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1031

**Deep-sea Oplophoridae (Crustacea Caridea) from the southwestern Brazil**

IRENE CARDOSO & PAULO YOUNG



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## Deep-sea Oplophoridae (Crustacea Caridea) from the southwestern Brazil

IRENE CARDOSO & PAULO YOUNG

Museu Nacional / UFRJ, Quinta da Boa Vista, 20940-040 - Rio de Janeiro — RJ, Brazil  
email: irenecardoso@mn.ufrj.br

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### ABSTRACT

The Brazilian expeditions Revizee and Oceanprof collected samples from the southwest Brazilian coast between depths of 200 and 2200m. These expeditions sampled eleven species of

Oplophoridae, ten of them new records for Southwestern Atlantic: *Oplophorus gracilirostris* A. Milne Edwards, 1881; *O. spinosus* (Brullé, 1839); *Acanthephyra eximia* A. Milne Edwards, 1881; *A. acutifrons* Bate, 1888; *A. quadrispinosa* Kemp, 1939; *A. stylorostratis* (Bate, 1888); *Ephyrina benedicti* Smith, 1885; *Janicella spinicauda* (A. Milne Edwards, 1883); *Notostomus elegans* A. Milne Edwards, 1881; *Systellaspis debilis* (A. Milne Edwards, 1881) and *S. pellucida* (Filhol, 1885). The specimens are described and figured.

**Key words:** Crustacea Caridea, Oplophoridae, Southwest Atlantic, deep-sea, taxonomy

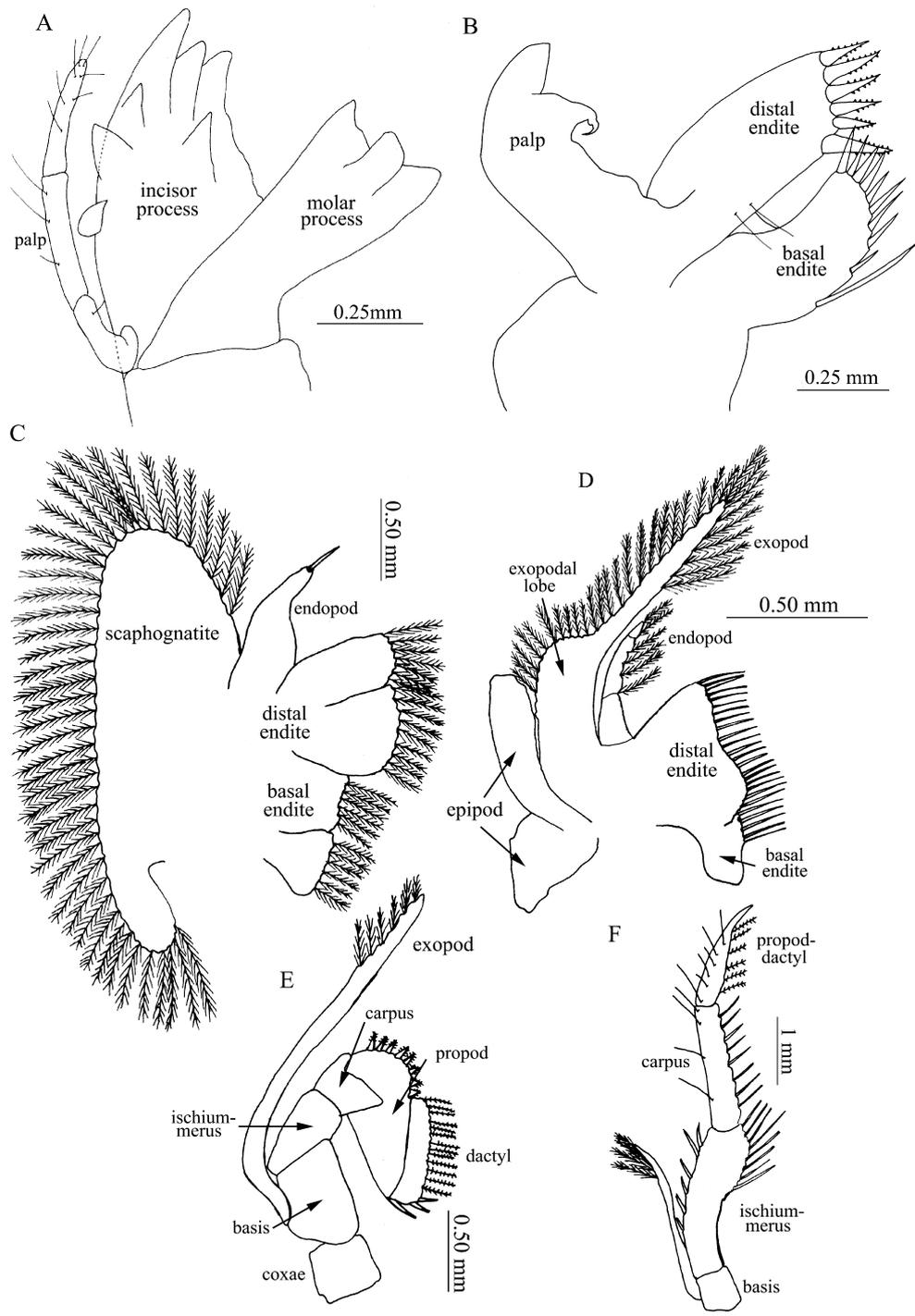
## INTRODUCTION

The Caridea Dana, 1852 includes the family Oplophoridae Dana, 1852 and another 35 families (Martin & Davis 2001). The Oplophoridae was first defined by Dana (1852) and presently includes ten genera and 74 species: *Oplophorus* H. Milne Edwards, 1837, with four species (type species *O. typus* H. Milne Edwards, 1837); *Hymenodora* Sars, 1877, with four species (type species *Pasiphaë glacialis* Buchholz, 1874); *Acanthephyra* A. Milne Edwards, 1881, with 34 species (type species *A. armata* A. Milne Edwards, 1881); *Notostomus* A. Milne Edwards, 1881, with nine species (type species *N. gibbosus* A. Milne Edwards, 1881); *Meningodora* Smith, 1882, with four species (type species *M. mollis* Smith, 1882); *Ephyrina* Smith, 1885, with six species (type species *E. benedicti* Smith, 1885); *Systellaspis* Bate, 1888, with ten species (type species *S. lanceocaudata* Bate, 1888); *Heterogenys* Chace, 1986, monotypic (*Acanthephyra microphthalmia* Smith, 1885); *Janicella* Chace, 1986, monotypic (*Oplophorus spinicauda* A. Milne Edwards, 1883); and *Kemphyra* Chace, 1986, monotypic (*Notostomus corallinus* A. Milne Edwards, 1883) (Crosnier & Forest 1973; Chace 1986; Wasmer 1986; Crosnier 1987; Holthuis 1993).

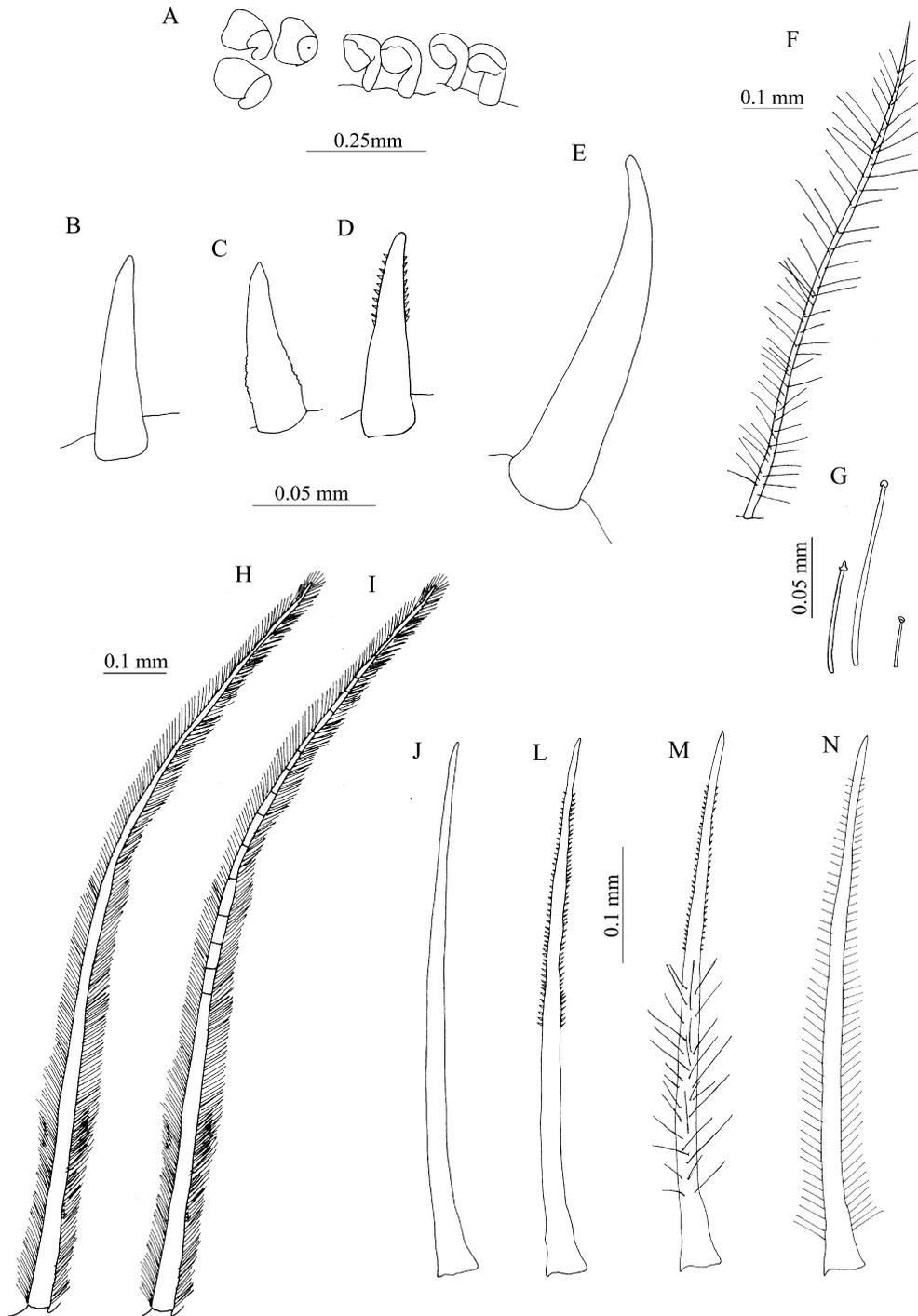
From the Brazilian coast, *Acanthephyra eximia*, *Meningodora mollis* and *Notostomus gibbosus* were recorded only (Ramos-Porto & Coelho 1998). This study describes and figures eleven species of Oplophoridae collected from the Southwestern Atlantic collected during the Revizee and Oceanprof Programs.

All the measurements presented are of the carapace length, taken from the rostrum base to the carapace end. The nomenclature of the cephalic structures was followed that of McLaughlin (1980) (Fig. 1) and the setae nomenclature used was that presented by Watling (1989) (Fig. 2).

Abbreviations used: ai — appendix interna; am — appendix masculina; as — antennal spine; bas — basis; brc — branchiostegal carina; brs — branchiostegal spine; c — carpus; cg — cervical groove; goc — gastro—orbital carina; hc — hepatic carina; hg — hepatic groove; igoc — infra gastro—orbital carina; i—m — ischium—merus; lrc — lateral rostral carina; lrci — lateral rostral carina inferior; lrsc — lateral rostral carina superior; p—d — propod—dactyl; sbrc — suprabranchial carina; shc — subhepatic carina; smc — submarginal carina; st — stylocerite; sto — sharp tooth.



**FIGURE 1** — Mouth appendages nomenclature. Hypothetical caridean; A, left mandible; B, left maxilla 1; C, left maxilla 2; D, left maxilliped 1; E, left maxilliped 2; F, left maxilliped 3.



**FIGURE 2** — Types of setae observed; A, hook; B, stout; C, stout serrate; D, stout pectinate; E, long stout denticulate; F, pappose; G, captate; H, densely plumose; I, densely plumose articulated; J, simple; L, pappose pectinate; M, pectinate; N, scattered plumose.

## MATERIAL AND METHODS

The specimens of this study were collected during two oceanographic programs: Revizee and Oceanprof. Between June and July of 2000 during the Revizee Program, N.O. Thalassa collected samples from the continental shelf and slope of the Central Brazilian coast (from 11°S — Real estuary, Bahia to 22°S — Cabo de São Tomé, Rio de Janeiro) in depths ranging from 200 to 2000m. These dredges were made with two net types: ARROW (47.4m X 26.8m) and GOV (Grat Opening Vertical). A total of 58 tows were done. During February of 2003 the Oceanprof I Program, using the N.O. Astrogaroupa, collected samples from the continental slope of Campos Basin (21°48' S to 22°48'S, Rio de Janeiro) in depths ranging from 1074 to 1649m. A total of 18 tows were collected. The samples are deposited in the Collection of Crustacea of the Museu Nacional, Rio de Janeiro (MNRJ).

## SYSTEMATICS

### Family Oplophoridae Dana, 1852

Diagnosis: Rostrum immovable. Antennular flagella simple, without accessory filament. Mandible with palp; molar and incisor processes not conspicuously separated. Mandibles dissimilar. Maxilliped 3 elongate, not unusually expanded, five segmented, bearing well developed exopod. All pereopods with well developed exopod. Pereopod 1 to 3, at least, bearing strap like epipod with end piece extending perpendicularly into branchial chamber. Pereopod 1 and 2 with well developed chela and undivided carpus. Pereopod 3 to 5 not unusually long, carpus shorter than propodus. Pleopods with appendix interna. Probably all species capable of some form of bioluminescence (modified from Chace 1986).

### Genus *Acanthephyra* Milne-Edwards, 1881

*Ephyra* Roux, 1831: 24.

*Miersia* Kingsley, 1879: 416.

*Acanthephyra* A. Milne Edwards, 1881: 12; Chace, 1986: 6; Holthuis, 1993: 32, fig. 11.

*Bentheocaris* Bate, 1888: 723.

*Acanthephyropsis* Riggio, 1895: 246.

*Hoplocaricyphus* Coutière, 1907: 7.

Diagnosis: Rostrum with, at least, as many dorsal as ventral teeth. Carapace not denticulate dorsally; usually without lateral gastro-orbital carina; without branchiostegal groove and hepatic spine. Abdomen dorsally carinate on, at least, somite three to six. Telson superficially blunt posteriorly; not tapering to sharply acute apex; without spinose

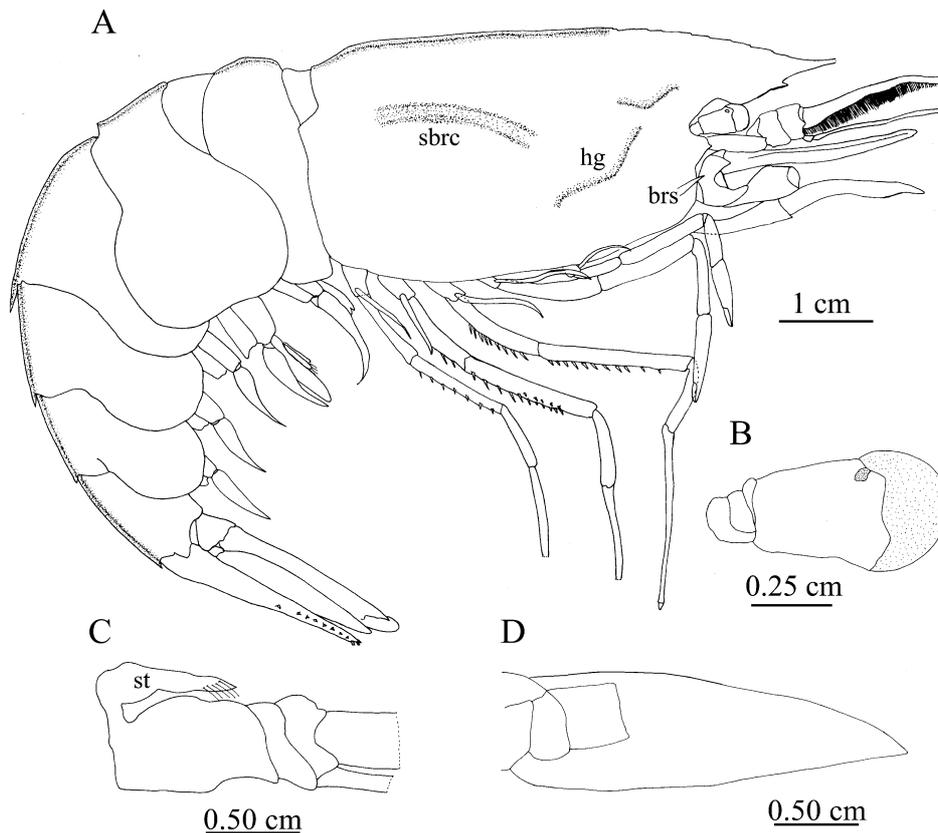
end piece. Scaphocerite without lateral teeth. Mandible dissimilar, incisor process armed in entire length. Pereopods with ischium and merus not broadly compressed. Pereopod 4 with epipod vestigial or absent. Appendix masculina on second pleopod. Eggs small to medium-sized and numerous (more than 80) (modified from Chace 1986).

***AcanthePHYra acutifrons* Bate, 1888**

(Figs 3–7)

*AcanthePHYra acutifrons* Bate, 1888: 749, pl. 126: fig. 3; Chace, 1940: 146, fig. 23; 1986: 10, figs 2b, 4b, 5b.

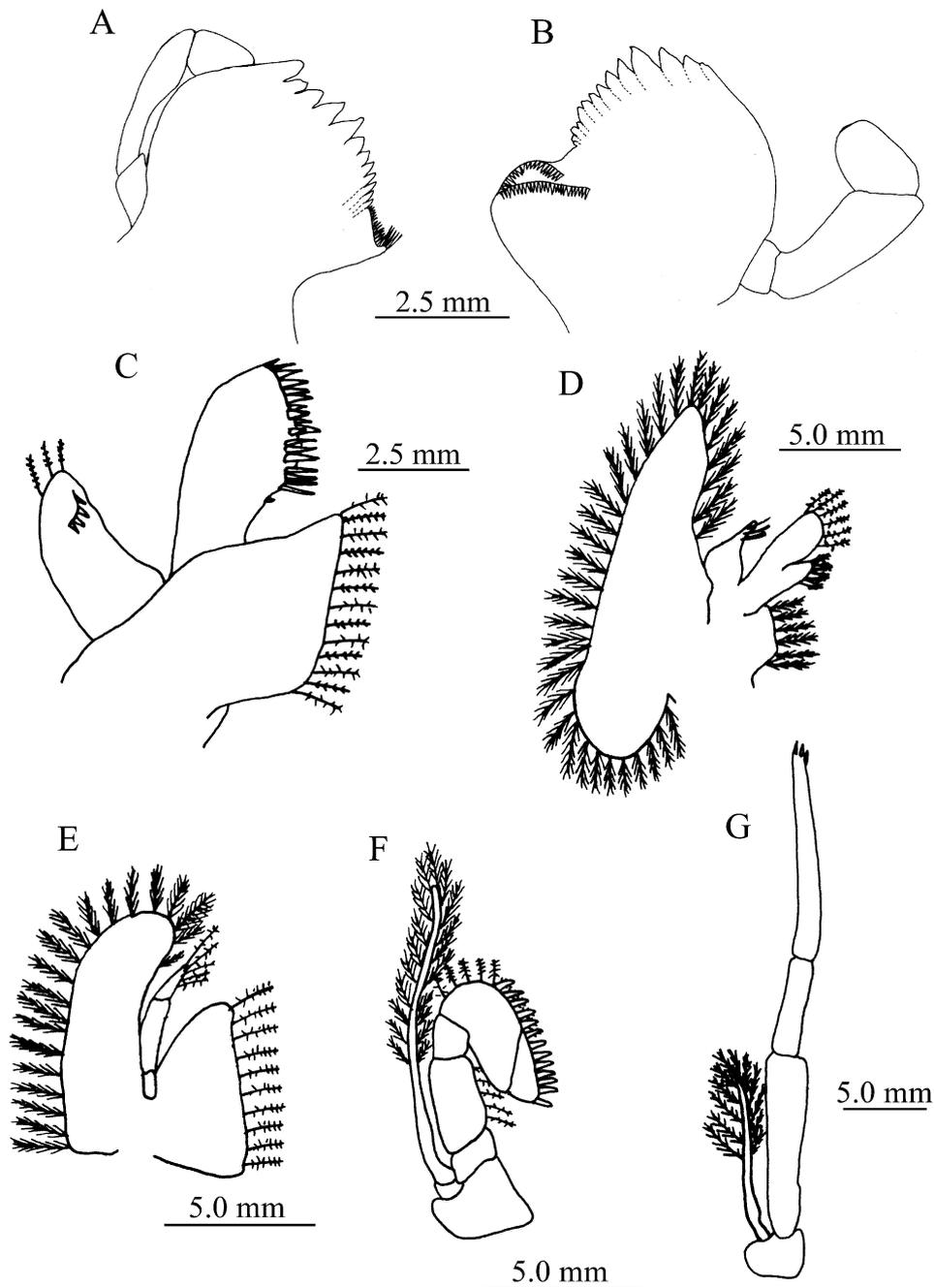
Material examined: Revizee Program: E-0520, 13°21'S, 38°16'W, 2137 m, 1 male (48.5mm), MNRJ 14843; E-0519, 13°19'S, 38°19'W, 1730m, 2 males (45, 49mm), MNRJ 14848; E-0552, 21°07'S, 39° 46'W, 1694m, 1 male (51mm), MNRJ 18882.



**FIGURE 3** — *AcanthePHYra acutifrons* Bate, 1888, male, MNRJ 14848 (carapace length 45mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (brs, branchiostegal spine; hg, hepatic groove; sbrc, suprabranchial carina; st, stylocerite).

Diagnosis: Carapace with rostrum short, reaching 2/3 of scaphocerite, ventral margin with one tooth; antennal spine absent; branchiostegal spine present, without distinct carina. Abdomen dorsally carinate on all somites; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong. Male pleopod 1 with endopod rounded, lateral margins with densely plumose setae, distal lobe with numerous hook setae on distal portion. Male pleopod 2 appendix interna, about 3/4 as long as appendix masculina, with numerous densely plumose setae on lateral margins, distal portion slightly triangular, with hook setae. Appendix masculina with strong acute simple setae on distal and lateral margins.

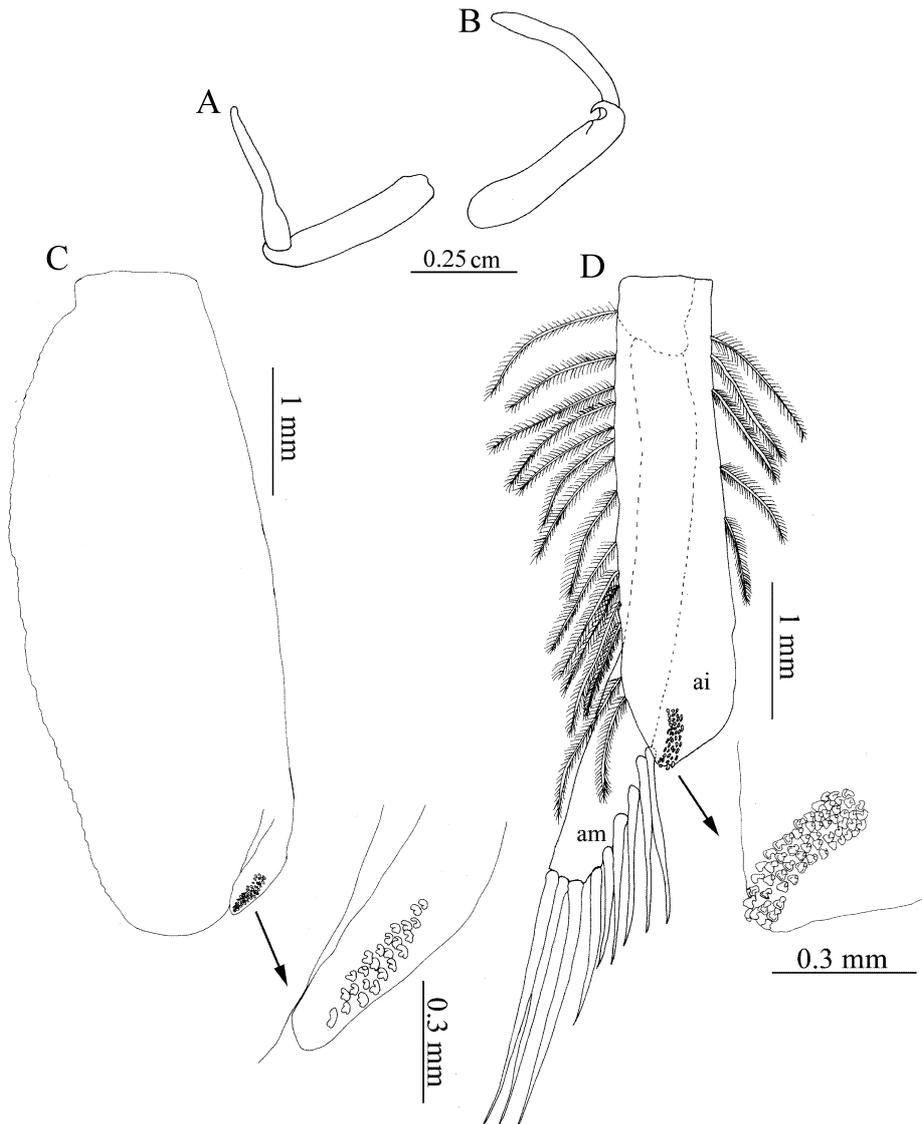
Description: Eyestalk with an ocellus on superior distal portion (Fig. 3B). Carapace with rostrum 1/3 length of carapace, reaching 2/3 of scaphocerite, ventral margin oblique, with one tooth, dorsal margin serrate, with nine-ten denticles; dorsal margin carinate throughout entire length; antennal spine absent; branchiostegal spine present, without distinct carina; supraorbital and pterygostomial spine absent; cervical groove absent; suprbranchial carina and hepatic groove present (Fig. 3A). Stylocerite elongate, reaching 3/4 of first antennular peduncle article, with acute apex and simple setae (Fig. 3C). Scaphocerite with acute apex, and several simple setae on inner margin (Fig. 3D). Mandible with palp three-articulated, incisor process with about ten to 12 teeth, molar process triangular, with a row of small stout setae (Figs. 4A, B). Maxilla 1 with two endites, distal endite with numerous stout serrate setae on inner margin; basal endite leaf like, with pectinate and pappose setae on inner margin; palp with several pectinate setae on rounded apex, and four stout setae on a protuberance (Fig. 4C). Maxilla 2 with two endites, distal bilobed, basal lobe with long, stout, pectinate setae on inner margin, distal lobe with pappose-pectinate setae on inner margin; basal endite rounded, with densely plumose setae on inner margin; endopod half length of endites, with simple setae on apex; scaphognathite with densely plumose setae on all margins (Fig. 4D). Maxilliped 1, endite with pappose-pectinate setae on inner margin; endopod three-articulated, as long as endites, with several pappose setae on apex and inner margin; exopodal lobe with densely plumose setae in all margins (Fig. 4E). Maxilliped 2 endopod with elongate ischium and merus with pappose setae on inner margin; carpus short; propod rounded with pappose and pectinate setae on distal margin, and long, stout, pectinate setae on inner margin; dactyl with long, stout setae on inner margin; elongate exopod, with densely plumose setae on all margins (Fig. 4F). Maxilliped 3 slender and elongate, propod-dactyl with stout setae in distal portion; exopod elongate, with densely plumose setae on all margins (Fig. 4G). Pereopods 1 and 2 chelate. Pereopod 3, ischium with nine stout setae on inner margin; merus with 11 stout setae on inner margin. Pereopod 4, ischium with two stout setae on inner margin; merus with 11 stout setae and four small stout setae on inner margin. Pereopod 5, ischium unarmed; merus with seven stout setae on inner margin (Fig. 3A). Epipods with mesial teeth, present on pereopods 1 to 3 (Fig. 5A, B). Abdomen dorsally carinate on all somites; somites 3 to 6 with posteromesial tooth; one of somite 3 distinctly



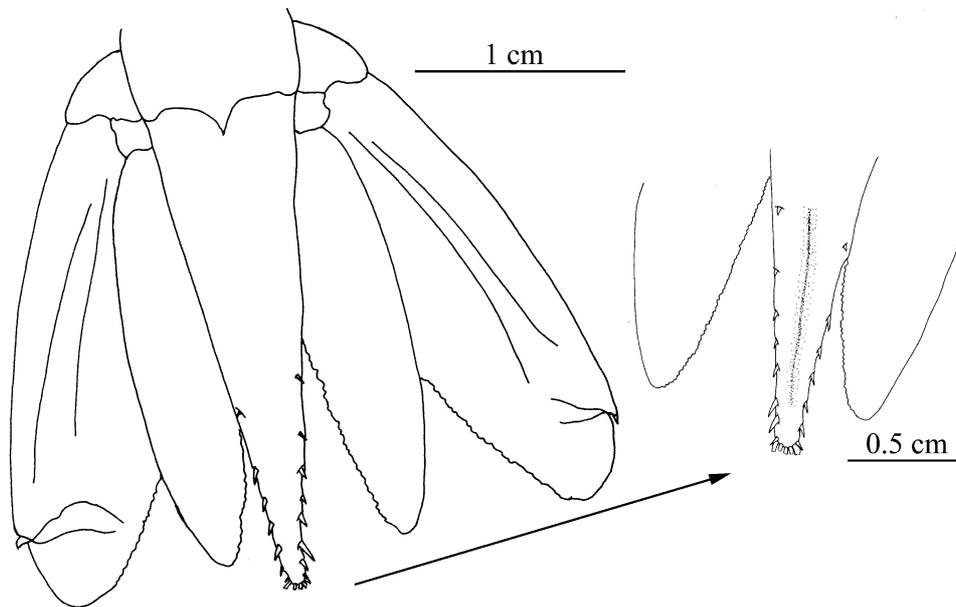
**FIGURE 4** — *Acanthephyra acutifrons* Bate, 1888, male, MNRJ 14848; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.

strong; somite 6 at least  $1\frac{1}{2}$  times as long as height (Fig. 3A). Male pleopod 1 with endopod rounded, with densely plumose setae on lateral margin, and a distal lobe with

numerous hook setae (Fig. 5C). Male pleopod 2 with slender appendix masculina, with numerous strong acute simple setae on distal and lateral margins; appendix interna 2/3 length of appendix masculina, with numerous plumose setae on lateral margins, apex slightly triangular with numerous hook setae (Fig. 5D). Exopod of uropod with uncomplete diarsis, and one distal spine on outer margin (Fig. 6A). Telson sulcate in dorsal midline, with about six pairs of dorsolateral stout setae, three pairs of distal setae, and one median setae (Fig. 6B).

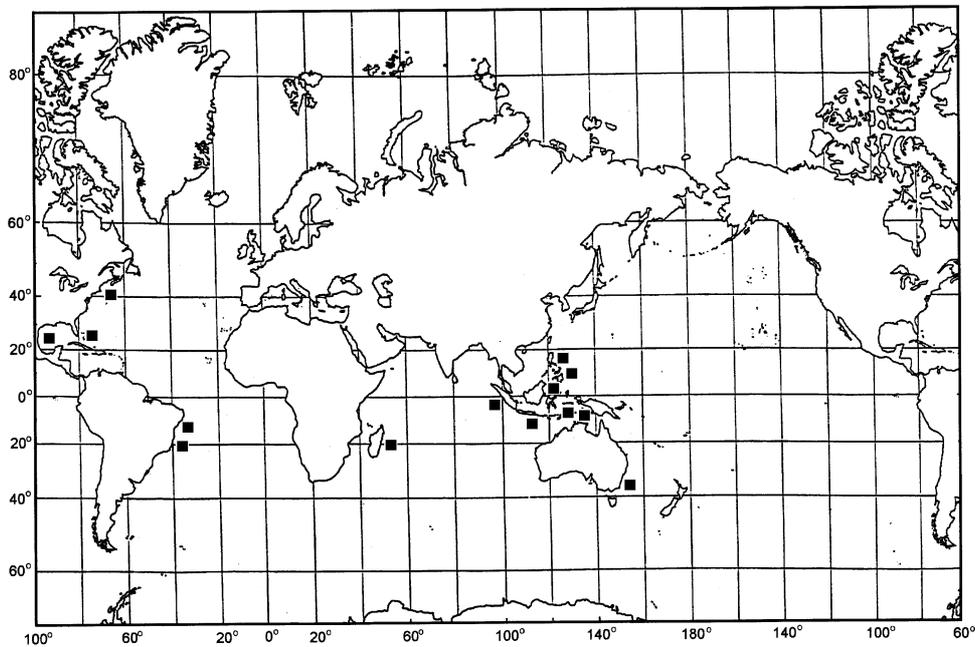


**FIGURE 5** — *Acanthephyra acutifrons* Bate, 1888, male, MNRJ 14848; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and masculina from right second pleopod, lateral view (ai — appendix interna; am — appendix masculina).



**FIGURE 6** — *Acanthephyra acutifrons* Bate, 1888, male, MNRJ 14848; telson and uropods, dorsal view.

Distribution: Western Atlantic: Mexico (Gulf of Mexico), Bahamas, Brazil (Bahia, Espírito Santo). Indian and Pacific: West Indian Ocean, Madagascar, Philippines, Indonesia (Sumatra), Australia. Adults probably live in depths between 650 and 2400 m (Chace 1986; Crosnier 1987; Kensley 1987).



**FIGURE 7** — Geographic distribution of *Acanthephyra acutifrons* Bate, 1888.

Remarks: This species occurs in the Indian, Pacific and Atlantic oceans, and has never been recorded before from Brazilian waters (Fig. 7).

The genus *Acanthephyra* comprises 30 species, 11 of them occurring in the Western Atlantic Ocean. Of these 11 species, only two species (*A. gracilipes* Chace, 1940 and *A. stylostratis* (Bate, 1888)) have carapaces with a longitudinal ridge or carina on posterior half of the lateral surface, which is distinct from *A. acutifrons* that does not have a carina on the posterior half of the carapace lateral surface. *Acanthephyra acutifrons* and *A. eximia* Smith, 1884. have the carapace dorsally carinate on entire length. *Acanthephyra acutifrons* differs from *A. eximia* by the short rostrum, not reaching the end of the scaphocerite, in the carapace length (45–51 mm), and by the abdominal somite 1 with a dorsal carina.

*Acanthephyra acutifrons*, *A. eximia*, *A. quadrispinosa* Kemp, 1939 and *A. stylostratis* occur from Brazilian waters. *Acanthephyra acutifrons* differs from *A. quadrispinosa* by the carapace with dorsal carina in entire length, the rostrum short with only one ventral tooth and the abdominal somite 1 with dorsal carina. *Acanthephyra acutifrons* differs from *A. stylostratis* in the rostrum shape, in the absence of the branchiostegal groove and by a larger carapace length (Table 1).

**TABLE 1.** Comparison between the species of *Acanthephyra* that occur in Brazilian waters.

	<i>A. acutifrons</i>	<i>A. eximia</i>	<i>A. quadrispinosa</i>	<i>A. stylostratis</i>
Carina on posterior half of lateral surface	absent	absent	absent	present
Carapace dorsal carina	entire length	entire length	absent	entire length
Rostrum shape	dorso-ventrally expanded	anteriorly expanded	anteriorly expanded	dorso-ventrally expanded
Teeth on rostrum dorsal and ventral	serrate (10 denticles), one tooth	7 teeth, 3–4 teeth	7 teeth, 4 teeth	5 small teeth, one apical strong tooth
Rostrum length	short	long	long	short
Carapace length	41–51mm	18–45mm	16mm	15mm
Branchiostegal groove	absent	absent	short, twice spine length	long, overreaching half of carapace
Carina on abdominal somite 1	present	absent	absent	absent
Dorsal tooth on abdominal somites	present 3–6, 3 stronger	present 3–6, 3 and 4 stronger	present 3–6, all strong	present 3–6, 3 stronger
Dorsolateral stout setae of telson	6 pairs	4 pairs	4 pairs	3 pairs
Distal setae of telson	3 pairs	3 pairs	2 pairs	2 pairs

The material examined herein agrees mostly with the descriptions of Bate (1888) and Chace (1940, 1986). The telson of the specimens examined present six pairs of dorsolateral stout setae, only one specimen having seven stout setae in right side of telson (Fig. 7B) and three pairs of distal setae were observed. Bate (1888) observed three or four and Chace (1940, 1986) observed five or six dorsolateral stout setae on telson of *A. acutifrons*. Furthermore, Bate (1888) observed four pairs of distal setae on telson.

### *Acanthephyra eximia* Smith, 1884

(Figs 8–13)

*Acanthephyra eximia* Smith, 1884: 376; 1886: 63, pl. 14, fig. 1.

*Acanthephyra angusta* Bate, 1888: 737, pl.12, fig. 6.

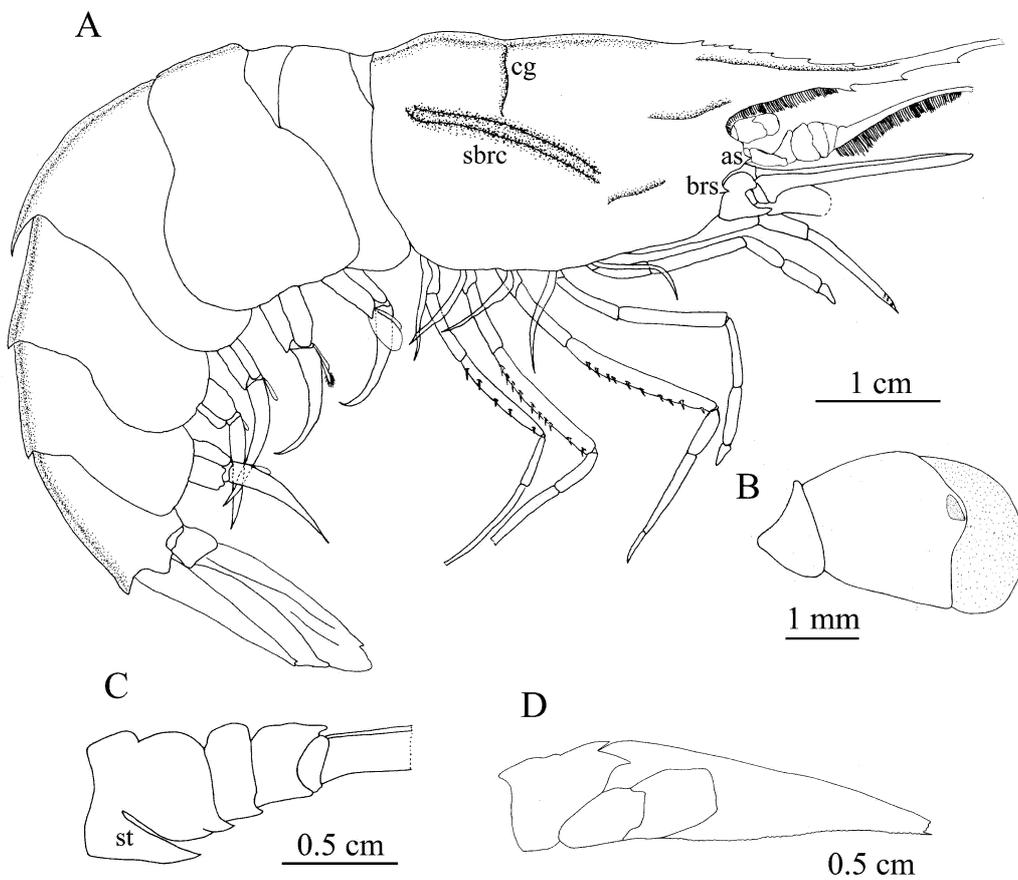
*Acanthephyra edwardsii* Bate, 1888: 747, pl. 124, fig. 1; Moreira, 1901: 10.

*Acanthephyra brachytelsonis* Bate, 1888: 753, pl. 126, fig. 7.

*Acanthephyra eximia* – Crosnier & Forest, 1973: 34, fig. 7c–d; Chace, 1986: 18, figs 2j, 4j, 5j, 6h, 9A; Ramos & Coelho, 1988: 326; Tavares, 1999: 675.

Material examined: Revizee Program: D-0503, 19°39'S, 38°38'W, 740m, 3 females (22.5 to 34mm), MNRJ 13771; D-0504, 19°42'S, 38°36'W, 278m, 1 ovigerous female (41mm), 5 females (38 to 44.5mm), MNRJ 13772; D-0505, 19°43'S, 38°38'W, 1089m, 1 female (34mm), 1 male (21mm), MNRJ 13773; D0506, 19°42'S, 38°36'W, 1067m, 5 females (25 to 42mm), 1 male (27mm), MNRJ 13774; E-0535, 19°58'S, 39°35'W, 1002m, 23 ovigerous females (31 to 43mm), 20 females (20 to 46mm), 18 males (21 to 40mm), MNRJ 14821; E-0548, 21°28'S, 39°40'W, 1799m, 1 ovigerous female (40mm), 1 male (21.5mm), MNRJ 14822; E-0527, 19°50'S, 39°10'W, 1402m, 1 female (39mm), 2 males (42, 45mm), MNRJ 14823; E-0552, 21°07'S, 39°46'W, 1694m, 1 male (35mm), MNRJ 14824; E-0505, 14°36'S, 38°49'W, 1089m, 1 ovigerous female (38mm), 2 females (38, 26mm), 1 male (25mm), MNRJ 14825; E-0507, 15°08'S, 38°40'W, 1026m, 1 ovigerous female (39mm), 2 females (26, 28mm), 1 male (44 mm), MNRJ 14826; E-0524, 19°43'S, 38°39'W, 925m, 4 females (32 to 39mm), 3 males (23 to 32mm), MNRJ 14827; E-0523, 19°42'S, 38°32'W, 922m, 3 ovigerous females (36.5 to 44mm), 4 females (38 to 41mm), MNRJ 14828; E-0544, 21°24'S, 40°02'W, 1159m, 7 males (38 to 42mm), MNRJ 14829; E-0512, 15°50'S, 38°02'W, 1043m, 1 female (26mm), 4 males (22 to 39mm), MNRJ 14830; E-0506, 14°36'S, 38°49'W, 1067m, 1 ovigerous female (39mm), 17 females (21 to 38mm), 11 males (25 to 41mm), MNRJ 14831; E-0536, 20°24'S, 39°46'W, 1293m, 1 ovigerous female (32mm), 2 females (37, 41mm), 4 males (40.5 to 42.5mm), MNRJ 14832; E0538, 19°45'S, 39°03'W, 1237m, 1 ovigerous female (42mm), 3 males (30 to 43mm), MNRJ 14833; E-0537, 20°26'S, 39°41'W, 1545m, 1 juvenile (18mm), MNRJ 14834; E-0517, 13°22'S, 38°36'W, 750m, 1 ovigerous female (38mm), 6 females (30 to 39mm), 2 males (31, 36mm), MNRJ 14836; E-0550, 21°26'S, 39°49'W, 1598m, 1 ovigerous female (44mm), 2 males (41, 44mm), MNRJ 14838; E-0529, 19°48'S,

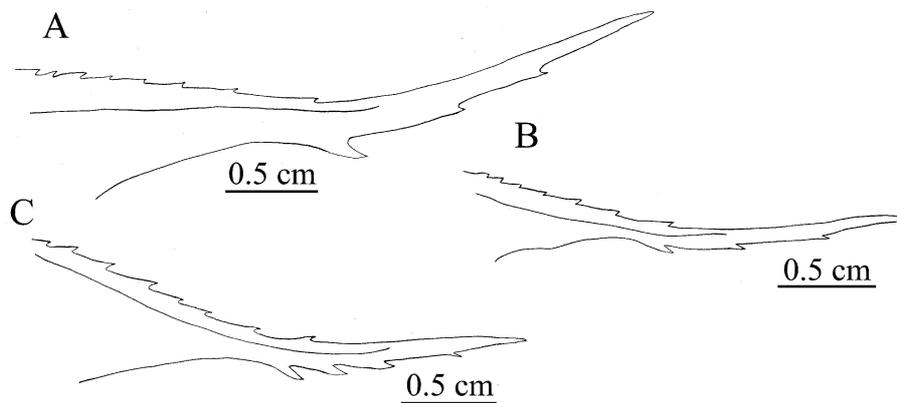
39°02'W, 1639m, 1 ovigerous female (41mm), 3 males (38 to 43mm), MNRJ 14839; E-0525, 20°08'S, 38°38'W, 1 ovigerous female (42mm), 1 male (32mm), MNRJ 14840; E-0522, 13°30'S, 38°38'W, 1144m, 4 ovigerous females (32 to 40mm), 3 females (28 to 34mm), 1 male (39mm), MNRJ 14844; E-0496, 13°17'S, 38°17'W, 1717m, 1 female (22mm), MNRJ 14846; E-0526, 20°06'S, 38°40'W, 1637m, 1 male (41.5mm), MNRJ 14847; E-0497, 13°13'S, 38°19'W, 1374m, 1 ovigerous female (38mm), 2 males (33, 39mm), MNRJ 14849. Other material: Seychelles Island, 04°08'S, 56°11.3'W, 580m, 3 specimens (without pleopods) (23 to 36mm), MNRJ 18640; East coast of Taiwan, 25°2.2'S, 122°21.3'W, 1170m, 1 male (21mm), MNRJ 18641.



**FIGURE 8** — *AcanthePHYRA eximia* Smith, 1884, male, MNRJ 14832 (carapace length 42.5mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; brs, branchiostegal spine; cg, cervical groove; sbrc, suprabranchial carina; st, stylocerite).

Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with three, occasionally four teeth; antennal spine present; branchiostegal spine present,

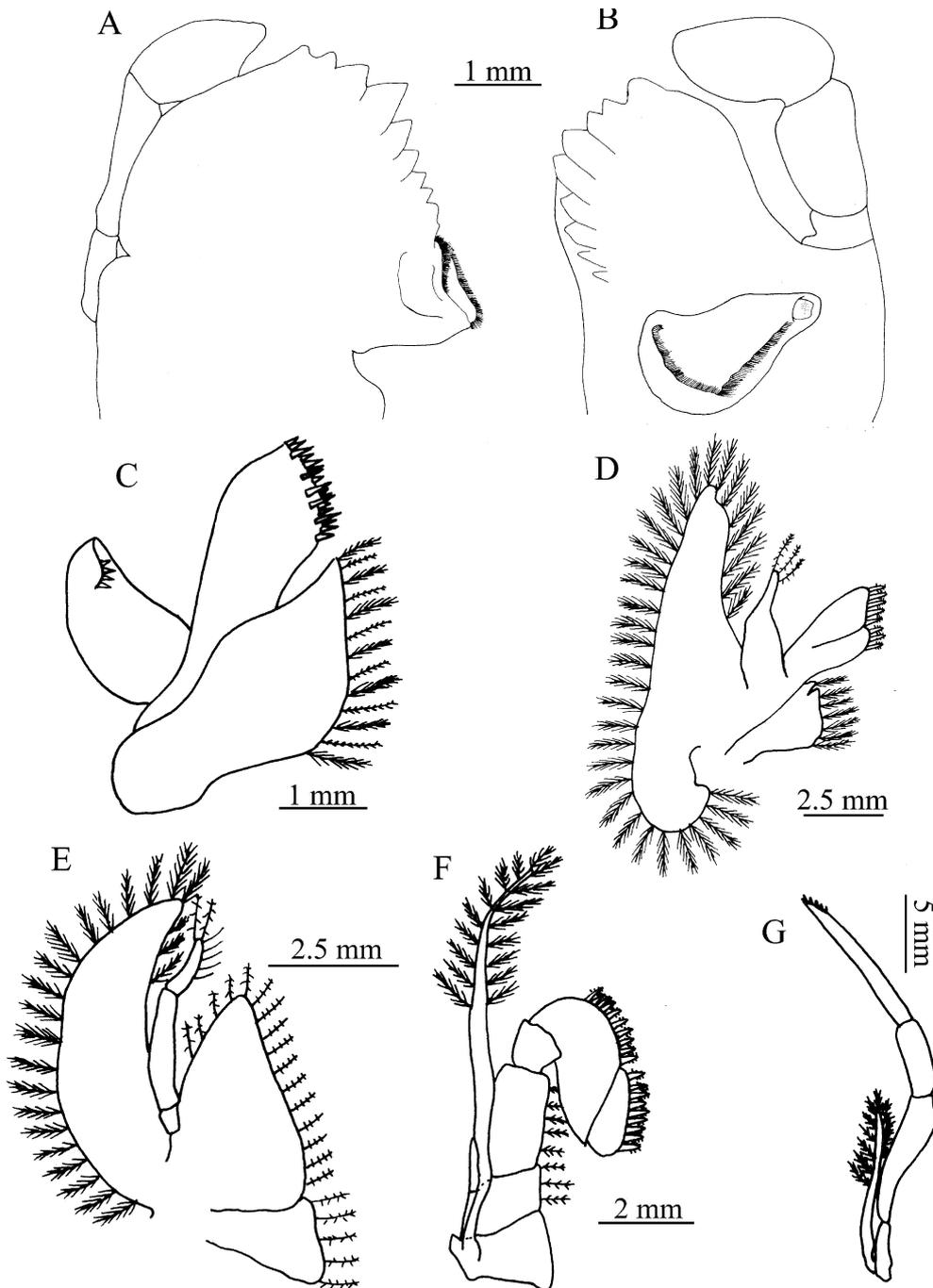
without distinct carina. Abdomen dorsally carinate on all somite but somite 1; somites 1 to 4 with posteromesial tooth, the one of somite 3 distinctly strong. Male pleopod 1 with endopod, rounded, with numerous stout setae on proximal to mesial portion, distal lobe with numerous hook setae; male pleopod 2 with appendix interna, little more than half length of appendix masculina, with densely plumose setae on lateral margins and slightly triangular shape on distal portion; appendix masculina with pectinate setae on distal and lateral margins.



**FIGURE 9** — Rostrum variation of *Acanthephyra eximia* Smith, 1884, female, MNRJ 14830 (carapace length 26mm); A, lateral view, first ventral tooth stronger than others. Female, MNRJ 14844 (carapace length 34mm); B, lateral view. Female, MNRJ 14839 (carapace length 41mm); C, lateral view with four ventral teeth.

Description: Eyestalk with an ocellus on medio-distal portion (Fig. 8B). Carapace with rostrum about 3/4 length of carapace, overreaching scaphocerite, ventral margin convex, with three, occasionally four teeth, dorsal margin with seven to eight teeth (Fig. 9A–C); dorsal margin sharply carinate throughout entire length, distinctly sinuous in lateral view; antennal spine present; with small branchiostegal spine, without distinct carina; supraorbital and pterygostomial spine absent; conspicuous cervical groove; suprabranchial carina distinct (Fig. 8A). Stylocerite triangular, reaching 2/3 of first antennular peduncle article, apex acute (Fig. 8C). Scaphocerite with blunt apex, densely plumose setae on inner margin and a distal tooth that distinctly overreaches blade (Fig. 8D). Mandible with palp three-articulated, incisor process with about nine teeth, molar process rounded and blunt, with a row of small setae and a tubercle (Fig. 10A, B). Maxilla 1 with two endites, distal endite with numerous stout setae on inner margin; basal endite with pectinate and densely plumose setae on inner margin; palp unarmed on rounded apex, and with four stout setae on a protuberance (Fig. 10C). Maxilla 2 with two endites, distal

endite bilobed, both lobe with long, stout, pectinate setae on inner margins; basal endite rounded, with densely plumose setae on inner margin; endopod as long as endite length,



**FIGURE 10** — *Acanthephyra eximia* Smith, 1884, male, MNRJ 14832; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.

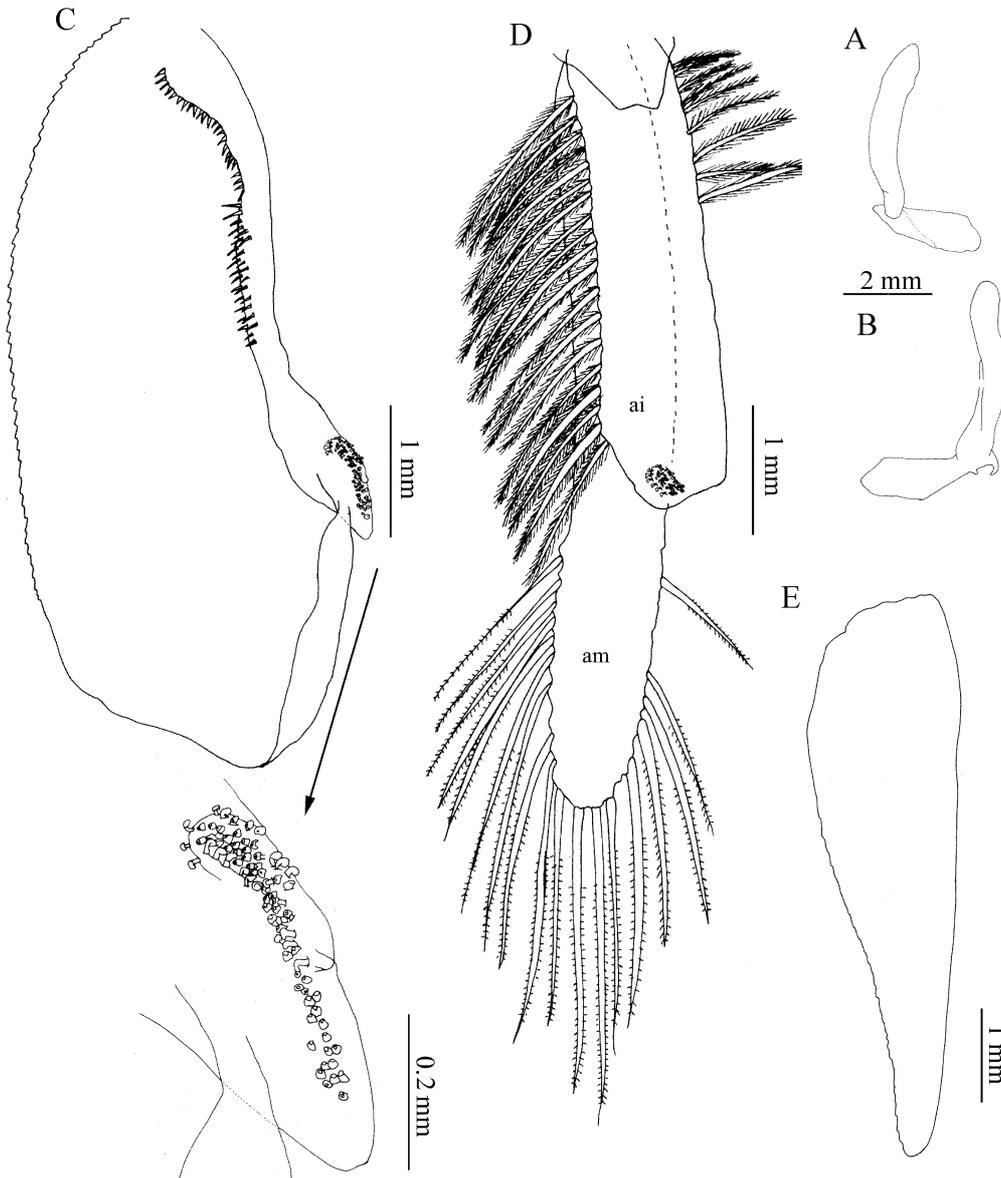
with pappose-pectinate setae on apex; scaphognathite with densely plumose setae on all margins (Fig. 10D). Maxilliped 1 with two endites, distal endite with pappose setae on distal margin, and pectinate setae on inner margin; basal endite with pappose setae on inner margin; endopod three-articulated, longer than distal endite, with several pappose setae on apex and simple setae on inner margin; exopodal lobe with densely plumose setae in all margins (Fig. 10E). Maxilliped 2, endopod with elongate ischium and merus with scattered plumose setae on inner margin; carpus short; propod rounded with long, stout, pectinate setae on inner margin; dactyl with long, stout, pectinate setae on inner margin; exopod elongate, with densely plumose setae on all margins (Fig. 10F). Maxilliped 3 slender and elongate, propod-dactyl with stout setae on apex; exopod with densely plumose setae on all margins (Fig. 10G). Pereopods 1 and 2 chelate. Pereopods 3 to 5 with fringes of setae on ischium and merus. Pereopods 3 and 4, merus with about ten stout setae on inner margin. Pereopod 5, merus with about five stout setae on inner margin (Fig. 8A). Epipods with mesial teeth, present on pereopods 1 to 3 (Fig. 11A, B). Abdomen dorsally carinate on all somites, but somite 1; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 at least 1 ½ times long as height (Fig. 8A). Male pleopod 1, endopod rounded, with numerous stout setae on proximal to mesial portion, densely plumose setae on posterior margin and a distal lobe with numerous hook setae (Fig. 11C). Pleopod 2 with appendix masculina long and slender, with numerous strong acute pectinate setae on distal portion; appendix interna little longer than half length of appendix masculina, with a slightly triangular shape on distal portion, and densely plumose setae on lateral margins (Fig. 11D). Female pleopod 1, endopod leaf shaped, with densely plumose setae on posterior margin (Fig. 11E). Exopod of uropod with complete diaresis, and one distal spine on outer margin (Fig. 12A). Telson not sulcate in dorsal midline; with four pairs of dorsolateral stout setae, and three pairs of distal setae, median stronger (Fig. 12B).

Distribution: Cosmopolitan: Western Atlantic: from Cape Hatteras to Bahamas, Gulf of Mexico, Brazil (Sergipe to Rio de Janeiro). Eastern and Central Atlantic: France (Gulf of Gascogne), Spain (Bay of Cadix), near Gibraltar, Azores, Madeira and Canary Archipelagos. Indian and Pacific: from Southeastern Africa to Japan, Hawaii and New Zealand. Adults probably live in depths between 200 and 4700 m (Bate 1888; Chace 1986; Tavares 1999).

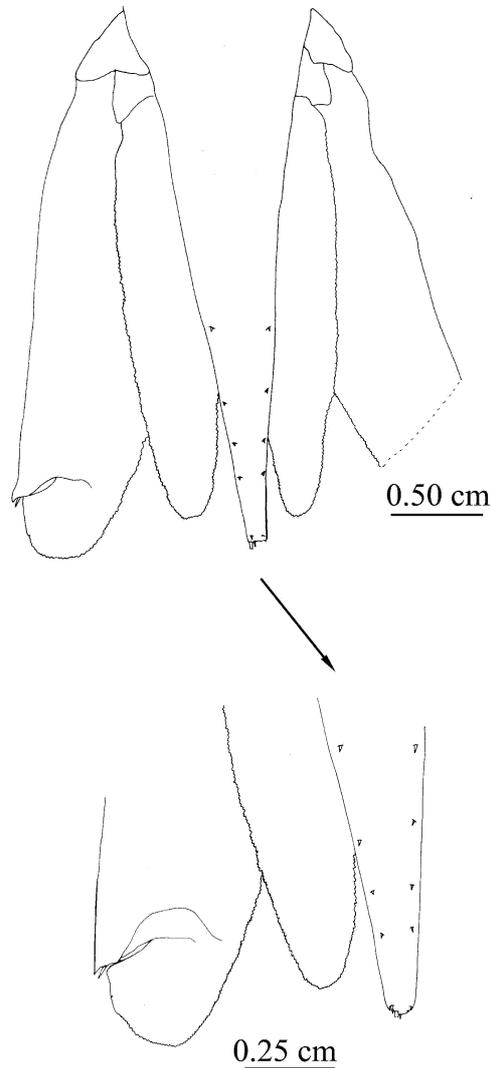
Remarks: This species is widely distributed in the Indian, Pacific and Atlantic. Was previously recorded from Brazilian waters in Espírito Santo (Tavares 1999) and Alagoas (Bate 1888) (Fig. 13).

The specimens examined agrees with the descriptions of Chace (1940, 1986) and Crosnier & Forest (1973) in the carapace being dorsally carinate on entire length; absence of a branchiostegal groove, cervical groove and suprbranchial carina present; abdominal somites 2 to 6 dorsally carinate; abdominal somites 3 to 6 with dorsal tooth and dorsal tooth of abdominal somite 3 stronger than the others. However, Chace (1940, 1986) states

that the rostrum ventral surface has one to five teeth, and the material examined herein has only three or four teeth. According to Wood-Mason & Alcock (1892), the female of *A. eximia* has a rostrum longer and more styliform than the male; this sexual dimorphism was also observed in the present material.



**FIGURE 11** — *AcanthePHYRA eximia* Smith, 1884, male, MNRJ 14832; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and masculina of right second pleopod, lateral view (ai, appendix interna; am, appendix masculina). *AcanthePHYRA eximia* Smith, 1884, E, female, MNRJ 14828 (carapace length 41mm); endopod of right first pleopod, lateral view.



**FIGURE 12** — *AcanthePHYRA eximia* Smith, 1884, male, MNRJ 14832 (carapace length 42.5mm); telson and uropods, dorsal view.

Crosnier & Forest (1973) compared specimens of *A. eximia* from Africa and from Brazil (USNM) and no conspicuous morphological differences were found. Herein, specimens of *A. eximia* from Brazil (Atlantic) were compared with specimens from Archipelago Seychelles and from Taiwan (Pacific) and some rostrum variation were observed: in the Seychelles specimens the number of dorsal teeth on rostrum range from five to six, in Taiwan specimen, there are nine dorsal teeth on rostrum, while in Brazilian specimens the dorsal teeth on rostrum range from seven to eighth. Furthermore, the Seychelles and the Brazilian specimens have four pairs of dorsolateral stout setae on telson, while in the Taiwan specimen the telson has five dorsolateral stout setae at one side and four on the other.

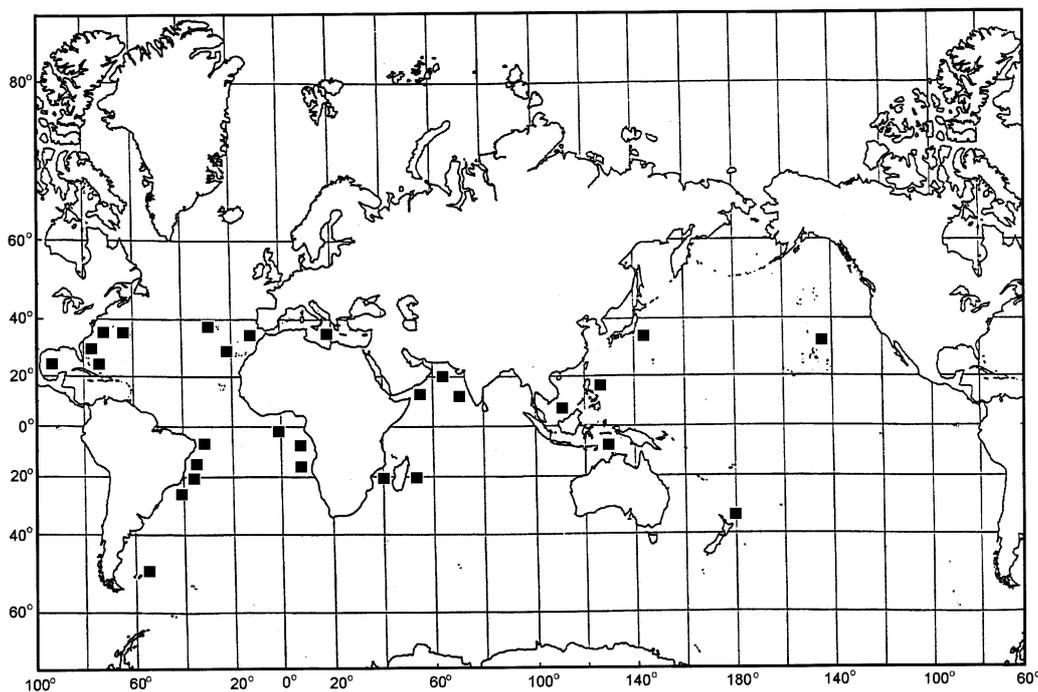


FIGURE 13 — Geographic distribution of *Acanthephyra eximia* Smith, 1884.

***Acanthephyra quadrispinosa* Kemp, 1939**

(Figs 14–18)

*Acanthephyra batei* — Stebbing, 1905: 107, pl. 24B (not *A. batei* Faxon, 1895).

*Acanthephyra quadrispinosa* Kemp, 1939: 576; Barnard, 1950: 668, fig. 124g; Chace, 1986: 26, figs 3h, 4t, 7g, 10c, 14; Kensley, 1987: 284.

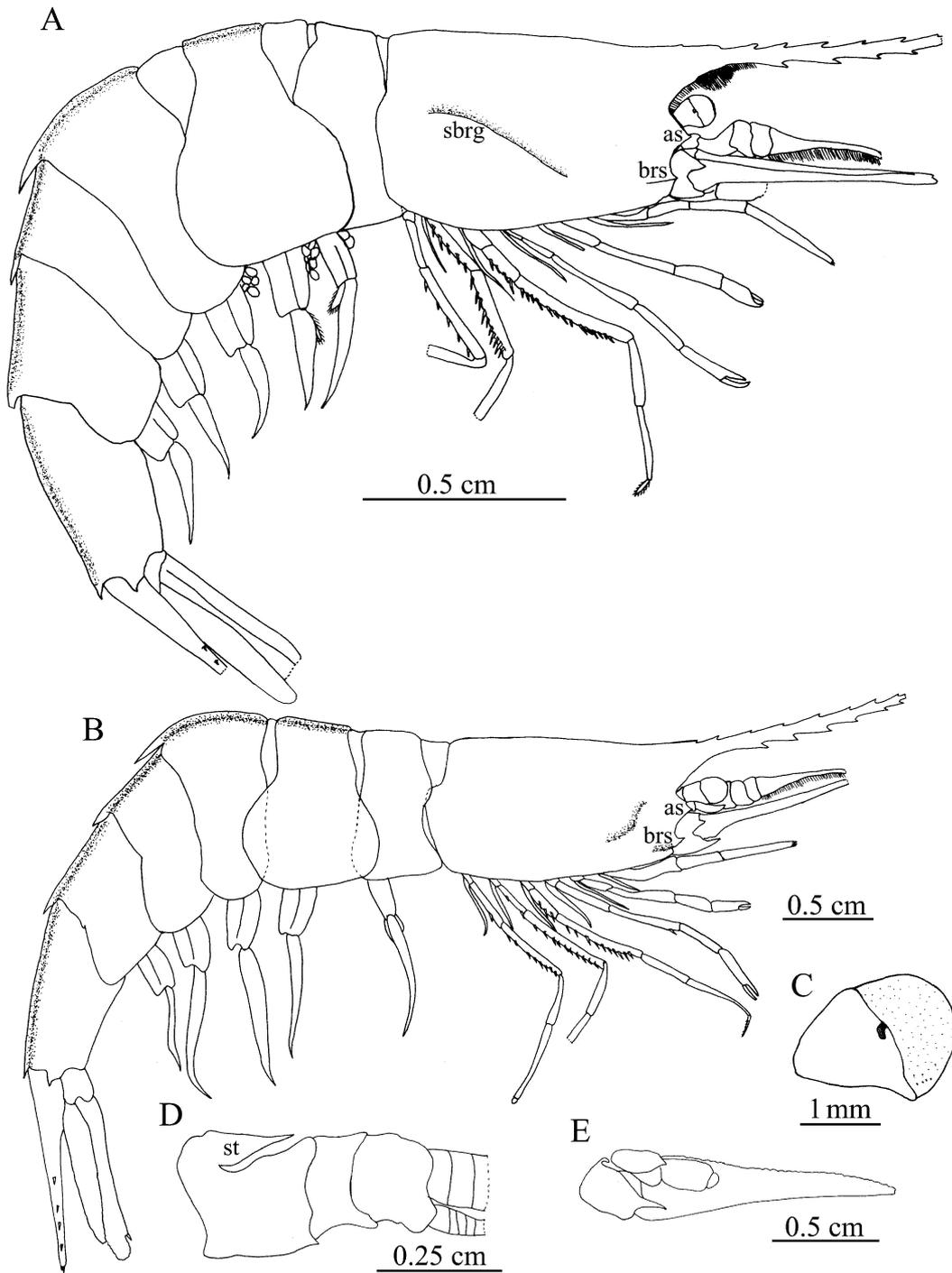
Material examined: Revizee Program: E-0540, 21°12'S, 40°00'W, 1364m, 1 ovigerous female (16mm), MNRJ 14837. Oceanprof I: 22°48'S, 40°15'W, 1324m, A-8, 1 male (14mm), MNRJ 19195.

Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with three to seven teeth; antennal spine present; branchiostegal spine present with distinct carina extending twice length of spine. Abdomen dorsally carinate on all somites, except on somite 1; somites 3 to 6 with posteromesial tooth, the one of somite 3 distinctly strong. Telson sulcate on dorsal midline, with four pairs of dorsolateral stout setae (modified from Chace 1986).

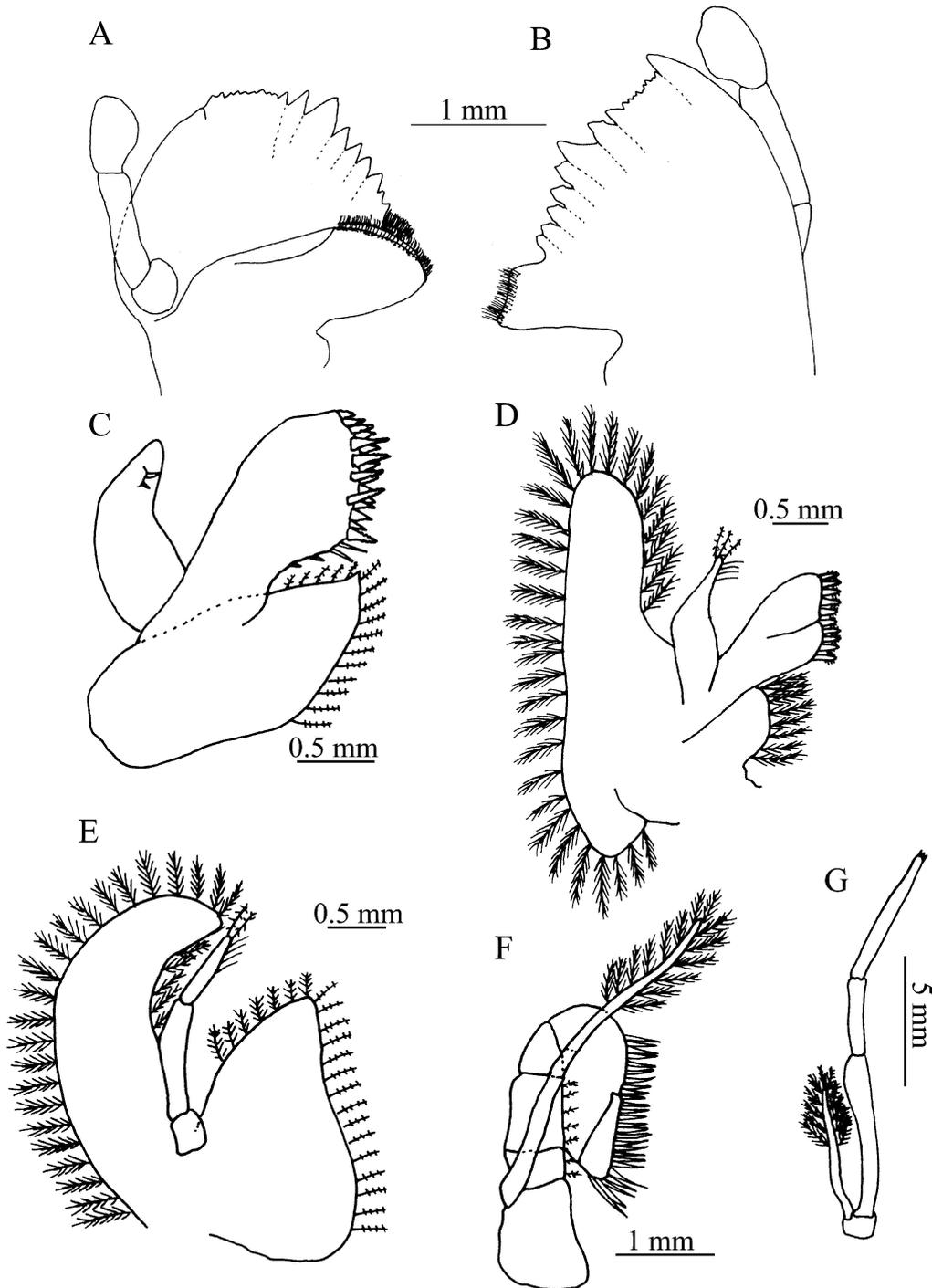
Description: Eystalk with an ocellus on median distal portion (Fig. 14C). Carapace with rostrum usually as long as carapace, overreaching scaphocerite, ventral margin straight, with, six teeth, dorsal margin with eight teeth (Fig. 14A); dorsal margin not carinate; antennal spine present; branchiostegal spine present, with distinct carina extending twice length of spine; supraorbital and pterygostomial spine absent; cervical

groove absent and suprabranchial groove not well marked (Fig. 14A, B). Stylocerite narrow, ending in sharp apex almost reaching end of first antennular peduncle article (Fig. 14D). Scaphocerite narrow, with blunt apex, and densely plumose setae on inner margin (Fig. 14E). Mandible with palp three-articulated, incisor process with about eight teeth, and a serrate area; molar process triangular, with numerous simple short setae (Fig. 15A, B). Maxilla 1 with two endites, distal with numerous stout serrate setae on inner margin; basal endite with pappose setae on distal margin and pectinate setae on inner margin; palp with unarmed, rounded apex, and 2 stout setae on a protuberance (Fig. 15C). Maxilla 2 with two endites, distal endite bilobed, both lobe with long, stout, pectinate setae on inner margin; basal endite rounded, with densely plumose setae on inner margin; endopod as long as endites, with pappose setae on apex, and several slender, simple setae on inner margin; scaphognathite with densely plumose setae on all margins (Fig. 15D). Maxilliped 1, endite with pectinate setae on inner margin, and scattered plumose setae on distal margin; endopod three-articulated, almost as long as distal endite, with several pappose setae on apex and several simple setae on inner margin; exopodal lobe with densely plumose setae on all margins (Fig. 15E). Maxilliped 2, endopod with elongate ischium and merus, with pappose setae on inner margin; carpus short; propod rounded, with long, stout setae on inner margin; dactyl with long, stout setae on inner margin; exopod with densely plumose setae on margins (Fig. 15F). Maxilliped 3 slender and elongate, propod-dactyl with stout setae in apex; exopod with densely plumose setae on margins (Fig. 15G). Pereopods 1 and 2 chelate. Pereopod 3, ischium with three to four stout setae on inner margin; merus with ten to 14 stout setae on inner margin. Pereopod 4, ischium with two to five stout setae on inner margin; merus with ten robust setae on inner margin. Pereopod 5, ischium with one or without seta on inner margin; merus with five to eight stout setae on inner margin (Fig. 14A, B). Epipods with mesial teeth, on pereopods 1 to 3 (Fig. 16A, B). Abdomen dorsally carinate on all somites, except on somite 1; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 at least two times longer than wide (Fig. 14A, B). Male pleopod 1, endopod rounded, with pappose setae on posterior margin, scattered plumose setae on anterior margin, an anterior distal lobe elongate, with hook setae on apex, and scattered plumose setae on base (Fig. 16C). Male pleopod 2, appendix masculina elongate, with acute pectinate setae on apex; appendix interna 2/3 of appendix masculina length, with scattered plumose setae on lateral margins and hook setae on triangular apex (Fig. 16D). Female pleopod 1, endopod leaf shaped, with densely plumose setae on lateral margins (Fig. 16E). Exopod of uropod without diarsis, with a distal spine on outer margin (Fig. 17A). Telson sulcate in dorsal midline, with four pairs of dorsolateral stout setae, two pairs of distal stout setae (Fig. 17A, B).

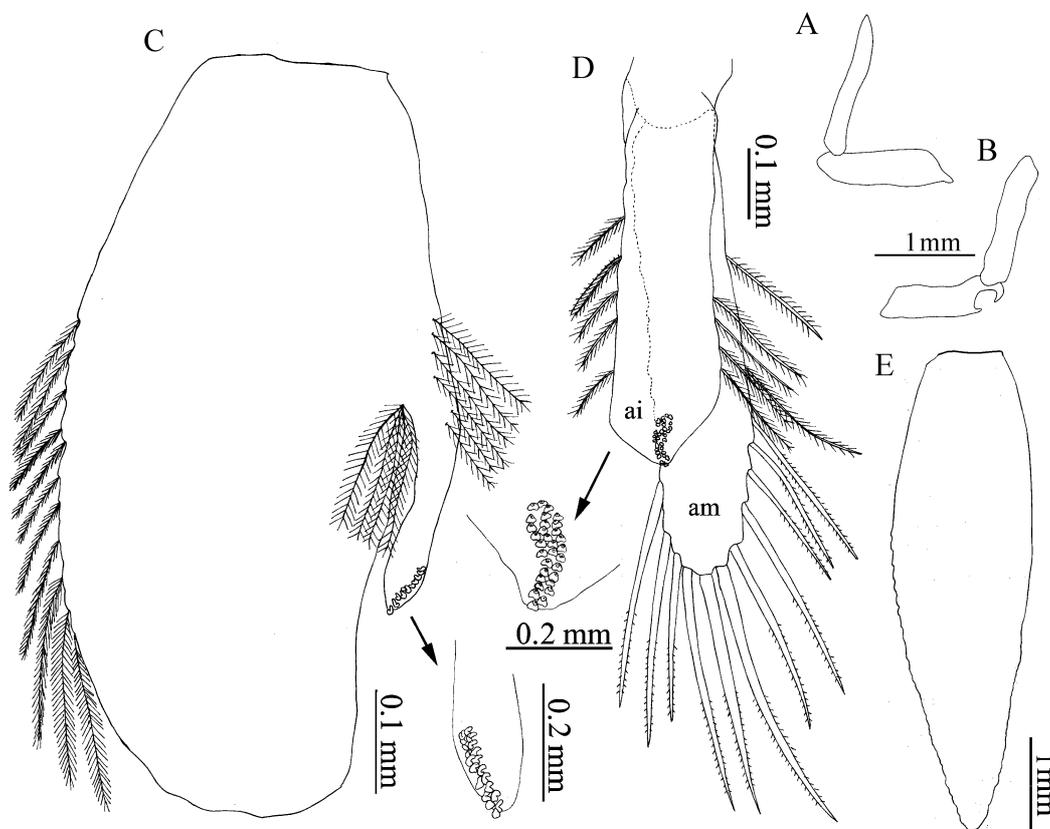
Distribution: In the South Atlantic Ocean; from 35°S to 40°S. Brazil (Espírito Santo and Rio de Janeiro), 21°S, 40°W. Indian and Pacific Oceans: from East Africa to 163°W, and from 25°N to 44°S; between depths of 250 and 1700 m (Barnard 1950; Chace 1986; Wasmer 1986).



**FIGURE 14** — *Acanthephyra quadrispinosa* Kemp, 1939, ovigerous female, MNRJ 14837 (carapace length 16mm); A, lateral view. Male, MNRJ 19195 (carapace length 14mm); B, lateral view; C, ocular peduncle and cornea, lateral view; D, right antennule, dorsal view; E, right scaphocerite, dorsal view (as, antennal spine; brs, branchiostegal spine; sbrg, suprbranchial groove; st, stylocerite).



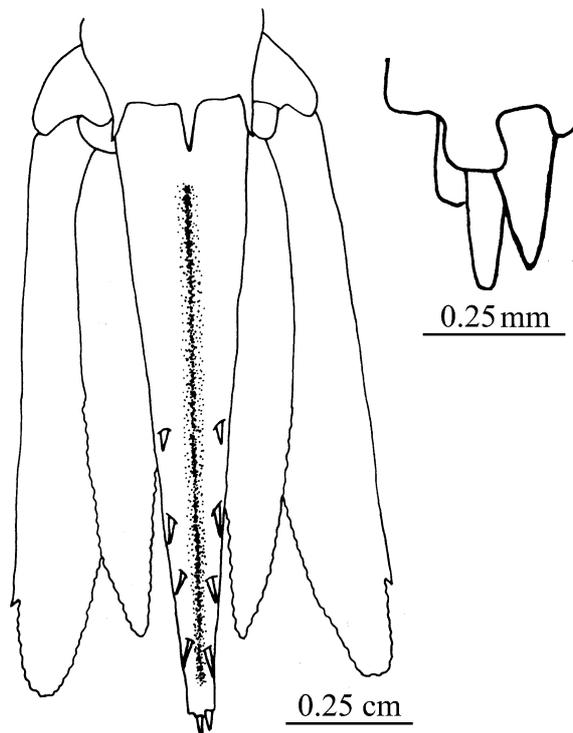
**FIGURE 15** — *Acanthephyra quadrispinosa* Kemp, 1939, male, MNRJ 19195; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.



**FIGURE 16** — *Acanthephyra quadrispinosa* Kemp, 1939, male, MNRJ 19195; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and masculina of right second pleopod, lateral view. Ovigerous female, MNRJ 14837 (carapace length 16mm) E, endopod of right first pleopod, lateral view (ai, appendix interna; am, appendix masculina).

Remarks: *Acanthephyra quadrispinosa* is widely distributed in the Indian and Pacific Oceans. In the Atlantic Ocean this species was recorded by Kemp (1939) from the Challenger and Dana Expeditions, and from Discovery Committee (Fig. 18). In his account on *Acanthephyra purpurea* A. Milne Edwards, 1881 species group, Kemp (1939) affirms that *A. purpurea* and *A. pelagica* (Risso 1816) occur in the North Atlantic, and *A. sexpinosa* Kemp, 1939 and *A. acanthitelsonis* Bate, 1888 occur in the Central and South Atlantic occurs. Kemp (1939) observes the southern limit of *A. sexpinosa* as 18°S, and for *A. quadrispinosa* between 35°S and 40°S. *Acanthephyra sexpinosa* has six dorsolateral stout setae on the telson and abdominal somites 4 and 5 do not have dorsal tooth, while *A. quadrispinosa* has four dorsolateral stout setae on the telson and abdominal somites 4 and 5 have dorsal tooth. Latter, *A. sexpinosa* was considered synonym of *A. kingsleyi* Bate, 1888 (Crosnier & Forest 1973).

*Acanthephyra brevirostris* Smith, 1885 has the dorsal tooth on abdominal somite 3 large, fleshy, overreaching abdominal somite 4, while *A. quadrispinosa* has it of normal size. *Acanthephyra curtirostris* Wood-Mason, 1891, and *A. media* Bate, 1888, have the rostrum ventral margins with one or two teeth, while *A. quadrispinosa* has more than two teeth. *Acanthephyra pelagica* and *A. acanthitelsonis* have seven to 19 pairs of dorsolateral stout setae on the telson, while *A. quadrispinosa* has four to six pairs of dorsolateral stout setae. *Acanthephyra purpurea* and *A. kingsleyi* have abdominal somite 4 without dorsal tooth, while *A. quadrispinosa* has abdominal somite 4 with dorsal tooth.



**FIGURE 17** — *Acanthephyra quadrispinosa* Kemp, 1939, male, MNRJ 19195; telson and uropods, dorsal view.

In Brazilian waters *A. acutifrons*, *A. eximia*, *A. quadrispinosa* and *A. stylostratis* occur. *Acanthephyra quadrispinosa* differs from *A. eximia* and *A. acutifrons* in length of carapace dorsal carina, in the number of dorsal and ventral teeth of rostrum, and on length of carapace. *Acanthephyra quadrispinosa* differs from *A. stylostratis* in the rostrum shape, in the carapace without dorsal carina and in the short branchiostegal groove (Table 1).

The specimens examined agrees with descriptions of with Chace (1940, 1986), Barnard (1950) and Wasmer (1986) in the presence of a branchiostegal spine, with a distinct carina that extends twice the length of spine, the carapace without dorsal carina,

the abdominal somites 2–6 dorsally carinate, the dorsal tooth present in abdominal somite 4, and the four pairs of dorsolateral stout setae on telson.

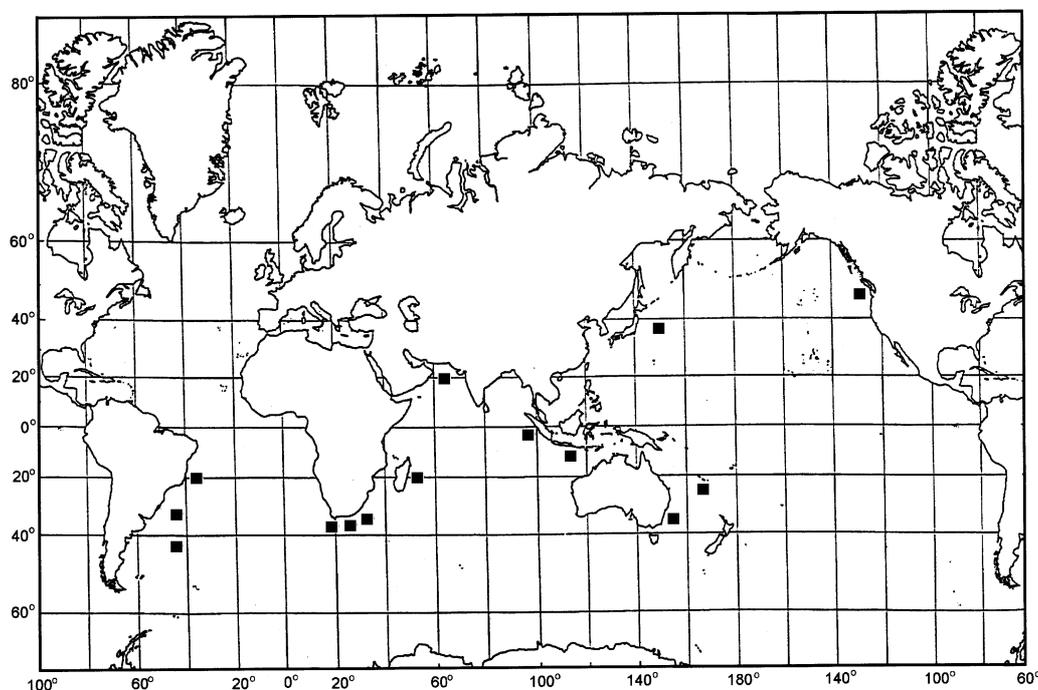


FIGURE 18 — Geographic distribution of *Acanthephyra quadrispinosa* Kemp, 1939.

*Acanthephyra stylostratis* (Bate, 1888)

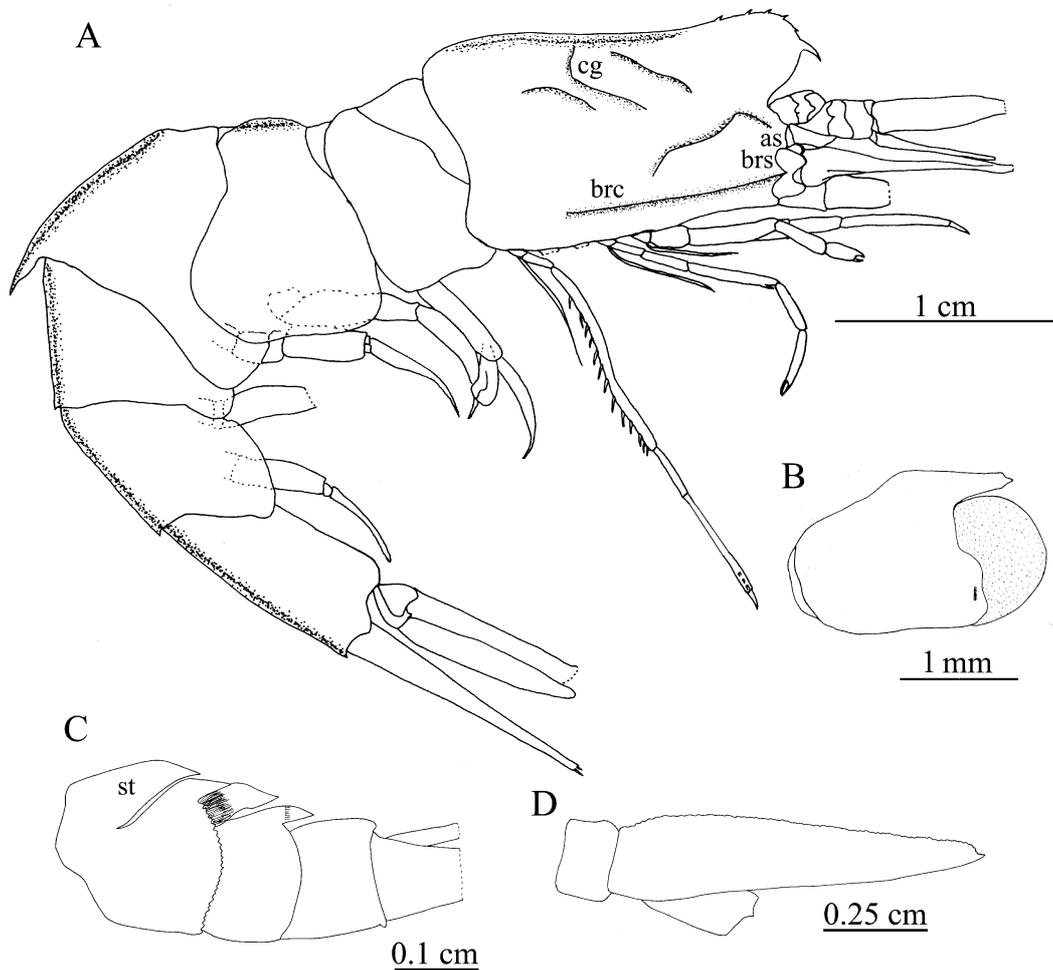
(Figs 19–23)

*Bentheocaris stylostratis* Bate, 1888: 726, pl. 123, fig. 4.

*Acanthephyra stylostratis* — Calman, 1925: 14; Chace, 1936: 30; 1940: 144, fig. 22; 1986: 10.

Material examined: Revizee Program: E-0538, 20°27'S, 39°38'W, 1680m, 1 male (15mm), MNRJ 14845.

Diagnosis: Carapace with a thin crest that projects in a rounded rostrum with six spiniform teeth dorsally, anterior one styliform and longer than others; antennal spine small; branchiostegal spine supported by a long carina, reaching 2/3 of carapace. Abdomen dorsally carinate on all somites, except on somite 1; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong. Male pleopod 1, endopod rounded, with numerous long, stout setae on anterior margin, and a distal lobe with hook setae. Male pleopod 2, appendix interna 1 ¼ length of appendix masculina, apex triangular with hook setae; appendix masculina with rounded apex, acute, simple setae on distal margin.



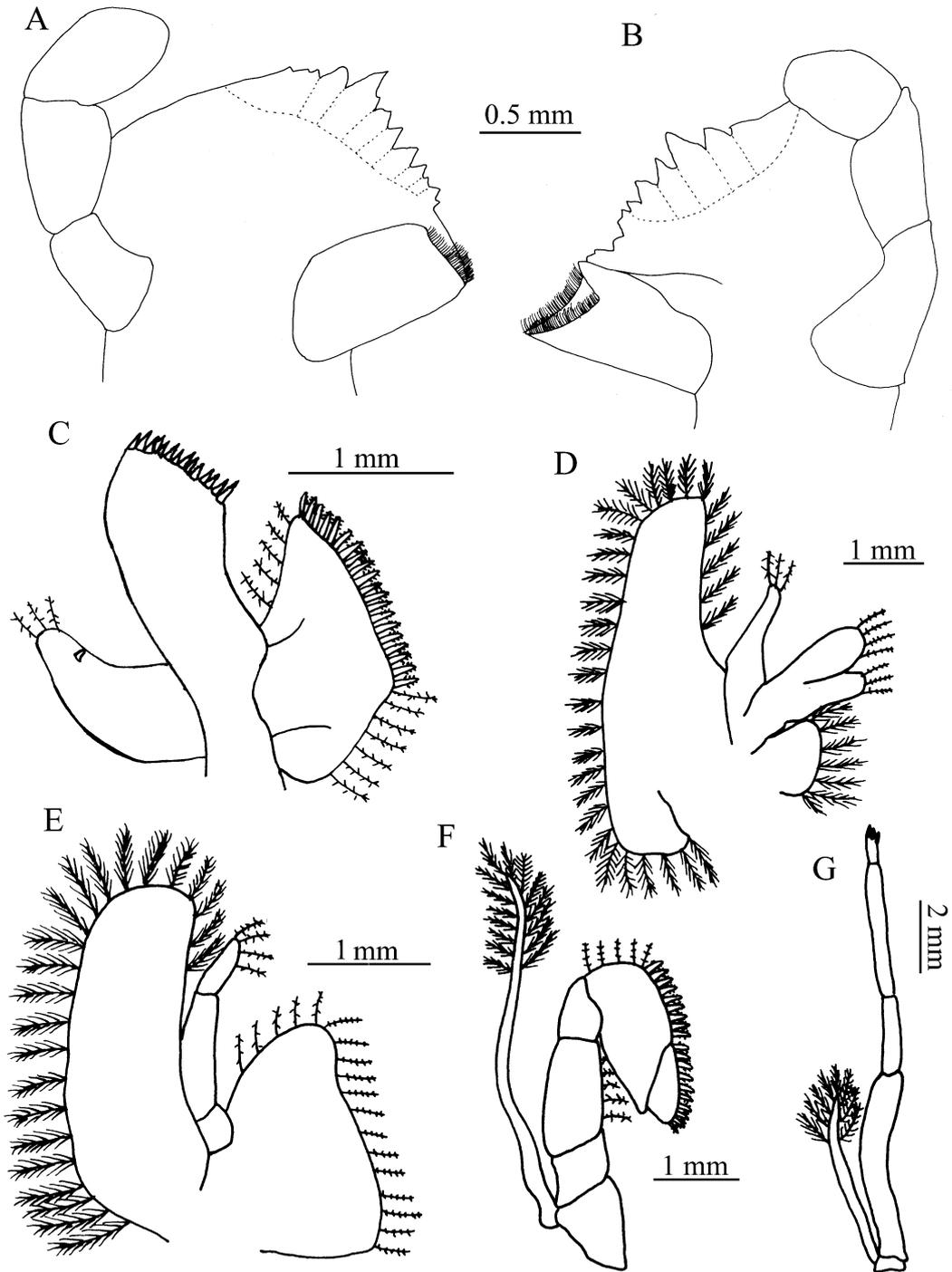
**FIGURE 19** — *Acanthephyra stylostratis* (Bate, 1888), male, MNRJ 14845 (carapace length 15mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as — antennal spine; brc — branchiostegal carina; brs — branchiostegal spine; cg — cervical groove; st — stylocerite).

Description: Eyestalk slightly shorter than styliform tooth of rostrum, with dorsal protuberance, without ocellus on medio-distal portion (Fig. 19B). Carapace with a thin laterally compressed crest that projects over the frontal margin in a rounded rostrum, with six spiniform teeth dorsally, anterior styliform tooth longer than others; rostrum reaching 1/6 of scaphocerite; carapace carinate on posterior end; small antennal spine present; branchiostegal spine supported by a long carina, reaching 2/3 of carapace; supraorbital and pterygostomial spines absent; cervical groove present; suprabranchial carina absent (Fig. 19A). Stylocerite broad, acute apex reaching end of first antennular peduncle article; first antennular peduncle article with distal margin serrate, tooth on outer margin reaching end of second antennular peduncle article; second antennular peduncle article with tooth on

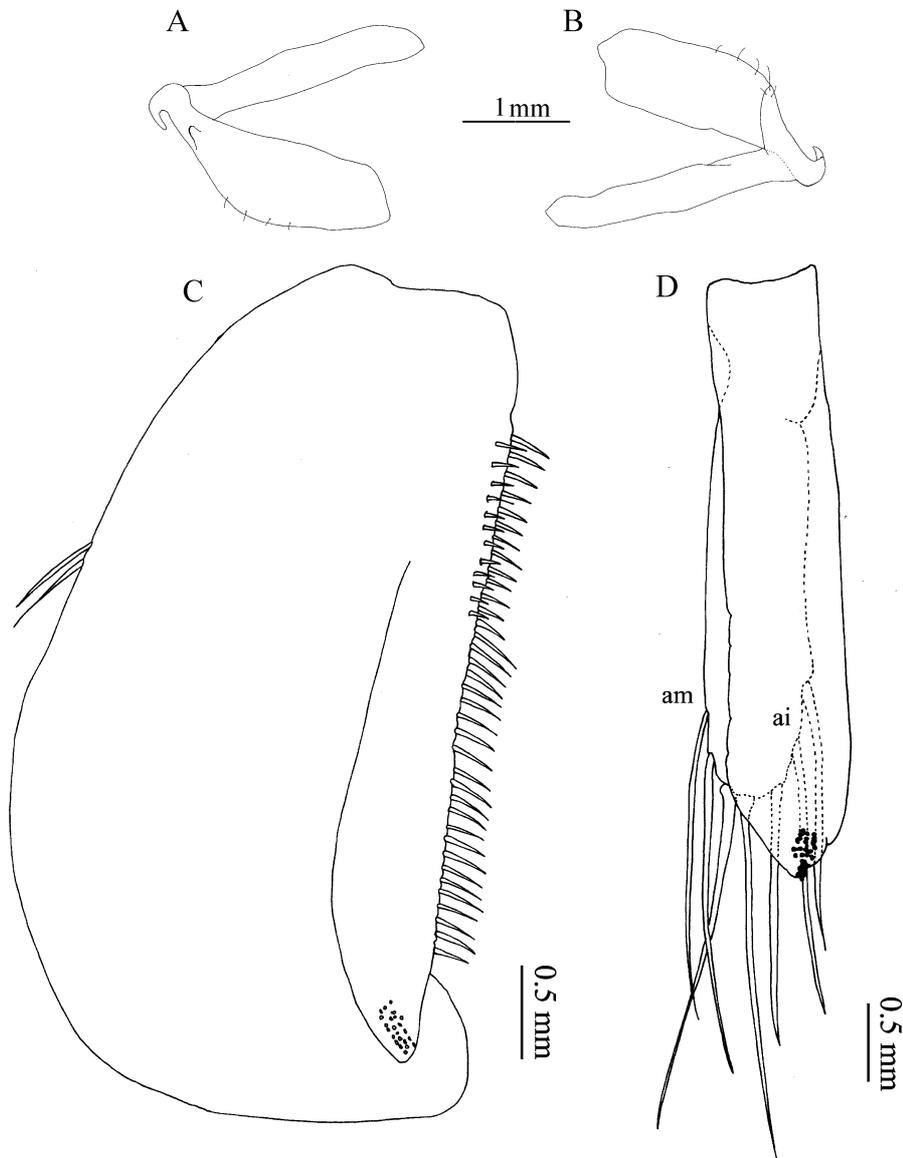
outer margin reaching 1/3 of third antennular peduncle article (Fig. 19C). Scaphocerite with blunt apex, densely plumose setae on inner margin and small distal tooth on outer margin (Fig. 19D). Mandible with palp three-articulated; incisor process with eight teeth, molar process triangular, with row of simple, short setae (Fig. 20A, B). Maxilla 1 with two endites, distal endite with numerous stout, serrate setae on inner margin; basal endite with pappose setae on distal margin, long, stout, pectinate setae on inner margin and several pappose setae on basal margin; palp with several pappose setae on rounded apex and one stout seta (Fig. 20C). Maxilla 2 with two endites, distal endite bilobed, both lobes with pectinate setae on inner margin; basal endite rounded, densely plumose setae on inner margin; endopod longer than endites, pappose setae on apex; scaphognathite with densely plumose setae on all margins (Fig. 20D). Maxilliped 1 endite with pappose setae on distal margin and pectinate setae on inner margin; endopod three-articulated, longer than distal endite, several pappose setae on apex and inner margin; exopodal lobe with densely plumose setae on margins (Fig. 20E). Maxilliped 2 endopod with elongate ischium and merus, pappose setae on inner margins; carpus short; propod rounded, pectinate setae on distal margin and long, stout, pectinate setae on inner margin; dactyl with long, stout, pectinate setae on inner margin; exopod with densely plumose setae on all margins (Fig. 20F). Maxilliped 3 slender, elongate; propod-dactyl with stout setae in apex; exopod with densely plumose setae on all margins (Fig. 20G). Pereopods 1 and 2 chelate. Pereopod 5 merus with 13 stout setae on inner margin (Fig. 19A). Epipods with mesial teeth present on pereopods 1 to 3 (Fig. 21A, B). Abdomen dorsally carinate on all somites, except on somite 1; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 at least 1 1/2 times longer than high (Fig. 19A). Male pleopod 1 endopod rounded, with numerous stout setae on anterior margin, distal lobe with numerous hook setae (Fig. 21C). Male pleopod 2 with appendix masculina shorter than appendix interna, with numerous acute pectinate setae on distal margin; appendix interna, about 1 1/4 length of appendix masculina, with apex slightly triangular with hook setae (Fig. 21D). Telson not sulcate in dorsal midline, with two pairs of dorsolateral stout setae, and three pairs of distal setae, median pair stronger (Fig. 22A, B).

Distribution: Western Atlantic: U.S.A. (off New Jersey), Mexico (Gulf of Mexico), Brazilian coast (21°12'S; 40°00'W). Eastern Atlantic: Canary, Madeira and Cape Verde Islands. Indian and Pacific: South Africa (Natal), Tuamotu Archipelago. Adults probably are mesopelagic (Barnard 1950; Chace 1986; Wasmer 1986).

Remarks: *Acanthephyra stylostratis* occurs in the Indian, Pacific and Atlantic Oceans. In the Western Atlantic, this species was recorded on North and Central America. This is the first record of this species from the Brazilian coast (South America) (Fig. 23). *Acanthephyra gracilipes* does not have a dorsal carina on abdominal somite 2, and the dorsal tooth on abdominal somite 3 is low and curved to left, while *A. stylostratis* has a dorso-dorsal carina on abdominal somite 2, and the dorsal tooth on abdominal somite 3 is not curved.



**FIGURE 20** — *Acanthephyra stylostratis* (Bate, 1888), male, MNRJ 14845; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.



**FIGURE 21** — *Acanthephyra stylostratis* (Bate, 1888), male, MNRJ 14845; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and masculina from right second pleopod, lateral view (ai, appendix interna; am, appendix masculina).

In Brazilian waters, *A. acutifrons*, *A. eximia*, *A. quadrispinosa* and *A. stylostratis* occur. *Acanthephyra stylostratis* differs from *A. eximia* and *A. acutifrons* in the rostrum shape, in the presence of branchiostegal carina, and by the smaller carapace length. *Acanthephyra stylostratis* differs from *A. quadrispinosa* in the rostrum shape, in the presence of dorsal carina on carapace and by the longer branchiostegal carina (Table 1).

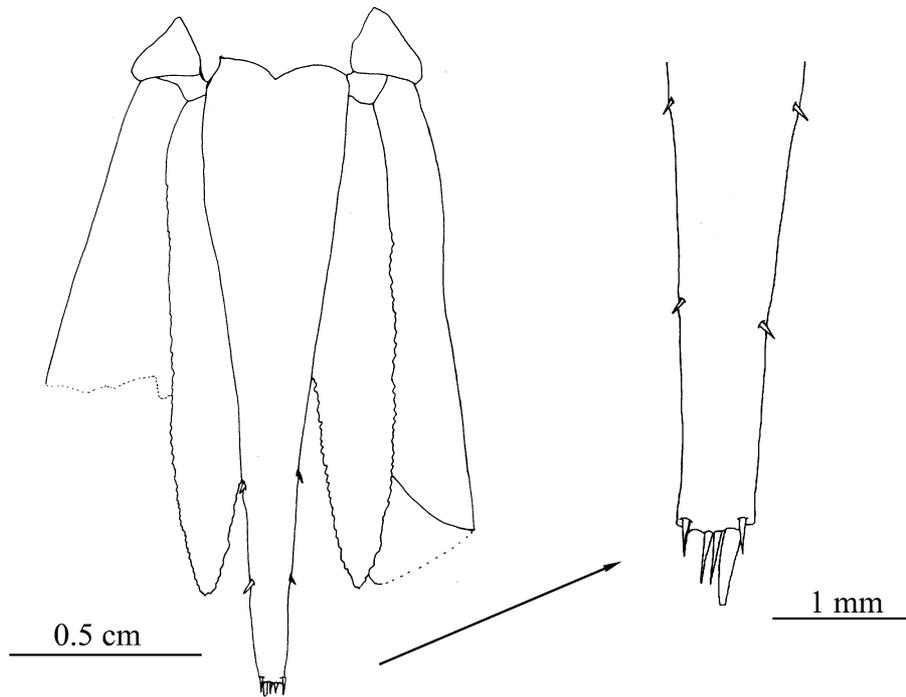


FIGURE 22 — *Acanthephyra stylostratis* (Bate, 1888), male, MNRJ 14845; telson and uropods, dorsal view.

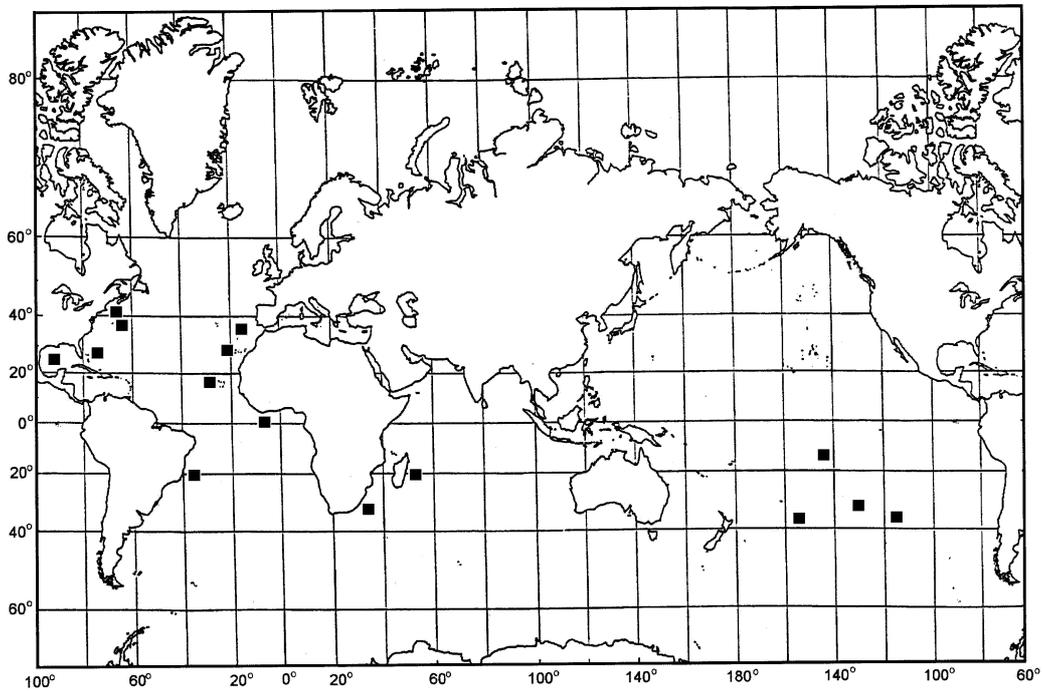


FIGURE 23 — Geographic distribution of *Acanthephyra stylostratis* (Bate, 1888).

The material examined agrees with the description of Bate (1888) in the rounded rostrum, with dorsal small teeth and the apical styliform tooth, and in the carapace and abdominal somite 2 to 6 being carinate. The material examined agrees with the descriptions of Chace (1940), Barnard (1950) and Wasmer (1986) except for three dorsolateral stout setae on telson compared to only two pairs of dorsolateral stout setae on the present material.

### **Genus *Ephyrina* Smith, 1885**

*Ephyrina* Smith, 1885: 506; Chace, 1986: 31; Holthuis, 1993: 34, fig. 12.

*Calymarina* Bate, 1888: 731.

*Tropirinus* Bate, 1888: 750.

*Tropiocaris* Bate, 1888: 834.

Diagnosis: Rostrum laterally compressed in subtriangular or subretangular shape, unarmed. Carapace not denticulate dorsally; with sinuous lateral gastro-orbital carina extending from near orbit to near posterior margin; without branchiostegal groove and hepatic spine. Abdomen without dorsal carina on all somites. Telson tapering to sharply acute apex; without spinose end piece. Scaphocerite without lateral teeth. Mandibles slightly dissimilar, incisor process unarmed in half of opposable margin nearest palp. Pereopods with ischium and merus broadly compressed. Pereopod 4 with epipod vestigial or absent. Appendix masculina present on second pleopod. Eggs large and few (less than 50) (modified from Chace 1986).

### ***Ephyrina benedicti* Smith, 1885**

(Figs 24–28)

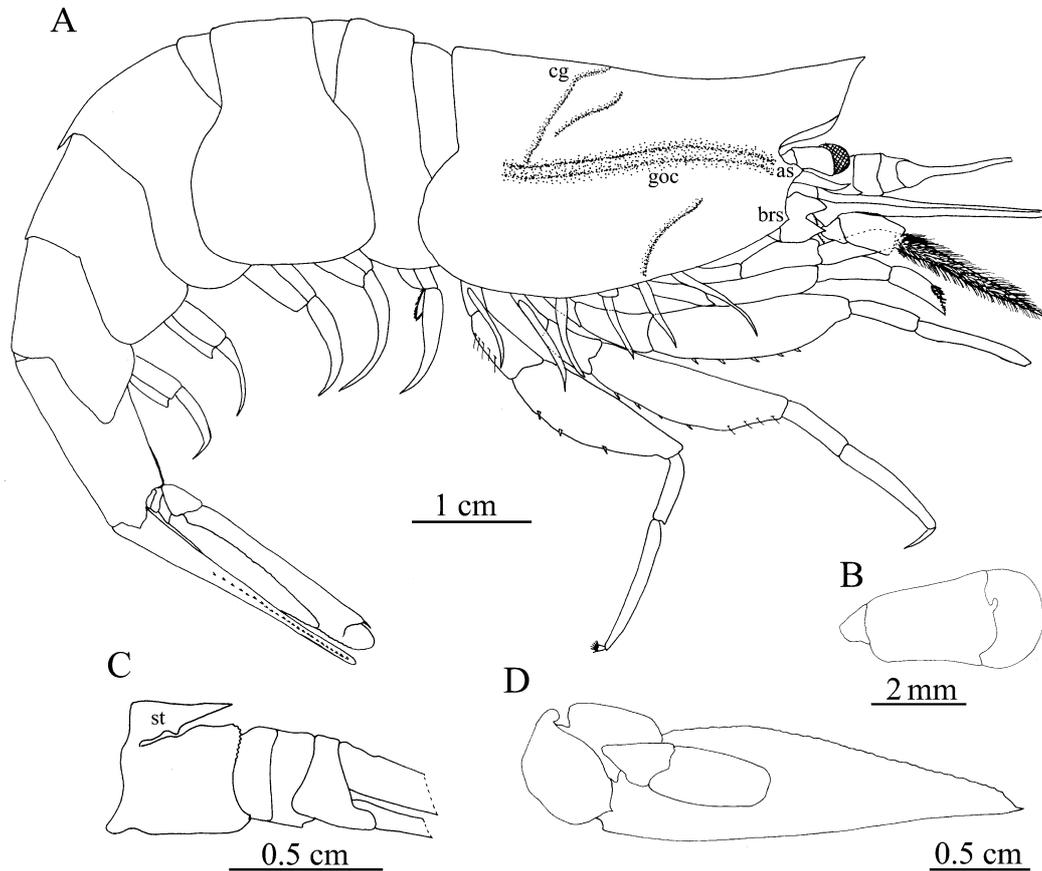
*Ephyrina benedicti* Smith, 1885: 506; De Man, 1920: 46; Crosnier & Forest, 1973: 65, figs 18, 19a; Chace, 1986: 33.

*Tropiocaris planipes* Bate, 1888: 835, pl. 136, fig. 1.

Material examined: Revizee Program: E-0519, 13°19'S, 38°19'W, 1730m, 1 ovigerous female (30mm), MNRJ 14885; E-0538, 20°27'S, 39°38'W, 1680m, 1 female (28mm), MNRJ 18883; E-0526, 20°06'S, 38°40'W, 1637m, 1 female (30mm), 1 male (37mm), MNRJ 18884.

Diagnosis: Carapace with rostrum short reaching 1/4 of scaphocerite length, unarmed; antennal and branchiostegal spine present, but not prominent; branchiostegal spine without distinct carina. Abdomen not dorsally carinate on all somites; somites 3 and 4 with posteromesial tooth, the one of somite 3 distinctly strong. Male pleopod 1, endopod rounded, posterior margin with densely plumose setae, anterior margin with a slender and

elongate lobe, with stout setae on anterior margin and numerous hook setae on apex; male pleopod 2 with appendix interna, as long as appendix masculina, distal portion slightly triangular in shape, with hook setae; appendix masculina with acute simple setae on distal margin.

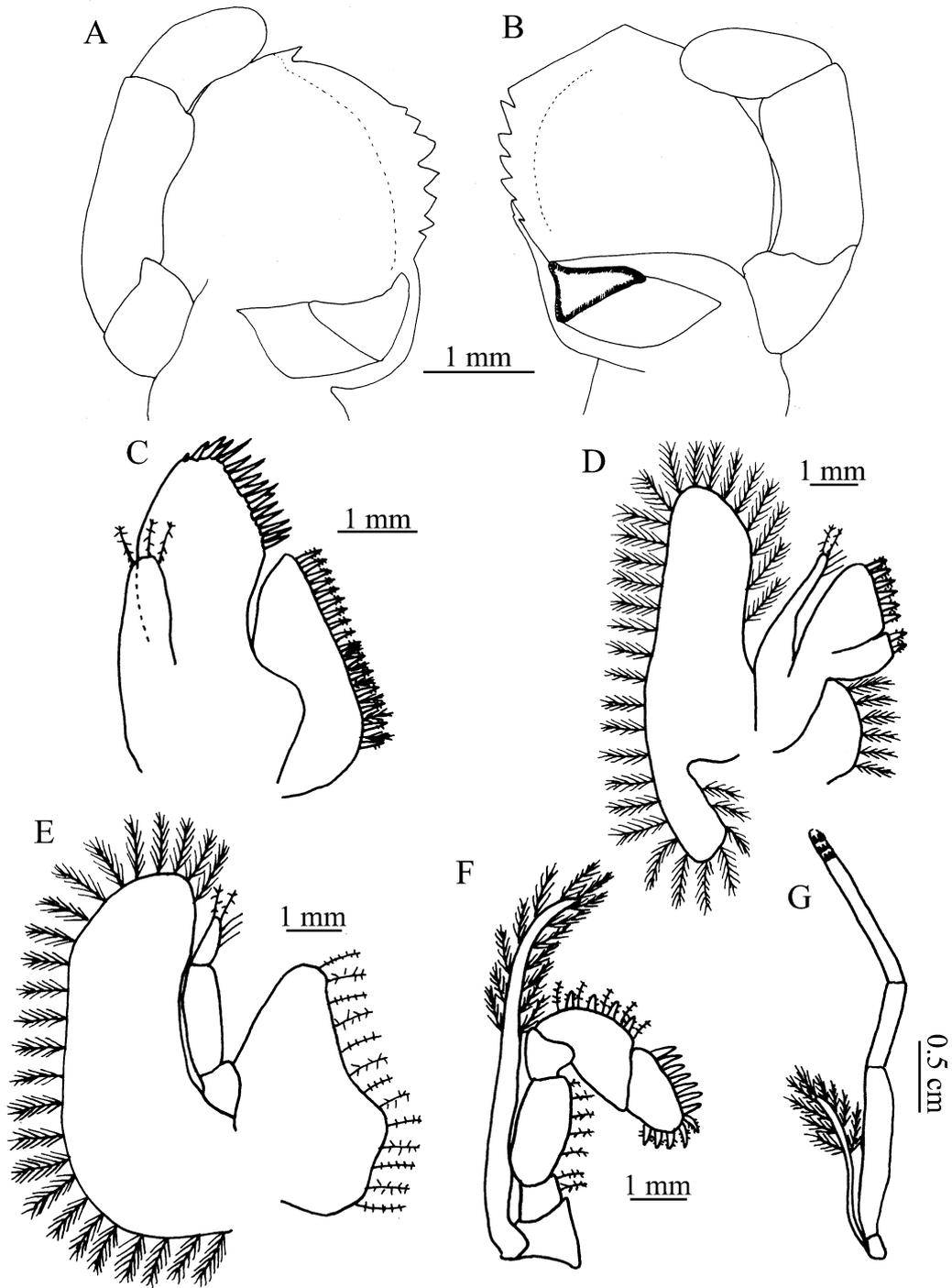


**FIGURE 24** — *Ephyrina benedicti* Smith, 1885, female, MNRJ 14845 (carapace length 28mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; brs, branchiostegal spine; cg, cervical groove; goc, gastro—orbital carina; st, stylocerite).

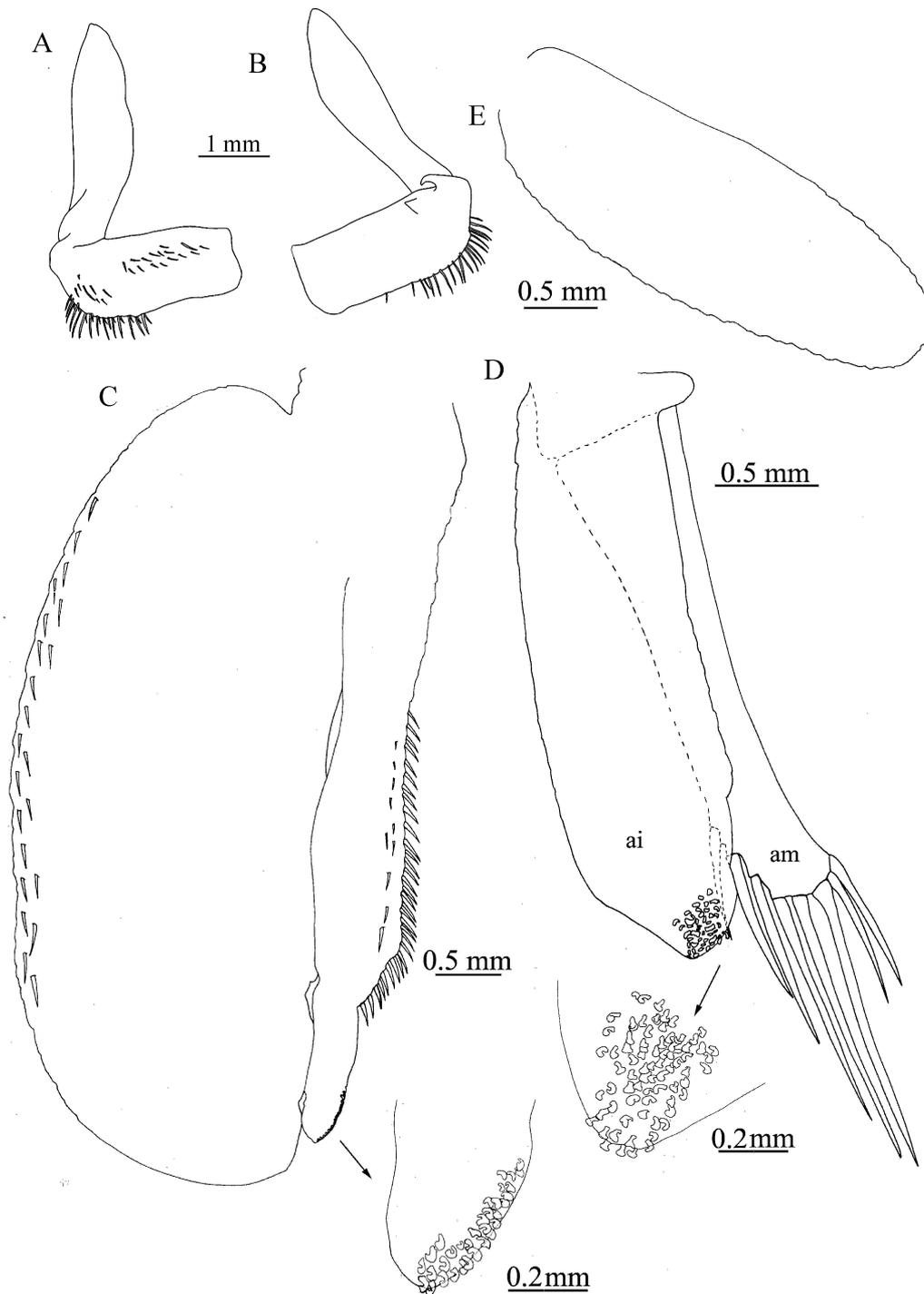
Description: Eyestalk without an ocellus on medio-distal portion (Fig. 24B). Carapace with rostrum laterally compressed in subtriangular shape, short, reaching 1/4 of scaphocerite length, unarmed (Fig. 24A); dorsal margin not carinate; antennal and branchiostegal spines present; branchiostegal spine without distinct carina; supraorbital and pterygostomial spines absent; sinuous lateral gastro-orbital carina extending from near orbit to near posterior margin; well marked cervical groove; suprabranchial carina absent (Fig. 24A). Stylocerite with straight margins, acute apex reaching end of first

antennular peduncle article; first antennular peduncle article with distal margin serrate on outer half (Fig. 24C). Scaphocerite broad at base, narrowing on tip, densely plumose setae on inner margin, distal tooth on outer margin (Fig. 24D). Mandible with palp three-articulated; incisor process with about six teeth; molar process triangular, numerous small simple setae on apex (Fig. 25A, B). Maxilla 1 with two endites; distal endite with numerous stout setae on inner margin; basal endite with long, stout, pectinate setae and short, broad, plumose setae on inner margin; palp with several pappose setae on rounded apex, without protuberance (Fig. 25C). Maxilla 2 with two endites; distal endite bilobed, both lobes with long, stout, pectinate setae on inner margin; basal endite rounded, densely plumose setae on inner margin; endopod as long as endites, pappose setae on apex, several simple setae on inner margin; scaphognathite with densely plumose setae on all margins (Fig. 25D). Maxilliped 1 endite with pectinate and pappose setae on inner margin; endopod three-articulated, as long as endite, with pappose setae on apex, several simple setae on inner margin; exopodal lobe with densely plumose setae in all margins (Fig. 25E). Maxilliped 2 endopod with elongate ischium and merus, pappose setae on inner margin; carpus short; propod rounded with pectinate and long, stout, pectinate setae on inner margin; dactyl with long, stout setae on inner margin, and several long, stout, pectinate setae on distal margin; exopod with densely plumose setae on all margins (Fig. 25F). Maxilliped 3 slender and elongate, propod-dactyl with stout setae on apex; exopod with densely plumose setae on all margins (Fig. 25G). Pereopods 1 and 2 not chelate, dactyl with many stout setae. Pereopods 3 to 5 with ischium and merus laterally strongly compressed. Pereopod 3, merus with five stout setae on inner margin. Pereopod 4, merus with four stout setae on inner margin. Pereopod 5, merus with three stout setae on inner margin (Fig. 24A). Epipods with mesial teeth, on pereopods 1 to 3 (Fig. 26A, B). Abdomen without dorsal carina on somites; somites 3 and 4 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 at least 1 ½ times longer than high (Fig. 24A). Male pleopod 1 endopod rounded, densely plumose and stout setae on posterior margin, distal lobe slender and elongate with stout setae on anterior margin and numerous hook setae on apex (Fig. 26C); Male pleopod 2 with long, slender, appendix masculina acute simple setae on apex; appendix interna as long as appendix masculina, apex slightly triangular, numerous hook setae (Fig. 26D). Female pleopod 1 endopod rounded, densely plumose setae on all margins (Fig. 26E). Exopod of uropod with complete diaresis, one distal spine on outer margin (Fig. 27). Telson not sulcate in dorsal midline, with about 24 pairs of dorsolateral stout setae, without distal setae (Fig. 27).

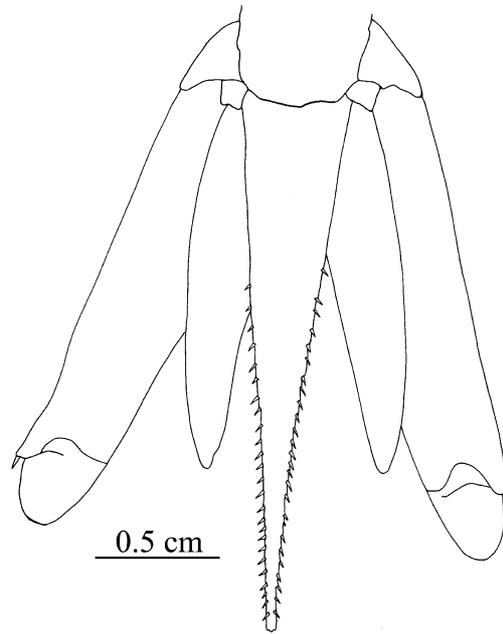
Distribution: Western Atlantic: South Greenland (56°56'S; 51°17'W), U.S.A. (40°26'S; 67°05'W), Brazil (Bahia, Espírito Santo). Eastern Atlantic: south-west Ireland (50°28'S; 11°39'W), west Portugal (36° to 45°S; 11°W), west Canary Archipelago, Gabon, Saint Tomé Island. Indian and Pacific Oceans: northeastern Philippine Sea, west of Bonin Islands, Japan, Hawaii. Adults probably are mesopelagic and bathypelagic (Crosnier & Forest 1967; Chace 1986; Crosnier 1987).



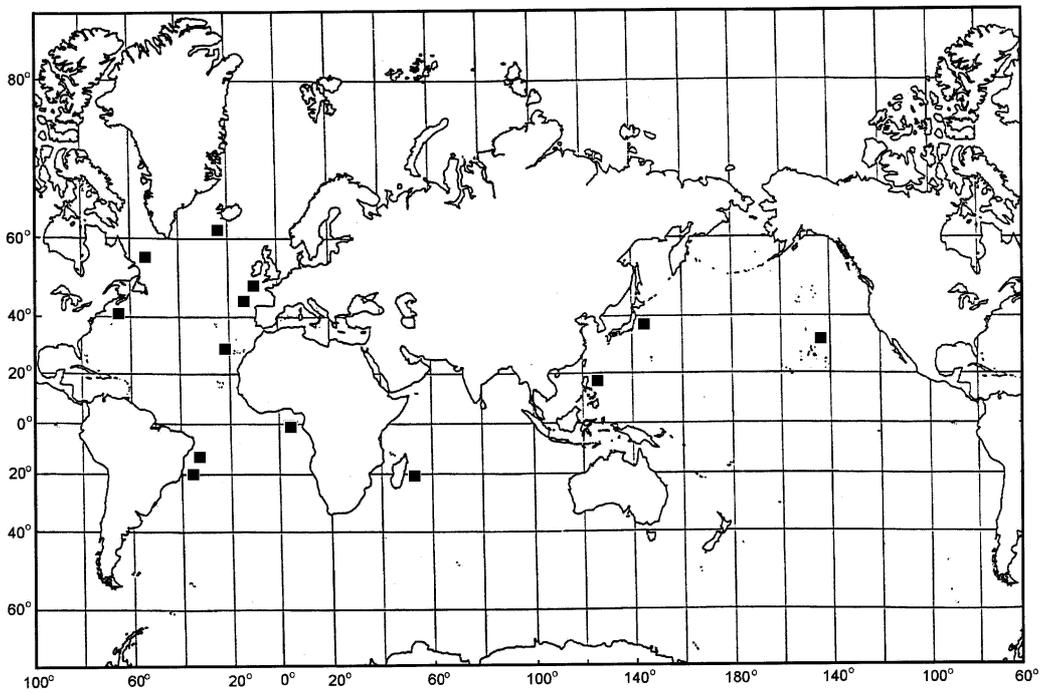
**FIGURE 25** — *Ephyrina benedicti* Smith, 1885, female, MNRJ 14845; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.



**FIGURE 26** — *Ephyrina benedicti* Smith, 1885, female, MNRJ 14845. A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view. *Ephyrina benedicti* Smith, 1885, male, MNRJ 14847 (carapace length 37mm) C, endopod of right first pleopod, lateral view; D, appendix interna and masculina from right second pleopod, lateral view. Female, MNRJ 14845 E, endopod of right first pleopod, lateral view (ai, appendix interna; am, appendix masculina).



**FIGURE 27** — *Ephyrina benedicti* Smith, 1885, female, MNRJ 14845; telson and uropods, dorsal view.



**FIGURE 28** — Geographic distribution of *Ephyrina benedicti* Smith, 1885.

Remarks: This species occurs on Indian, Pacific and Atlantic Oceans. In the Western Atlantic this species was recorded only from North America. This is the first record of this genus and species from Brazilian waters (South America) (Fig. 28).

*Ephyrina* encompasses six species, four of them occurring in the North Western Atlantic. Of these, two (*E. figueirai* Crosnier & Forest, 1973 and *E. ombango* Crosnier & Forest, 1973) have abdominal somite 3 without a dorsal tooth, distinct from *E. benedicti* and *E. bifida* Stephensen, 1923 that have abdominal somite 3 with a dorsal tooth. *Ephyrina bifida* has abdominal somite 3 with bifid dorsal tooth, and the telson with four to seven pairs of dorsolateral stout setae, while *E. benedicti* has abdominal somite 3 with a simple dorsal tooth, and the telson with 22 to 27 pairs of dorsolateral stout setae.

The samples examined herein agree with the description of Smith (1885) in the carapace and abdominal somites without a dorsal carina, the simple dorsal tooth on abdominal somite 3 and the telson much longer than the sixth somite, with 20 to 25 dorsolateral stout setae. Crosnier & Forest (1973) illustrated the suprbranchial carina but not the cervical groove observed in the present material-

### Genus *Janicella* Chace, 1986

*Janicella* Chace, 1986: 43; Holthuis, 1993: 36, fig. 15.

Diagnosis: Rostrum with more dorsal than ventral teeth. Carapace not denticulate dorsally; without lateral gastro-orbital carina extending from near orbit to near posterior margin; branchiostegal groove present, not delimited by vertical groove; without hepatic spine. Abdomen dorsally carinate on somites 2 to 4; dorsal tooth on somites 3 to 6, the one of somite 2 distinctly strong; somite 6 longer than 5. Telson tapering to sharply acute apex; with spinose end piece. Scaphocerite with lateral teeth. Mandible similar, incisor process armed along entire length, molar process reduced. Pereopods with ischium and merus not broadly compressed. Pereopod 4 with epipod well developed except for vertical component. Appendix masculina absent on second pleopod. Eggs large and few (nine or ten) (modified from Chace 1986).

### *Janicella spinicauda* (A. Milne Edwards, 1883) (Figs 29–33)

*Oplophorus spinicauda* A. Milne Edwards, 1883; Chace, 1940: 184, fig. 54; Kensley, 1972: 38, fig. 17D, E.

*Oplophorus foliaceus* Rathbun, 1906: 922, pl. 20, fig. 8; De Man, 1920: 48.

*Acathephyra anomala* Boone, 1927: 104, fig. 21.

*Janicella spinicauda* – Chace, 1986: 44, figs 23, 24; Kensley, 1987: 285.

Material examined: Revizee Program: D-0536, 20°0'S, 34°40'W, 1293m, 5324 specimens, MNRJ 14108; D-0416, 18°02'S, 36°06'W, 56m, 1391 specimens, MNRJ 14109; D-0463, 21°48'S, 40°02'W, 37m, 3267 specimens, MNRJ 14110; D-0471, 21°31'S, 39°47'W, 138m, 242 specimens, MNRJ 14142; E-0536, 20°24'S, 39°46'W, 1293m, 3 females (8 to 9.5mm), 1 male (9.5mm), MNRJ 14854; E-0526, 20°06'S, 38°40'W, 32m, 1 female (8mm), MNRJ 14855; E-0528, 19°45'S, 39°03'W, 1237m, 1 ovigerous female (9mm), 1 female (9mm), 1 male (8mm), MNRJ 14856; E-0535, 19°58'S, 39°38'W, 1002m, 1 male (9mm), MNRJ 14857; E-0529, 19°48'S, 39°02'W, 1337m, 1 male (8.5mm), MNRJ 14859; E-0546, 21°43'S, 40°03'W, 565m, 2 males (7.5, 8mm), MNRJ 14858; E-0541, 21°13'S, 40°14'W, 557m, 4 ovigerous females (9 to 10mm), 16 females (7.5 to 9mm), 14 males (8.5 to 9mm), MNRJ 14860; E-0533, 19°42'S, 39°26'W, 239m, 2 females (7.5, 9mm), 1 male (9mm), MNRJ 14861; E-0538, 20°27'S, 39°38'W, 1680m, 1 juvenile (7mm), MNRJ 14862; E-0543, 21°23'S, 40°11'W, 666m, 1 male (9mm), MNRJ 14863; E-0534, 19°42'S, 39°21'W, 613m, 2 ovigerous females (9.5, 10mm), 9 females (8 to 10mm), 17 males (6.5 to 9.5mm), MNRJ 14864; E-0523, 19°42'S, 38°32'W, 922m, 2 males (9, 9.5mm), MNRJ 14865. Oceanprof I: A-18, 22°15'S, 39°47'W, 1608m, 1 ovigerous female (11mm), 2 females (4.5, 10.5mm), 3 males (7.5 to 11mm), MNRJ 19047; A-1, 22°24'S, 39°54'W, 1128m, 2 females (6, 9mm), MNRJ 19048; A-12, 22°11'S, 39°47'W, 1632m, 2 females (7.5, 8mm), MNRJ 19180; 22°15'S, A-17, 39°51'W, 1294m, 31 ovigerous females (8.5 to 11mm), 15 female (7 to 10.5mm), 20 males (8 to 11mm), MNRJ 19181; A-10, 22°11'S, 39°51'W, 1144m, 3 females (4 to 7mm), 4 males (7–11mm), MNRJ 19182; A-4, 22°24'S, 39°54'W, 1128m, 3 ovigerous females (10 to 10.5mm), 5 females (7.5 to 9.5mm), 4 males (9 to 11mm), MNRJ 19183; A-5, 22°27'S, 39°54'W, 1320m, 3 females (8 to 11mm), MNRJ 19194; A-2, 22°24'S, 39°55'W, 1130m, 1 female (8.5mm), MNRJ 19213; A-7, 22°45'S, 40°19'W, 1124m, 3 females (6.5 to 7mm), 3 males (5.5 to 7mm), MNRJ 19214; A-14, 21°50'S, 39°49'W, 1358m, 1 male (9mm), MNRJ 19215; A-11, 22°10'S, 39°48'W, 1319m, 3 males (9 to 10mm), MNRJ 19216; A-18, 22°15'S, 39°47'W, 1608m, 1 ovigerous female (9.5mm), 2 females (7, 7.5mm), 1 male (10.5mm), MNRJ 19218; A-6, 22°27'S, 39°52'W, 1649m, 1 female (8mm), MNRJ 19219; A-16, 22°15'S, 39°53'W, 1071m, 1 male (7mm), MNRJ 19224.

Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with six teeth, dorsal margin with 12 teeth; antennal spine absent; branchiostegal spine not well marked, without distinct carina. Scaphocerite with four teeth on mesial outer margin. Abdomen dorsally carinate on somites 2 to 4, with strong posteromesial tooth, the one of somite 2 distinctly strong; somites 1 and 2 with pleura ventral margin convexly incised in male. Male pleopod 1, endopod leaf like, densely plumose, articulated setae on lateral margins, several pectinate setae on outer surface, several hook setae on apex; male pleopod 2 without appendix masculina; appendix interna with densely plumose setae on lateral margins, rounded apex with several hook setae.

Description: Eyestalk with ocellus on medio-distal portion (Fig. 29B). Rostrum longer

than carapace, overreaching scaphocerite, ventral margin with six teeth, dorsal margin with 12 teeth (Fig. 29A); dorsal margin carinate throughout entire length; antennal spine absent; branchiostegal spine not well marked, without distinct carina; supraorbital and pterygostomial spines absent; cervical groove present; suprabranchial carina absent (Fig. 29A). Stylocerite short, slightly rounded apex, reaching half of first antennular peduncle article; first antennular peduncle article with rounded tooth on distal outer margin reaching 2/3 of second antennular peduncle article (Fig. 29C). Scaphocerite ending in acute apex, four strong teeth on outer margin and densely plumose setae on inner margin (Fig. 29D). Mandible with palp three-articulated; incisor process with about 16 serrate teeth; molar process reduced, triangular, with a row of small teeth (Fig. 30A, B). Maxilla 1 with two endites; distal endite with several pectinate setae on distal margin, stout, pectinate setae on inner margin, several pappose setae on basal margin; basal endite rounded, pappose setae on distal and inner margins; palp with several pectinate setae on distal and inner margins, without protuberance (Fig. 30C). Maxilla 2 with two endites; distal endite bilobed, distal lobe with pappose setae on distal margin, pectinate setae on inner margin; basal lobe with pectinate setae on inner margin; basal endite bilobed, rounded, both lobes with pappose setae on inner margin; endopod shorter than endites, pectinate setae on apex and outer margin; scaphognathite with densely plumose setae on all margins (Fig. 30D). Maxilliped 1 with two endites, distal with pappose and pectinate setae on inner margin; basal endite with pappose setae on inner margin; endopod bi-articulated, shorter than basal endite, several pappose setae on apex; exopodal lobe with densely plumose setae in all margins (Fig. 30E). Maxilliped 2 endopod with ischium and merus fused, pappose setae on inner margin; carpus short; propod rounded with long, stout, pectinate setae on distal and inner margins; dactyl with long, stout, pectinate setae on inner margin; exopod with densely plumose setae on all margins (Fig. 30F). Maxilliped 3 slender, elongate, simple setae in all articles, propod-dactyl with tufts of long, stout, pectinate setae on inner margin, stout setae on outer margin; exopod with densely plumose setae on all margins (Fig. 30G). Pereopods 1 and 2 chelate. Pereopod 3 propod with six robust teeth on inner margin. Pereopod 4 propod with four teeth on inner margin. Pereopod 5 propod unarmed on inner margin, dactyl not rounded, claw like (Fig. 29A). Epipods with mesial teeth present on pereopods 1 to 3; epipods well developed on pereopod 4, except for vertical component (Fig. 31A, B). Abdomen dorsally carinate on somites 2 to 4; somites 2 to 4 with posteromesial tooth; the one of somite 2 distinctly strong; somite 6 longer than somite 5 (Fig. 29A). Male pleopod 1 endopod leaf like, densely plumose, articulated setae on lateral margins, several pectinate setae on inner surface, and several hook setae on apex (Fig. 31C). Male pleopod 2 without appendix masculina; appendix interna with densely plumose setae on lateral margins, rounded apex, with several hook setae (Fig. 31D). Female pleopod 1, endopod leaf shaped, with numerous plumose articulated setae on lateral margins (Fig. 31E). Exopod of uropod with complete diaresis, distal spine on outer margin (Fig. 32A). Telson sulcate in dorsal midline, three pairs of dorsolateral stout setae (Fig. 32A), spinose end

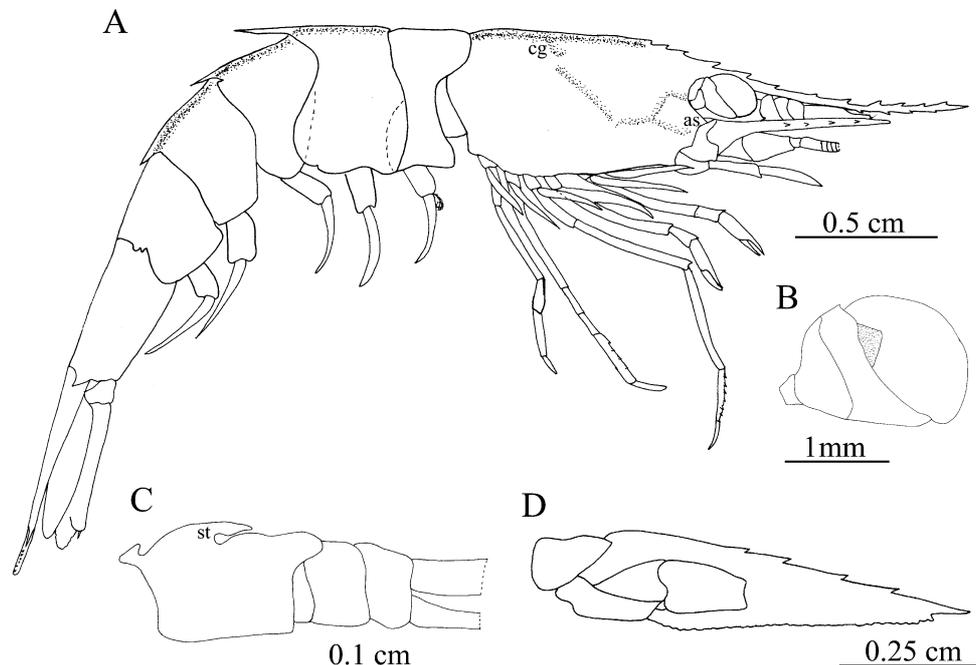
piece flanked by pair of long, stout, pectinate setae, formed by ten pairs of stout, pectinate setae (Fig. 32B).

Distribution: Western Atlantic: U.S.A. (east coast of Florida), Bermuda, Bahamas, Caribbean Sea, Honduras, Brazil (Bahia to Rio de Janeiro). Indian and Pacific Oceans: north of Madagascar, southwestern India, Philippines, Hawaii. Adults probably are mesopelagic (Chace 1940, 1986).

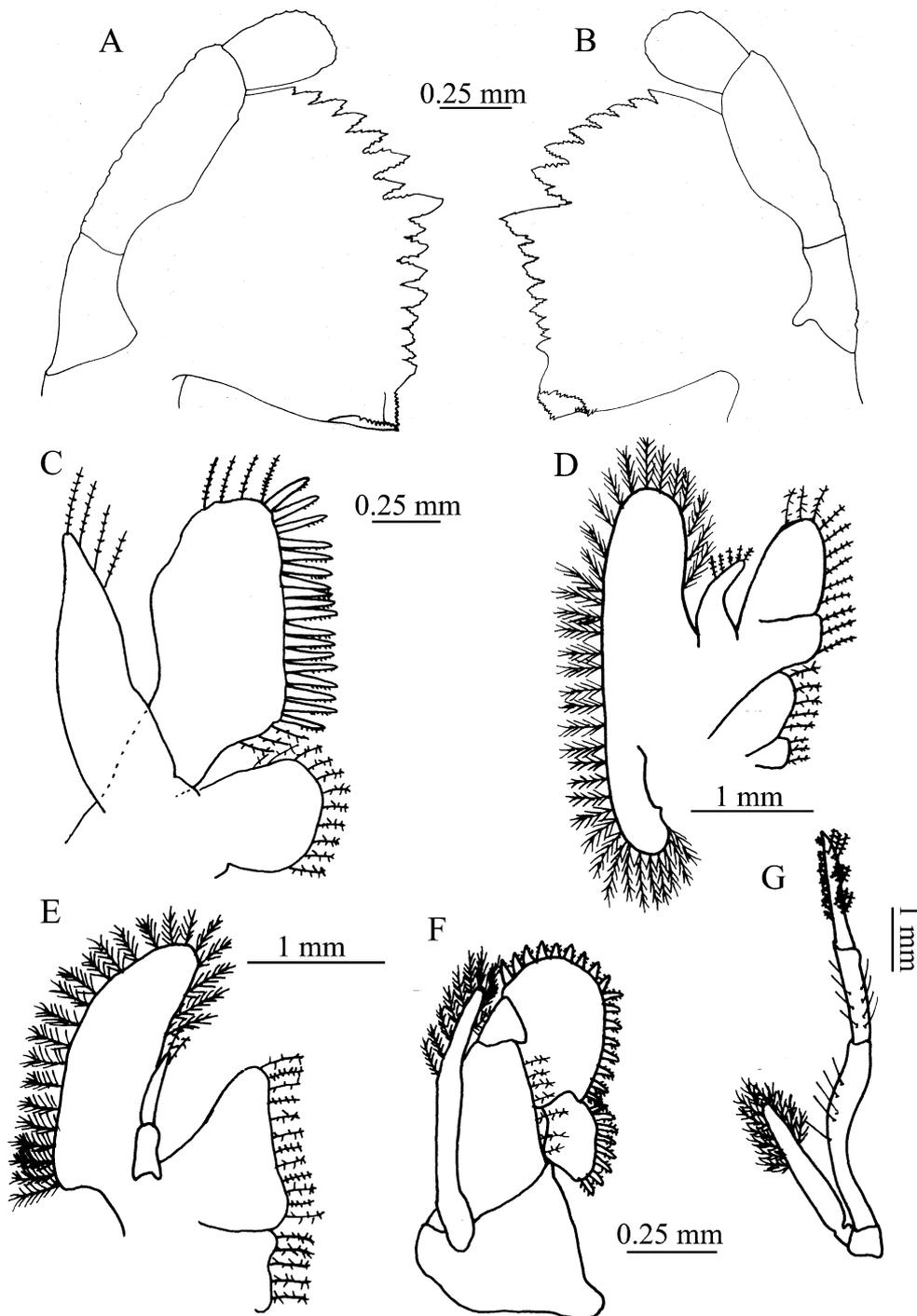
Remarks: This species is widespread in the Indian, Pacific and Atlantic Oceans. In the Western Atlantic, this species occurs in North and Central America. This is the first record of this species from South American waters (Fig. 33).

The genus *Janicella* is monotypic and was created by Chace (1986) to accommodate *Oplophorus spinicauda* A. Milne Edwards, 1883 that has the abdominal somite 2 with a dorsal tooth, the abdominal somite 5 without a dorsal tooth and the male pleopod 2 not bearing an appendix masculina.

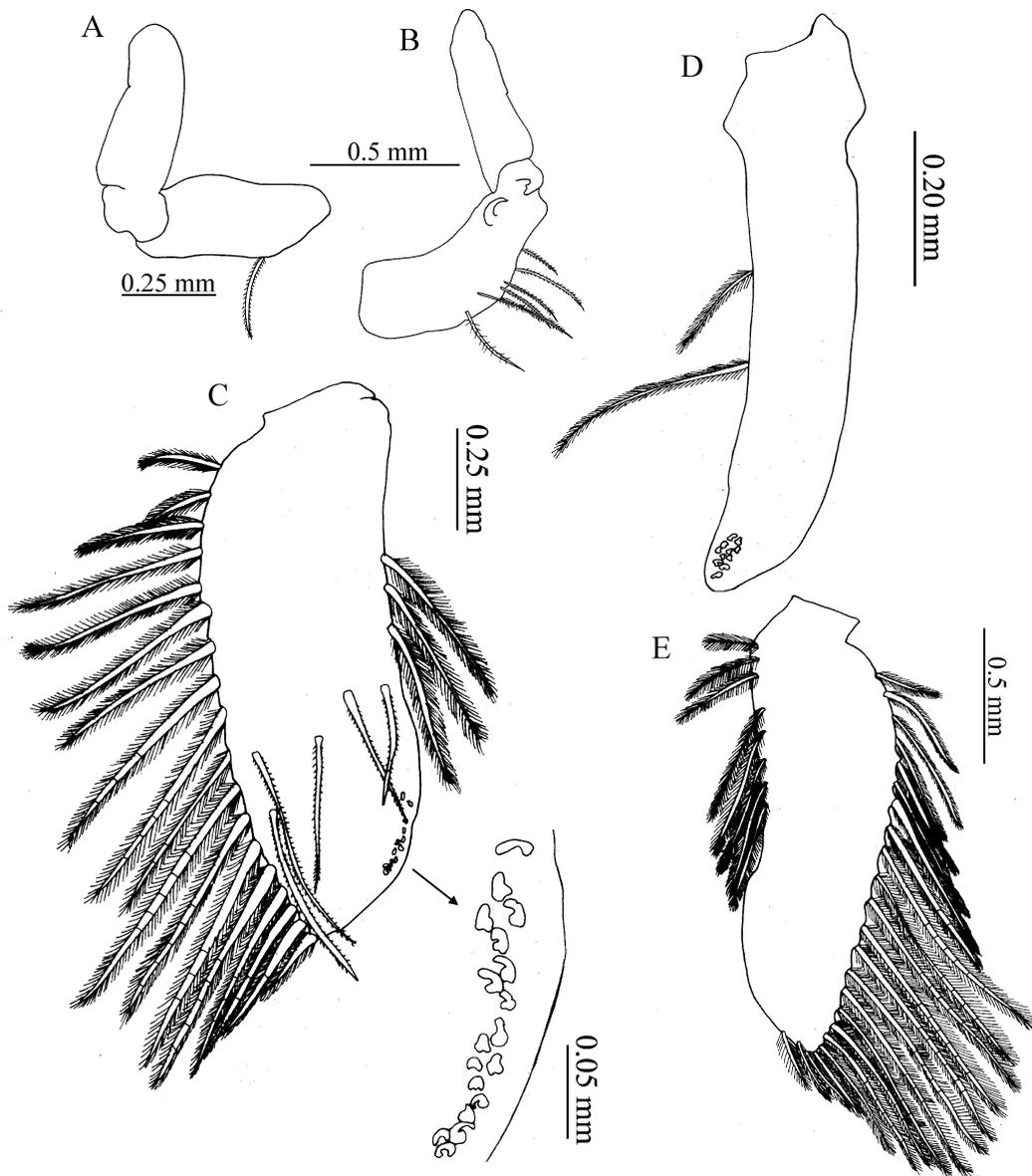
The material examined agrees with the description of Chace (1940) with the carapace without ventral posterior tooth, the abdominal somites 2 to 4 with a dorsal tooth, and the telson with spinose end piece flanked by long, stout setae. The Brazilian material also agrees with Chace's (1986) description in having the rostrum longer than carapace, with 12 dorsal and six ventral teeth, the scaphocerite with four teeth on outer margin, and the ventral margin of pleura of abdominal somites 1 and 2 with a convex incision in males.



**FIGURE 29** — *Janicella spinicauda* (A. Milne Edwards, 1883), male, MNRJ 14857 (carapace length 9mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; cg, cervical groove; st, stylocerite).



**FIGURE 30** — *Janicella spinicauda* (A. Milne Edwards, 1883), male, MNRJ 14857; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.



**FIGURE 31** — *Janicella spinicauda* (A. Milne Edwards, 1883), male, MNRJ 14857; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna of right second pleopod, lateral view (ai, appendix interna). *Janicella spinicauda* (A. Milne Edwards, 1883), female, MNRJ 14856 (carapace length 9mm) E, endopod of right first pleopod, lateral view .

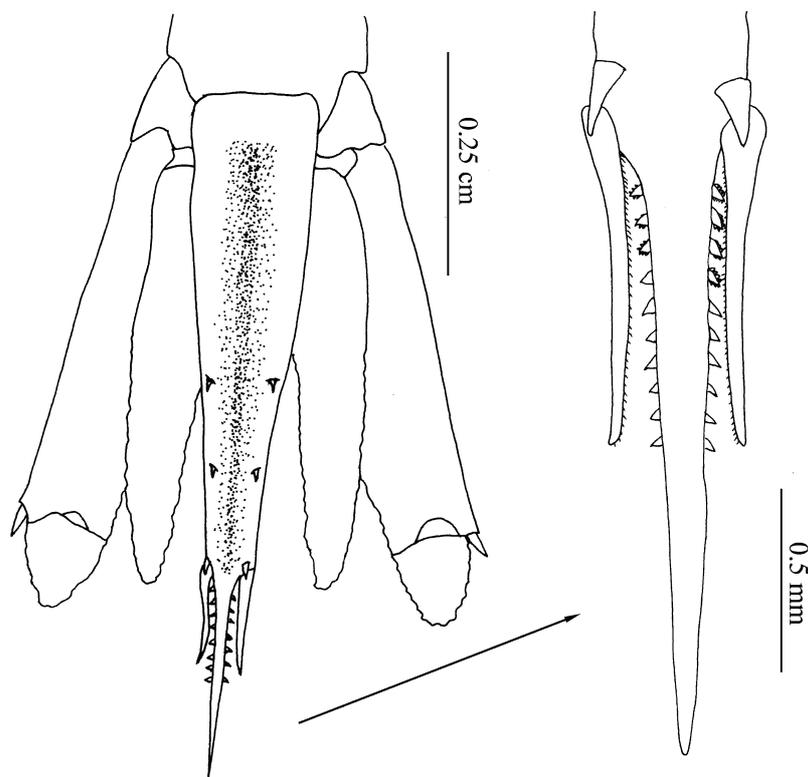


FIGURE 32 — *Janicella spinicauda* (A. Milne Edwards, 1883), male, MNRJ 14857; telson and uropods, dorsal view.

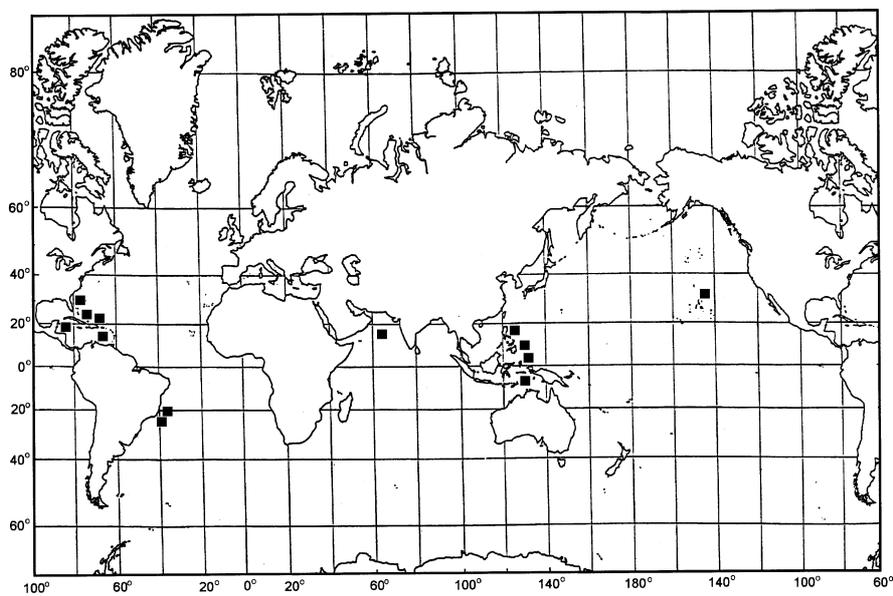


FIGURE 33 — Geographic distribution of *Janicella spinicauda* (A. Milne Edwards, 1883).

**Genus *Notostomus* A. Milne Edwards, 1881**

*Notostomus* A. Milne Edwards, 1881: 7; Chace, 1986: 52; Holthuis, 1993: 38, fig. 18.

Diagnosis: Rostrum with more dorsal than ventral teeth. Carapace denticulate dorsally; with lateral gastro-orbital carina extending from near orbit to near posterior margin; with two, or more longitudinal carina near ventral margin; branchiostegal groove present, delimited by vertical groove; without hepatic spine. Abdominal somites 3 to 5 with strong dorsal tooth; somite 6 shorter than 5, without dorsal carina. Telson tapering to sharply acute apex; without spinose end piece. Scaphocerite with lateral teeth. Mandible not very dissimilar, incisor process unarmed in half of opposable margin nearest palp. Pereopods with ischium and merus not broadly compressed. Pereopod 4 with epipod vestigial. Appendix masculina present on second pleopod. Eggs small and numerous (more than 80) (modified from Chace 1986).

***Notostomus elegans* A. Milne Edwards, 1881**

(Figs 34–38)

*Notostomus elegans* A. Milne Edwards, 1881: 7; Crosnier & Forest, 1973: 49; Chace, 1986: 56, figs 28D–F, 29C–E, 30; Kensley, 1987: 287.

*Notostomus patentissimus* Bate, 1888: 826, pl. 123, figs 1, 1A–C, 2.

*Notostomus longirostris* Bate, 1888: 833, pl. 135, fig. 4.

*Notostomus westergreni* Faxon, 1893: 208.

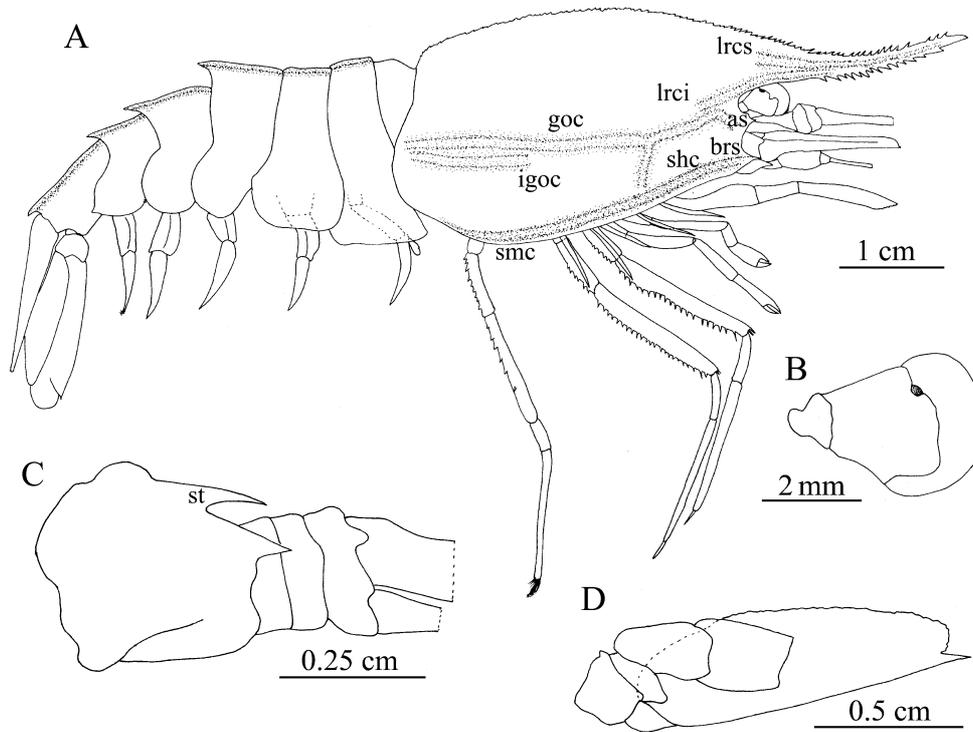
*Notostomus atlanticus* Lenz & Strunck, 1914: 330; De Man, 1920: 46.

Material: Revizee Program: E-0523, 19°42'S, 38°32'W, 922m, 1 female (16mm), MNRJ 14850; E-0524, 19°43'S, 38°39'W, 925m, 1 female (26mm), MNRJ 14883. Oceanprof I: A-12, 22°11'S, 39°47'W, 1632m, 1 female (20.5mm), MNRJ 19156.

Diagnosis: Carapace with rostrum overreaching scaphocerite length, with about 14 ventral teeth; antennal spine present; branchiostegal spine present, with distinct carina that extends to posterior carapace margin. Abdomen dorsally carinate on all somites; somites 3 to 6 with posteromesial tooth, the one of somite 3 distinctly strong. Female pleopod 1 with endopod leaf shaped, numerous plumose, articulated setae on lateral margin; female pleopod 2 with appendix interna, plumose setae on lateral margins, hook setae on rounded apex.

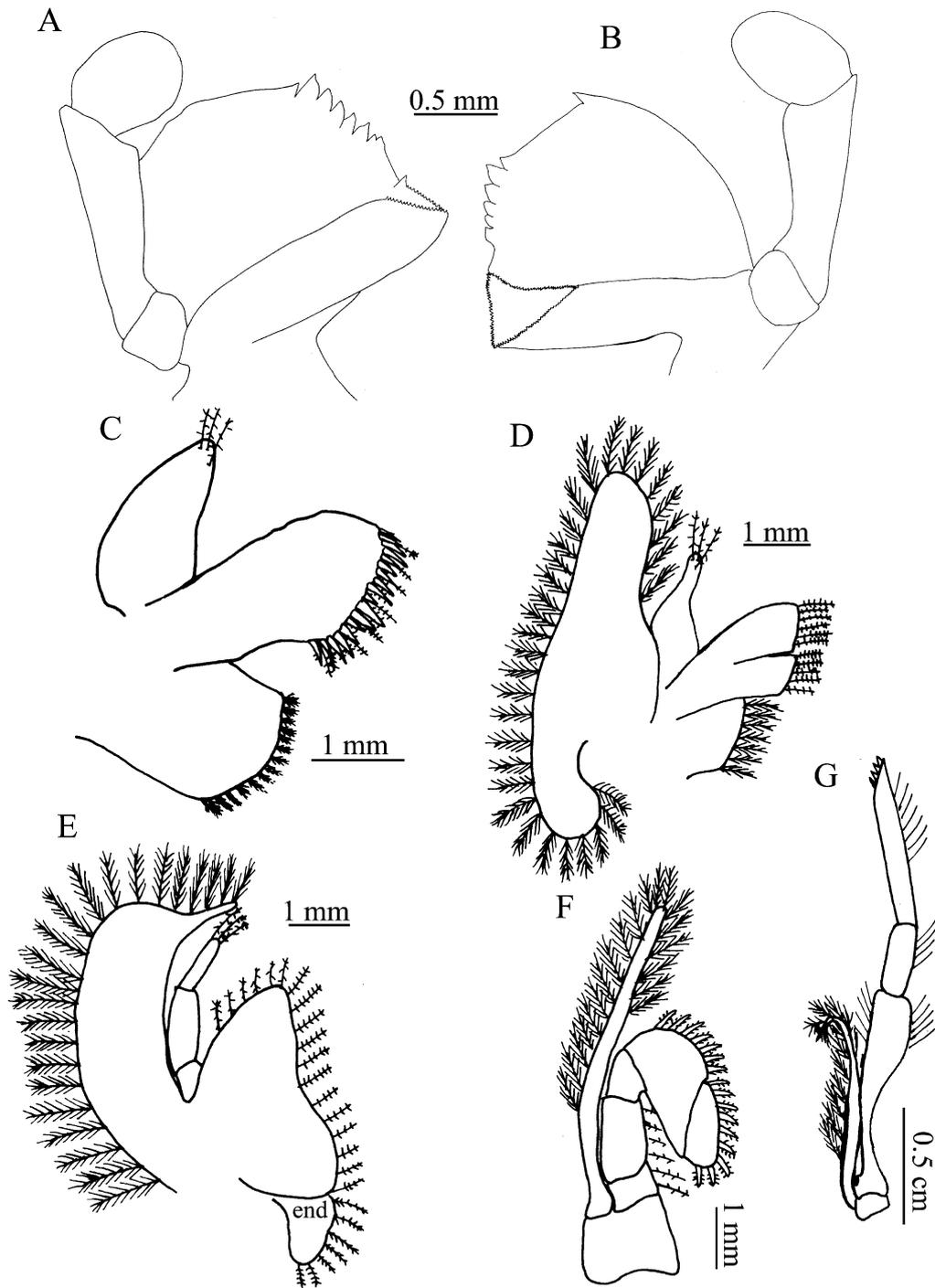
Description: Eyestalk with ocellus on medio-distal portion (Fig. 34B). Carapace with rostrum overreaching scaphocerite length, with 14 acute teeth on ventral margin and 32 acute teeth on dorsal margin, lateral rostral superior and inferior carinas present (Fig. 34A); dorsal margin denticulate in entire length; antennal and branchiostegal spines present; supraorbital and pterygostomial spine absent; with gastro-orbital carina extending from near orbit to near posterior margin; infra-gastro-orbital carina on posterior

1/3 of carapace; cervical groove and suprabranchial carina absent, with distinct subhepatic carina from anterior to posterior carapace margin; submarginal carina under subhepatic carina, extending from anterior to posterior carapace margin (Fig. 34A). Stylocerite narrow, acute



**FIGURE 34** — *Notostomus elegans* A. Milne Edwards, 1881, female, MNRJ 14883 (carapace length 26mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; brs, branchiostegal spine; goc, gastro-orbital carina; igoc, infra gastro-orbital carina; lrci, lateral rostral carina inferior; lrca, lateral view rostral carina superior; shc, subhepatic carina; smc, submarginal carina; st, stylocerite).

apex overreaching first antennular peduncle article; first antennular peduncle article with acute tooth on distal outer margin reaching half of second antennular peduncle article (Fig. 34C). Scaphocerite broad, ending in a rounded apex, densely plumose setae on inner margin and strong distal tooth overreaching blade on outer margin (Fig. 34D). Mandible with palp three-articulated; incisor process with about eight teeth; molar process triangular, a row of small setae and tooth on apex (Fig. 35A, B). Maxilla 1 with two endites; distal endite with numerous stout, pectinate and pectinate setae on inner margin; basal endite with short, broad, plumose setae on inner margin; palp with several pappose setae on rounded apex, without protuberance (Fig. 35C). Maxilla 2 with two endites; distal endite bilobed, both lobes with pectinate setae on inner margin; basal endite with densely



**FIGURE 35** — *Notostomus elegans* A. Milne Edwards, 1881, female, MNRJ 14883; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.

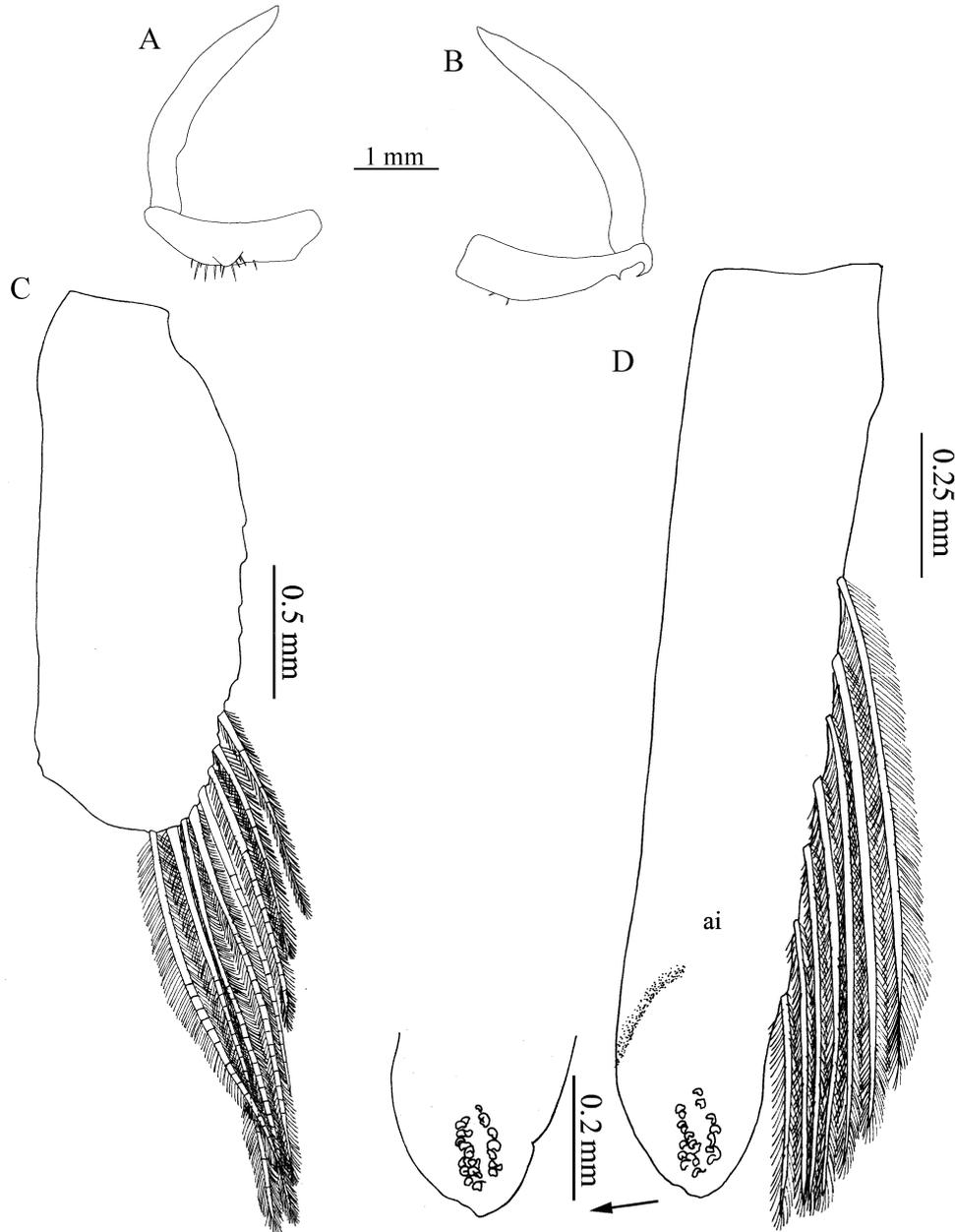
plumose setae on inner margin; endopod as long as endites, pappose setae on apex and inner margin; scaphognathite with densely plumose setae on all margins (Fig. 35D). Maxilliped 1 with two endites; distal endite with pappose setae on distal margin, pectinate setae on inner margin; basal endite with pectinate setae on inner margin; endopod three-articulated, shorter than basal endite, several pappose setae on apex; exopodal lobe with densely plumose setae on all margins; exopod small, densely plumose setae on outer margin (Fig. 35E). Maxilliped 2 endopod with elongate ischium and merus, pappose setae on inner margin; carpus short; propod rounded with long, stout, pectinate setae on inner margin; dactyl with long, stout, pectinate setae on inner and posterior margins; exopod with densely plumose setae on all margins (Fig. 35F). Maxilliped 3 slender, elongate, with simple setae on all segments, propod-dactyl with stout setae on distal portion; exopod with densely plumose setae on all margins (Fig. 35G). Pereopods 1 and 2 chelate. Pereopod 3 ischium with six and merus with 20 strong teeth. Pereopod 4 ischium with six and merus with 23 strong teeth. Pereopod 5 ischium with nine and merus with six strong teeth. (Fig. 34A). Epipods with mesial teeth on pereopods 1 to 3 (Fig. 36A, B). Abdomen dorsally carinate in all somites; somites 2 to 4 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 longer than somite 5 (Fig. 34A). Female pleopod 1 with rounded endopod, plumose, articulated setae on anterior margin (Fig. 36C); female pleopod 2 with appendix interna, plumose setae on anterior margin, rounded apex with hook setae (Fig. 36D). Exopod of uropod with complete diaresis, one distal spine on outer margin (Fig. 37A). Telson sulcate in dorsal midline, with three pairs of dorsolateral stout setae and two pairs of distal setae; inner pair of short stout setae, outer pair of long, stout setae (Fig. 37A, B).

Distribution: Western Atlantic: Bermudas, Bahamas, Gulf of Mexico, Brazil (Espírito Santo, Rio de Janeiro). Eastern Atlantic: Portugal, Spain (Bay of Cadix), Açores Archipelago, south Africa. Indian and Pacific Oceans: Philippines, Indonesia, Australian east coast, Ecuador. Adults probably live in depths between 450 to 5380m (mesopelagic and bathypelagic) (Chace 1947, 1986; Kensley 1987).

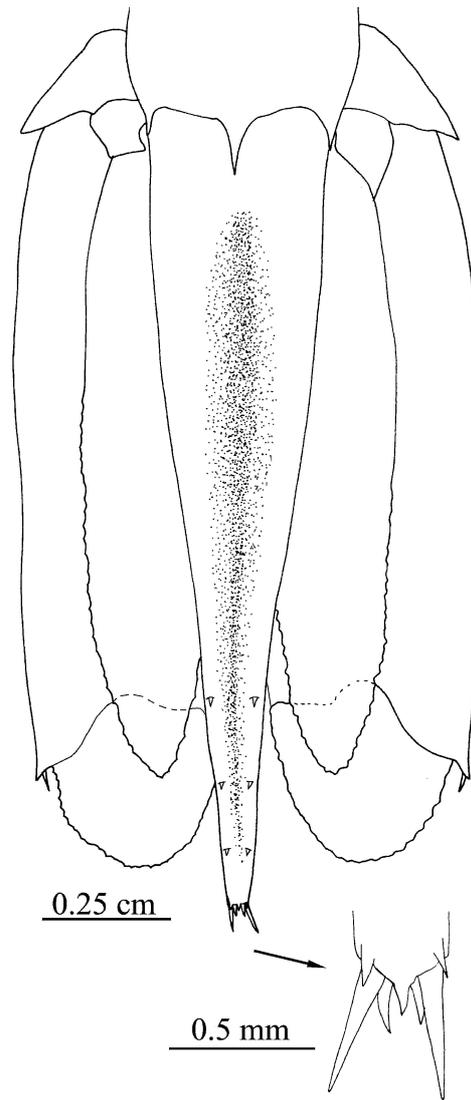
Remarks: This species occurs in the Indian, Pacific and Atlantic Oceans. In the Western Atlantic this species was previously recorded only from Central America. This is the first record of this species from Brazilian coasts (Fig. 38).

The genus *Notostomus* encompasses eight species, only one is restricted to the Indian and Pacific Oceans. Of the others seven species, one occurs in the Eastern Atlantic, one in the Central Atlantic (Tristan da Cunha) and five occur on the Western Atlantic Ocean. Of these five species, three have only one lateral carina on the rostrum base, distinct from *N. elegans* and *N. auriculatus* Barnard, 1950, that have two lateral carinae on the rostrum base. Both species are closely related and have two lateral carinae ventral to a branchiostegal carina. Crosnier & Forest (1973) present a table comparing these two species with diagnostic characters as follow: the carapace is elongate in *N. elegans* and shorter and higher in *N. auriculatus*; the upper lateral carina on rostrum extends to orbit in

*N. elegans* and overreaches orbit in *N. auriculatus*; the rostrum has short basal teeth in *N. elegans* and long on *N. auriculatus*; and the submarginal carina extends to posterior carapace margin in *N. elegans* and does not extend to posterior margin of carapace in *N. auriculatus*.



**FIGURE 36** — *Notostomus elegans* A. Milne Edwards, 1881, female, MNRJ 14883; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna of right second pleopod, lateral view (ai, appendix interna).



**FIGURE 37** — *Notostomus elegans* A. Milne Edwards, 1881, female, MNRJ 14883; telson and uropods, dorsal view.

*Notostomus gibbosus* Milne Edwards, 1881, was previously recorded from Brazil, off Pernambuco (Moreira 1901; Coelho & Ramos 1972). *Notostomus elegans* differs from *N. gibbosus* by having two lateral carina on rostrum base, and in most elongated carapace.

The material examined agrees with the descriptive characters mentioned by Crosnier & Forest (1973), and Chace (1986) with the rostrum having two lateral carinae at base, the upper carina extending to the orbit, the lower carina not continuous with the gastro-orbital carina, the shorter basal rostrum teeth, and in the presence of two carinae ventral to the branchiostegal carina.

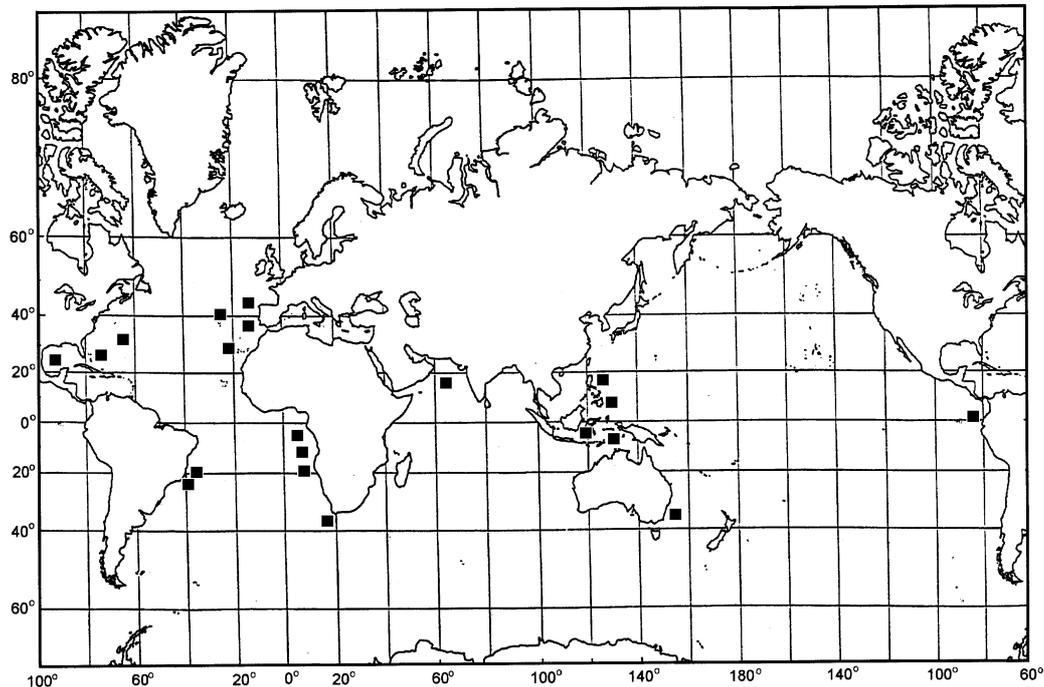


FIGURE 38 — Geographic distribution of *Notostomus elegans* A. Milne Edwards, 1883.

### **Genus *Oplophorus* H. Milne Edwards, 1837**

*Oplophorus* H. Milne Edwards, 1837: 423; Chace, 1986: 57; Holthuis: 39, fig. 19.

Diagnosis: Rostrum with as many or more dorsal as ventral teeth. Carapace not denticulate dorsally; without lateral gastro-orbital carina; branchiostegal groove present, not delimited by vertical groove, without hepatic spine. Abdomen somite 3 to 5 with strong dorsal tooth; somite 6 shorter than 5, without dorsal carina. Telson tapering to sharply acute apex; with or without spinose end piece. Scaphocerite with lateral teeth (except in *O. novazeelandiae*). Mandible not very dissimilar, incisor process in entire length. Pereopods with ischium and merus not broadly compressed. Pereopod 4 with epipod well developed, except for vertical component. Appendix masculina present on second pleopod. Eggs large and few (less than 50) (modified from Chace 1986).

### ***Oplophorus gracilirostris* A. Milne Edwards, 1881**

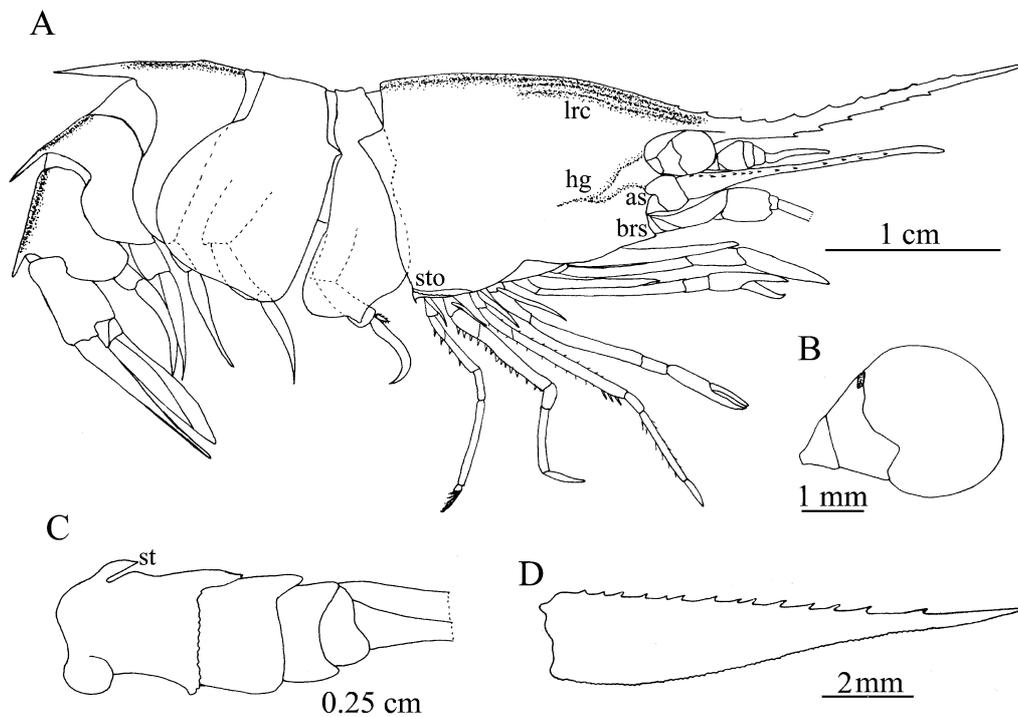
(Figs 39–43)

*Oplophorus gracilirostris* A. Milne Edwards, 1881: 6; De Man, 1920: 48; Chace, 1947: 44, figs 4–7; 1986: 59, fig. 32a–e.

*Oplophorus longirostris* Bate, 1888: 765, pl. 127, fig. 2.  
*Hoplophorus smithii* Wood-Mason & Alcock, 1891: 194.

Material examined: Revizee Program: E-0511, 15°42'S, 38°37'W, 251m, 1 female (16mm), MNRJ 14878.

Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with six teeth; antennal spine present; branchiostegal spine present, without distinct carina; with sharp tooth near posterior end of ventral margin; with posterior extensions of upper lateralk, rostral carina subparallel in dorsal aspect. Scaphocerite with 14 teeth on outer margin, without barb near apex of inner margin. Abdomen not dorsally carinate on somite 6; pleura of somite 1 with small tooth on ventral margin; somites 3 to 5 with posteromesial tooth, the one of somite 3 distinctly strong. Female pleopod 1 with endopod leaf-shaped, numerous plumose setae on lateral margin; female pleopod 2 with appendix interna rounded, plumose setae on lateral margins, hook setae on apex.

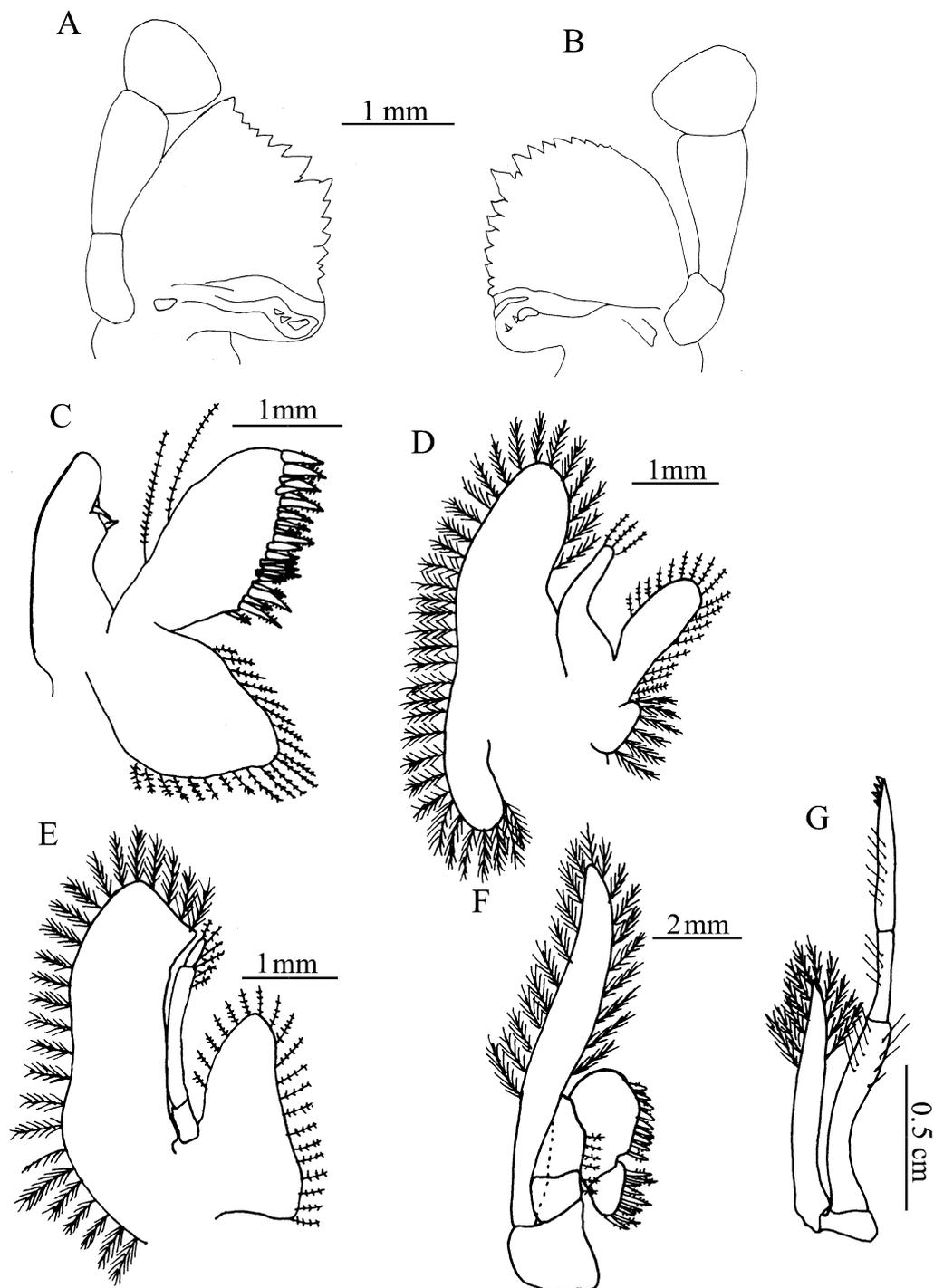


**FIGURE 39** — *Oplophorus gracilirostris* A. Milne Edwards, 1881, female, MNRJ 14878 (carapace length 16mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; brs, branchiostegal spine; hg, hepatic groove; lrc, lateral rostral carina; st, stylocerite; sto, sharp tooth).

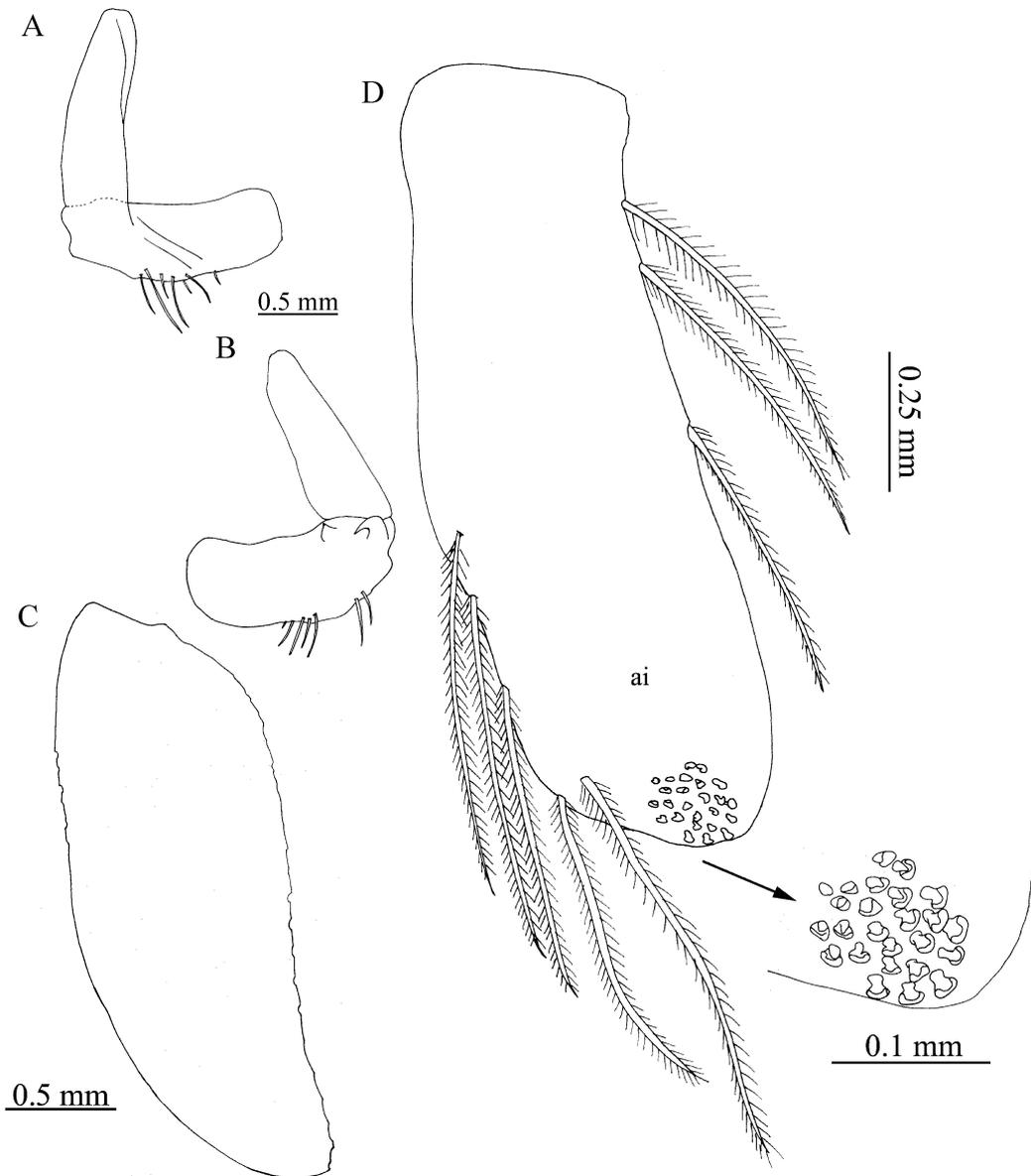
Description: Eyestalk with ocellus on medio-distal portion (Fig. 39B). Carapace with rostrum longer than carapace, overreaching scaphocerite, ventral margin convex, with six teeth, dorsal margin with 11 teeth (Fig. 39A); dorsal margin sharply carinate throughout

entire length; posterior extensions of upper lateral rostral carina subparallel in dorsal aspect; antennal spine present; branchiostegal spine present, without distinct carina; supraorbital and pterygostomial spine absent; cervical groove and suprabranchial carina absent; with sharp tooth near posterior end of ventral margin (Fig. 39A). Stylocerite short, with slightly rounded apex, reaching 1/3 of first antennular peduncle article; first antennular peduncle article with distal margin serrate and a broad tooth on distal outer margin that reaches 1/2 of second antennular peduncle article (Fig. 39C). Scaphocerite ending in acute apex, with 14 teeth on outer margin, without barb near apex of inner margin (Fig. 39D). Mandible with palp three-articulated, incisor process with about 14 teeth, molar process with grooves, three acute teeth and a basal tubercle (Fig. 40A, B). Maxilla 1 with two endites; distal endite with numerous stout, pectinate setae on inner margin; basal endite with pectinate setae on anterior and inner margins and pappose-pectinate setae on posterior margin; palp with rounded apex, two stout setae (Fig. 40C). Maxilla 2 with two endites; distal endite elongate, pectinate setae on inner and outer margins; basal endite rounded, densely plumose setae on inner margin; endopod as long as distal endite, pectinate setae on apex; scaphognathite with densely plumose setae on all margins (Fig. 40D). Maxilliped 1 endite with pectinate setae on outer and inner margins; endopod three-articulated, as long as endites, several pappose setae on apex and inner margin; exopodal lobe with densely plumose setae in all margins (Fig. 40E). Maxilliped 2 endopod with elongate ischium and merus, pappose setae on inner margins; carpus short; propod rounded with long, stout, pectinate setae on inner margin; dactyl with long, stout, pectinate setae on inner margin; broad, elongate exopod, densely plumose articulated setae on all margins (Fig. 40F). Maxilliped 3 slender, elongate, with simple setae on all segments; propod-dactyl with stout setae on distal portion; exopod densely plumose setae on all margins (Fig. 40G). Pereopods 1 and 2 chelate. Pereopod 3 ischium unarmed; merus with three stout setae on inner margin. Pereopod 4 ischium with three and merus with ten stout setae on inner margin. Pereopod 5 ischium and merus with 2 stout setae on ventral margin; dactyl rounded, with numerous long, stout, pectinate setae (Fig. 39A). Epipods with mesial teeth present on pereopods 1 to 3; epipods well developed on pereopod 4, except for vertical component (Fig. 41A, B). Abdomen dorsally carinate on somites 2 to 4; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 shorter than somite 5 (Fig. 39A). Female pleopod 1 leaf-shaped, plumose setae on lateral margins (Fig. 41C). Female pleopod 2 appendix interna rounded, scattered plumose setae on lateral margins, hook setae on apex (Fig. 41D). Exopod of uropod with uncomplete diaresis, without distal spine on outer margin (Fig. 42). Telson not sulcate in dorsal midline, with two pairs of dorsolateral stout setae, posterior stronger, without distal setae (Fig. 42).

Distribution: Western Atlantic: Bahamas, Gulf of Mexico, Caribbean Sea, Brazil (Bahia). Indian and Pacific Oceans: southeastern Africa, Indonesia, Philippines, southern Japan, Fiji Islands, Hawaii. Adults probably are mesopelagic (Chace 1986; Kensley 1987).

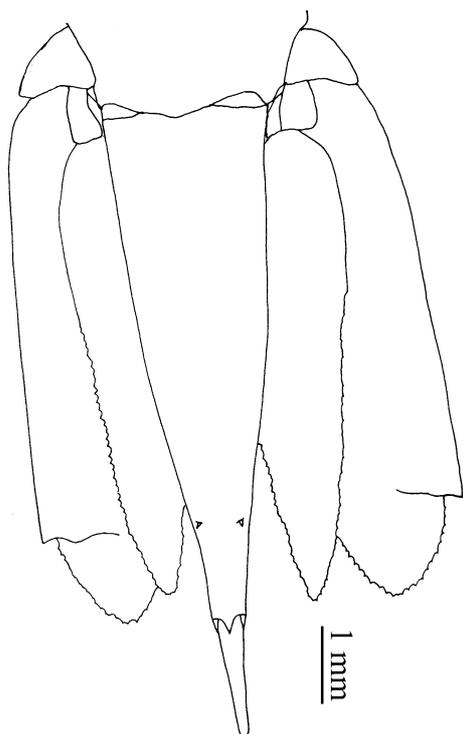


**FIGURE 40** — *Oplophorus gracilirostris* A. Milne Edwards, 1881, female, MNRJ 14878; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.

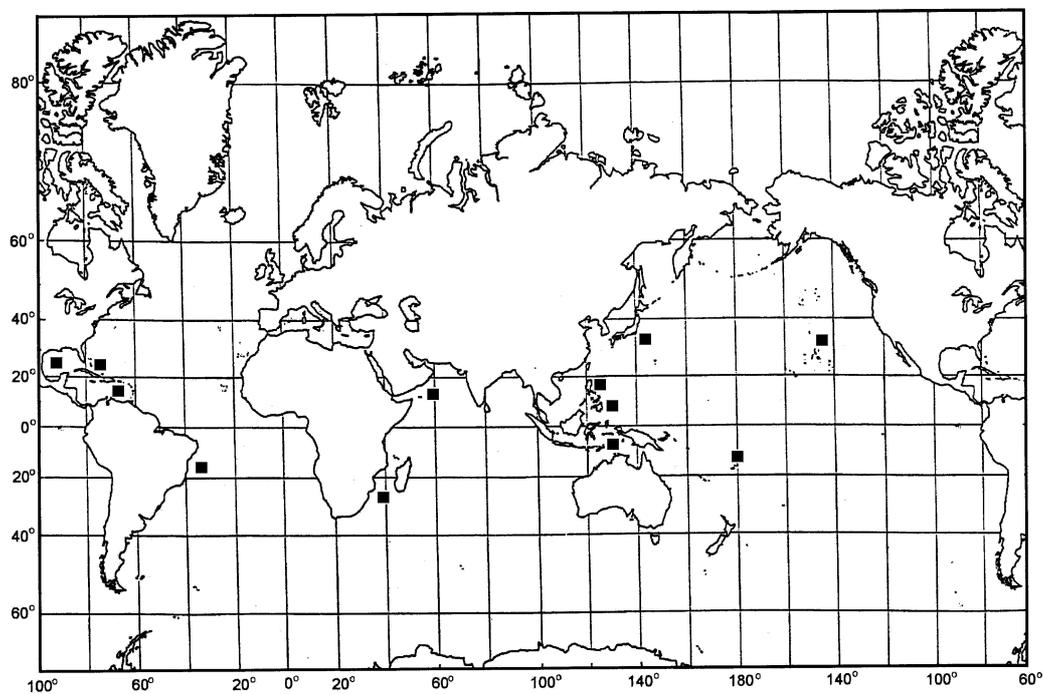


**FIGURE 41** — *Oplophorus gracilirostris* A. Milne Edwards, 1881, female, MNRJ 14878; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna of right second pleopod, lateral view (ai, appendix interna).

Remarks: *Oplophorus gracilirostris* occurs in the Indian, Pacific and Atlantic Oceans. In the Western Atlantic this species was previously recorded only from Central America. This is the first record of this genus and species from Atlantic South America (Fig. 43).



**FIGURE 42** — *Oplophorus gracilirostris* A. Milne Edwards, 1881, female, MNRJ 14878; telson and uropods, dorsal view.



**FIGURE 43** — Geographic distribution of *Oplophorus gracilirostris* A. Milne Edwards, 1881.

The genus *Oplophorus* comprises four species, two of them, *O. gracilirostris* and *O. spinosus* (Brullé, 1839) occur in the Northwestern Atlantic. *Oplophorus gracilirostris* has the carapace with a posteroventral tooth and the scaphocerite without a barb on the distal inner margin, while *O. spinosus* has the carapace without a posteroventral tooth and the scaphocerite with a barb on the distal inner margin.

The material examined agrees with the description and figures of Chace (1947, 1986) by the rostrum overreaching the scaphocerite, the scaphocerite without a barb on the distal inner margin, in the carapace with a posterior ventral tooth, and in the pleura of abdominal somite 1 with a ventral tooth.

***Oplophorus spinosus* (Brullé, 1839)**

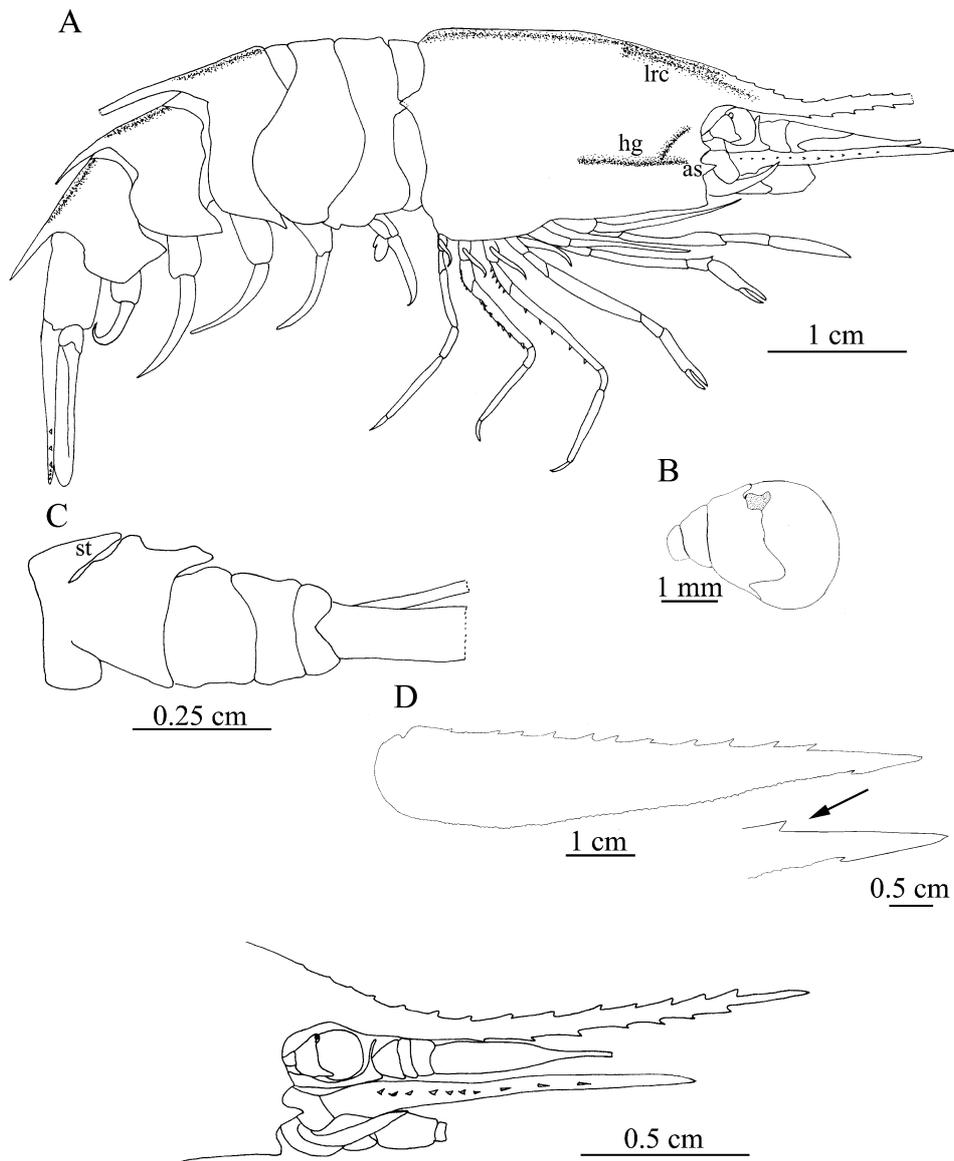
(Figs 44–48)

*Palaemon spinosus* Brullé, 1839: 18.

*Oplophorus grimaldii* Coutière, 1905: 1, fig. II–9; Calman, 1939: 189; Chace, 1940: 187, fig. 55; Kensley, 1972: 38, fig. 17i, j.

*Oplophorus spinosus* — Holthuis, 1949: 229; Crosnier & Forest, 1973: 25; Chace, 1986: 59; Kensley, 1987: 289.

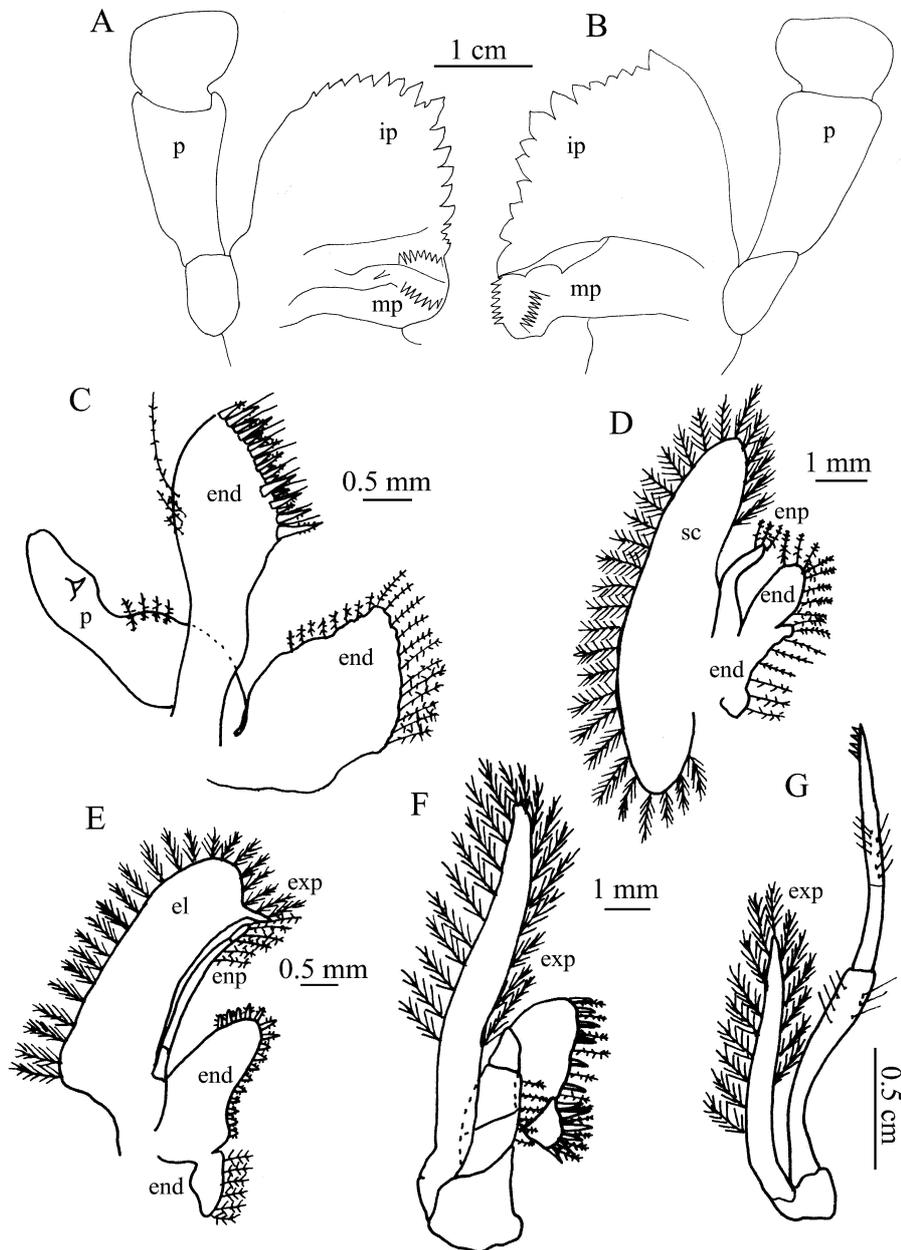
Material examined: Revizee Program: E-0538, 20°27'S, 39°38'W, 1680m, 1 female (24mm), MNRJ 14866; E-0543, 21°23'S, 40°11'W, 666m, 1 female (12mm), 3 males (12 to 13), MNRJ 14867; E-0534, 19°42'S, 39°21'W, 613m, 1 male (13mm), MNRJ 14868; E-0523, 19°42'S, 38°32'W, 922m, 1 female (13mm), MNRJ 14869; E-0552, 21°07'S, 39°46'W, 1694m, 1 ovigerous female (15mm), 1 male (14mm), MNRJ 14872; E-0550, 21°26'S, 39°46'W, 1598m, 1 male (20mm), MNRJ 14873; E-0544, 21°24'S, 40°02'W, 1159m, 3 females (13 to 14mm), MNRJ 14874; E-0524, 19°43'S, 38°39'W, 925m, 1 ovigerous female (14mm), 1 female (12mm), MNRJ 14875; E-0541, 21°13'S, 40°14'W, 557m, 3 females (10 to 12mm), MNRJ 14876; E-0535, 19°58'S, 39°38'W, 1002m, 1 ovigerous female (13mm), 4 females (11 to 15mm), MNRJ 14877; E-0528, 19°45'S, 39°03'W, 1237m, 2 females (11, 14mm), MNRJ 14879; E-0512, 15°50'S, 38°02'W, 1043m, 1 female (17mm), MNRJ 14880; E-0540, 21°12'S, 40°00'W, 1364m, 2 ovigerous females (13, 17mm), 2 females (11, 12mm), MNRJ 14881; E-0526, 20°06'S, 38°40'W, 1637m, 1 female (10mm), 2 males (15, 17mm), MNRJ 14882; E-0549, 21°25'S, 39°43'W, 1718m, 1 female (15mm), MNRJ 14886. Oceanprof I: A-12, 22°11'S, 39°47'W, 1632m, 1 male (15.5mm), MNRJ 19184; A-7, 22°45'S, 40°19'W, 1124m, 3 females (8 to 10mm), 3 males (11 to 13mm), MNRJ 19186; A-4, 22°24'S, 39°54'W, 1128m, 1 ovigerous female (17mm), MNRJ 19187; A-2, 30'S, 40°00'W, 1122m, 1 male (14mm), MNRJ 19193; A-6, 22°27'S, 39°52'W, 1649m, 1 female (13mm), MNRJ 19217; A-9, 22°41'S, 40°02'W, 1609m, 3 females (13.5 to 19mm), MNRJ 19188; A-18, 22°15'S, 39°47'W, 1608m, 1 female (12mm), 2 males (16, 17.5mm), MNRJ 19190; A-1, 22°45'S, 40°10'W, 1322m, 6 females (8.5 to 12.5mm), 4 males (13 to 18mm), MNRJ 19185; A-16, 22°15'S, 39°53'W, 1071m, 2 males (16.5, 19mm), MNRJ 19189.



**FIGURE 44** — *Oplophorus spinosus* (Brullé, 1839), male, MNRJ 14873 (carapace length 20mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; hg, hepatic groove; lrc, lateral view rostral carina; st, stylocerite).

Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with seven teeth; antennal spine present; branchiostegal spine present, without distinct carina; without sharp tooth near posterior end of ventral margin; with posterior extensions of upper lateral rostral carina slightly convergent in dorsal aspect. Scaphocerite with 11 teeth on outer margin, and a barb near apex of inner margin. Abdomen not dorsally carinate on somite 6; pleura of somite 1 without small tooth on ventral margin; somites 3 to 5 with posteromesial tooth, the one of somite 3 distinctly strong. Male pleopod 1 with endopod

rounded, densely plumose setae on lateral margins, hook setae on apex; male pleopod 2, appendix masculina slender with strong pectinate setae on apex; appendix interna half length of appendix masculina, lateral margins with pappose setae, distal portion rounded and with numerous hook setae.



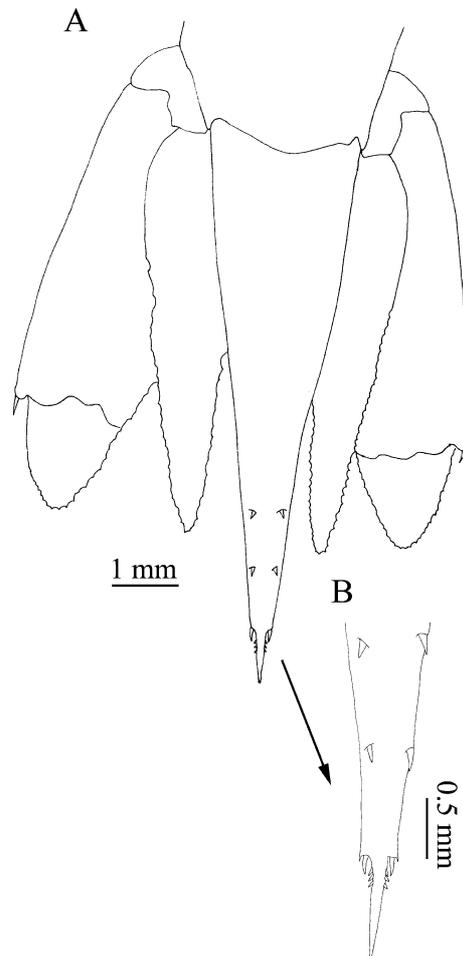
**FIGURE 45** — *Oplophorus spinosus* (Brullé, 1839), male, MNRJ 14873 (carapace length 20mm); A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.

Description: Eyestalk with ocellus on medio-distal portion (Fig. 44B). Carapace with rostrum as long as carapace, overreaching scaphocerite, ventral margin convex, with seven teeth, dorsal margin with 14 teeth; dorsal margin carinate throughout entire length; posterior extensions of upper lateral, rostral carina slightly convergent in dorsal aspect; antennal spine present; branchiostegal spine absent, without distinct carina; supraorbital and pterygostomial spine absent; cervical groove and suprabranchial carina absent; without sharp tooth near posterior end of ventral margin (Fig. 44A). Stylocerite short and broad; apex rounded reaching less than half of first antennular peduncle article; first antennular peduncle article with a blunt tooth on distal outer margin reaching a half of second antennular peduncle article (Fig. 44C). Scaphocerite ending in acute apex, 11 teeth on outer margin, barb near apex of inner margin (Fig. 44D). Mandible with palp three-articulated, incisor process with about 14 teeth; molar process with grooves and a row of many acute teeth (Fig. 45A, B). Maxilla 1 with two endites; distal endite with numerous stout, pectinate and simple setae on inner margin, several pappose setae on outer margin; basal endite with stout setae at surface near inner margin, pappose setae on distal and posterior half of inner margins, pectinate setae on anterior half of inner margin; exopod unarmed on rounded apex, one stout seta on a protuberance, several pappose setae on inner margin (Fig. 45C). Maxilla 2 with two endites; distal endite elongate, pappose-pectinate setae on distal and inner margins; basal endite with pappose and pectinate setae on inner margin; endopod as long as distal endite, pappose-pectinate setae on apex; scaphognathite with densely plumose setae on all margins (Fig. 45D). Maxilliped 1 with two endites; distal endite with stout, pappose-pectinate setae on anterior and inner margins; basal endite with scattered plumose setae on inner margin; endopod three-articulated, twice length of distal endite, with numerous pappose-pectinate setae on apex and inner margin; exopodal lobe with densely plumose setae on all margins; exopod small, densely plumose setae on outer margin (Fig. 45E). Maxilliped 2 endopod with elongate ischium and merus, pappose setae on inner margin; carpus short; propod rounded, pappose-pectinate and long, stout setae on inner margin; dactyl with pappose-pectinate and long, stout setae on inner margin; broad, elongate exopod, densely plumose setae on all margins (Fig. 45F). Maxilliped 3 slender and elongate, simple setae in all articles; propod-dactyl with stout setae in distal portion; exopod with densely plumose setae on all margins (Fig. 45G). Pereopods 1 and 2 chelate. Pereopod 3 ischium and merus with five stout setae on inner margin. Pereopod 4 ischium with six and merus with seven stout setae on inner margins. Pereopod 5 unarmed on inner margin; dactyl not rounded, claw shaped (Fig. 44A). Epipods with mesial teeth on pereopods 1 to 3; epipods well developed on pereopod 4, except for vertical component (Fig. 46A, B). Abdomen dorsally carinate on somites 2 to 4; somites 3 to 6 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 shorter than somite 5 (Fig. 44A). Male pleopod 1 with endopod rounded, densely plumose setae on lateral margin, hook setae on apex (Fig. 46C); male pleopod 2 appendix masculina slender, strong pectinate setae on apex; appendix interna half length of appendix masculina, lateral

margins with pappose setae, apex rounded, numerous hook setae (Fig. 46D). Female pleopod 1 with endopod leaf-shaped densely plumose setae on posterior margin and pappose-pectinate setae on anterior margin (Fig. 46E). Exopod of uropod with complete diaresis, distal spine on outer margin (Fig. 47A). Telson not sulcate in dorsal midline; with two pairs of dorsolateral stout setae, spinose end piece, flanked by a pair of long, stout setae, formed by three pairs of stout, pectinate setae (Fig. 47A, B).



**FIGURE 46** — *Oplophorus spinosus* (Brullé, 1839), male, MNRJ 14873; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and appendix masculina of right second pleopod, lateral view (ai, appendix interna; am, appendix masculina). *Oplophorus spinosus* (Brullé, 1839), female, MNRJ 14877(carapace length 13mm) E, endopod of right first pleopod, lateral view.



**FIGURE 47** — *Oplophorus spinosus* (Brullé, 1839), male, MNRJ 14873; telson and uropods, dorsal view.

Distribution: Western Atlantic: U.S.A., Bermudas, Bahamas, Brazil (Bahia, Espírito Santo). Eastern Atlantic: Azores, Madeira and Canary Archipelagos, Senegal, Tristan da Cunha. Indian and Pacific: southwestern Indian Ocean, west Australia, Indonesia, south Japan, Hawaii. Adults probably are mesopelagic (Chace 1947, 1986).

Remarks: *Oplophorus spinosus* occurs in the Indian, Pacific and North Atlantic Oceans. In the Western Atlantic this species was previously recorded on North and Central Americas. This is the first record of this genus and species from Brazil (Fig.48).

The observed material has the telson with two dorsolateral pairs of stout setae and a spinose end piece, flanked by a pair of long, stout setae, with three pairs of stout setae as observed by Coutiére (1905). The material examined agrees with the description and figures of Chace (1940, 1947) in the rostrum overreaching the scaphocerite, the scaphocerite with a barb on the distal inner margin, in the carapace without a posterior ventral tooth, and in the pleura of abdominal somite 1 without a ventral tooth.

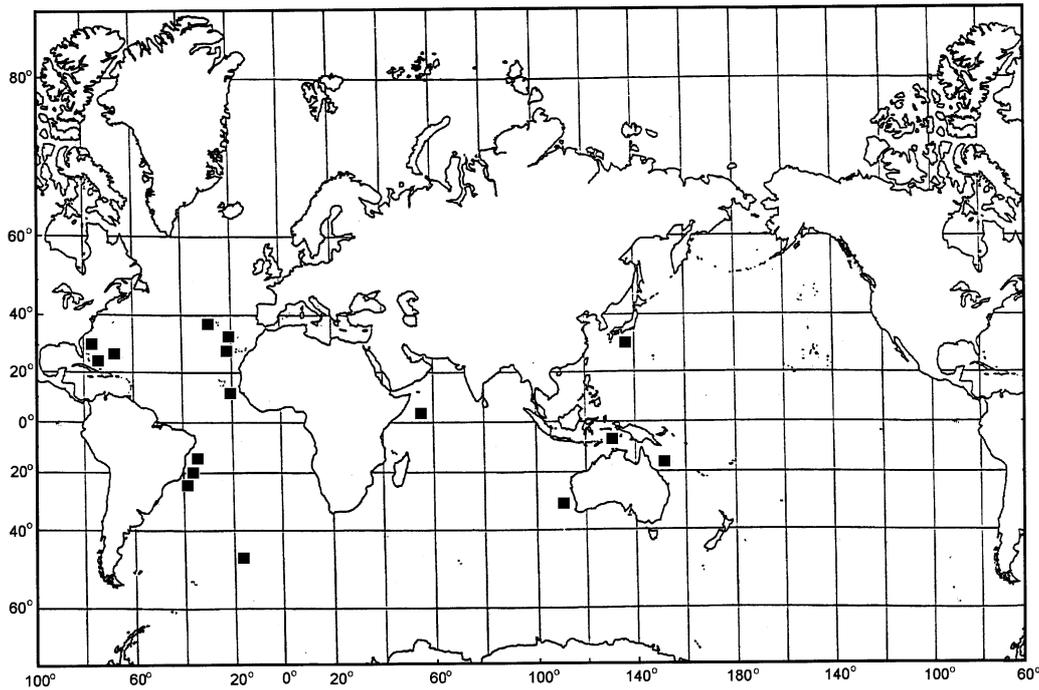


FIGURE 48 — Geographic distribution of *Oplophorus spinosus* (Brullé, 1839).

### Genus *Systellaspis* Bate, 1888

*Systellaspis* Bate, 1888: 757; Chace, 1986: 61; Holthuis, 1993: 39.

*Hoploaspisphaea* Yokoya & Shibata, 1965: 4.

Diagnosis: Rostrum with more dorsal than ventral teeth. Carapace not carinate or denticulate dorsally; with or without lateral gastro-orbital carina extending from near orbit to near posterior margin; without branchiostegal groove and hepatic spine. Abdomen not dorsally carinate on all somites; somite 6 longer than somite 5. Telson tapering to sharply acute apex; spinose end piece flanked by a pair of lateral, long, stout setae. Scaphocerite without lateral teeth. Mandible not very dissimilar, incisor process armed in entire length. Pereopods with ischium and merus not broadly compressed. Pereopod 4 with epipod well developed, except for vertical component. Appendix masculina present on second pleopod. Eggs large and few (less than 50) (modified from Chace 1986).

### *Systellaspis debilis* (A. Milne Edwards, 1881)

(Figs 49–53)

*Acanthephyra debilis* A. Milne Edwards, 1881: 13.

*Miersia gracilis* Smith, 1882: 70.

*Systellaspis Bouvieri* Coutière, 1905: 8, fig. 3.

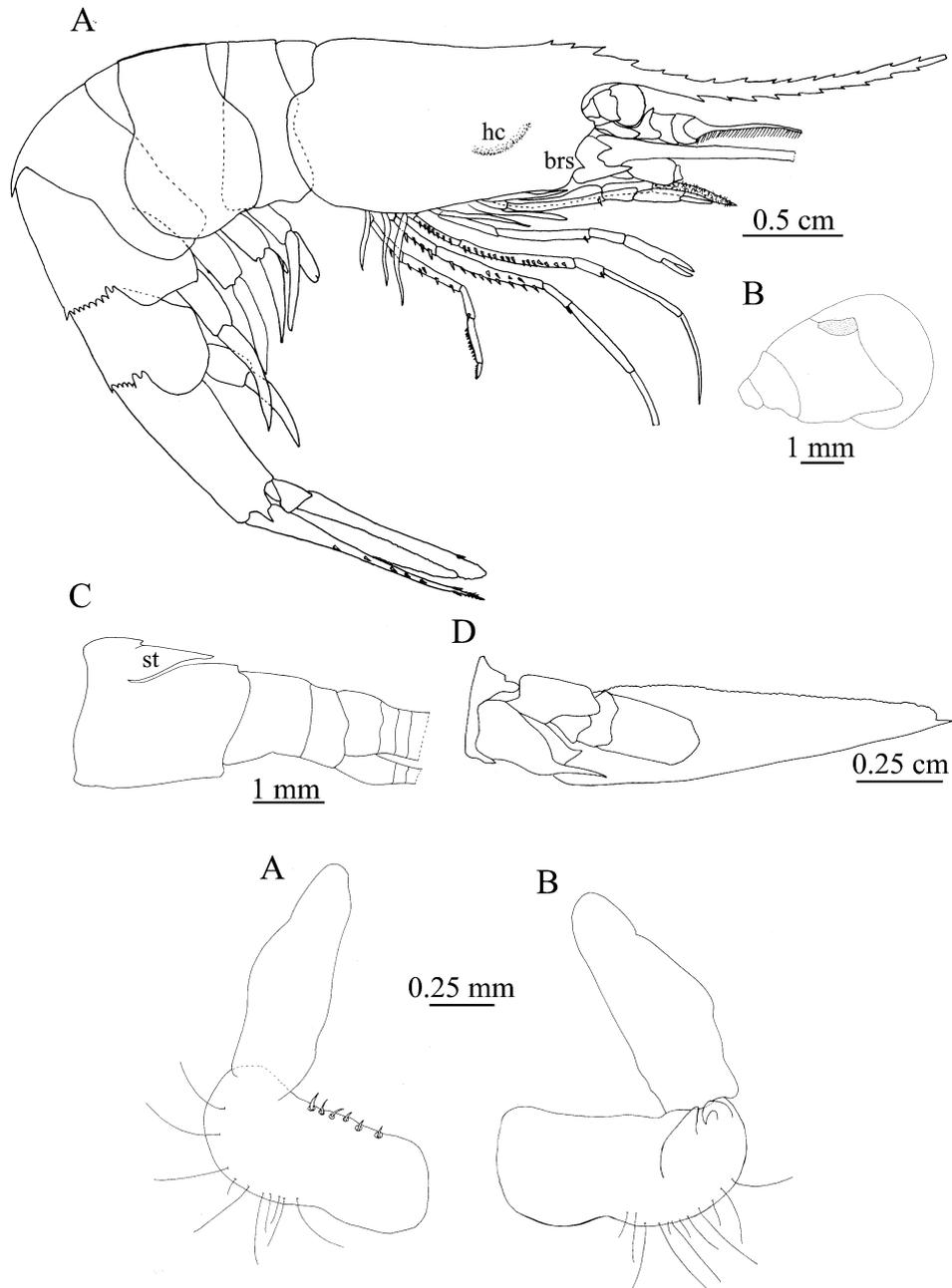
*Systellaspis debilis* — Crosnier & Forest, 1973: 87, figs 26b, 27b; Chace, 1940: 181, fig. 51; 1986: 67, figs 34m–o, 35g, h.

Material examined: Oceanprof I: A-9, 22°41'S, 40°02'W, 1609m, 1 male (13.5mm), MNRJ 19222; A-8, 22°48'S, 40°15', 1324m, 1 female (13mm), MNRJ 19221.

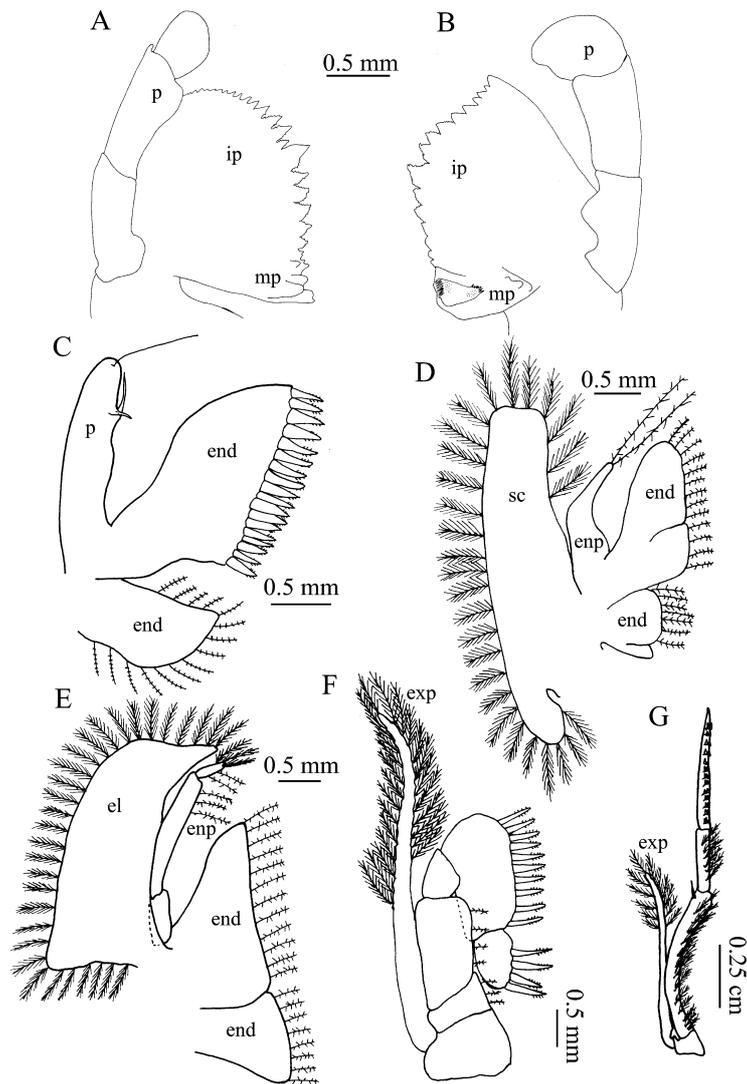
Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with about ten teeth, dorsal margin with about 15 teeth; antennal spine absent; branchiostegal spine present, without distinct carina. Abdomen not dorsally carinate on all somites; somites 3 to 5 with posteromesial tooth, the one of somite 3 distinctly strong. Tergum of abdominal somites 4 and 5 with markedly spinulose margin. Male pleopod 1 with endopod rounded, bilobed at apex, numerous densely articulated plumose setae on lateral margins, several hook setae at apex; male pleopod 2 with appendix masculina, little longer than appendix interna, rounded on distal portion.

Description: Eyestalk with ocellus on medio-distal portion (Fig. 49B). Carapace with rostrum usually longer than carapace, overreaching scaphocerite, ventral margin convex, with about ten teeth, dorsal margin with about 15 teeth (Fig. 49A); dorsal margin not carinate; antennal spine absent; branchiostegal spine present, without distinct carina; supraorbital and pterygostomial spine absent; cervical groove and suprabranchial carina absent; small hepatic carina present (Fig. 49A). Stylocerite broad at base narrowing at tip, acute apex reaching 3/4 of first antennular peduncle article (Fig. 49C). Scaphocerite with blunt apex, strong distal tooth overreaching blade, densely plumose setae on inner margin (Fig. 49D). Mandible with palp three-articulated, incisor process with about 13 strong, serrate teeth and about five small teeth; molar process formed by three rounded teeth in left mandible and by concavity where the teeth fits in right mandible (Fig. 50A, B). Maxilla 1 with two endites; distal endite with numerous stout, pectinate setae on inner margin; basal endite with pectinate setae on all margins; palp elongate, rounded apex, stout seta and spinose protuberance on inner margin (Fig. 50C). Maxilla 2 with two endites; distal endite bilobed, both lobes with pappose setae on inner margin; basal endite bilobed, distal lobe with scattered plumose and pappose setae on inner margin, basal lobe rounded, unarmed; endopod 2/3 endites length, several pappose setae on apex; scaphognathite with densely plumose setae on all margins (Fig. 50D). Maxilliped 1 with two endites; both endites with pappose setae on inner margin; endopod three-articulated, longer than distal endite, several plumose setae on apex, pappose setae on inner margin; exopodal lobe with densely plumose setae on all margins (Fig. 50E). Maxilliped 2 endopod with ischium and merus elongate pappose setae on inner margin; carpus short; propod rounded, long, stout, pectinate setae on inner margin; dactyl with long, stout, pectinate setae on inner margin; elongate exopod, densely plumose setae on all margins (Fig. 50F). Maxilliped 3 slender and elongate, with densely plumose setae in all articles; ischium-merus with distal stout seta on outer margin; propod-dactyl with tufts of stout setae on inner margin; exopod with densely plumose setae on all margins (Fig. 50G). Pereopods 1 and 2 chelate. Pereopod 3 ischium with six stout setae and merus with 16 stout setae on inner margin. Pereopod 4

ischium with four stout setae and merus with nine stout setae on inner margin, and four stout setae on outer margin. Pereopod five ischium with one stout seta and merus with four stout setae on inner margin and one stout seta on outer margin (Fig. 49A). Epipods with mesial teeth on pereopods 1 to 3; epipod of pereopod 4 well developed, except for vertical



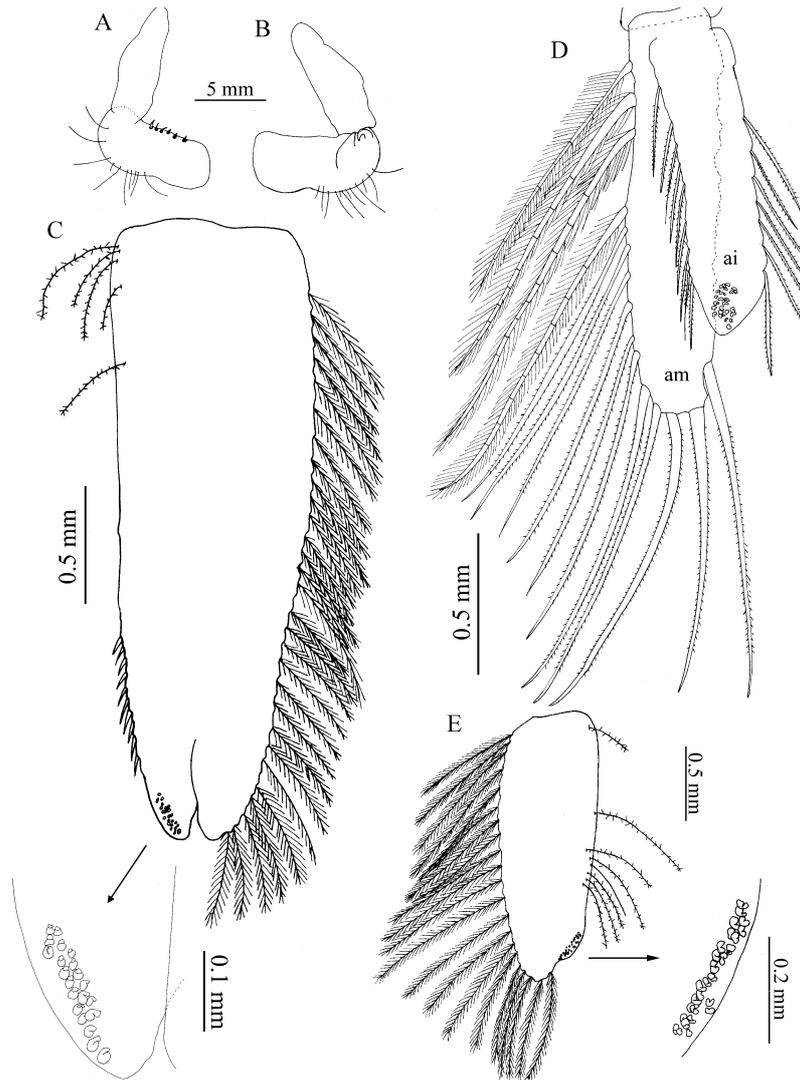
**FIGURE 49** — *Systellaspis debilis* (A. Milne Edwards, 1881), male, MNRJ 19222 (carapace length 13.5mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (brs, branchiostegal spine; hc, hepatic carina; st, stylocerite).



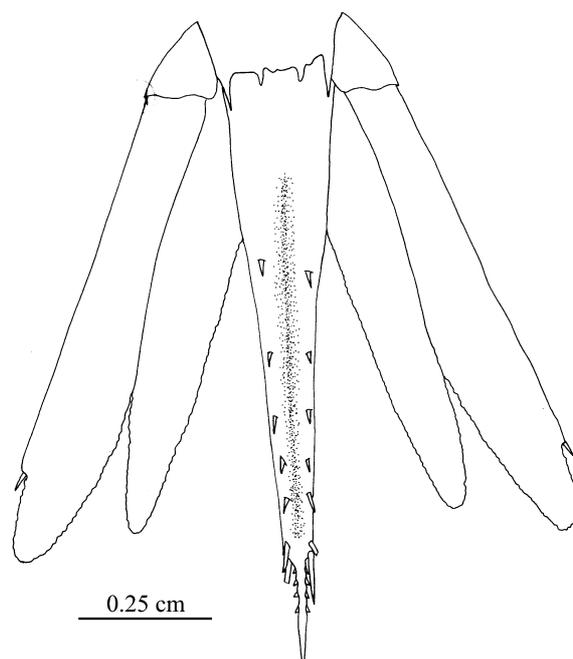
**FIGURE 50** — *Systellaspis debilis* (A. Milne Edwards, 1881), male, MNRJ 19222; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.

component (Fig. 51A, B). Abdomen not dorsally carinate on all somites; somites 3 to 5 with posteromesial tooth; the one of somite 3 distinctly strong, the one of the somite 4 slightly projected upwards; somite 6 longer than somite 5. Tergum of abdominal somites 4 and 5 with markedly spinulose margins (Fig. 49A). Male pleopod 1 endopod distally bilobed; articulated, plumose setae on posterior margin, several pappose setae on basal anterior margin, stout setae on distal anterior margin, hook setae on anterior distal lobe (Fig. 51C). Male pleopod 2 with appendix masculina elongate, articulated, plumose setae on anterior margin, pectinate setae on apex; appendix interna about 2/3 length of appendix

masculina, densely plumose setae on lateral margin, apex with a slightly triangular shape and many hook setae (Fig. 51D). Female pleopod 1 endopod leaf-shaped, numerous articulated, plumose setae on posterior margin and pappose setae on anterior margin (Fig. 51E). Exopod of uropod with complete diaeresis, one distal spine on outer margin (Fig. 52). Telson sulcate in dorsal midline; with six pairs of stout setae, spinose end piece formed by four pairs of stout setae, flanked by one pair of long stout setae (Fig. 52).



**FIGURE 51** — *Systellaspis debilis* (A. Milne Edwards, 1881), male, MNRJ 19222; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and appendix masculina of right second pleopod, lateral view (ai, appendix interna; am, appendix masculina). *Systellaspis debilis* (A, Milne Edwards, 1881), female, MNRJ 19221 (carapace length 13mm) E, endopod of right first pleopod, lateral view.



**FIGURE 52** — *Systellaspis debilis* (A. Milne Edwards, 1881), male, MNRJ 19222; telson and uropods, dorsal view.

Distribution: Western Atlantic: south of Greenland, Bermuda, Gulf of Mexico, Bahamas, Caribbean Sea, Brazil (Rio de Janeiro). Eastern Atlantic: Azores; west African coast, Nigeria, Congo, Angola. Indian and Pacific: Madagascar, Philippines, Indonesia, Hawaii. Adults probably live in depths between 300 and 600 m (Coutière 1905; Chace 1940, 1986).

Remarks: *Systellaspis debilis* occurs in the Indian, Pacific and Atlantic Oceans. In the Western Atlantic, this species was previously recorded from North and Central America. This is the first record of this species from South American waters (Fig. 53).

The genus *Systellaspis* comprises five species, four of them occur in Western Atlantic. Two of the Western Atlantic species have a carapace with gastro-orbital carina, extending from orbit to posterior margin, distinct from *Systellaspis pellucida* (Filhol, 1885) and *S. debilis* which have the carapace without gastro-orbital carina extending from orbit to posterior margin. *Systellaspis pellucida* has the rostrum with 11 dorsal and five ventral teeth, the tergum of abdominal somites 4 and 5 is not spinulose, and the dorsal tooth on abdominal somite 4 is not directed upwards, whereas *S. debilis* has the rostrum with 15 dorsal and ten ventral teeth, the tergum of abdominal somites 4 and 5 is spinulose and the dorsal tooth on abdominal somite 4 is slightly directed upwards.

The material examined agrees with Chace's (1986) description in the tergum of abdominal somites 4 and 5 with spinulose margin, in the dorsal tooth of abdominal somite 4 slightly directed upwards, and in the telson with 4–8 pairs of dorsolateral stout setae. The material examined also agrees with the figures of Crosnier & Forest (1973) in the these

characters and in the rostrum with 3 to 4 pre-rostral teeth projected upwards. However, in the present material, the antennal spine is absent.

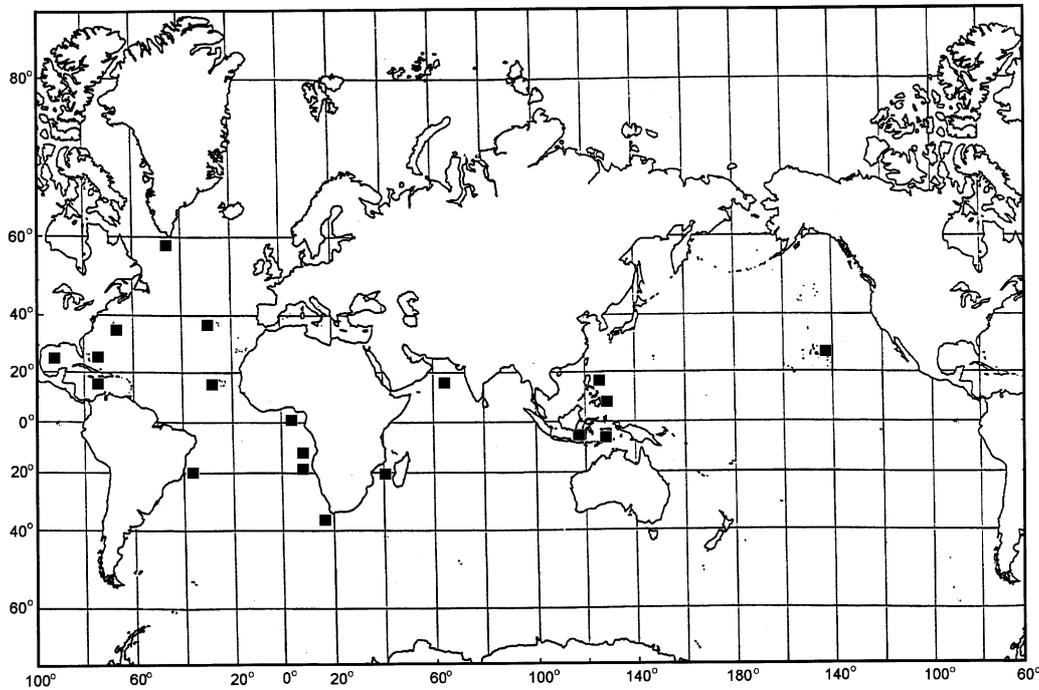


FIGURE 53 — Geographic distribution of *Systellaspis debilis* (A. Milne Edwards, 1881).

***Systellaspis pellucida* (Filhol, 1885)**

(Figs 54–58)

*AcanthePHYRA pellucida* Filhol, 1885: 144, 162.

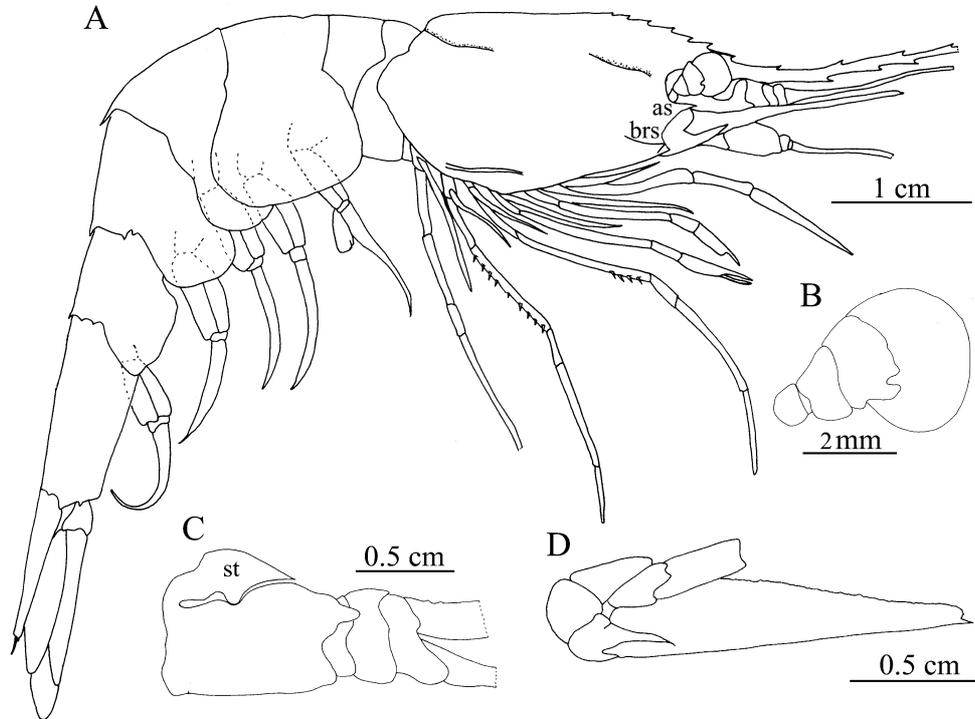
*AcanthePHYRA affinis* Faxon, 1896: 162, pl. 2, figs 1–3.

*Systellaspis pellucida* — Crosnier & Forest, 1973: 92, figs 26c, 27c; Chace, 1986: 67, figs 34m–o, 35g, h.

Material examined: Revizee Program: E-0515, 11°40'S, 37°13'W, 487m, 3 ovigerous females (32 to 35mm), 3 females (24 to 27mm), MNRJ 14851; E-0521, 13°27'S, 38°43'W, 376m, 1 male (19mm), MNRJ 14852; E-0511, 15°42'S, 38°37'W, 251m, 1 ovigerous female (16mm), 2 females (14, 16mm), 1 male (17mm), MNRJ 14853; E-0495, 13°06'S, 38°25'W, 341m, 1 ovigerous female (19mm), MNRJ 14884.

Diagnosis: Carapace with rostrum overreaching scaphocerite, ventral margin with at least three teeth, dorsal margin with at least 11 teeth; strong antennal spine present; branchiostegal spine present with distinct carina. Abdomen not dorsally carinate on all somites; somites 3 to 5 with posteromesial tooth, the one of somite 3 distinctly strong. Male pleopod 1 with endopod rounded, numerous densely plumose setae on lateral

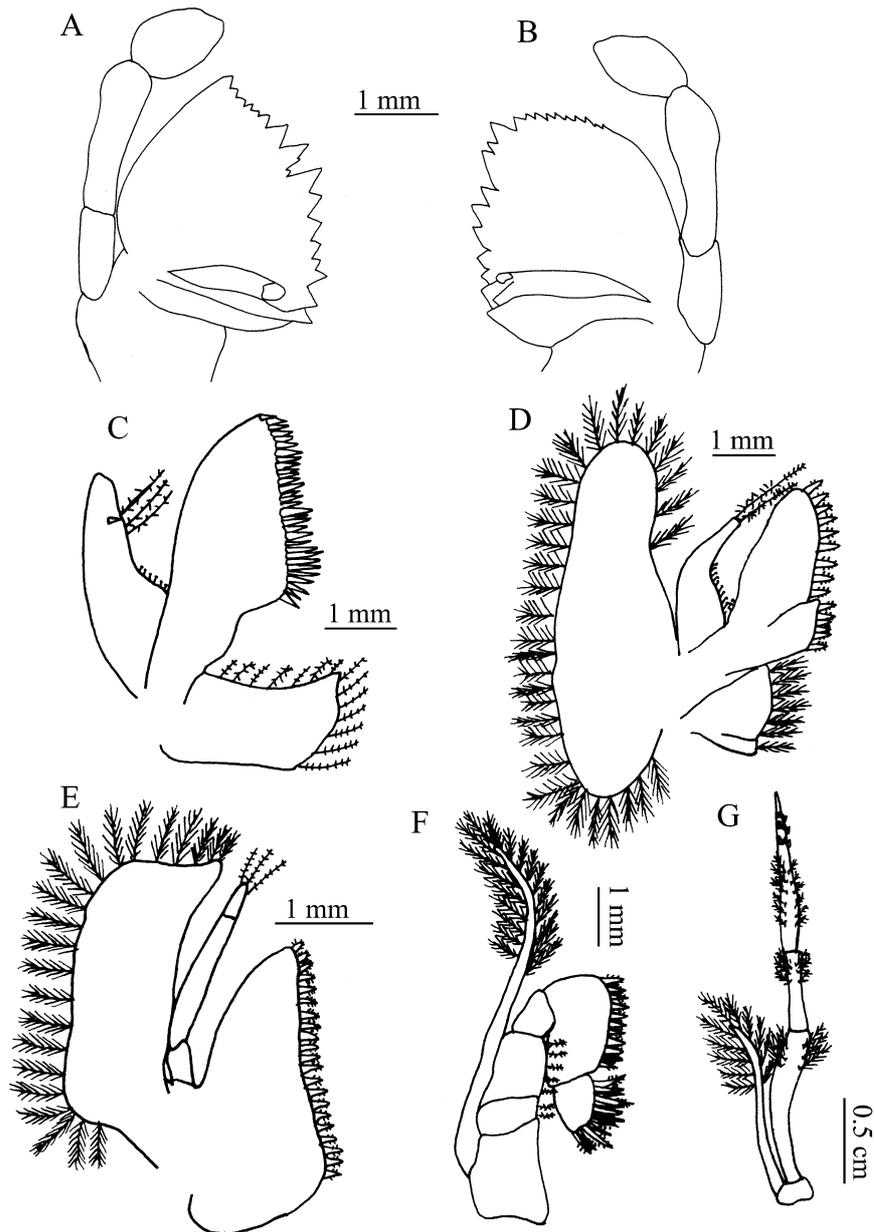
margins, small distal lobe with several hook setae; male pleopod 2 with appendix masculina, a little more than half length of appendix interna, rounded distally.



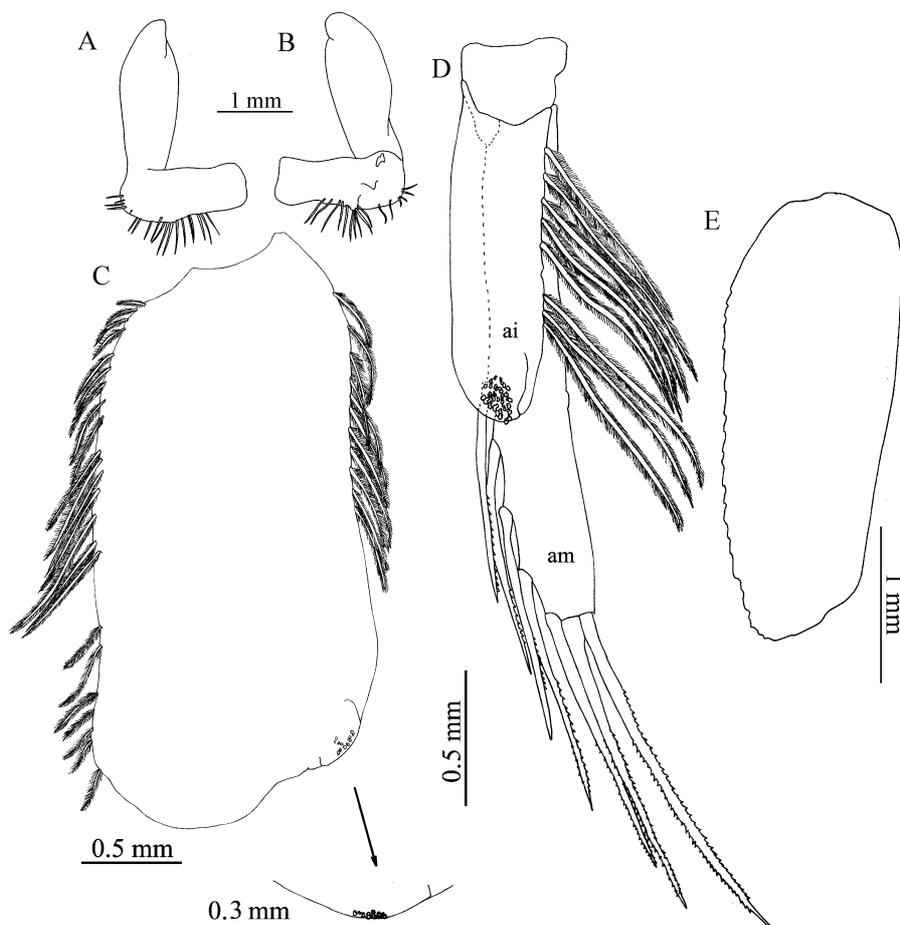
**FIGURE 54** — *Systellaspis pellucida* (Filhol, 1885), male, MNRJ 14853 (carapace length 20mm); A, lateral view; B, ocular peduncle and cornea, lateral view; C, right antennule, dorsal view; D, right scaphocerite, dorsal view (as, antennal spine; brs, branchiostegal spine; st, stylocerite).

Description: Eyestalk without ocellus on medio-distal portion (Fig. 54B). Carapace with rostrum usually as long as carapace, overreaching scaphocerite, ventral margin convex, with at least three teeth, dorsal margin with at least 11 teeth (Fig. 54A); dorsal margin not carinate; strong antennal spine present; strong branchiostegal spine present, with distinct carina extending twice length of spine; supraorbital and pterygostomian spine absent; cervical groove and suprabranchial carina absent (Fig. 54A). Stylocerite broad at base, narrowing in acute apex reaching 2/3 of first antennular peduncle article; first antennular peduncle article with rounded, short tooth on distal outer margin reaching half of second antennular peduncle article (Fig. 54C). Scaphocerite narrow, rounded apex, strong distal tooth overreaching blade, densely plumose setae on inner margin (Fig. 54D). Mandible with palp three-articulated; incisor process with about seven strong teeth near molar process, and ten small teeth; molar process formed by three acute teeth and tubercle (Fig. 55A, B). Maxilla 1 with two endites; distal endite with numerous stout setae on inner margin; basal endite with pectinate and stout setae near to inner margin, pappose and pectinate setae on distal margin, and pectinate setae on inner margin; palp with rounded apex, stout seta, numerous pappose setae and few small, captate setae on inner margin

(Fig. 55C). Maxilla 2 with two endites; distal endite bilobed, both lobes with long, stout, pectinate setae on inner margin; basal endite bilobed, both lobes with densely plumose setae on inner margin; endopod 2/3 endites length; endopod with pappose-pectinate setae on apex, inner margin with small captate setae; scaphognathite with densely plumose setae on all margins (Fig. 55D). Maxilliped 1 endite with long, stout, pectinate setae on inner margin; endopod three-articulated, longer than distal endite, several pectinate setae



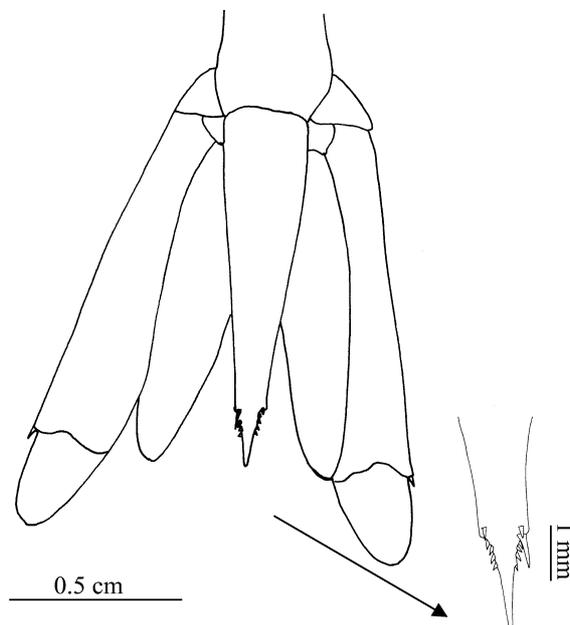
**FIGURE 55** — *Systellaspis pellucida* (Filhol, 1885), male, MNRJ 14853; A, left mandible, dorsal view; B, right mandible, dorsal view; C, left maxilla 1, dorsal view; D, left maxilla 2, dorsal view; E, left maxilliped 1, dorsal view; F, left maxilliped 2, dorsal view; G, left maxilliped 3, dorsal view.



**FIGURE 56** — *Systellaspis pellucida* (Filhol, 1885), male, MNRJ 14853; A, epipod of right second pereopod, lateral view; B, epipod of left second pereopod, lateral view; C, endopod of right first pleopod, lateral view; D, appendix interna and appendix masculina from right second pleopod, lateral view (ai, appendix interna; am, appendix masculina). *Systellaspis pellucida* (Filhol, 1885), female, MNRJ 14853 (carapace length 16mm) E, endopod of right first pleopod, lateral view.

on apex; exopodal lobe with densely plumose setae on all margins (Fig. 55E). Maxilliped 2 endopod with ischium and merus elongate, pappose setae on inner margins; carpus short; propod rounded, long, stout, pectinate setae on inner margin; dactyl with long, stout, pectinate setae on inner margin; elongate exopod, densely plumose setae on all margins (Fig. 55F). Maxilliped 3 slender and elongate, densely plumose setae in all articles, propod-dactyl with stout setae in distal portion; exopod with densely plumose on all margins (Fig. 55G). Pereopods 1 and 2 chelate. Pereopod 3 merus with four stout setae on inner margin. Pereopod 4 merus with nine stout setae on inner margin. Pereopod 5 merus without stout setae (Fig. 54A). Epipods with mesial teeth present on pereopods 1 to 3; epipod of pereopod 4 well developed, except for vertical component. (Fig. 56A, B).

Abdomen without dorsal carina on all abdominal somites; somites 3 to 5 with posteromesial tooth; the one of somite 3 distinctly strong; somite 6 longer than somite 5 (Fig. 54A). Male pleopod 1 with endopod rounded, with numerous densely plumose setae on lateral margins, small distal lobe with several hook setae (Fig. 56C). Male pleopod 2 appendix masculina long, slender, acute pectinate setae on distal and lateral margins; appendix interna, a little more than half length of appendix masculina, densely plumose setae on lateral margin, apex rounded and with many hook setae (Fig. 56D). Female pleopod 1 with endopod leaf-shape, numerous densely plumose setae on posterior margin (Fig. 56E). Exopod of uropod with complete diaeresis, one distal spine on outer margin (Fig. 57A). Telson not sulcate in dorsal midline; one pair of stout setae, one pair of long, stout setae and a spinose end piece formed by four pairs of stout setae (Fig. 57A, B).



**FIGURE 57** — *Systellaspis pellucida* (Filhol, 1885), male, MNRJ 14853; telson and uropods, dorsal view.

Distribution: Western Atlantic: Gulf of Mexico, Bahamas, Antilles, Brazil (Bahia). Eastern Atlantic: west African coast, from Cape Verde, Guine to Gabon. Indian and Pacific Oceans: Madagascar, Western Indian Ocean, South China Sea, Zanzibar, Philippines, Indonesia. Adults probably live in depths between 300 and 600 m (Chace 1986; Crosnier 1987).

Remarks: *Systellaspis pellucida* occurs in the Indian, Pacific and Atlantic Oceans. In the Western Atlantic, this species was previously recorded only from the Central America. This is the first record of this species from the South American waters (Fig. 58).

The material examined agrees with Chace (1986) description in the rostrum overreaching scaphocerite, the carapace without dorsal carina, without lateral carina

extending from orbit to posterior margin, the abdominal somites 3 to 5 with dorsal carina and the tergum of abdominal somite 5 not spinulose. The material examined also agrees with the figures of Crosnier & Forest (1973) in these characters and in the abdominal somite 3 with dorsal tooth of normal size, not projected upwards.

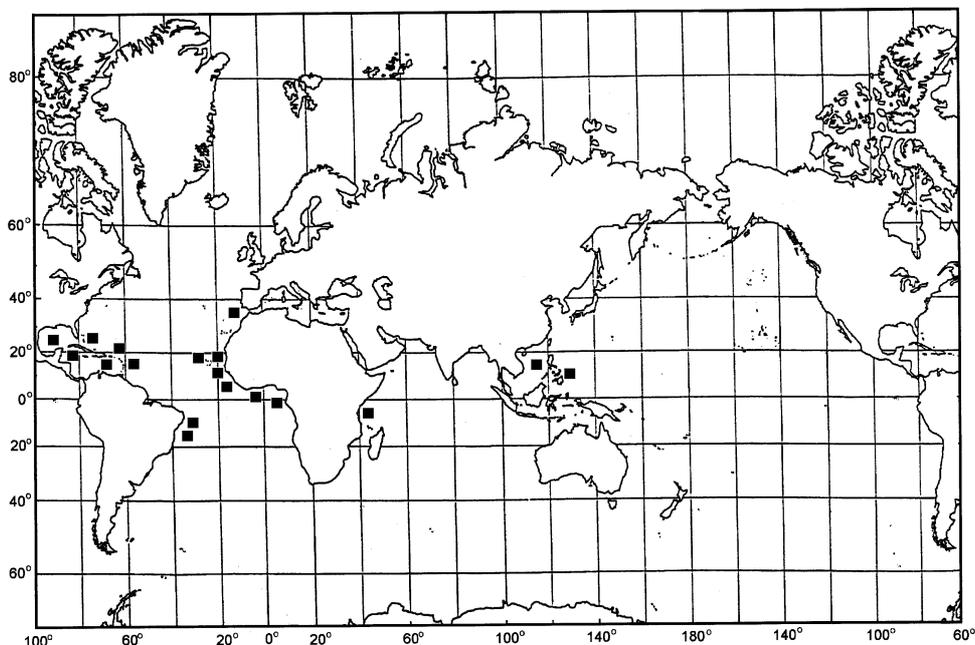


FIGURE 58 — Geographic distribution of *Systellaspis pellucida* (Filhol, 1885).

## ACKNOWLEDGEMENTS

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