

Three new species of *Macrocyprina* Triebel, 1960 (Crustacea, Ostracoda, Macrocyprididae) from Brazilian shallow marine waters

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ABSTRACT

Three new species of *Macrocyprina* Triebel, 1960 from the Brazilian shallow marine waters are described: *M. youngi* n. sp., *M. rocas* n. sp., and *M. coimbrai* n. sp. These three species differ from all known species of *Macrocyprina* by the modified male left appendage V, with the conspicuous podomere II not recurved and densely setose. *Macrocyprina hawkae* Maddocks, 1990 presents a similar modified male left appendage V, but the podomere II is vestigial. Furthermore, *Macrocyprina youngi* n. sp., reported from Armação de Búzios, Rio de Janeiro, is distinct from the other two new species by the following combined characters: fairly large, elongate carapace; its lateral surface with three or four small subcircular patches and other irregular patches in variable positions; Zenker's organ with tiny terminal bulb; and hemipenis with subtriangular posterior lamella, with one angle posteroventrally projected. *Macrocyprina rocas* n. sp., from Rocas Atoll, is characterized by the fairly small, elongate carapace, with the lateral surface bearing one to four central patches; the Zenker's organ with a small terminal bulb; and the posterior lamella of the hemipenis dorsoventrally elongated. *Macrocyprina coimbrai* n. sp., recorded from Abrolhos region, Bahia, can be distinguished from the other two new species by its large, elongate-ovate carapace, with the lateral surface presenting three large central patches, and other patches situated in variable positions; the elongated ventrodiscal peg of the podomere I of the male left appendage V; the Zenker's organ with a small terminal bulb; and the hemipenis with a bilobated posterior lamella.

KEY WORDS

Crustacea,
Ostracoda,
Macrocyprididae,
Macrocyprina,
Brazil,
shallow waters,
marine,
new species.

RÉSUMÉ

Trois nouvelles espèces de *Macrocyprina* Triebel, 1960 (Crustacea, Ostracoda, Macrocyprididae) des eaux marines peu profondes du Brésil.

Trois nouvelles espèces de *Macrocyprina* Triebel, 1960 des eaux marines peu profondes du Brésil sont décrites : *M. youngi* n. sp., *M. rocas* n. sp. et *M. coimbrai* n. sp. Ces trois espèces diffèrent des autres espèces de *Macrocyprina* par l'appendice V gauche du mâle modifié, avec le podomère II développé, non recourvé et avec beaucoup de soies. *Macrocyprina hawkae* Maddocks, 1990 présente l'appendice V gauche du mâle similaire, mais le podomère II est vestigial. En outre, *Macrocyprina youngi* n. sp., recensée pour la Armação de Búzios, Rio de Janeiro, se distingue des deux autres espèces nouvelles par la combinaison des caractères suivants : carapace modérément grande, allongée, sa surface latérale avec trois ou quatre taches subcirculaires et d'autres taches présentes en positions variables ; l'organe de Zenker avec un bulbe terminal très petit ; et la lamelle postérieure de l'hémipénis subtriangulaire, avec un angle projeté postéroventralement. *Macrocyprina rocas* n. sp., de l'atoll de Las Rocas, se caractérise par une carapace modérément petite, allongée, sa surface latérale porte une à quatre taches ; l'organe de Zenker avec un petit bulbe terminal ; et la lamelle postérieure de l'hémipénis est allongée dorsoventralement. *Macrocyprina coimbrai* n. sp., de la région d'Abrolhos, Bahia, diffère des deux autres espèces nouvelles par la carapace grande, allongée-ovale, dont la surface latérale porte trois grandes taches centrales et d'autres taches présentes à des positions variables ; le « peg » ventrodorsal allongé du podomère I de l'appendice V gauche du mâle ; l'organe de Zenker à un petit bulbe terminal ; et la lamelle postérieure de l'hémipénis est bilobée.

MOTS CLÉS

Crustacea,
Ostracoda,
Macrocyprididae,
Macrocyprina,
Brésil,
eaux peu profondes,
marine,
nouvelles espèces.

INTRODUCTION

The genus *Macrocyprina* Triebel, 1960 is one of the eight genera, which are included in the superfamily Macrocypridoidea, the most morphologically homogenous and least diverse of the infraorder Cypridocopina Baird, 1845 (Maddocks 1977). This genus is the only one in the family, which is typical of shallow waters, being easily differentiated from the others by the opaque patches present on the carapace surface. The genus *Macrocyprina* occurs worldwide, with a live depth range from 1 to 232 m, but recorded dead down to 427 m, and with a known geologic range from the Oligocene and Holocene (McKenzie 1967 *apud* Maddock 1990). Most of

the 26 named species occur in warm, shallow water, between 1 and 40 m. They are found "in tropical carbonate environments associated with coral reefs, but a few species live in the clastic sedimentary environments of continental shelves at midlatitudes" (Maddocks 1990: 109).

Only four papers on *Macrocyprina* from Brazil have been published. Pinto *et al.* (1978) recorded this genus from the northern limit of Brazilian coast (Oiapoque river, 4°25'N) to Paranaguá (25°32'S), but the author did not identify the specimens to the species level. Dias-Brito *et al.* (1988) recorded *Macrocypris* sp. in Sepetiba Bay, Rio de Janeiro (23°S, 44°W). Based on their illustration (Dias-Brito *et al.* 1988: pl. 2.42), Maddocks (1990: 144) assigned this species to

the genus *Macrocyprina*. This species of *Macrocyprina* was not described, with only a SEM photograph of the external surface of the right valve of one specimen available.

Coimbra *et al.* (1992) recorded a different *Macrocyprina* sp. in Tamandaré Bay (8°S, 35°W), Pernambuco. Subsequently, Coimbra *et al.* (1999) extended the occurrence of this species to the northern Brazilian shelf and shallow continental slope (4°N to 8°S, 51°W to 35°W, from 15 to 223 m depth). This was considered a new species by Coimbra in his Ph. D. thesis (Coimbra 1995: 38), but it has not been published since.

Therefore, only two undescribed species of *Macrocyprina* (cited below as sp. 1 and sp. 2) are recorded from Brazilian coast (Fig. 15). Both can be easily differentiated from each other by their published illustrations (Dias-Brito *et al.* 1988: pl. 2.42; Coimbra *et al.* 1992: pl. 3.2a, 2b; 1999, pl. 3.9).

In the present paper, the species of *Macrocyprina* from samples of macroalgae, invertebrates (corals and sponges) and sediment, collected in several localities from the Brazilian shallow waters, are studied. The new species are described and figured.

ABBREVIATIONS

h	height;
l	length;
LV	left valve;
RLV	closed carapace (right and left valves);
RV	right valve;
spm	specimen;
MNHN	Muséum national d'Histoire naturelle, Paris;
MNRJ	Museu Nacional, Rio de Janeiro.

MATERIAL AND METHODS

The specimens were collected by scuba and free diving; algae, invertebrates (corals and sponges) and sediment were packed in plastic bags. The algae and invertebrates were fragmented manually in separated plastic pails containing seawater and alcohol. After about one hour, the fragments were discarded and the water containing the microinvertebrates was filtered over a 300 µm

sieve. The sediment was sieved through nets of 500 or 300 µm. The samples were fixed either with ethanol 70% or with formalin 4%. The samples were sorted and the *Macrocyprina* specimens were kept in ethanol 70%.

The specimens were dissected in a drop of glycerine on a microscopic slide, and the appendages were mounted on another slide containing CMC medium. The specimens were illustrated with the aid of a camera lucida coupled to a Zeiss microscope. As several terms have been applied to the same structures of macrocypridids by different authors, the terminology used herein is presented below. Appendage is used instead of limb. The appendages of macrocypridids are named: antenna I, antenna II, mandible, maxilla I, appendage V, appendage VI, and appendage VII. All the articles of the appendages are termed "podomeres". The podomeres are numbered from the most proximal (podomere I) to the most distal (podomere VII of antenna I, for example). Maddocks (1990: 14) called the dorsoproximal structure of antenna II bearing three setae (arrowed in Figure 2B) "dorsoproximal scale", and stated it was inserted on podomere III. Otherwise, Broodbakker & Danielopol (1982) considered this structure to be inserted on podomere II, and applied the term exopodite. Under the higher magnification available to the present study (1000 ×, optic microscope) it is not possible to ascertain the site of insertion of the dorsoproximal structure. I follow Maddocks' terminology, as it was used in the revision of the Macrocyprididae (1990). The three mouth-directed projections of the base of maxilla I are termed endites, and the endites are numbered from the one most distant to palp (endite I) to the one which is situated next to the palp (endite III), as used by Müller (1894). Terminology used in describing an appendage is based on the resting position of an appendage in life (as the antenna II in Figure 2B, for example): anterior, posterior; dorsal, ventral; medial (inner side), lateral (outer side); distal, proximal (as used by Kornicker 1993).

The measurement of the body length, for comparison with the hemipenis and Zenker's organ, was made from the forehead to the base of furca.

SYSTEMATICS

Suborder CYPRIDOCOPINA Baird, 1845

Superfamily MACROCYPRIDOIDEA Müller, 1912

Family MACROCYPRIDIDAE Müller, 1912

Genus *Macrocyprina* Triebel, 1960TYPE SPECIES. — *Macrocyprina propinqua* Triebel, 1960 (original designation).

OTHER SPECIES INCLUDED. — *M. africana* (Müller, 1908); *M. barbara* Maddocks, 1990; *M. belizensis* Maddocks, 1990; *M. bermudae* Maddocks, 1990; *M. bonaducei* Maddocks, 1990; *M. caiman* Maddocks, 1990; *M. captiosa* Maddocks, 1990; *M. decora* (Brady, 1866); *M. dispar* (Müller, 1908); *M. hartmanni* Maddocks, 1990; *M. hawkae* Maddocks, 1990; *M. hortuli* Maddocks, 1990; *M. jamaicae* Maddocks, 1990; *M. maculata* (Brady, 1866); *M. madagascarensis* Maddocks, 1990; *M. moza* Maddocks, 1990; *M. noharai* Maddocks, 1990; *M. okinawae* Maddocks, 1990; *M. parcens* Maddocks, 1990; *M. quadrimaculata* Maddocks, 1990; *M. rattrayi* Whatley, Jones & Wouters, 2000; *M. schmitti* (Tressler, 1949); *M. skinneri* Kontrovitz, 1976; *M. succinea* (Müller, 1894); *M. swaini* Maddocks, 1990; *M. vargata* Allison & Holden, 1971; *M. youngi* n. sp.; *M. rocas* n. sp.; *M. coimbrai* n. sp.

REMARKS

Maddocks (1990: 115, 119) considered *Macrocyprina decora* and *M. maculata* as *nomen dubium*. Although analysing part of the collections of G. S. Brady, Maddocks (1990) could not locate any specimen of both species, and as the descriptions and illustrations of Brady (1866) were too vague or puzzling, the author stated that these names should “be ignored as a *nomen dubium*”.

Titterton *et al.* (2001), while analysing the collections of G. S. Brady, followed Maddocks (1990) in assigning these two species to the genus *Macrocyprina*. Otherwise, the authors stated that the right valve contained in the slide HM No. 1.12.37 is the holotype of *M. decora* and the left valve contained in the slide HM No. 2.06.42 is the holotype of *M. maculata*. In the present study, the author follows Titterton *et al.* (2001) while considering these two names as valid.

Macrocyprina youngi n. sp.

(Figs 1-5)

TYPE MATERIAL. — Holotype: Praia da Tartaruga, Armação de Búzios, Rio de Janeiro, 22°52'S, 41°54'W, on sponges over rocky shore, between 1 to 5 m, 27.III.2000, S. N. Brandão, E. N. Calderon & C. A. Echeverría coll., adult ♀ (in alcohol 70%, MNRJ 15700). Paratypes: same locality, 9 ♂♂, 22 ♀♀, 29 juvs (MNRJ 15701); same locality, 1 ♂, 4 ♀♀, 5 juvs (MNHN-Os 592); Praia de João Fernandes, Armação de Búzios, Rio de Janeiro, on macroalgae, 27.III.2000, S. N. Brandão, E. N. Calderon & C. A. Echeverría coll., 1 ♀, 2 ♂♂, 6 juvs, 3 LV, 1 RV, 3 RLV (MNRJ 16833).

DIMENSIONS. — Holotype (MNRJ 15700) ♀: LV, h 0.50 mm, l 1.23 mm; RV, h 0.53 mm, l 1.25 mm. Paratypes (MNRJ 15701) spm 2, ♀: LV, h 0.53 mm, l 1.28 mm; RV, h 0.53 mm, l 1.30 mm; spm 3, ♂: RV broken; LV, h 0.50 mm, l 1.38 mm; spm 4, ♂: LV, h 0.50 mm, l 1.35 mm; RV, h 0.53 mm, l 1.38 mm; spm 6, ♀: LV, h 0.53 mm, l 1.35 mm; RV, h 0.55 mm, l 1.38 mm; spm 8, ♂: LV, h 0.53 mm, l 1.33 mm; RV, h 0.53 mm, l 1.35 mm; spm 9, ♀: LV, h 0.50 mm, l 1.28 mm; RV, h 0.53 mm, l 1.30 mm; ♂: LV, h 0.50 mm, l 1.35 mm; RV broken; spm 11, ♀: LV, h 0.50 mm, l 1.28 mm; RV, h 0.53 mm, l 1.30 mm.

ETYMOLOGY. — Named in honour to Dr Paulo S. Young (†), who was a brilliant Brazilian carcinologist, and who was a mindful advisor

DISTRIBUTION. — Recent. Only known from the type locality. Brazil, Rio de Janeiro, Armação de Búzios, between 1 and 5 m.

DIAGNOSIS. — Carapace fairly large, elongate in lateral outline, its lateral surface with three or four small sub-circular patches and other irregular patches in variable positions. Male appendages V strongly asymmetrical, right appendage larger than left; left appendage bell shaped, with base and two podomeres, last podomere not recurved, profusely setose. Zenker's organ with tiny terminal bulb; hemipenis with subtriangular posterior lamella, with one angle posteroventrally projected.

DESCRIPTION

Carapace fairly large, elongate in lateral outline, inequilateral (Fig. 1A, B), with fairly ramified radial pore canals (Fig. 1C, D). Greatest height at midlength, slightly posterior to muscle scars. Length approximately 2.5 times maximum height. Lateral surface with three or four small subcircular, white, opaque patches; other irregular patches in variable positions, but mainly near

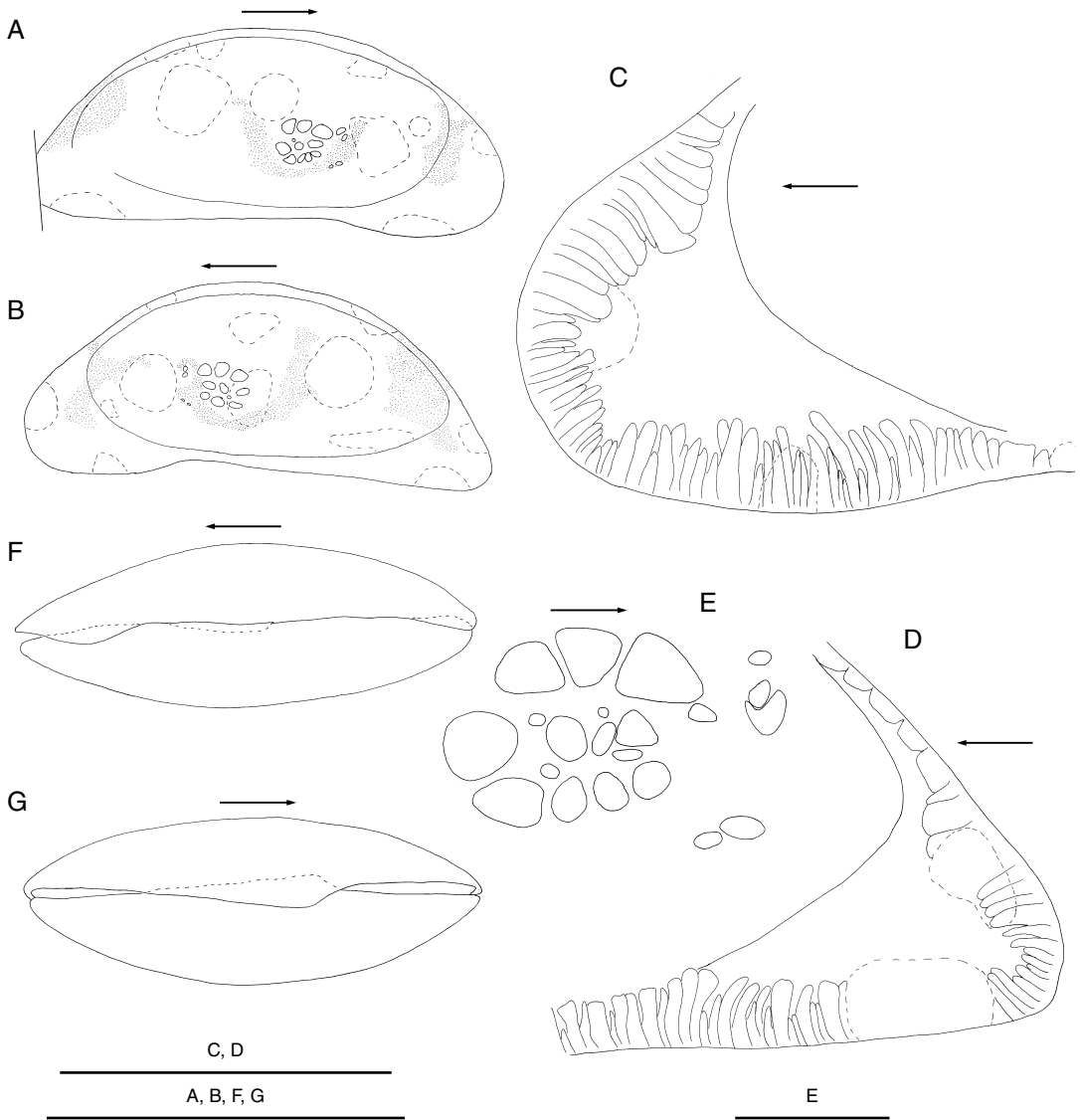


FIG. 1. — *Macrocyprina youngi* n. sp., paratypes (MNRJ 15701); **A-E**, spm 8, ♂; **F, G**, spm 2, ♀; **A**, right valve; **B**, left valve; **C**, anterior vestibule and radial pore canals; **D**, posterior vestibule and radial pore canals; **E**, adductor muscle scars; **F**, dorsal view of carapace; **G**, ventral view of carapace. The arrows point towards the anterior of the animal. Scale bars: A, B, F, G, 1 mm; C-E, 0.1 mm.

margins. Dark brown cuticle around central opaque patch, and at anterodorsal and posterior regions of valve surface. Dorsal margin evenly low-arched, with indistinct dorsal angle. Posterodorsal margin fairly straight. Anterior margin (Fig. 1C) unevenly rounded. Ventral

margin rounded anteriorly; with shallow indentation, and only slightly upswing posteriorly. Posterior angle rounded (Fig. 1D), dorsal and ventral margins forming an angle of about 50°. Zone of concrescence (Fig. 1C, D) of moderate width, irregular. Adductor muscle pattern

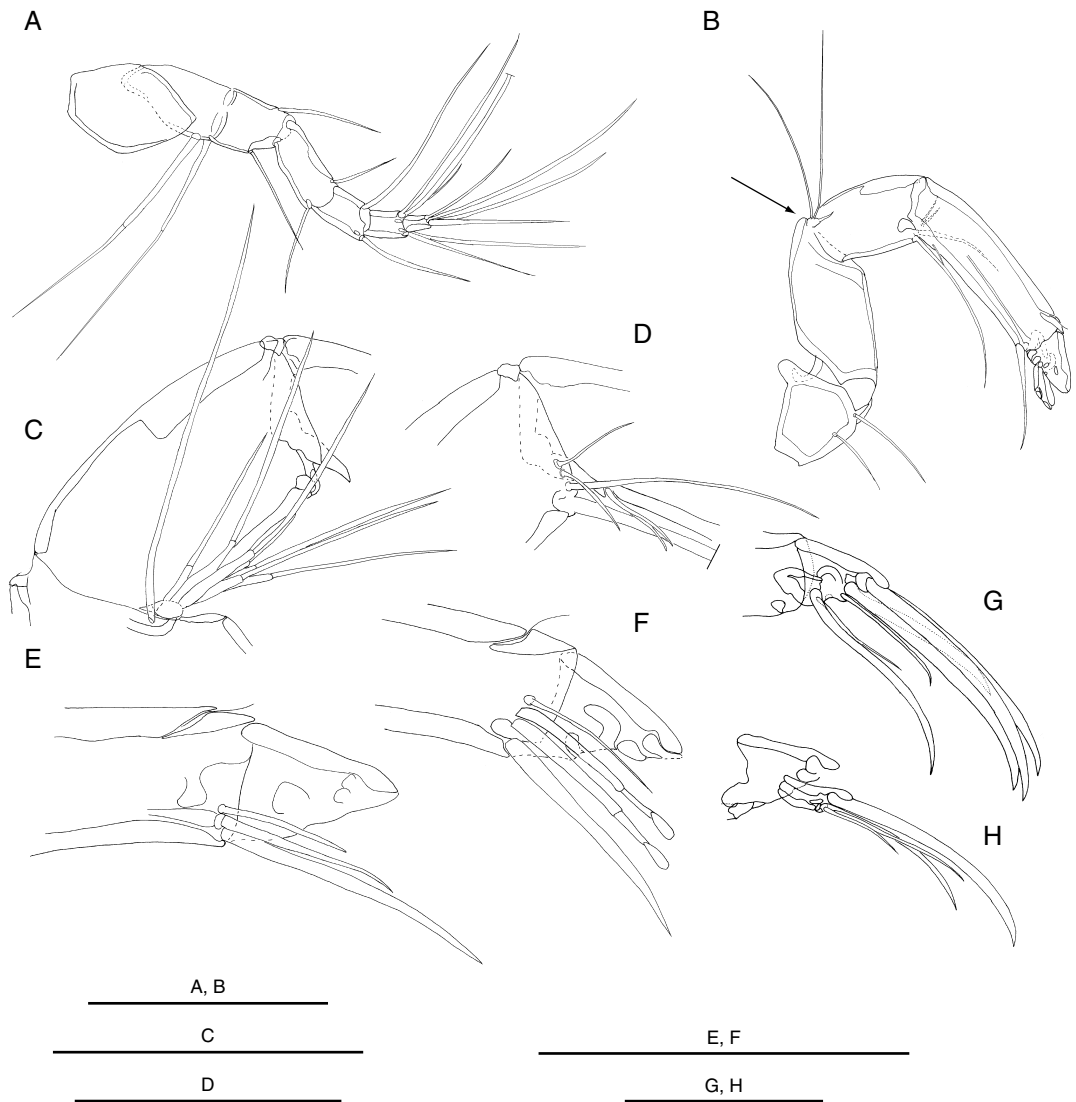


FIG. 2. — *Macrocyprina youngi* n. sp., paratypes (MNRJ 15701); **A-D, F-H**; spm 8, ♂; **E**, spm 9, ♀; **A**, antenna I; **B**, antenna II; **C**, podomere III of antenna II; **D**, ventrodistal angle of podomere III of antenna II; **E**, distal region of podomere IV of antenna II of female; **F**, distal region of podomere IV of antenna II of male; **G**, podomere V of antenna II; **H**, podomere VI of antenna II. The arrow points to the dorsoproximal scale of antenna II. Scale bars: A, B, 0.2 mm; C-H, 0.1 mm.

(Fig. 1E) with three dorsal scars and eight scars of variable sizes situated below. Carapace ovate-oblong in ventral and dorsal views (Fig. 1F, G). Antenna I (Fig. 2A) with seven slender, elongate podomeres, with long, thin, flexible setae. Podomeres II and III fused with incomplete suture. Podomere VII with four setae, dorsodistal seta thinner than others.

Antenna II (Fig. 2B) robust, with six podomeres. Podomere III, medially (Fig. 2C), with six long, subequal setae located ventrally at proximal margin; laterally, with dorsoproximal scale with three setae; ventrally at distal margin with four setae (Fig. 2D). Podomere IV with two thin setae proximally at dorsal margin; with one thin seta near ventrodistal edge; medially, dorsodistal angle

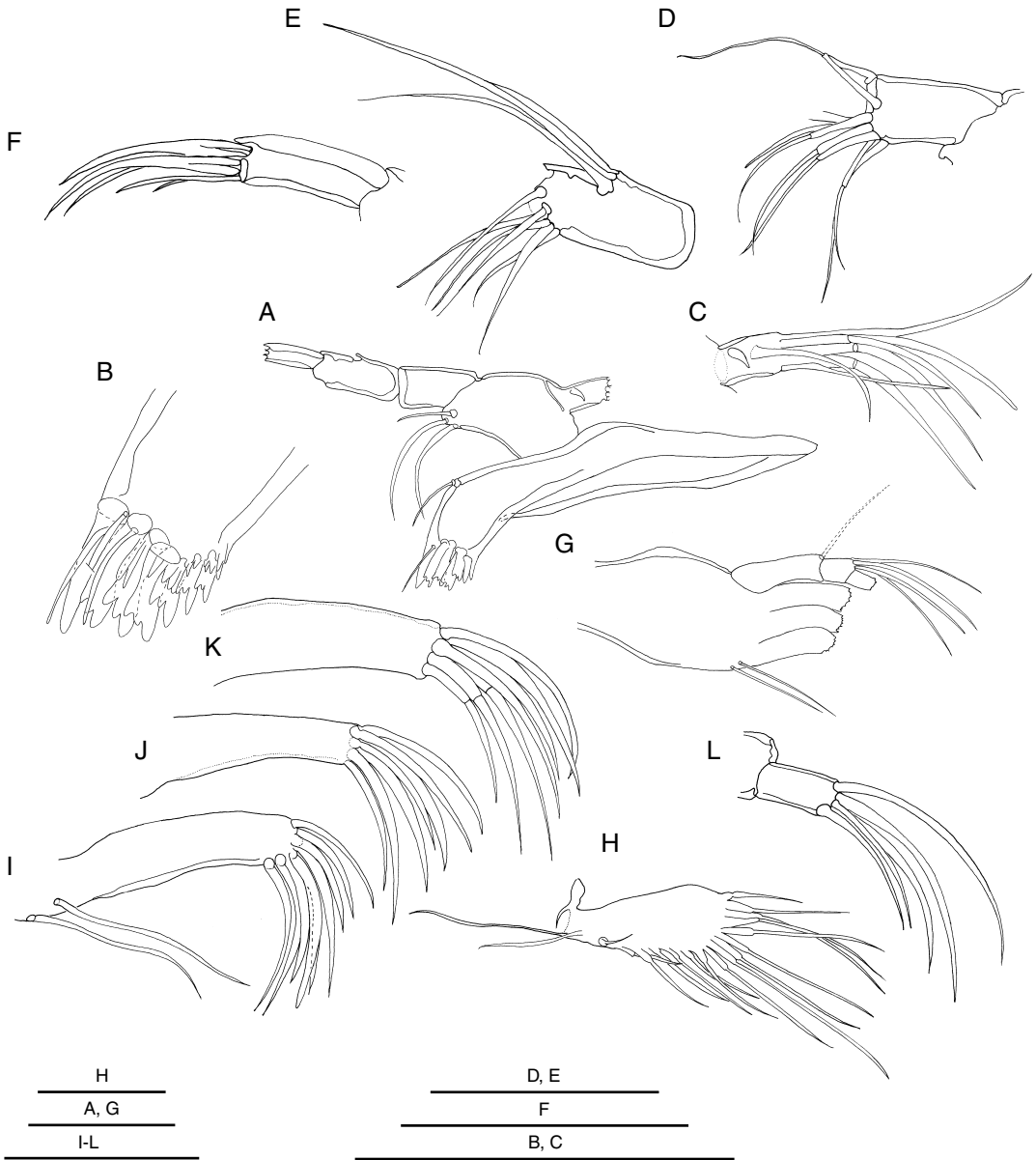


FIG. 3. — *Macrocyprina youngi* n. sp., paratype ♂ (MNRJ 15701) spm 8; **A**, mandible; **B**, masticatory jaw of mandible; **C**, exopodite of mandible; **D**, podomere II of palp of mandible; **E**, podomere III of palp of mandible; **F**, podomere IV of palp of mandible; **G**, maxilla I; **H**, vibratory plate of maxilla I; **I**, endite I of maxilla I; **J**, endite II of maxilla I; **K**, endite III of maxilla I; **L**, podomere III of palp of maxilla I. Scale bars: 0.1 mm.

(Fig. 2E, F) with three ventral setae, two of them sexually dimorphic setae (simple in female and candle-shaped in male); sexually dimorphic setae subequal in length in male, but in female more ventral seta about two thirds length of more dor-

sal seta. Male also with one thin seta dorsal to sexually dimorphic setae. Podomere V subtriangular (Fig. 2G); distal angle with four claws and one seta; dorsoproximal angle with one claw and one seta.

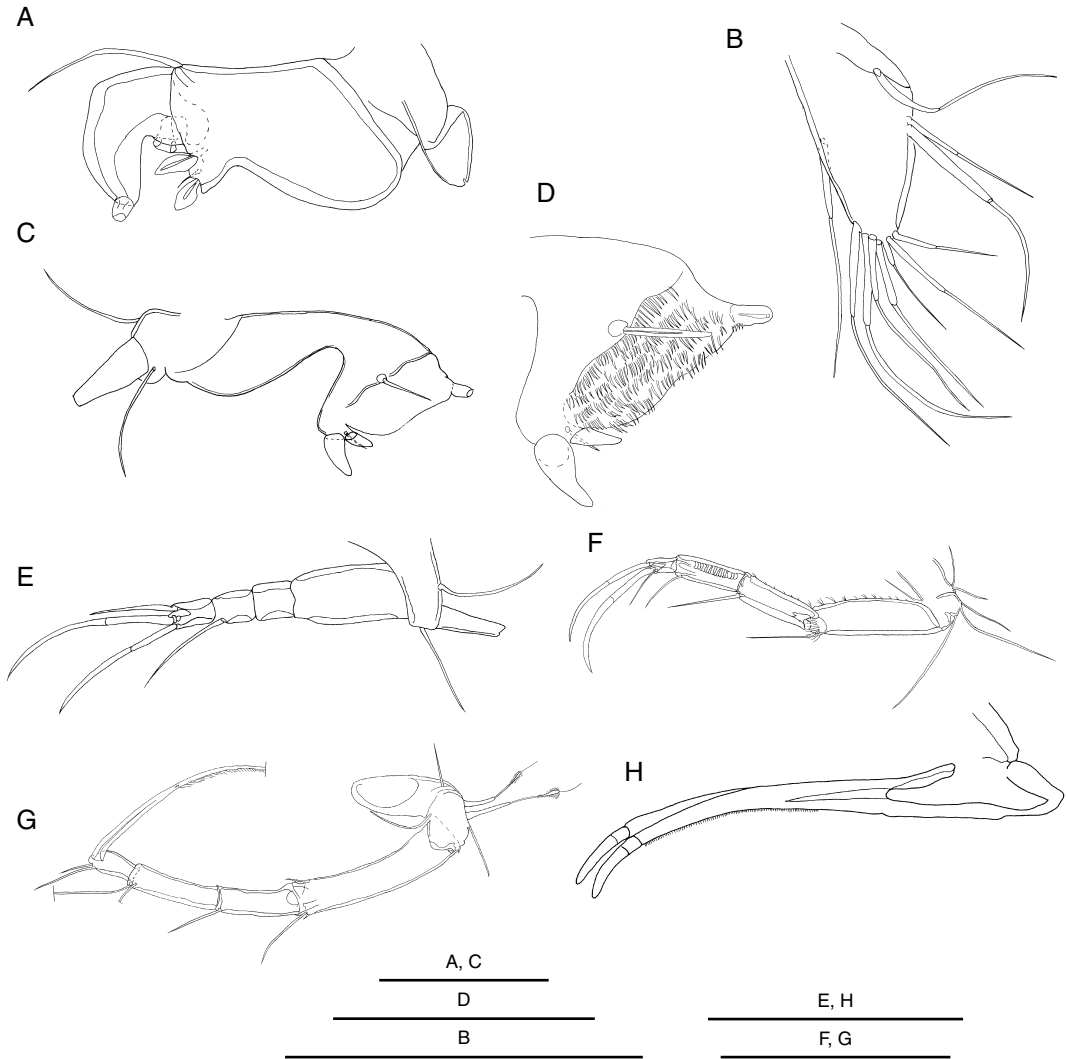


FIG. 4. — *Macrocyprina youngi* n. sp., paratypes (MNRJ 15701); **A-D, F-H**, spm 8, ♂; **E**, spm 6, ♀; **A**, male right appendage V; **B**, anterior lobe of male right appendage V; **C**, male left appendage V; **D**, podomere II male left appendage V; **E**, female appendage V; **F**, appendage VI; **G**, appendage VII; **H**, furca. Scale bars: A-D, 0.1 mm; E, H, 0.2 mm; F, G, 0.3 mm.

Mandible (Fig. 3A) with a broad masticatory jaw (Fig. 3B) armed with one dorsal, conical tooth followed by six tricuspidate teeth and several setae and pegs. Podomere I of palp with exopodite (Fig. 3C) with a dorsoproximal peg on medial surface, and six or seven distal setae. Podomere I with three setae at ventrodistal angle. Podomere II (Fig. 3D) with eight ventrodistal setae. Podomere III (Fig. 3E) with three mid-

dorsal setae; six ventrodistal setae. Podomere IV (Fig. 3F) with about three thick claws and two setae at distal margin.

Maxilla I (Fig. 3G) with three slender endites, each armed distally with a dense fringe of sub-equal claws. Endite I (Fig. 3H) with 10 distal claws, and two ventral setae; endites II and III (Fig. 3I, J) with seven distal claws each. Dorsal vibratory plate (Fig. 3K) with two proximal setae;

and with a series of long setae along posterior and ventral margins. Palp slender, flexible with three podomeres. Podomere II with four dorsodistal setae. Podomere III (Fig. 3L) with five distal setae. Anterior lobe of appendage V similar in males and females, with nine to 11 setae (Fig. 4B). Female left and right appendages V symmetrical, slender, with thick distal claws (Fig. 4E). Podomere IV with three distal claws (middistal one longest). Male appendages V very asymmetrical (Fig. 4A, C). Right appendage (Fig. 4A) robust, highly sclerotized, considerably larger, about 1.5 time length of left appendage. Palp hook-shaped, ventrodiscal angle of podomere I with two thick pegs; one short, thin seta; and one thick, short, cylindrical structure, similar to distal aesthetasc of hook. Dorsodistal angle with one seta. Podomere II recurved at approximately 100°; with one robust, distal aesthetasc; without thin aesthetascs (also without visible gaps in dorsal and ventral cuticle). Left appendage (Fig. 4C) slightly sclerotized, highly modified. Podomere I with convex ventral margin; distal setae at lateral surface; ventrodiscal angle with two pegs and one short, thin seta. Podomere II (Fig. 4D) short, but conspicuous, not recurved, lateral surface hirsute, covered with numerous short setulae; with well developed aesthetasc on dorsodistal angle; without thin, ventral aesthetascs (also without visible gaps in dorsal and ventral cuticle). Suture between podomeres I and II conspicuous, but not complete.

Podomeres I and II of appendage VI (Fig. 4F) fused, with an incomplete suture, recurved, forming a knee; with one seta at posterodistal angle (inside the knee); anterior margin (outside the knee) with two setae proximal to suture, and three setae distal to suture. Distal margin of podomere III with a fanlike tuft of setulae. Podomeres III and IV with tufts of very short, fine setulae at dorsal margin. Podomere VI with two thick claws and one seta; dorsodistal claw slightly smaller than middistal claw; length of short seta about one third length of middistal claw.

Appendage VII (Fig. 4G) with basal segment recurved, forming a knee; and apparently composed of two podomeres (I + II), separated by a

weak, incomplete suture; posterodistal angle (inside the knee) with one seta. Dorsal margin with one seta proximal to suture; and three setae distal to suture, two of them modified. Podomere III with one ventrodiscal seta, and one dorsodistal setula. Podomere IV with one ventrodiscal seta. Podomere V with two ventrodiscal setae. Podomere VI with two ventrodiscal setae, the most ventral one longest; and one reflexed seta of the same length of podomeres III to VI together. Furcal rods (Fig. 4H) symmetrical, long, thick, curved at tips, with conspicuous suture between rami and distal setae; with short proximal setae; distal two thirds of posterior margin of each ramus with thin, short barbs.

Male genitalia: hemipenis (Fig. 5A, B) oblong-ovate, posterior lamella subtriangular, one angle posteroventrally projected. Hemipenis approximately half of length of body. Zenker's organ (Fig. 5C, D) long, approximately three quarters of body length, with tiny terminal bulb; vas deferens arranged in three loose loops, about equal in length to Zenker's organ and situated around it.

REMARKS

Macrocyprina youngi n. sp. presents a ventral, huge aesthetasc medial to the hook of male right appendage V (Fig. 4A). This aesthetasc is similar to the distal aesthetasc of the podomere II of the same appendage. In the other species of Macrocypridae the aesthetasc ventral to the hook is, as Maddocks (1990: 16) describes it "delicate, sometimes hard to see".

The male appendages are known for 15 species of *Macrocyprina*: *M. africana*; *M. barbara*; *M. bermudae*; *M. captiosa*; *M. dispar*; *M. hartmanni*; *M. hawkae*; *M. hortuli*; *M. madagascarensis*; *M. moza*; *M. propinqua*; *M. schmitti*; *M. skinneri*; *M. succinea*; *M. swaini*. The male left appendages V of these species, with the exception of *M. hawkae*, are hook shaped, being similar to the respective right appendages. The male left appendage V of *M. youngi* n. sp. is remarkably different from these species, the ventral margin of the podomere I is concave, the podomere II is not recurved, and the lateral surface of the podomere II is densely setose. *Macrocyprina hawkae* presents a similar

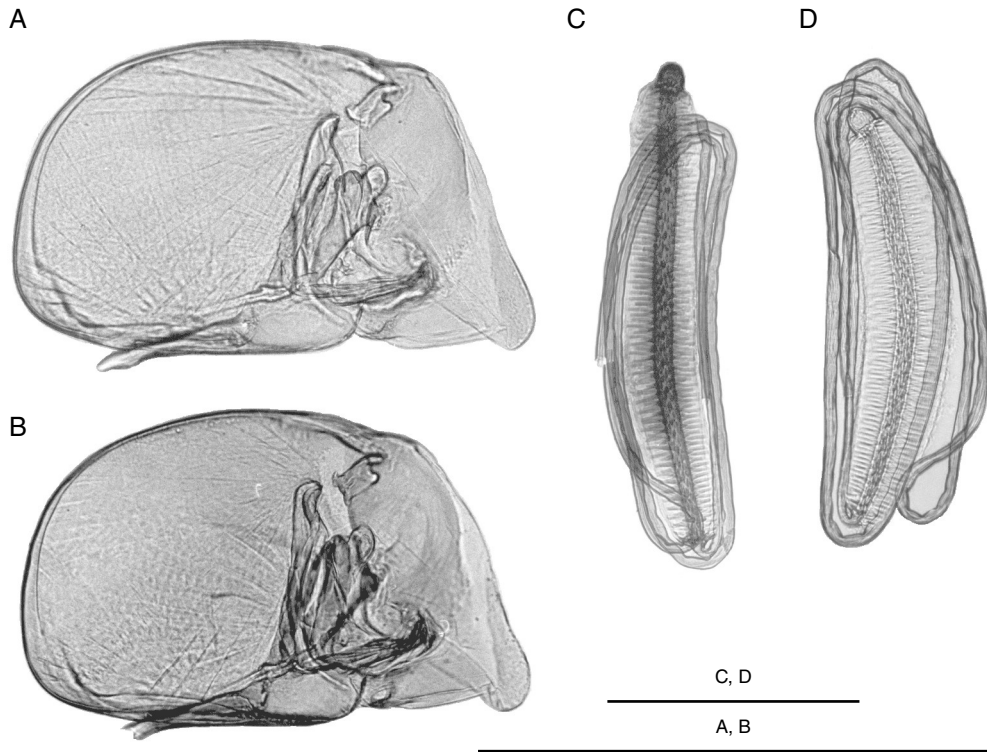


FIG. 5. — *Macrocyprina youngi* n. sp., paratypes (MNRJ 15701); **A**, spm 4, ♂; **B**, C, spm 8, ♂; **D**, spm 10, ♂; **A**, **B**, hemipenis; **C**, **D**, Zenker's organs. Scale bars: 0.4 mm.

modified male left appendage V, but the podomere II is vestigial (Maddocks 1990: fig. 28.15, 16). *Macrocyprina youngi* n. sp. is very similar to *M. hawkae*, which inhabits the Caribbean Sea, not only on the modified left appendage V (which was until now unique to *M. hawkae*), but also on carapace features, hemipenis and Zenker's organ. These two species differ in the following characters: *Macrocyprina hawkae* is less elongate, higher in proportion to length, with a more arcuate dorsal margin than *M. youngi* n. sp.; *M. hawkae* has larger lateral patches, tending to fuse with each other, and occupying great part of the lateral surface (Maddocks 1990: figs 16.11, 12, 17.11, 12), while *M. youngi* n. sp. has smaller and subcircular patches; the hirsute podomere II of male left appendage V is vestigial in *M. hawkae*, while in *M. youngi* n. sp. this podomere is conspicuous;

the posterior lamella of the hemipenis of *M. hawkae* is irregularly shaped, while *M. youngi* n. sp. presents a subtriangular posterior lamella.

The other 10 species were described from carapaces, and sometimes also from females appendages. *M. caiman*, *M. jamaicae*, *M. okinawae*, *M. parcens* and *M. vargata* are higher in proportion to length, with a more triangular outline than *M. youngi* n. sp.; *M. bonaducei* and *M. rattrayi* have more angulate anteroventral margins and deeper ventral indentations; *M. quadrimaculata* has a more straight ventral margin, with four lateral patches situated more dorsally, while *M. youngi* n. sp. has three large patches situated more ventrally and other smaller patches in variable positions. *Macrocyprina belizensis*, from Caribbean, and *M. noharai*, from West Pacific, are more similar to *M. youngi* n. sp. But *M. beli-*

zensis has a smaller size, the carapace is higher in proportion to length, with a more arched dorsal margin, with a deeper ventral indentation and larger opaque patches. *Macrocyprina noharai* has more equilateral valve, with a less arched dorsal margin, more narrowly rounded anterior margin, and with the middle and posterior lateral opaque patches tending to fuse, while the patches of *M. youngi* n. sp. are distinctly separated.

The carapace of *Macrocyprina* sp. 1 recorded by Dias-Brito *et al.* (1988) is higher in proportion to length, has a more arcuate dorsal margin, and a more straight ventral margin than *M. youngi* n. sp. The carapace of *Macrocyprina* sp. 2 recorded by Coimbra (1995) and Coimbra *et al.* (1992, 1999) has a more broadly concave ventral margin; a more convex dorsal margin; and a greater carapace length (1.6 mm vs 1.3 mm) than *M. youngi* n. sp. Furthermore, the posterodorsal margin of left valve of *Macrocyprina* sp. 2 is slightly concave, and in *M. youngi* n. sp. it is continuously convex.

Macrocyprina rocas n. sp.

(Figs 6-10)

TYPE MATERIAL. — Holotype: Rocas Atoll, 3°51.680'S, 33°49.604'W, on sponges and macroalgae, 19 m, P. S. Young, P. C. Paiva & A. A. Aguiar coll., 16.X.2000, adult ♀ in alcohol 70% (MNRJ 15702). Paratypes: same locality, 10 ♀♀, 5 ♂♂, 8 juvs (MNRJ 15703); same locality, 3 adults, 2 juvs (MNHN-Os 593); Rocas Atoll, 3°51.356'S, 33°49.559'W, on sediment and macroalgae, 16 m, 16.X.2000, P. S. Young, P. C. Paiva & A. A. Aguiar coll., 1 ♂, 4 juvs (MNRJ 15704); Rocas Atoll, Ilha do Cemitério, intertidal region, 9.XI.2001, C. S. Serejo & M. C. Rayol coll., 1 LV, 1 RV (MNRJ 16834); Rocas Atoll, outside of the Atoll, northwestern region, on macroalgae, 9 m, 3.I.2001, F. B. Pitombo & R. Barroso coll., 1 juv. (MNRJ 15705).

DIMENSIONS. — Holotype (MNRJ 15702) ♀: LV, h 0.39 mm, l 1.06 mm; RV, h 0.40 mm, l 1.08 mm. Paratypes (MNRJ 15702) spm 3, ♂: LV, h 0.40 mm, l 1.08 mm; RV, broken valve, l 1.09 mm; spm 2, ♂: LV, h 0.40 mm, l 1.10 mm; RV, h 0.40 mm, l 1.13 mm; spm X, ♂: LV, h 0.40 mm, l 1.08 mm; RV, h 0.40 mm, l 1.08 mm; spm 4, ♀: LV, h 0.40 mm, l 1.05 mm; RV, h 0.40 mm, l 1.08 mm; spm 5, ♀: LV, h 0.40 mm, l 1.05 mm; RV, h 0.41 mm, l 1.08 mm; spm 6, ♀: LV, h 0.41 mm, l 1.05 mm; RV, h 0.43 mm, l 1.08 mm; spm 7, ♂: LV, h 0.41 mm, l 1.10 mm; RV, h 0.44 mm, l 1.10 mm; sex unknown: LV, h 0.41 mm, l 1.08 mm; RV, h 0.43 mm, l 1.08 mm.

ETYMOLOGY. — The name refers to the type locality, Rocas Atoll, and is used in apposition.

DISTRIBUTION. — Recent. Only known from the type locality. Brazil, Rocas Atoll, between 9 and 19 m.

DIAGNOSIS. — Carapace elongate, fairly small, its lateral surface with one to four central opaque patches. Male appendages V very asymmetrical, right appendage larger than left; left appendage V bell-shaped, with base and two podomeres, podomere II not recurved, profusely setose. Zenker's organ with small terminal bulb; posterior lamella of hemipenis elongated dorsoventrally.

DESCRIPTION

Carapace yellow-brown in fresh specimens, fairly small (Fig. 6A-F), elongate in lateral outline, inequilateral, with ramified radial pore canals. Greatest height at midlength, slightly posterior to muscle scars. Length approximately 2.7 times maximum height. Lateral surface with one to four central opaque patches. Only posterodorsal patch (the largest one) present in all specimens, this patch is diagonally elongated, reaching the dorsal margin. Most specimens with one anterior medium-sized patch. Approximately half of specimens with a small centrodorsal patch in both valves, patch on right valve always stronger than patch on left valve; other specimens with this patch only on right valve. Few specimens with one centroventral medium-sized patch, with part of this patch on the adductor muscle scars. Cuticle present on lateral surface of carapace lightly coloured, not dark brown. Dorsal margin evenly low-arched, with indistinct dorsal angle. Posterodorsal margin fairly straight. Anterior margin of carapace unevenly rounded. Ventral margin sinuous, with conspicuous, broad indentation. Posterior angle rounded, dorsal and ventral margins forming an angle of about 55°. Zone of concrescence very broad. Adductor muscle scar pattern (Fig. 7B) with three large dorsal scars and about nine or 10 scars of variable sizes situated below. Carapace ovate-oblong in dorsal and ventral views (Fig. 6G, H).

Antenna I (Fig. 7A) with seven slender, elongate podomeres, with long, thin, flexible setae. Podomeres II and III fused with incomplete suture. Podomere VII with four setae, dorsodistal seta thinner than others.

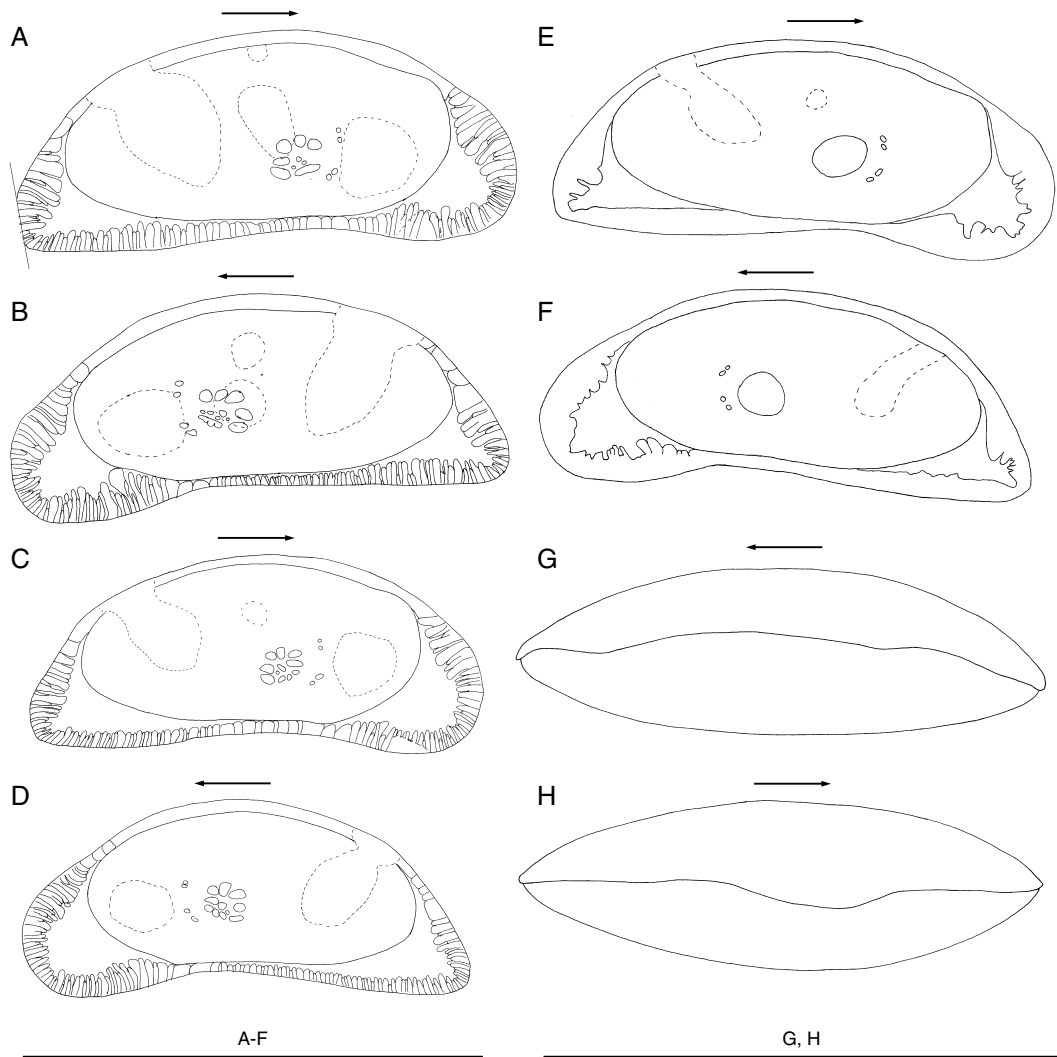


FIG. 6. — *Macrocyprina rocas* n. sp., paratypes (MNRJ 15703); **A, B**, spm 7, ♂; **C, D**, spm 6, ♀; **E, F**, spm 2, ♂; **A**, right valve; **B**, left valve; **C**, right valve; **D**, left valve; **E**, right valve; **F**, left valve; **G**, dorsal view of carapace; **H**, ventral view of carapace. The arrows point towards the anterior of the animal. Scale bars: 1 mm.

Antenna II (Fig. 7C-H) robust, with six podomeres. Podomere III, medially (Fig. 7D), with six long, subequal setae located ventrally at proximal margin; laterally, with dorsoproximal scale with three setae; ventrally at distal margin with four setae. Podomere IV with two thin setae at dorsal margin; with one thin seta near ventrodistal edge; medially, dorsodistal angle with three ventral setae, two of them sexually dimorphic (simple in female

and candle-shaped in male) (Fig. 7E, F); sexually dimorphic setae subequal in length in male, but in female more ventral seta about two thirds length of more dorsal seta. Male also with one thin seta dorsal to sexually dimorphic setae. Podomere V subtriangular (Fig. 7G); distal angle with four claws and one seta; dorsoproximal angle with two setae. Mandible (Fig. 8A) with a broad masticatory jaw (Fig. 8B) armed with one dorsal, conical tooth

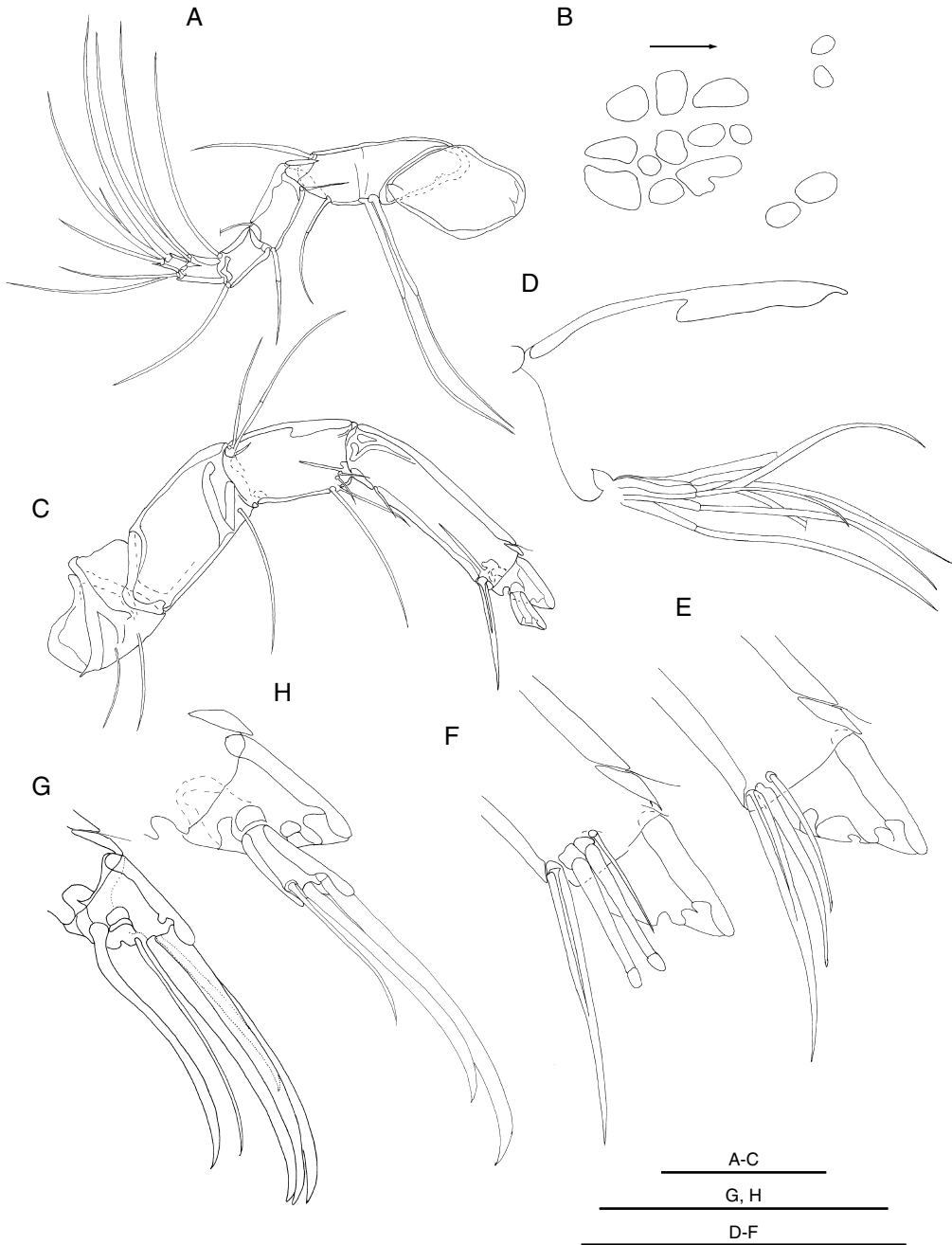


FIG. 7. — *Macrocyprina rocas* n. sp., paratypes (MNRJ 15703); **A-D, F-H**, spm 7, ♂; **E**, spm 5, ♀; **A**, antenna I; **B**, adductor muscle scars; **C**, antenna II; **D**, podomere III of antenna II; **E**, distal region of podomere IV of antenna II of female; **F**, distal region of podomere IV of antenna II of male; **G**, podomere V of antenna II; **H**, podomere VI of antenna II. The arrow points towards the anterior of the animal. Scale bars: 0.1 mm.

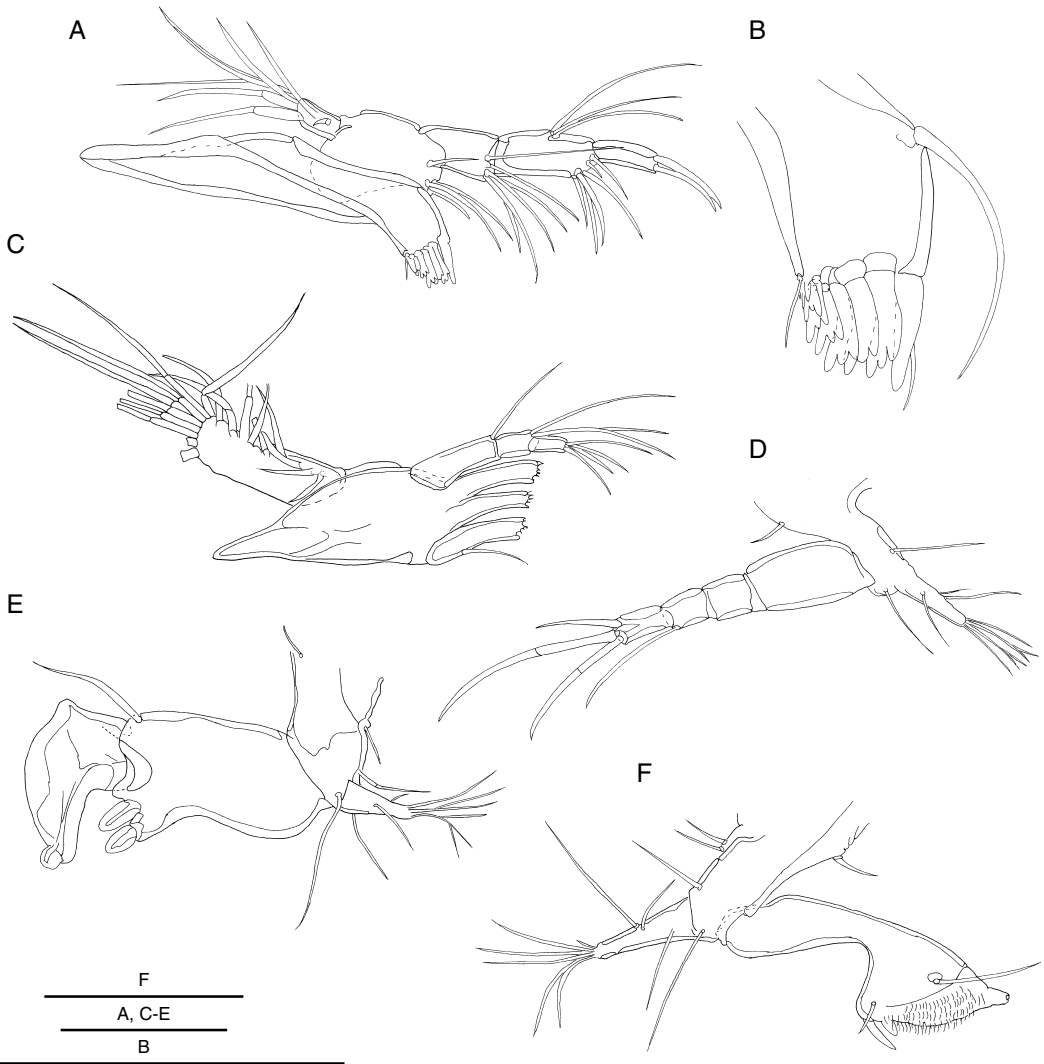


FIG. 8. — *Macrocyprina rocas* n. sp., paratypes (MNRJ 15703): **A-C, E, F**, spm 7, ♂; **D**, spm 5, ♀; **A**, mandible; **B**, masticatory jaw of mandible; **C**, maxilla I; **D**, female appendage V; **E**, male right appendage V; **F**, male left appendage V. Scale bars: 0.1 mm.

followed by six tricuspidate teeth and several setae and pegs. Podomere I of palp with exopodite with a dorsoproximal peg on medial surface, and six or seven distal setae. Podomere I with three ventrodiscal setae. Podomere II with six ventrodiscal setae. Podomere III with three mid-dorsal setae; and six ventrodiscal setae. Podomere IV with about three thick distal claws. Maxilla I (Fig. 8C) with three slender endites, each armed distally with a dense fringe of sub-

equal claws. Endite I with two ventral setae. Dorsal vibratory plate with two proximal setae; and with a series of long setae along posterior and ventral margins. Palp slender, flexible with three podomeres. Podomere II with three dorsodiscal setae. Podomere III with three distal setae. Anterior lobe of appendage V similar in males and females, with ten setae (Fig. 8D-F). Female left and right appendages V symmetrical, slender, with thick distal claws (Fig. 8D). Podomere IV

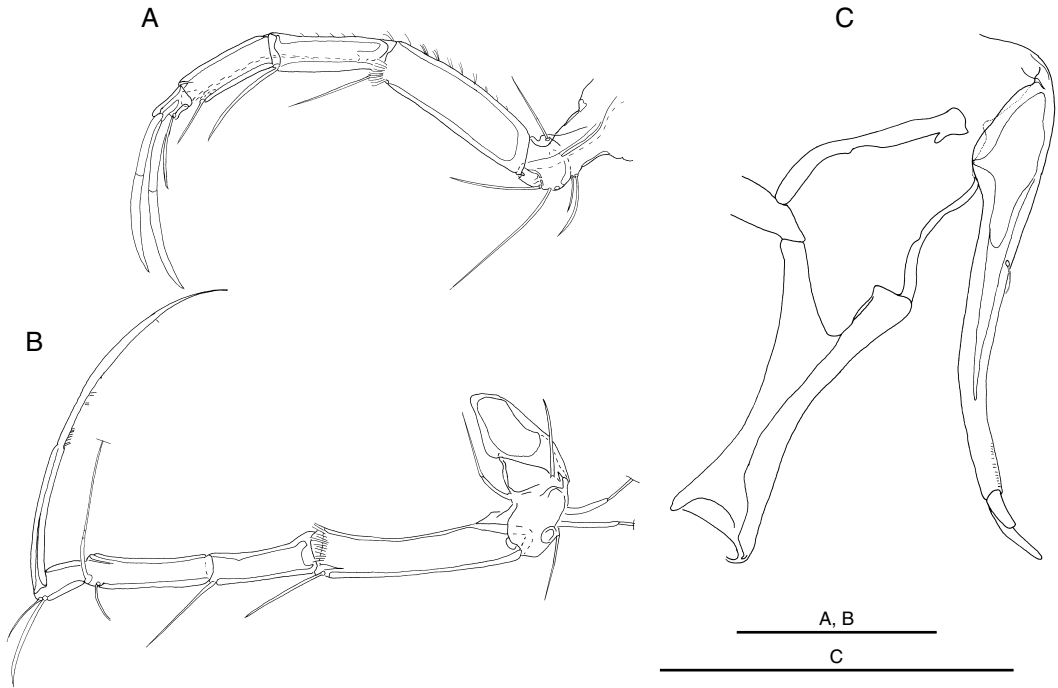


FIG. 9. — *Macrocyprina rocas* n. sp., paratype (MNRJ 15703), spm 7, ♂; **A**, appendage VI; **B**, appendage VII; **C**, furca. Scale bars: 0.2 mm.

with three distal claws (middistal one longest). Male appendages V very asymmetrical (Fig. 8E, F). Right appendage (Fig. 8E) robust, highly sclerotized, considerably larger, about 1.5 times length of left appendage. Palp hook-shaped, ventrodorsal angle of podomere I with two thick pegs; none or one short, thin seta; and none or one thick, short, cylindrical structure, similar to distal aesthetasc of hook. Dorsodorsal angle with one seta. Podomere II recurved at approximately 125°; with one robust, distal aesthetasc; without dorsal, thin aesthetasc (also without visible gap in dorsal cuticle). Left appendage (Fig. 8F) slightly sclerotized, highly modified. Podomere I with convex ventral margin; distal seta at lateral surface; ventrodorsal angle with two pegs and one short, thin seta. Podomere II short, but conspicuous, not recurved, lateral surface covered with numerous short setulae; with well developed aesthetasc on dorsodorsal angle; without thin, ventral aesthetascs (also without visible gaps in dorsal

and ventral cuticle). Suture between podomeres I and II conspicuous, but not complete. Podomeres I and II of appendage VI (Fig. 9A) fused, with an incomplete suture, and recurved, forming a knee; with one seta at posterodorsal angle (inside the knee); anterior margin (outside the knee) with two setae proximal to suture, and three setae distal to suture. Distal margin of podomere III with a fanlike tuft of setulae. Podomeres III and IV with tufts of very short, fine setulae at dorsal margin. Podomere VI with two thick claws and one seta; dorsodorsal claw slightly smaller than middistal claw; length of short seta about half the length of middistal claw. Appendage VII (Fig. 9B) with basal segment recurved, forming a knee; and apparently composed of two podomeres (I + II), separated by a weak, incomplete suture; posterodorsal angle (inside the knee) with one seta. Dorsal margin with one seta proximal to suture; and three setae distal to suture, two of them modified. Podomere III

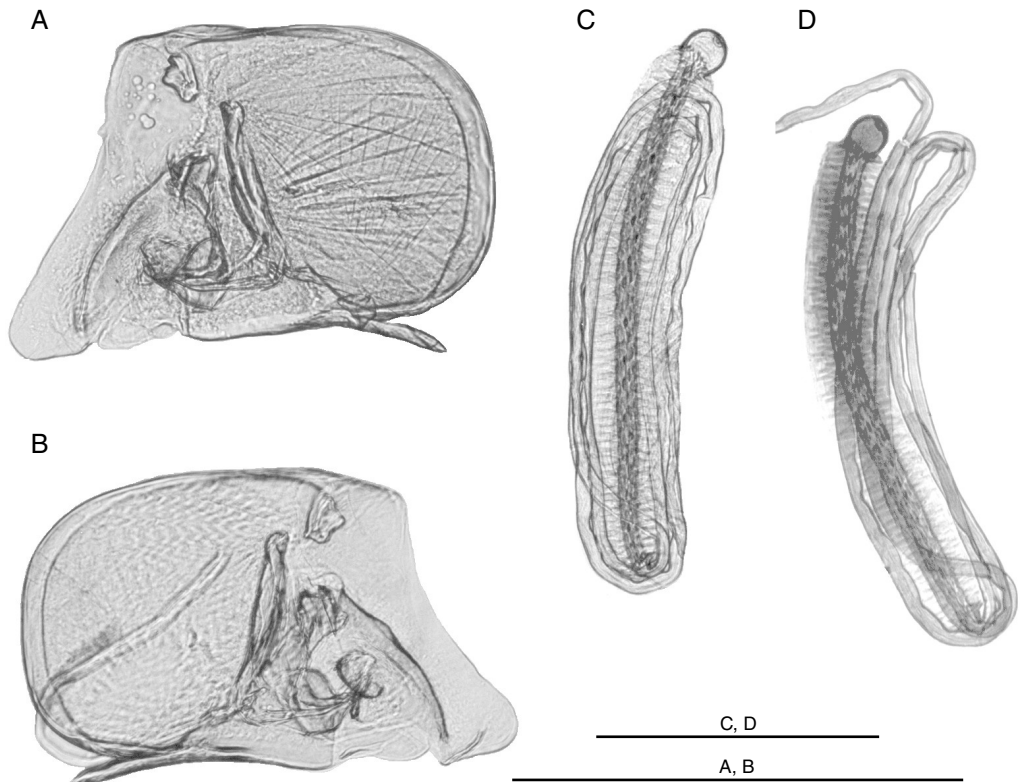


FIG. 10. — *Macrocyprina rocas* n. sp., paratypes (MNRJ 15703); **A**, spm 7, ♂; **B**, **D**, spm 3, ♂; **C**, spm 1, ♂; **A**, **B**, hemipenis; **C**, **D**, Zenker's organs. Scale bars: 0.3 mm.

with one ventrodistal seta, and a tuft of very short setulae at distal margin. Podomere IV with one ventrodistal seta. Podomere V with two ventrodistal setae. Podomere VI with two ventrodistal setae, the most ventral longest; and one reflexed seta of the same length of podomeres III to VI together.

Furcal rods (Fig. 9C) symmetrical, long, thick, curved at tips, with conspicuous suture between rami and distal setae; with short proximal setae; distal two thirds of posterior margin of each ramus with thin, short barbs.

Male genitalia: hemipenis (Fig. 10A, B) oblong-ovate, posterior lamella elongated. Hemipenis approximately half of length of body. Zenker's organ (Fig. 10C, D) long, approximately three quarters of body length, with small terminal

bulb; vas deferens arranged in three loose loops, about equal in length to Zenker's organ and situated around it.

REMARKS

An age-related variation in number and size of lateral patches is observed in specimens of *Macrocyprina*; the juveniles usually present fewer and smaller patches than adults (Maddocks 1990: 25). Only adults of *M. rocas* n. sp. (the appendages were used to determine the adulthood) were analysed in this study in order to describe the variation of the patches. Therefore, the described variation is not related to size and ontogenetic stages. The largest specimen analysed (spm 2, male: LV length 1.10 mm, RV length 1.13 mm) presents only the posterodorsal patch on the two valves, and

a small central patch on right valve (Fig. 6E, F); while another specimen of approximately the same size (spm 7, male: LV length 1.10 mm, RV length 1.10 mm) presents four well developed patches on both valves (Fig. 6A, B); and one smaller specimen (spm 6, female: LV length 1.05 mm, RV length 1.08 mm) presents three patches on each valve (Fig. 6C, D).

The male appendages are known for 15 species of *Macrocyprina* (enumerated in Remarks of *M. youngi* n. sp.). The male left appendages V of these species, with the exception of *M. hawkae*, are hook shaped, being similar to the respective right appendages. The male left appendage V of *M. rocas* n. sp. is remarkably different (Fig. 4C, D) from these species (details of these differences described to *M. youngi* n. sp. also apply to *M. rocas* n. sp.).

Beside the differences on the male left appendage V, *M. hawkae* has a more triangular carapace, presents larger lateral patches and less ramified radial pore canals than *M. rocas* n. sp.

The valves of *M. belizensis*, *M. caiman*, *M. jamaicae*, *M. noharai* and *M. parcens* are higher in relation to length, with more arched dorsal margins, and thinner zones of concrescence. The valves of *M. bonaducei* have a deeper ventral indentation, and are higher in proportion to length. *Macrocyprina okinawae* and *M. vargata* have more subtriangular and equilateral valves than *M. rocas* n. sp. The carapace of *M. quadrimaculata* has a more straight ventral margin, and smaller lateral patches, which are located in a more dorsal position. Finally, *M. rattrayi* has more subtriangular valves.

The outline of *Macrocyprina* sp. 1 recorded by Dias-Brito *et al.* (1988) is more subtriangular, with a more straight ventral margin than *M. rocas* n. sp. *Macrocyprina* sp. 2 recorded by Coimbra (1995: 38) and Coimbra *et al.* (1999: 373) is larger, with valves more elongated, less triangular, and presenting a straight posterodorsal margin, while the posterodorsal margin of *M. rocas* n. sp. is concave to slightly concave.

Macrocyprina youngi n. sp. is larger than *M. rocas* n. sp. The cuticle present on the lateral surface of the carapace of *M. youngi* n. sp. is dark brown, on

M. rocas n. sp. it is lightly coloured. *Macrocyprina youngi* n. sp. presents the valve with a more acute posterior angle than *M. rocas* n. sp. The ventral margin of *M. youngi* n. sp. is upswung and straight posteriorly, while that of *M. rocas* n. sp. is sinuous. The outlines of the male right appendages V are different in both species. The basal region of podomere I of male left appendage V of *M. youngi* n. sp. is thicker than that of *M. rocas* n. sp.; podomere II is subrectangular in *M. youngi* n. sp., and subtriangular in *M. rocas* n. sp. The terminal bulb of Zenker's organ of *M. youngi* n. sp. is proportionally smaller than terminal bulb of *M. rocas* n. sp.

Macrocyprina coimbrai n. sp.

(Figs 11-14)

MATERIAL EXAMINED. — Holotype: Abrolhos, BA, 17°59.646'S, 38°45.147'W, between 10 and 20 m, 20.III.1995, P. S. Young, CBC, CAE, RJTS coll., 1 dissected ♂, appendages in slide with CMC medium, valves in micropalaeontological slide (MNRJ 15706). Paratypes: same locality, 1 ♂, 1 ♀, 2 spms (MNRJ 15714); Abrolhos, BA, 17°58.853'S, 38°39.629'W, on carbonate sediment, 25 m, 24.II.2000, 3 adult ♂♂ with damaged appendages, 1 adult of indeterminate sex, 2 ♀♀, 40 RLV, 1 RV, 1 LV (MNRJ 15713); same locality, 1 RLV (MNHN-Os 594); 17°59.646'S, 38°45.147'W, between 10 and 20 m, on sponges, 20.III.1995, P. S. Young, CBC, CAE, RJTS coll., 1 adult, 2 juvs, 1 LV (MNRJ 15715); 17°59.646'S, 38°45.147'W, between 10 and 20 m, on corals, 20.III.1995, P. S. Young, CBC, CAE, RJTS coll., 2 ♀♀ (MNRJ 15716); Abrolhos, BA, Paredes Reef, 17°46.029'S, 39°02.655'W, between 10 and 20 m, 19.III.1995, P. S. Young, CBC, CAE, RJTS coll., 2 adults (MNRJ 15711); 17°46.029'S, 39°02.655'W, on corals, 19.III.1995, P. S. Young, CBC, CAE, RJTS coll., 2 ♂♂, 1 ♀, 1 juv. (MNRJ 15712); same locality, 1 ♀ (MNHN-Os 595); on sponges, 3.III.1994, P. S. Young, C. S. Serejo coll., 1 adult (MNRJ 15708); Abrolhos, BA, Coroa Vermelha, Nova Viçosa, on corals and sponges, 25.I.1995, P. S. Young, C. S. Serejo coll., 1 ♂, 6 juvs (MNRJ 15718); same locality, 1 juv. (MNHN-Os 596); Abrolhos, BA, Viçosa Reef, 28.II.1994, P. S. Young, A. L. Leta, C. B. Castro coll., on corals, 1 ♂, 2 juvs (MNRJ 15710); 17°58.30'S, 39°15.40'W, on algae, 18.III.1995, P. S. Young, CBC, CAE, RJTS coll. (MNRJ 18629).

DIMENSIONS. — Holotype (MNRJ 15706) ♂: LV, h 0.58 mm, l 1.40 mm; RV, h 0.60 mm, l 1.43 mm. Paratypes (MNRJ 15713) spm 1, ♀: LV, h 0.55 mm, l 1.44 mm; RV, h 0.59 mm, l 1.45 mm; spm 2, ♀: LV, h 0.55 mm, l 1.43 mm; RV, h 0.58 mm, l 1.44 mm;

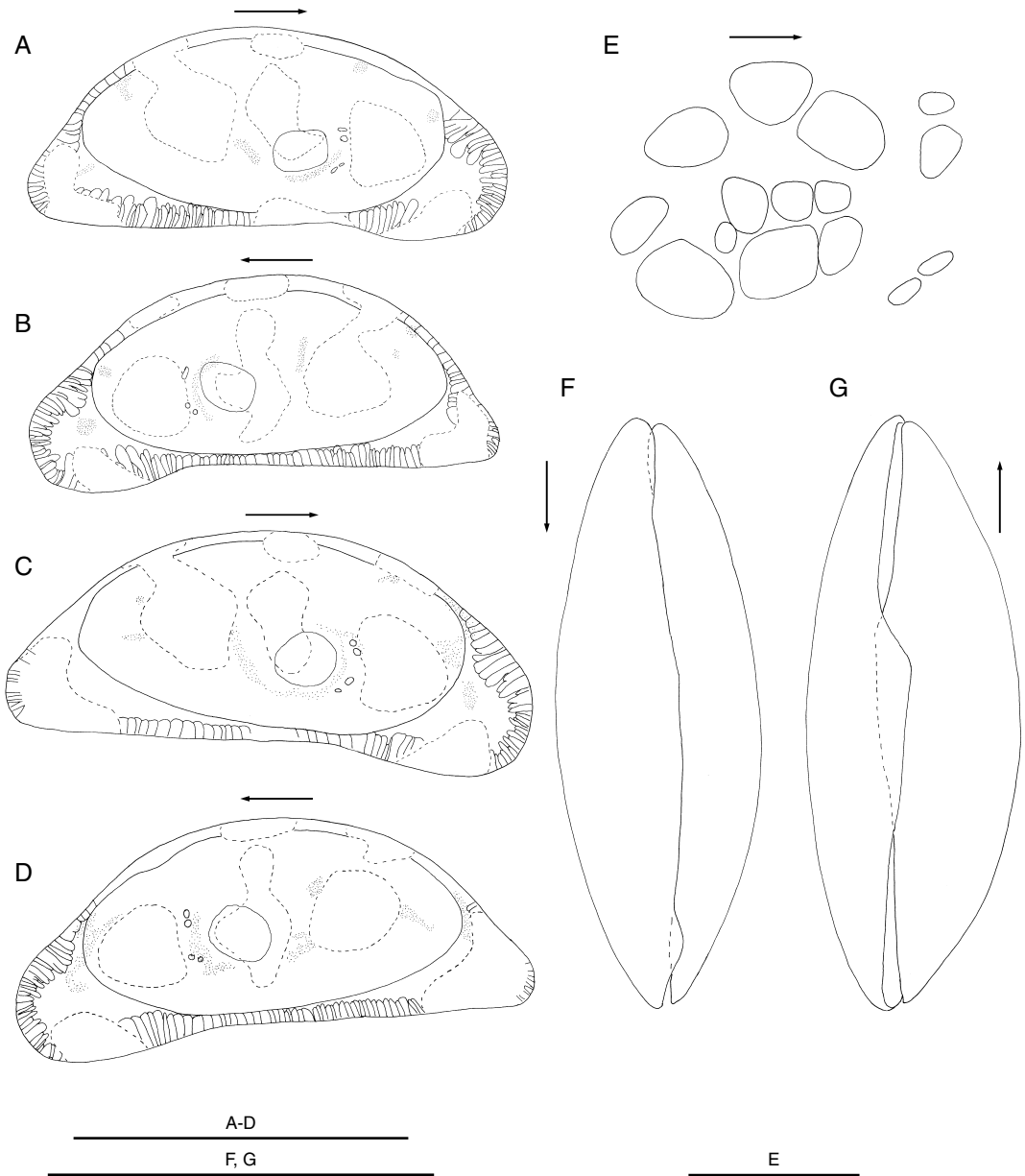


FIG. 11. — *Macrocyprina coimbrai* n. sp.; **A, B, E**, holotype ♂ (MNRJ 15706); **C, D**, paratype ♀ (MNRJ 15713), spm 2; **F, G**, paratype ♂ (MNRJ 15714), spm 5; **A**, right valve; **B**, left valve; **C**, right valve; **D**, left valve; **E**, adductor muscle scars; **F**, dorsal view of carapace; **G**, ventral view of carapace. The arrows point towards the anterior of the animal. Scale bars: A-D, F, G, 1 mm; E, 0.1 mm.

spm 5, ♂: LV, h 0.60 mm, l 1.51 mm; RV, h 0.63 mm, l 1.53 mm; spm 7 (MNRJ 15715), ♀: LV, h 0.55 mm, l 1.38 mm; RV, h 0.58 mm, l 1.40 mm.

ETYMOLOGY. — Named in honor of Dr João C. Coimbra (Universidade Federal do Rio Grande do

Sul), who has published important studies on Brazilian ostracods, and who helped me in my first steps studying ostracods.

DISTRIBUTION. — Recent. Brazil, south Bahia, between 10 and 25 m.

DIAGNOSIS. — Carapace large, elongate-ovate in lateral outline, with conspicuous posterodorsal concavity, lateral surface with three large central patches, other irregular patches at dorsal and ventral margins. Male appendages V very asymmetrical, right appendage larger than left; left appendage bell-shaped, with base and two podomeres, most ventral peg of podomere I elongated; podomere II not recurved, profusely setose. Zenker's organ with small terminal bulb; hemipenis with bilobated posterior lamella.

DESCRIPTION

Carapace large (Fig. 11A-D), elongate-ovate in lateral outline, inequilateral, with slightly ramified radial pore canals. Greatest height at mid-length, slightly posterior to muscle scars. Length approximately 2.6 times maximum height. Lateral surface with three large patches. Anterior patch subcircular; central patch elongated tending to fuse with the small, elongated mid-dorsal patch; posterior patch subcircular to subquadrate, also tending to fuse with the small, elongated, posterodorsal patch. One anterior patch sometimes present in dorsal margin. Two medium-sized, irregular patches anteriorly and posteriorly at ventral margin, one small patch sometimes present at mid-ventral margin. Dark brown cuticle covering small areas around adductor muscle scars, and at anterodorsal and posterior regions of valve surface. Anterior margin narrowly rounded. Ventral margin rounded anteriorly, with conspicuous, broad indentation, upswung posteriorly. Posterior angle truncate, dorsal and ventral margins forming an angle of about 50°. Posterodorsal margin concave. Dorsal margin evenly arched, with indistinct dorsal angle, with slight anterodorsal concavity. Irregular zone of concrescence broad, especially anterodorsally. Adductor muscle scar pattern (Fig. 11E) with three large, dorsal scars and seven or eight scars of variable size situated below. Carapace elongate in dorsal and ventral views (Fig. 11F, G).

Antenna I (Fig. 12A) with seven slender, elongate podomeres, with long, thin, flexible setae. Podomeres II and III fused with very slight, incomplete suture. Podomere VII with four setae. Antenna II (Fig. 12B-F) robust, with six podomeres. Podomere III, medially, with seven subequal setae located ventrally at proximal margin;

laterally, dorsoproximal scale with three setae; ventrally at distal margin with four setae. Podomere IV with two thin setae proximally at dorsal margin; with one thin seta near ventrodistal edge; medially, dorsodistal angle with three setae, two of them median-sized, sexually dimorphic setae (simple in female and candle-shaped in male) (Fig. 12C, D); sexually dimorphic setae subequal in length in male, but in female more ventral seta about two thirds length of more dorsal seta. Male also with one thin seta dorsal to sexually dimorphic setae. Podomere V subtriangular (Fig. 12E); distal angle with four claws and one seta; dorsoproximal angle with one claw and one seta.

Mandible (Fig. 12G) with a broad masticatory jaw armed with one dorsal, conical tooth followed by six tricuspidate teeth and several setae and pegs. Podomere I with exopodite with a dorsoproximal peg on medial surface, and five distal setae. Podomere I with three setae at ventrodistal angle. Podomere II with eight ventrodistal setae. Podomere III with three mid-dorsal setae; and six ventrodistal setae. Podomere IV with about five thick distal claws.

Maxilla I (Fig. 12H) with three slender endites, each armed distally with a dense fringe of subequal claws. Endite I with two ventral setae. Dorsal vibratory plate with two proximal setae; and with a series of long setae along posterior and ventral margins. Palp slender, flexible with three podomeres. Podomere II with four dorsodistal setae. Podomere III with five distal setae.

Anterior lobe of appendage V similar in males and females (Fig. 13A, B), with 10 to 12 setae. Female left and right appendages V symmetrical, slender, with thick distal claws (Fig. 13A). Podomere IV with three distal claws (middistal one longest). Male appendages V very asymmetrical (Fig. 13B, C). Right appendage (Fig. 13B) robust, highly sclerotized, considerably larger, about 1.5 times length of left appendage. Palp hook-shaped, ventrodistal angle of podomere I with two thick pegs; and one short, thin seta. Dorsodistal angle with one seta. Podomere II recurved at approximately 110°; with one robust, distal aesthetasc; without thin aesthetascs (also

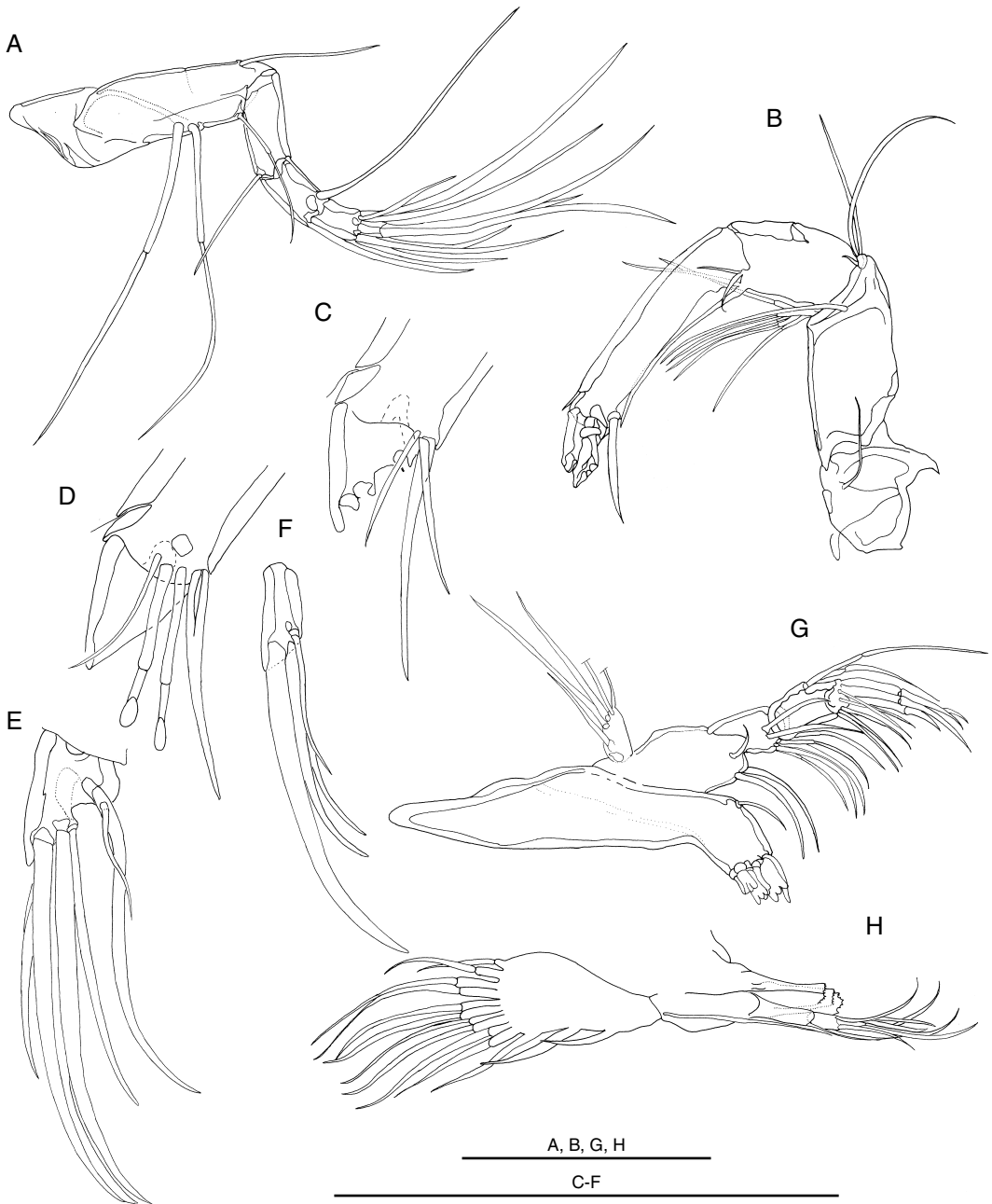


FIG. 12. — *Macrocyprina coimbrai* n. sp.; **A, B, D-H**, holotype ♂ (MNRJ 15706); **C**, paratype ♀ (MNRJ 15714), spm 7; **A**, antenna I; **B**, antenna II; **C**, distal region of podomere IV of antenna II of female; **D**, distal region of podomere IV of antenna II of male; **E**, podomere V of antenna II; **F**, podomere VI of antenna II; **G**, mandible; **H**, maxilla I. Scale bars: 0.2 mm.

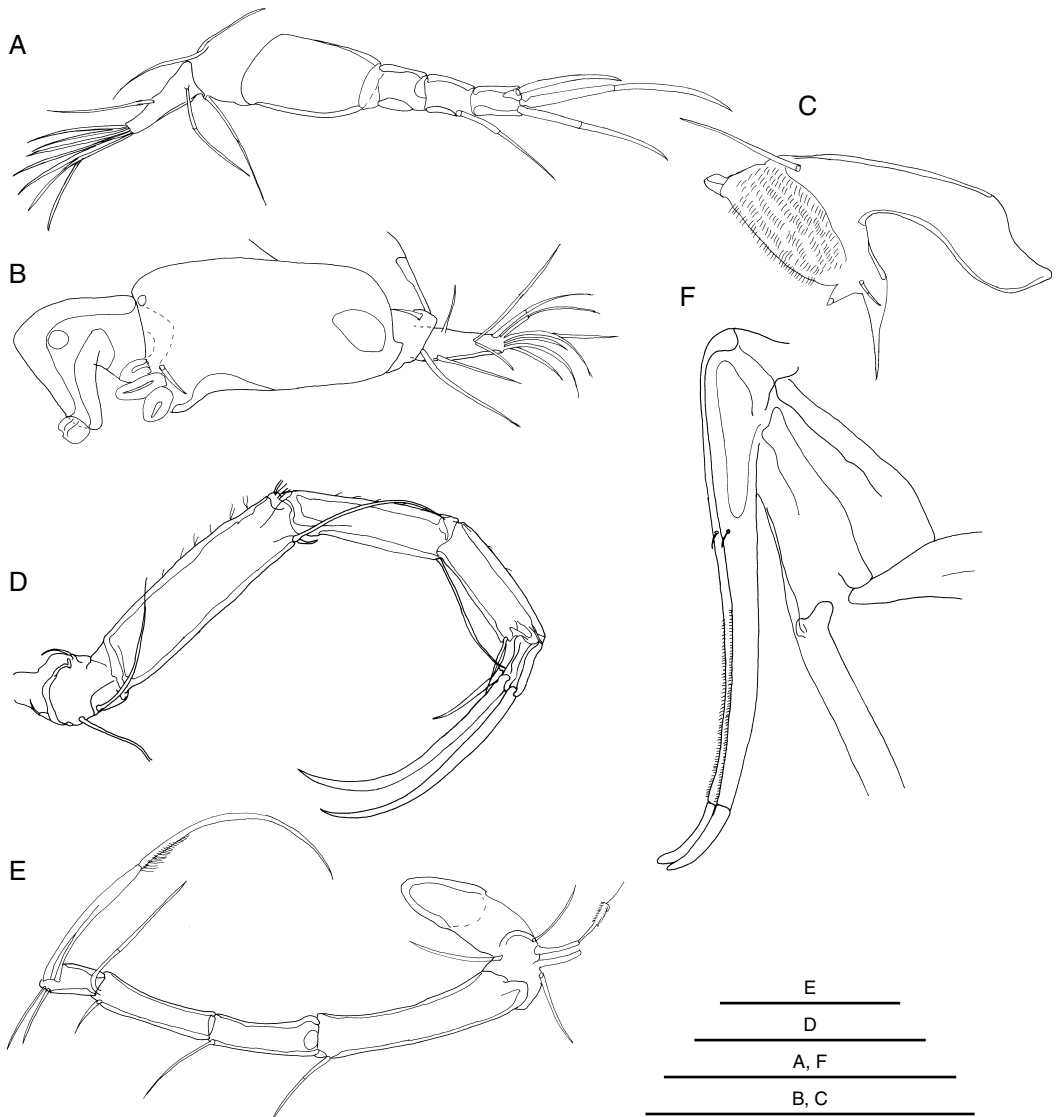


FIG. 13. — *Macrocyprina coimbrai* n. sp.; **A**, paratype ♀ (MNRJ 15714), spm 7; **B-F**, holotype ♂ (MNRJ 15706); **A**, female appendage V; **B**, male right appendage V; **C**, male left appendage V; **D**, appendage VI; **E**, appendage VII; **F**, furca. Scale bars: 0.2 mm.

without visible gaps in dorsal and ventral cuticle). Left appendage (Fig. 13C) slightly sclerotized, highly modified. Podomere I with convex ventral margin; distal seta at dorsodistal angle; ventrodiscal angle with one short, thin seta; and two pegs, one of them thick basally and elongated distally. Podomere II short, but conspicuous, not recurved, lateral surface covered with numerous short

setulae; with well developed aesthetasc on dorso-distal angle; without thin, ventral aesthetasc (also without visible gaps in dorsal and ventral cuticle). Suture between podomeres I and II conspicuous, but not complete.

Podomeres I and II of appendage VI (Fig. 13D) fused, with an incomplete suture, recurved, forming a knee; with one seta at posterodistal angle

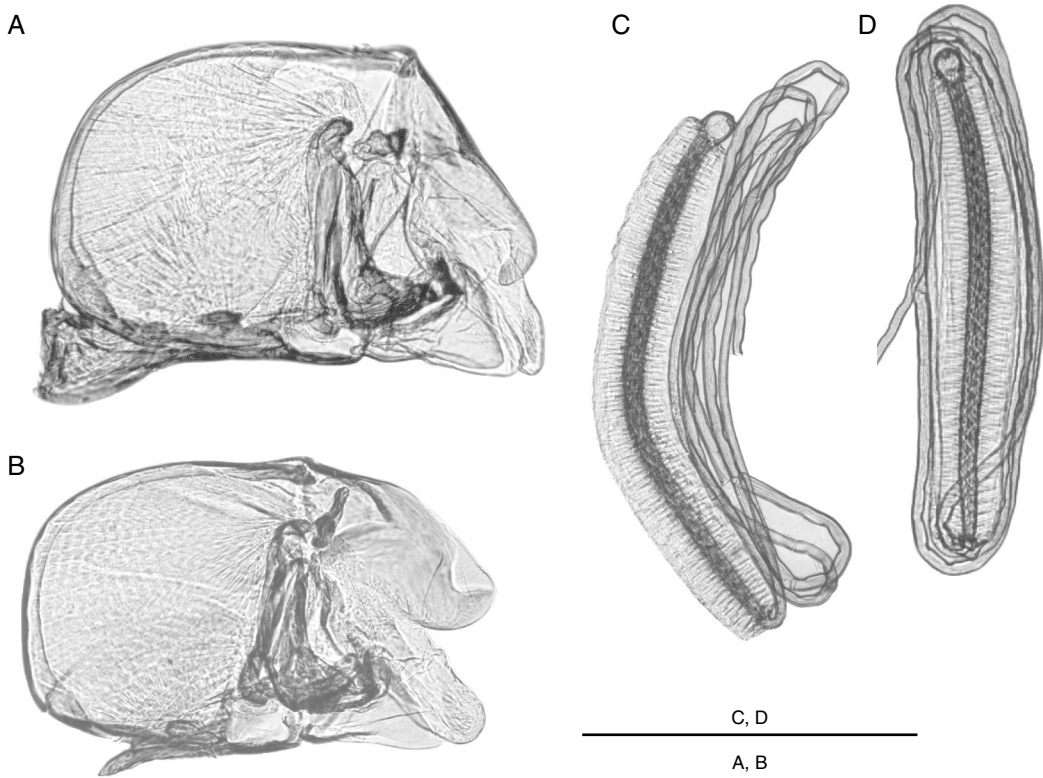


FIG. 14. — *Macrocyprina coimbrai* n. sp.; **A, C**, holotype ♂ (MNRJ 15706); **B, D**, paratype (MNRJ 15714), spm 5, ♀; **A, B**, hemipenis; **C, D**, Zenker's organs. Scale bars: 0.5 mm.

(inside the knee); anterior margin (outside the knee) with two setae proximal to incomplete suture, and three setae distal to suture. Distal margin of podomere III with a fanlike tuft of setulae. Podomeres III, IV and V with tufts of very short, fine setulae at dorsal margin. Podomere VI with two thick claws and one seta; dorsodistal claw slightly smaller than middistal claw; length of short seta about one third length of middistal claw.

Appendage VII (Fig. 13E) with basal segment recurved, forming a knee; and apparently composed of two podomeres (I + II), separated by a weak, incomplete suture; posterodistal angle (inside the knee) with one seta. Dorsal margin with one seta proximal to suture; and three setae distal to suture, two of them modified. Podomere III with one ventrodistal seta. Podomere IV with one ventrodistal seta. Podomere V with two ventrodistal

setae. Podomere VI with two ventrodistal setae, the most ventral longest; and one reflexed seta, same length of podomeres III to VI together. Furcal rods (Fig. 13F) symmetrical, long, rather thick, curved at tips, with conspicuous suture between rami and distal setae; with short proximal setae; distal two thirds of posterior margin of each ramus with thin, short barbs.

Male genitalia: hemipenis (Fig. 14A, B) oblong-ovate, with bilobated posterior lamella; hemipenis approximately half of length of body. Zenker's organ (Fig. 14C, D) long, approximately two thirds of body length, with tiny terminal bulb; vas deferens arranged in three loose loops, about equal in length to Zenker's organ and situated around it.

REMARKS

The male appendages are known for 15 species of *Macrocyprina* (enumerated in Remarks of *M. youngi*

n. sp.). The male left appendages V of these species, with the exception of *M. hawkae*, are hook-shaped, being similar to the respective right appendages. The male left appendage V of *M. coimbrai* n. sp. is remarkably different (Fig. 13C) from these species (details of these differences described to *M. youngi* n. sp. also apply to *M. coimbrai* n. sp.). Beside the differences on the male left appendage V, the carapace outline of *M. hawkae* is less elongated, higher in proportion to length than that of *M. coimbrai* n. sp.; the lateral patches of *M. hawkae* are larger; the posterior angle of *M. hawkae* is more acute; the podomere I of the male left appendage V of *M. hawkae* presents a short ventral peg, while in *M. coimbrai* n. sp. this peg is elongated; and the posterior lamella of the hemipenis of *M. hawkae* is irregularly shaped, while in *M. coimbrai* n. sp. the posterior lamella is bilobated.

Macrocyprina belizensis presents the valves with the anterior margin less acutely rounded; the ventral margin more concave; and anterodorsal and posterodorsal margins less sinuous than *M. coimbrai* n. sp. *Macrocyprina bonaducei* has a more truncate anterior margin and a deeper ventral indentation. *Macrocyprina caiman* has a less sinuous dorsal margin and a deeper ventral indentation. *Macrocyprina jamaicae* and *M. noharai* have less sinuous outlines; less lateral patches; and narrower zones of concrescence. *Macrocyprina okinawae* has a more subtriangular and equilateral outline. *Macrocyprina parcens* has a more truncate anterior margin; a unique, large lateral patch; and narrower zone of concrescence. *Macrocyprina quadrimaculata* has a more straight ventral margin, and a less sinuous dorsal margin. *Macrocyprina ratrayi* has a less sinuous and more subtriangular outline. And *M. vargata* is more equilateral, with a more concave ventral margin.

Macrocyprina sp. 1 recorded by Dias-Brito *et al.* (1988) presents a less sinuous outline, without the posterodorsal concavity and ventral indentation present in *M. coimbrai* n. sp.

Macrocyprina sp. 2 recorded by Coimbra (1995) and Coimbra *et al.* (1999) is larger, has a more broadly rounded anterior margin, and a more straight posterodorsal margin than *M. coimbrai* n. sp.

Macrocyprina youngi n. sp. is smaller, and lower in relation to length, with proportionately small

lateral patches, with less acute posterior angle than *M. coimbrai* n. sp. In dorsal view, *M. youngi* n. sp. has less acutely tapering anterior and posterior ends, and the male left appendage V presents a less elongated ventral peg.

The carapace of *M. rocas* n. sp. is smaller and more elongated than *M. coimbrai* n. sp., with a less acute posterior angle, and with a concave ventral margin, while in *M. coimbrai* n. sp. this margin is posteriorly upswing. In dorsal view, *M. rocas* n. sp. has more parallel sides, while *M. coimbrai* n. sp. is more lozenge-shaped. The podomere I of male left appendage V of *M. rocas* n. sp. has a shorter ventral peg than that of *M. coimbrai* n. sp.

DISCUSSION

MORPHOLOGY

While revising the Macrocyprididae, Maddocks (1990) made a general description of the family. However, some of the characters listed in this revision do not agree with the new species of *Macrocyprina* described herein. These features are presented below.

Maddocks (1990: 15) observed six setae on the exopodite of the mandible, but in the new species the number of setae varies: *Macrocyprina youngi* n. sp. presents seven setae; *M. rocas* n. sp. six or seven, and *M. coimbrai* n. sp. five.

Maddocks (1990: 15) recorded three dorsodistal setae on podomere II of the maxilla I palp. Despite some specimens figured by this author present four dorsodistal setae (Maddocks 1990: figs 78.1, 78.7, 79.1, 79.7, 79.12). *Macrocyprina youngi* n. sp. and *M. coimbrai* n. sp. present four long dorsodistal setae, while *M. rocas* n. sp. presents three setae.

Maddocks (1990: 15) cited one basal seta at each of the three endites of maxilla I, but in the figures of this previous publication there is no species with setae at the base of endites II and III and there are species with one or two basal setae on endite I (Maddocks 1990: figs 78.5-7, 79.6). The three new species of this study have only two long basal setae on the endite I, and the other two endites do not present any basal setae.

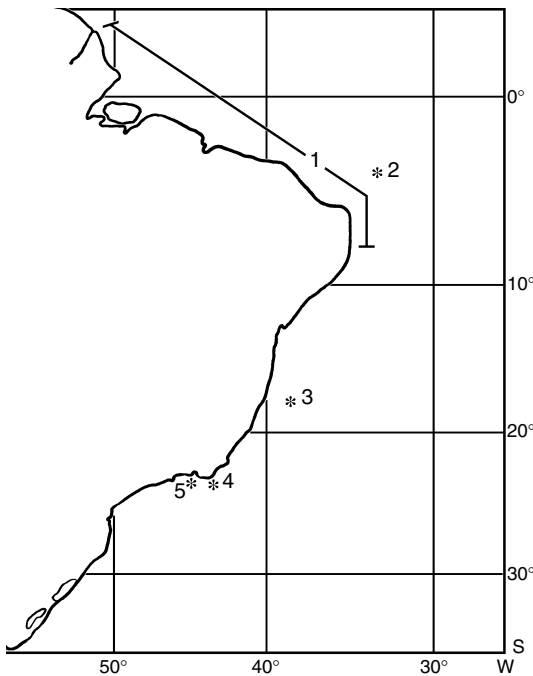


FIG. 15. — Geographic distribution of *Macrocyprina* along Brazilian coast; 1, *Macrocyprina* sp. of Coimbra (1995) and Coimbra *et al.* (1999); 2, *M. rocas* n. sp.; 3, *M. coimbrai* n. sp.; 4, *M. youngi* n. sp.; 5, *M.* sp. of Dias-Brito *et al.* (1988).

Maddocks (1990: 16) recorded one dorsal and one ventral aesthetascs on the podomere II of male right and left appendage V. Maddocks (1990) stated that, most of the time, these aesthetascs are very thin and difficult to see, but being usually indicated by a gap in the neighbouring cuticle. None of the species described herein present the dorsal aesthetasc, nor the gap in the cuticle. Only *M. youngi* n. sp. presents the ventral aesthetasc.

Concerning the morphology of the strongly modified male left appendage V of *Macrocyprina hawkae*, Maddocks (1990) stated that the “vestigial, triangular extension”, present on the dorsodistal region of the appendage, might be homologous to the podomere II (hook) of the macrocypridid non-modified appendages. Based on the morphology of the three new species, I suppose that the non-modified podomere II might be homologous to the hirsute podomere II present in the left modified appendages. In this way, the dorsodistal “vestigial, triangular exten-

sion” described by Maddocks (1990) might be homologous to the distal, ventral aesthetasc of the non-modified podomere II. In the modified appendages, this aesthetasc occupies the dorsal margin, instead of the ventral, due to the straight, not recurved disposition of the podomere. The setae present on the distal margin of podomeres I of modified left appendages (dorsal in *M. hawkae* and *M. coimbrai* n. sp.; and at lateral surface on *M. youngi* n. sp. and *M. rocas* n. sp.) might be homologous to the dorsodistal setae of podomere I of non-modified appendages V of Macrocyprididae. The modified male left appendage V indicate a phylogenetic closeness between the three species described herein and *M. hawkae*.

The dorsoproximal peg present on the medial surface of the exopodite of mandible described to the three new species (Figs 3C; 8A; 12G), have never been described nor figured in any other species of Macrocyprididae. In this way, this character may have taxonomic importance. However, further analysis on the morphology and function of this structure, and involving several species of the genus, is necessary to support any assumption.

DISTRIBUTION

At the moment, five species of *Macrocyprina* have been recorded from Brazil (Fig. 15). They inhabit the continental shelf, shallow continental slope and in the Rocas Atoll (1 to 223 m), and occur only in the Holocene.

With the exception of the studies of Coimbra (1995) and Coimbra *et al.* (1999), which concerned 207 samples of sediment containing ostracods collected from north Brazil, the records of *Macrocyprina* along the Brazilian coast are scarce. Therefore, more studies involving samples of Macrocyprididae from other geographic localities are necessary until the actual diversity and geographic distribution of the species of *Macrocyprina* along the Brazilian coast have been known.

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