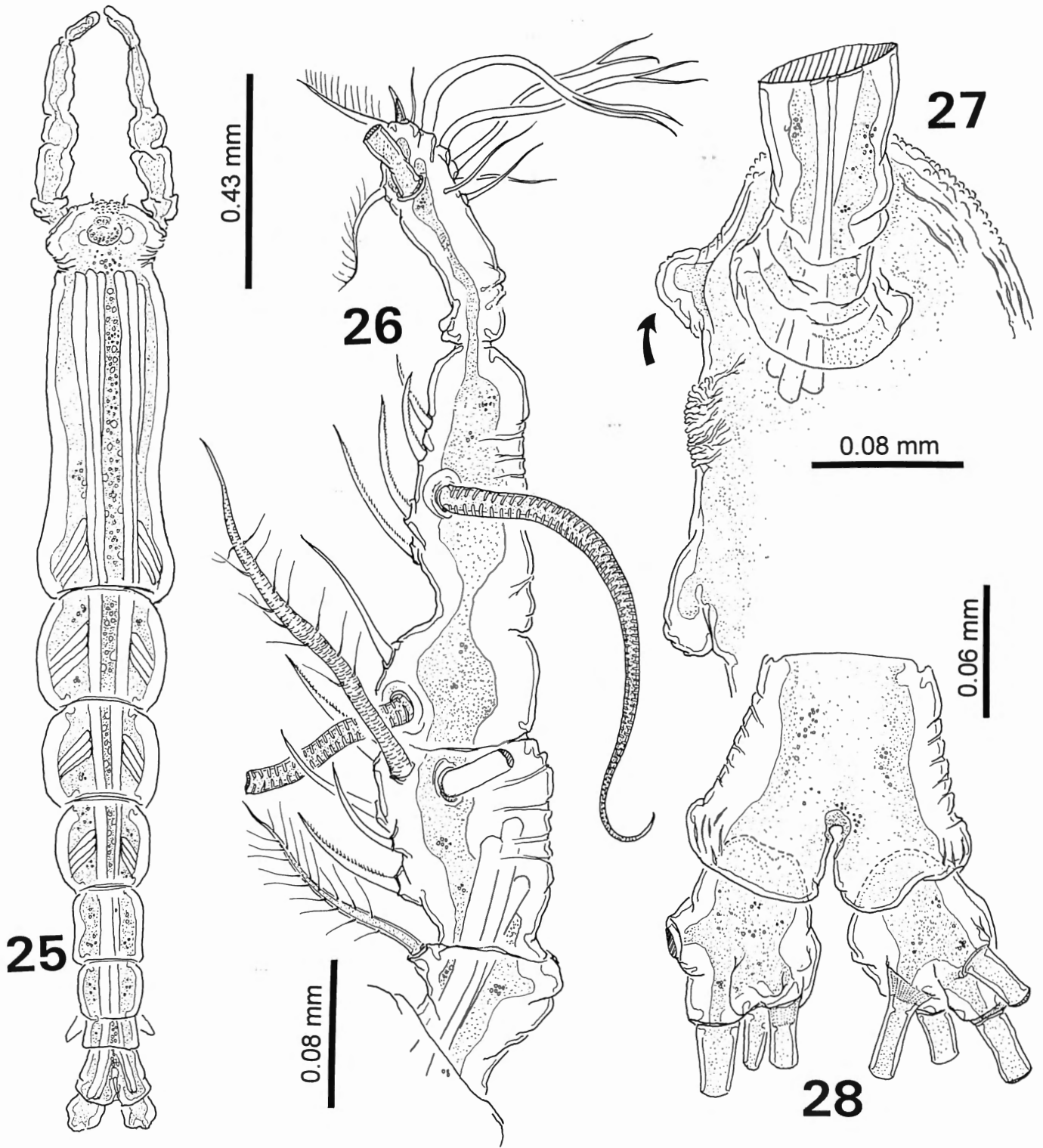
Camburi, State of Espírito Santo, Brazil (20°16'97"S - 40°15'17"W).

ETYMOLOGY

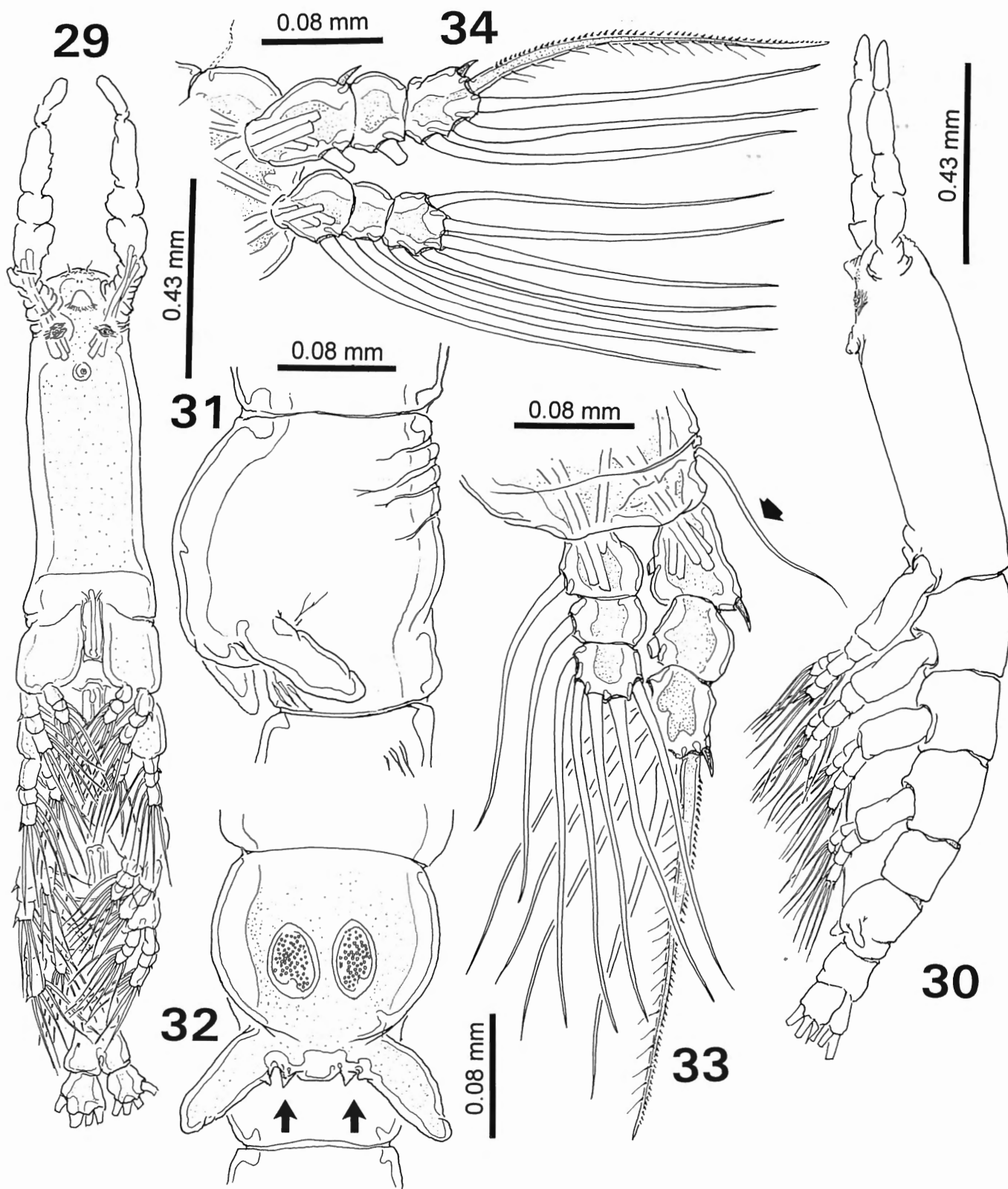
The species name is dedicated to the Brazilian copepodologist Dr. Carlos E. Falavigna da Rocha, for his outstanding taxonomic work on Copepoda.

DESCRIPTION

Male. Body length of analyzed specimen 1.8 mm, measured in dorsal view from anterior end of cephalothorax to posterior edge of anal somite. Cephalothorax 0.69 mm long, representing about 42% of total body length (Figs. 25, 30). Oral papilla located 0.28 of way back along ventral surface of cephalothorax (Fig. 30). Cephalic region abruptly broadening on anterior 1/5, posterior part of cephalothorax almost entirely cylindrical, gradually broadening to same width as anterior end. Dorsal ocelli present, very reduced, unpigmented, rounded in dorsal view. Cephalic region flat in dorsal view, with patch of blister-like cuticular protuberances on forehead between antennule bases and extending to the dorsal surface (Fig. 27). Two short, slender sensillae present between antennular bases. Two large, chitinized, nipple-like cuticular processes located ventrally between antennule bases and oral papilla (arrowed in Figs. 27, 29). Midventrally and above these nipple-like processes, lies a relatively large conical protuberance which is subtriangular, with rounded tip, wide-based, and projected forward (see Fig. 27, 29, 30). Antennules relatively short. Antennular length of studied specimens averaging 0.52 mm, representing close to 24% of total body length, and 56% of cephalothorax length. Length ratio of antennular segments, from the proximalmost to the distal: 13.6: 20.4: 41.8 (fused segments 3-4): 24.2 (=100). As usual in *Cymbasoma* males, antennules with five segments, segments 3-4 partially fused, intersegmental division marked by a cuticular constriction. Segments armed with 0-I; 1-V; 1-I; 1-IV; 9-I setae (in Arabic numbers) and spines (in Roman numbers), respectively (Fig. 26). Distal antennular segment with three subequal, dichotomously branched setae aligned near outer distal end. In terms of the basic setal nomenclature of GRYGIER & OHTSUKA (1995) for female monstrilloid copepod antennules, elements in first (1) and second ($2d_{1,2}$, $2v_{1-3}$, IIId) segments, complete. Third segment with elements 3 and IIIId, seta IIIv missing. In purported fourth segment, elements $4v_{1-3}$, $4d_2$, IVd are present, only IVv, $4d_1$, and $4aes$ are missing. Setae $4v_{1,2}$, and $4d_1$ with row of tightly arranged denticles along inner margin (see Fig. 26). In the fifth segment only setae b_{1-3} , b_5 , b_6 , $6_1, 6_2$, and $6aes$ were identified. First pedigerous thoracic somite incorporated into cephalothorax. This and succeeding three pedigers each bearing well developed swimming legs, all with 3-segmented rami and with same armament pattern, except for leg 1 exopod which has one seta less on the last segment. Legs 1 and 2 slightly smaller than 3 and 4; exopods longer than endopods in swimming legs 1-4. Coxae of each pair unarmed, joined by intercoxal sclerite about twice longer than wide. Basis separated from coxa posteriorly by diagonal articulation. Outer margin of basis of swimming legs 1, 2, and



Figs. 25-28. *Cymbasoma rochai* spec. nov. adult male holotype. 25. habitus, dorsal view; 26. right antennule, dorsal view; 27. head and oral papilla showing ventral rounded protuberance (arrowed); 28. caudal rami, dorsal view.



Figs. 29-34. *Cymbasoma rochai* spec. nov. adult male holotype. 29. habitus, ventral view; 30. habitus, lateral view (inner structures not shown); 31. genital apparatus, lateral view; 32. same, ventral view, showing four denticles on base of genital lappets; 33. third swimming leg showing long basipodal seta (arrowed); 34. first swimming leg, some setae cut short, expected length (broken line) of basipodal seta.

4 with small, thin seta (see Fig. 34); seta on leg 3 about 3.5 times larger than in the other legs, naked (Fig. 33). Outer distal corner of first and third exopodal segments of swimming legs 1-4 each with short, spinelike seta. Spine on first and third exopodal segments relatively short, about one-third as long as bearing segments. All natatory setae lightly and biserially plumose except for spiniform seta on outer distal corner of third exopodal segments of legs 1-4, this being lightly setulated along inner side, but bearing continuous and tight row of small denticles along outer margin (see Figs. 33, 34). These structure is curved on legs 1 and two and almost straight in swimming legs 2-4.

Armament formula of swimming legs as:

	Basis	Exopod	Endopod
Leg 1	0-1	1-0;0-1;1,2,2	0-1;0-1;1,2,2
Legs 2-4	0-1	1-0;0-1;1,2,3	0-1;0-1;1,2,2

Fifth leg absent. Succeeding somite with large medial ventral protuberance which is base of pair of short genital lappets, both widely divergent, with broad main arms medially conjoined (Fig. 31). Inner margins smooth, naked. A pair of relatively large triangular denticles present on base of each lappet (arrowed in Fig. 32).

Urosome consisting of three somites: fifth pedigerous, double genital somite (with genital lappets) and one free (anal) somite. From dorsal view, genital somite longer than anal somite, anterior half rounded, expanded laterally. Ratio of lengths of genital somite and free posterior somite being: 57.2: 42.8 (=100).

Caudal rami short, subquadrate, about 1.2 times longer than wide, with terminal margin 1.1 times wider than proximal. Rami with four setae, three terminal setae, one lateral on outer margin, terminal setae being subequal in length and breadth (Fig. 28).

REMARKS

Following the key to the known males of *Cymbasoma* in SUÁREZ-MORALES (2000b), these specimens key down to *Cymbasoma tenue* (ISAAC, 1975), a species known only from the Mediterranean and whose male was redescribed recently by SUÁREZ-MORALES & RICCARDI (1997). The main characters used in the identification of male monstrelloids, such as the structure of the genital complex and of the genital lappets agree quite closely with the taxonomic key and also with previous descriptive works (ISAAC, 1975; SUÁREZ-MORALES & RICCARDI, 1997). However, there are some features showing a certain degree of variation from the *C. tenue* pattern. One of them is the relative length of the antennules, which is between 24 and 24.7% in the Brazilian specimens and up to 36.8% of the body length in the illustrations and description of *C. tenue* by SUÁREZ-MORALES & RICCARDI (1997). Another difference of this species with respect to *C. tenue* is the morphology of the forehead and the anteriormost part of the head. In *C. tenue* the head is medially prominent, showing a relatively high rounded protuberance which is absent in the Brazilian specimens. These have also a patch of blister-like ornamentations on this surface, which in turn are absent in *C. tenue*. *Cymbasoma tenue* bears a dorsal protuberance be-

tween the ocelli (SUÁREZ-MORALES & RICCARDI, 1997, figs 2A, 2C); this feature is absent in the Brazilian material which in turn shows a ventral high protuberance as described above. This structure has not been reported previously for male *Cymbasoma*. The oral papilla of both species are located at about the same position, between 28-30% of way back along ventral surface of the cephalothorax.

The antennular armature seems to diverge in both species when compared closely. The proportion of the antennular segments is somewhat different, particularly considering the second segment, which is relatively longer in *C. tenue* (23-25%) than it is in the Brazilian specimens (20.4%). As expected in such morphologically close species, the antennular armature differs in the element of the first segment, element 1 following nomenclature of GRYGIER & OHTSUKA (1995); it is represented by a very small spine in *C. tenue* and it is a long, setulated seta in *M. rochai*.

However, the strongest difference between both groups of specimens relies on the structure of the genital lappets. It is clear that in *C. tenue*, the arms are much longer and slenderer than in the Brazilian specimens. In *C. tenue* their tips reach almost halfway the anal somite, whereas the arms are relatively much shorter and their tips do not go beyond the posterior margin of the bearing somite.

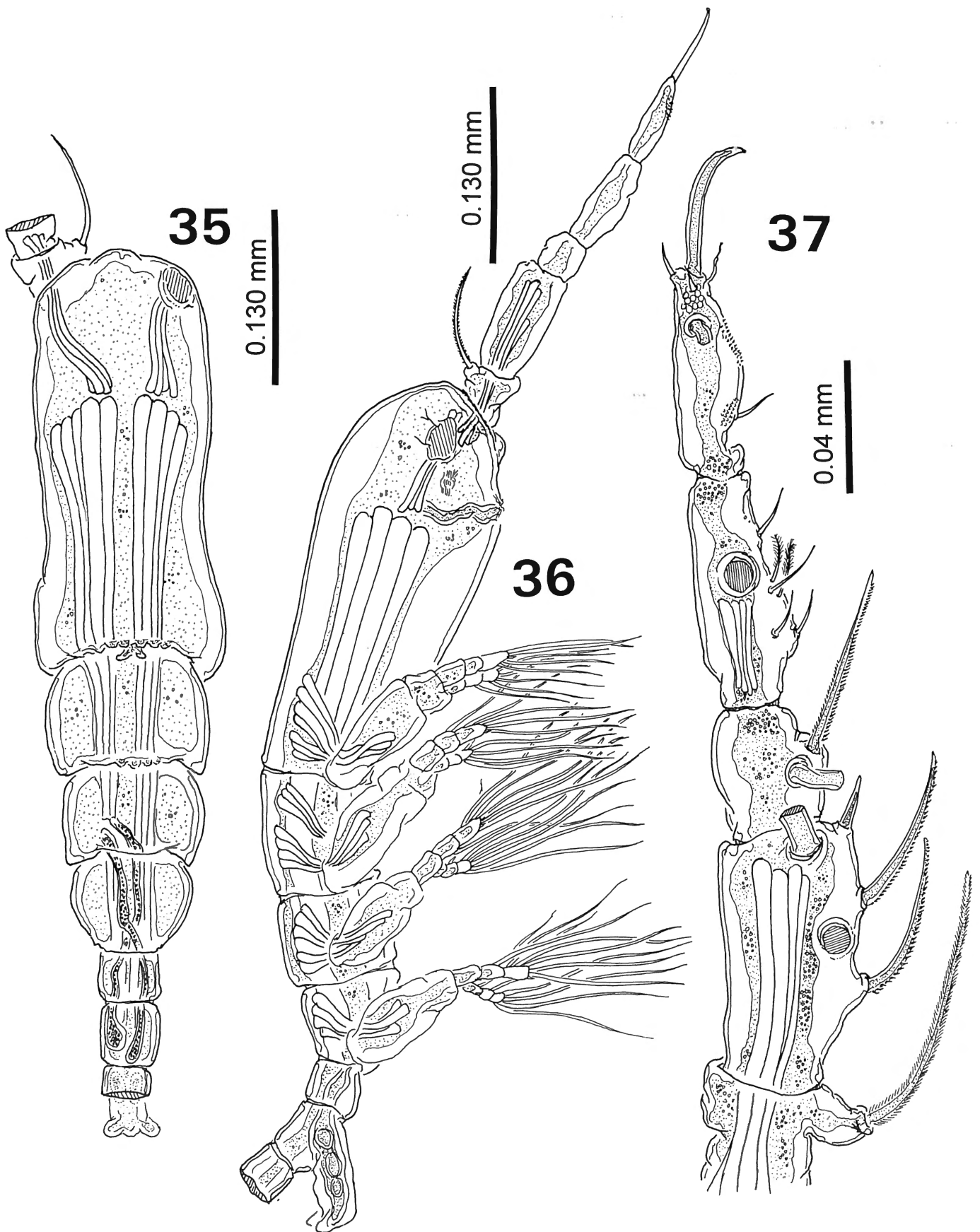
With these differences in mind, and following again SUÁREZ-MORALES (2000b) key, the species from Brazil keys down to *C. longispinosum* (BOURNE, 1890). However, after reviewing again the characters and descriptions of this species (SARS, 1921; ISAAC, 1975), we found important differences with respect to the Brazilian specimens.

The body proportions differ somewhat in both species, the cephalothorax is relatively longer in *C. longispinosum*, representing 47% of the total body length. The figure for the Brazilian specimens is between 42 and 43.5%. Furthermore, the constriction of the head is quite deep in the Brazilian specimens whereas it is very soft in the illustrations of SARS (1921).

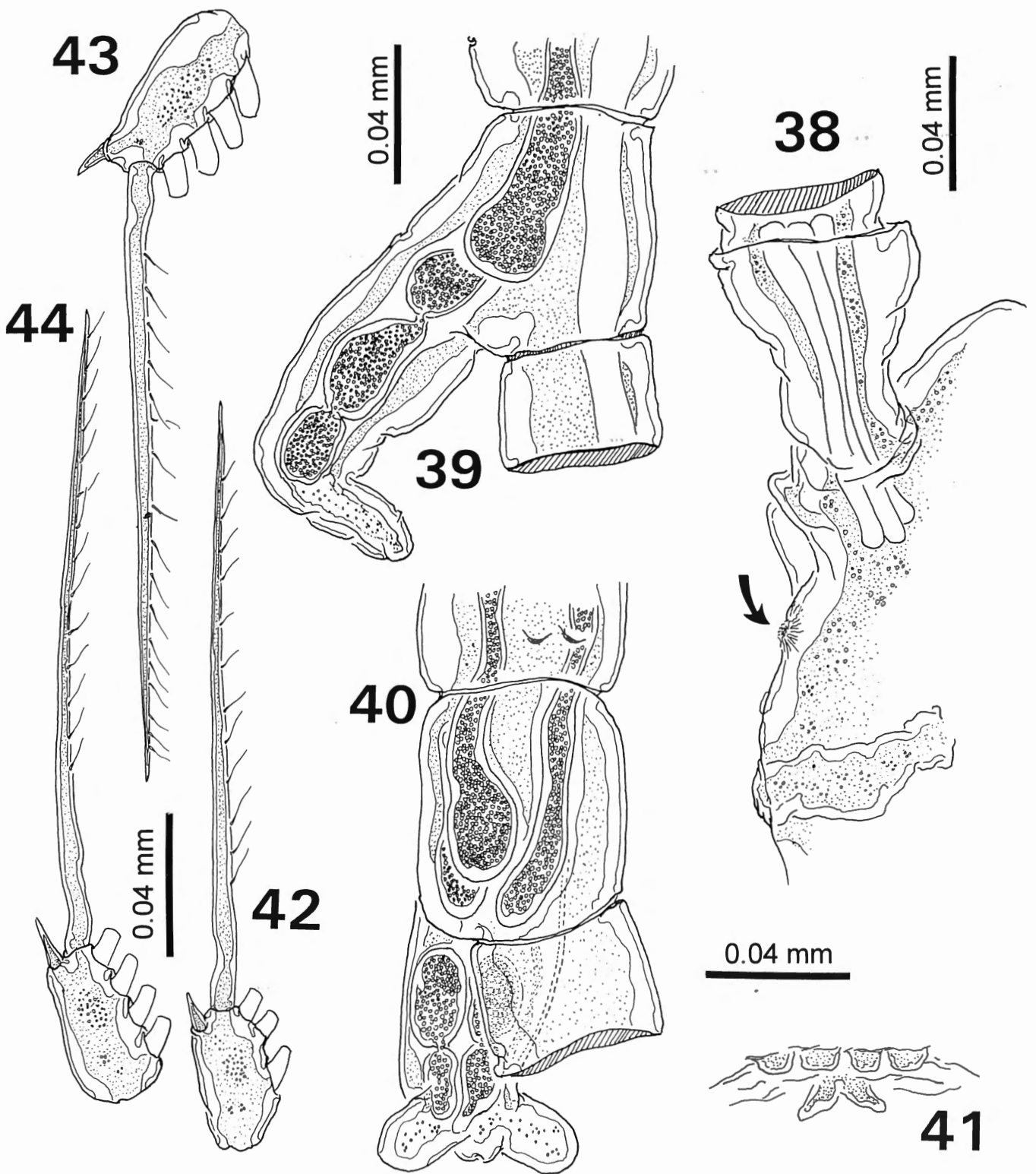
The relative length of the antennules is different in both cases, it represents almost 26% of the total body length and 54.2% of the cephalothorax in *C. longispinosum* (see SARS, 1921, pl. XIII). The corresponding proportions in the Brazilian specimens are 24-24.7% and 58.4%, respectively.

The genital apparatus of *C. longispinosum* shows a different structure than that of the Brazilian specimens. It has a medial low, wide rounded prominence which together with the short arms, makes almost a continuous straight margin along the distal end of the apparatus (see SARS, 1921). SARS (1921) described the apparatus as "...divided at the end into 2 comparatively short diverging lobes". The arms of the genital apparatus in *M. rochai* are relatively longer and are more clearly separated from each other than they are in *C. longispinosum*. The two spiniform processes at the base of the apparatus which characterize both *C. tenue* and the Brazilian specimens, are absent in *C. longispinosum* (SARS, 1921; ISAAC, 1975, fig. 18b; SUÁREZ-MORALES, 2000b).

Considering the genital somite and the two succeeding free somites, proportions differ in both species, mainly in the genital somite relative length (36.3% in *C. longispinosum* vs 41.8% in the new species), and in the postgenital somite (23.6% vs 18.6%, respectively). Representing 40% of this



Figs. 35-37. *Monstrillopsis fosshageni* n. sp., incomplete adult male holotype. 35. habitus, dorsal view, left antennule cut short; 36. habitus with antennule, lateral view; 37. left antennule, dorsal view.



Figs. 38-43. *Monstrillopsis fosshageni* spec. nov., incomplete adult male holotype; 38. anteroventral part of head, lateral view, showing cuticular process (arrowed); 39. genital apparatus, lateral view; 40. same, semi-ventral view; 41. detail of cuticular processes near the posterior end of cephalothorax; 42. third exopod of first swimming leg; 43. same of third swimming leg; 44. same of fourth swimming leg.

group of somites, the anal somite is equally long in both cases.

Therefore, it is justified to consider the Brazilian specimens as a new species which, although closely related to both *C. tenue* and *C. longispinosum*, it can be distinguished from them by a combination of characters. These characters include the peculiar protuberance on the ventral surface of the anteriormost part of the cephalothorax, the antennule first segment with an extraordinarily long, setulated setiform spine, and a pair of spiniform processes at the base of both arms of the genital apparatus.

The distribution of *C. longispinosum* has been reported to be worldwide (ISAAC, 1975), along with several other species. However, considering the general morphological resemblance of the Brazilian species with *C. longispinosum*, some of the earlier records of this species, particularly those of the western hemisphere could really belong to this new species. This seems to be the case of the report of *C. longispinosum* in Brazil by DIAS (1996) and repeated later on by JOHANSSON (1998). This kind of problems are not uncommon within the group since a closer morphological analysis of monstrilloid copepods (SUÁREZ-MORALES, 1998, 2000a) have shown that the wide distributional pattern reported for some of the commonest species might be misleading. Several species show subtle differences at the species level and can be easily confused during casual observation.

Monstrillopsis fosshageni spec. nov.

MATERIAL EXAMINED

Single holotype adult male from Brazil. CST 1. State of Espírito Santo, Brazil. Collected March 19, 1993, plankton trawl. Undissected, specimen badly damaged, urosome broken from postgenital somite, right antennule broken at base. Catalogue number MNRJ-14441.

TYPE LOCALITY

Off coasts of State of Espírito Santo, Brazil (20°15'56"S - 40°13'15"W).

ETYMOLOGY

This species is dedicated to the Norwegian copepodologist Audun FOSSHAGEN, for his relevant contributions to Copepodology.

DESCRIPTION

Male. Body length of analyzed specimen 1.8 mm, measured in dorsal view from anterior end of cephalothorax to posterior edge of postgenital somite. Cephalothorax 0.29 mm long, representing about 47% of body length considered to posterior margin of postgenital somite (Figs. 35, 36). Oral papilla much reduced, represented by rounded, low protuberance located 0.24 of way back along ventral surface of cephalothorax (Fig. 36). Cephalothorax broad, almost cylindrical; cephalic region broadest on anterior third, posterior part of cephalothorax gradually broadening to same width. Ocelli present, very reduced, unpigmented, rounded in dorsal view. Cephalic region slightly protuberant in dorsal view.

Cephalic sensillae not seen. Two chitinized, nipple-like cuticular processes located ventrally between oral papilla and antennular bases (arrowed in Fig. 38). Above these nipple-like processes, lies a large conical protuberance similar to that described for the male of *Cymbasoma* cf. *longispinosum*, but much lower (Figs. 36, 38).

Posterior margin of cephalothorax with cuticular process on dorsal surface. Process represented by a row of four transverse teeth-like projections directed backwards; near their distal end lies a pair of divergent subtriangular processes apparently borne on a common base (see Fig. 41). Another similar, but much reduced process is present on posterior margin of second pedigerous somite (see Fig. 35).

Antennules relatively long. Antennular length of studied specimens 0.27 mm, representing close to 94% of the cephalothorax length. As usual in monstrilloid males, antennules with five segments, segments clearly separated. Length ratio of antennular segments starting from the proximalmost being: 11.9: 26.2: 14.4: 24.7: 22.8 (=100) (Fig. 37). Segments armed with 0-I; 1-IV; 1-I; 1-IV; 3-III setae (in Arabic numbers) and spines (in Roman numbers), respectively (Fig. 37). In terms of basic setal nomenclature of GRYGIER & OHTSUKA (1995) for female monstrilloid copepod antennules, elements on first (1) segment only are present. In segment two, elements 2v_{1,2}, 2d_{1,2}, and IId are present, only 2v₃ is absent. In segment three IIIId and 3 are present and IIIIv is absent. The fourth segment bears almost all the elements (4v₁₋₃, 4d_{1,2}, IVv, IVd), but 4aes is missing. Distal segment with elements 6aes, 6₂, 5, b_{1,3} only. Element 6₂ is particularly long and strong, it has the shape of a curved sable; it represents almost 74% of the length of bearing -fifth-segment, and up to 19% of the entire antennular length.

First pedigerous thoracic somite incorporated into cephalothorax. This and succeeding three pedigers each bearing well developed swimming legs, all with 3-segmented rami and with same armament pattern, except for leg 1 exopod which has one seta less on the terminal segment of the exopod (see Fig. 42). Exopods longer than endopods in all cases. Coxae of each pair unarmed, joined by subrectangular intercoxal sclerite. Basis separated from coxa posteriorly by diagonal articulation. Outer margin of basis of swimming legs 1, 2 and 4 with small, thin seta; seta on leg 3 about 2.5 times larger than in the other legs, naked. Outer distal corner of first and third exopodal segments of legs 1-4 each with short, spinelike seta. Spine on third exopodal segment of swimming legs relatively short, about 1/5 as long as bearing segment. All natatory setae lightly and biserially plumose except for spiniform seta on outer distal corner of third exopodal segments of swimming legs 1-4, this being lightly and sparsely setulated along inner side, outer margin naked (Figs. 42-44).

Armament formula of swimming legs as:

	Basis	Exopod	Endopod
Leg 1	0-1	1-0;0-1;1,2,2	0-1;0-1;1,2,2
Legs 2-4	0-1	1-0;0-1;1,2,3	0-1;0-1;1,2,2

Fifth leg absent from fifth pedigerous somite. Succeeding somite with medial ventral protuberance which is base of a long genital apparatus, nearly cylindrical but having two ter-

minal lobes widely divergent. A rounded process is present between bases of lobes. Inner margins of lobes smooth, naked (Figs. 39, 40).

Urosome consisting of probably four segments: fifth pedigerous somite, genital somite (with genital complex) and one free -anal- somite. From dorsal view, genital somite relatively long. Caudal rami absent in this specimen.

REMARKS

One of the most relevant characters to separate the monstrolloids at the genus level is the number of urosomites. In male *Cymbasoma*, there is only one segment between the genital and the anal somites. In male *Monstrilla* there are two somites. Another distinctive character is the presence of fifth legs, which is exclusive of *Monstrilla* (i.e. *M. longicornis* THOMPSON, 1890, *M. longiremis* GIESBRECHT, 1892, *M. wandelli* STEPHENSEN, 1913), but there are species of the same genus without a fifth leg. It is interesting that the generic characters are so limited to separate both genera, as mentioned by HUYS & BOXSHALL (1991). Hence, looking for other distinctive characters at the genus level when the main ones are not available is a relevant issue. HUYS & BOXSHALL (1991) separated four distinct types of terminal male antennular segment. Two of them are assignable to *Monstrilla*, one to *Monstrillopsis*, and the other one to *Cymbasoma* (= *Thaumaleus*) species, with only one exception. Trying to apply this criterion to define the genus to which this particular specimen belongs, we compared the structure of our specimen's fifth antennular segment with the types proposed by HUYS & BOXSHALL. Beforehand, we eliminated types 3 and 4, the former exclusive of *Monstrilla*, which has 5 subterminal transverse serrate ridges and the tip is blunt, the two distal spines are subterminal. Type four, derived from type 3 maintains a discernible serrate process on the inner margin; although our specimen shows two patches of short hair-like setules, they can not be confused with the serrate condition as that described and depicted by HUYS & BOXSHALL (1991) for antennules of type 4. Hence, conditions of these two types are not present in our specimen. The other two types were analysed as follows:

In type 1, the segment is slender and elongate, with two terminal spines on apical position (HUYS & BOXSHALL, 1991, figs. 2.5.5A, 2.5.6E); one of the spines is larger and longer than the other one, and it is not curved. This is present in most *Monstrilla* species. In type 2 the segment is not slender but bears a bump proximally on the medial margin and tapers distally into a curved tip (see HUYS & BOXSHALL, 1991, fig. 2.5.5B). This one is the *Monstrillopsis* type and is the one which seems to be more related to the condition found in our specimen, which under this criterion should be included in this genus. This condition is present in other species of *Monstrillopsis*, such as *M. dubia* (T. SCOTT, 1904) (see SARS, 1921, pl. XIV), and *M. reticulata* (DAVIS, 1949, pl. 1, fig. 8), clearly with the characters of antennular type 2.

Besides the antennular type, perhaps the most important character of this specimen is the long, cylindrical genital apparatus. This kind of apparatus, with this peculiar form has been recorded mainly in species of *Monstrilla* (*M. reidae* SUÁREZ-MORALES, 1993, and in *Monstrilla bahiana*

spec. nov., described in this paper). However, it is not exclusive of the genus since it is present in *Monstrillopsis* as well (see HUYS & BOXSHALL, 1991, fig. 2.5.8C,D). In fact, the genital apparatus of our specimen is quite similar to that depicted by HUYS & BOXSHALL (1991) for a *Monstrillopsis* sp., but differ in having a terminal middle protuberance at the tip of the apparatus, which is absent in HUYS & BOXSHALL's (1991) specimen. It is also similar to that depicted by DAVIS (1949), but in this species the lappets are relatively longer than in our specimen, and the apical spine, although curved, is quite smaller than the apical spine of our specimen.

All this evidence together suggest that this is a new species of *Monstrillopsis*. It is expected that future collections in the same area and particularly in the type locality of this new species will harbour more specimens of this species. The easiest way to recognize it is the sable-like terminal spine on the last segment of the antennule. Additional material will allow us to define the taxonomic status of this form.

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References

- DAVIS, C.C., 1949. A preliminary revision of the Monstrolloida, with descriptions of two new species. *Transactions of the American Microscopical Society*, 68: 245-255.
- DIAS, C., 1996. Monstrolloida (Copepoda) off the Brazilian coast. *Hydrobiologia*, 324: 253-256.
- GIESBRECHT, W., 1892. Systematik und Faunistik der pelagischen Copepoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. Fauna und Flora des Golfes von Neapel und der angrenzenden Meeres-Abschnitte herausgegeben von der Zoologischen Station zu Neapel, 19:1-831, Atlas von 54 Tafeln nebst den Tafelerklärungen.
- GRYGIER, M.J., 1994a [dated 1993]. Identity of *Thaumatoessa* (= *Thaumaleus*) typica Krøyer, the first described monstrolloid copepod. *Sarsia* 78:235-242.
- GRYGIER, M.J., 1994b. Nomenclature, redescription, and new record from Okinawa of *Cymbasoma morii* Sekiguchi, 1982 (Monstrolloida). *Hydrobiologia*, 292/293:23-29.
- GRYGIER, M.J., 1995. Annotated chronological bibliography of Monstrolloida (Crustacea: Copepoda). *Galaxea*, 12:1-82.
- GRYGIER, M.J. & Ohtsuka, S., 1995. SEM observation of the nauplius of *Monstrilla hamatapex*, new species, from Japan and an example of upgraded descriptive standards for monstrolloid copepods. *Journal of Crustacean Biology*, 15:703-719.
- HUYS, R. & BOXSHALL, G.A., 1991. Copepod Evolution. London. The Ray Society. 468 p.
- ISAAC, M.J., 1974a. Copepoda Monstrolloida from south-west Britain including six new species. *Journal of the Marine Biological Association of the United Kingdom* 54:25-31.
- ISAAC, M.J., 1974b. Studies on Planktonic Arthropods. Ph.D. thesis. University College of Swansea, Wales, U.K., 146 p.

ISAAC, M.J., 1975a. Copepoda, Suborder: Monstrilloida. *Fiches pour l' Identification du Zooplancton*. 144/145:1-10.

JOHNSON, R. 1998. Maxillopoda-Copepoda. Monstrilloida. In: YOUNG, P.S. (ed.). *Catalogue of Crustacea of Brazil*. Museu Nacional. Rio de Janeiro. Serie Livros 6:261-262.

SUÁREZ-MORALES, E. 1993. *Monstrilla reidae*, a new species of monstrilloid copepod from the Caribbean Sea off Mexico. *Bulletin of Marine Science*, 52(2):717-720.

SUÁREZ-MORALES, E., 1994. Lista faunística comentada de los copépodos monstrilloides (Crustacea, Copepoda) de la Bahía de Ascensión, Q.Roo. *Sian Ka'an, Serie Documentos*, 2:11-17.

SUÁREZ-MORALES, E., 2000a. A new species and new geographic records of *Monstrilla* (Copepoda: Monstrilloida) from the Philippines. *Journal of Crustacean Biology*, 20(4):680-686.

SUÁREZ-MORALES, E., 2000b. The male of *Cymbasoma quintanarooense* (Suárez-Morales) (Copepoda, Monstrilloida) from the Caribbean with an identification key for the known males of *Cymbasoma*. *Sarsia*, 85(3):345-355.

SUÁREZ-MORALES, E. & DIAS, C., 2000. Two new species of *Monstrilla* (Copepoda: Monstrilloida) from Brazil. *Journal of the Marine Biological Association of the United Kingdom*, 80: 1031-1039.

SUÁREZ-MORALES, E. & DIAS, C., 2001. A new species of *Monstrilla* (Crustacea: Copepoda: Monstrilloida) from Brazil with notes on *M. brevicornis*. *Proceedings of the Biological Society of Washington*, 114(1):219-228.

Suárez-Morales, E. & N. Riccardi. 1997. Redescription and first record of *Cymbasoma tenue* (Isaac, 1975) (Copepoda: Monstrilloida) in the Mediterranean Sea. *Proceedings of the Biological Society of Washington*, 110(1):99-106.

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