



Morphology of Oplophorid and Bresiliid larvae (Crustacea, Decapoda) of Southwestern Atlantic plankton, Brazil

LOHENGRIN D. A. FERNANDES^{1,2}, MARCELO F. DE SOUZA¹ &
SÉRGIO LUIZ C. BONECKER^{1,2}

¹ Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro (UFRJ).

² Programa de Pós-graduação em Zoologia, Museu Nacional, Universidade Federal do Rio de Janeiro (UFRJ).

Abstract. The present study describes the morphology of Oplophoridae and Bresiliidae larvae collected during the cruise of the RV *Thalassa* in the Southwestern Atlantic Ocean in 1999. The larvae were caught by oblique hauls from the surface to 200 meters using a bongo net. Thirteen stages of five species of Oplophoridae (*Acantheephyra* sp.1 to 4, and *Janicella spinicauda*), and two stages of a single species of Bresiliidae (*Discias* sp.) were identified and described. All these larvae were very abundant in the shelf break, mainly those of *Acantheephyra* sp.1. *Acantheephyra* spp. larvae resembles in morphology those of *Discias* sp., with exception of the modified dactylus of first pereopod in the larvae of *Discias* sp. These similarities suggest convergence between Oplophoridae and Bresiliidae larval forms. In contrast, the larvae of *Janicella spinicauda* share little details with *Acantheephyra* larvae and are easily recognized by the long serrated rostrum on both ventral and dorsal margins.

Key words: larval morphology, *Acantheephyra*, *Janicella*, *Discias*, meroplankton, southwestern Atlantic.

Resumo. Morfologia das larvas de Oplophoridae e Bresiliidae (Crustacea, Decapoda) do plâncton do Atlântico Sudoeste, Brasil. O presente trabalho descreve morfologia das larvas de Oplophoridae e Bresiliidae coletadas durante o cruzeiro oceanográfico do NO *Thalassa* no Atlântico Sudoeste em 1999. As larvas foram coletadas por meio de arrastos oblíquos desde próximo da superfície até 200 metros com uma rede bongo. Foram identificados e descritos 13 estádios larvares de Oplophoridae (*Acantheephyra* sp.1 a sp.4, e *Janicella spinicauda*), e dois estádios de uma única espécie de Bresiliidae (*Discias* sp.). Todas essas larvas foram abundantes no talude continental, especialmente *Acantheephyra* sp.1. As larvas de *Acantheephyra* spp. assemelham-se às larvas de *Discias* sp., exceto pelo dactilo modificado em *Discias* sp. Essas semelhanças sugerem convergência na morfologia larvar entre Oplophoridae e Bresiliidae. Em contrapartida, as larvas de *Janicella spinicauda* compartilham poucos detalhes com as larvas de *Acantheephyra* e podem ser reconhecidas pelo rostro serrilhado nas margens ventral e dorsal.

Palavras-chave: morfologia larvar, *Acantheephyra*, *Janicella*, *Discias*, meroplâncton, Atlântico Sudoeste.

Introduction

The great majority of the Southwestern Atlantic Ocean (SAO) waters are adjacent to three countries of South America: Brazil, Uruguay and Argentina. The tropical boundaries of the SAO comprise a highly diverse area, with about 110 caridean species (Coelho *et al.* 2006). For such an important area, there are many species for which larval developmental stages remain unknown and some efforts have been made to minimize this lack (Calazans, 1994; Pohle *et al.*, 1999; Fernandes *et al.*, 2006). In the North Atlantic Ocean, where diversity is lower, many researchers are trying to

study ecology, physiology and distribution of decapod larvae (Barnich 1996, González-Gordillo *et al.* 2001, Santos & González-Gordillo 2004) but developmental stages of many species are also undescribed. One of the main reasons could be that pointed out by Santos & Gonzalez-Gordillo (2004: 205): "identification of decapod larvae from plankton samples is not easy, principally because there are great morphological changes between developmental phases". Also contributing for this scenario, most of the larvae of adults decapods reported for the region remain unknown and

differences in larval morphology between geographically separated populations increase the difficulty in specific identification (Martin & Goy 2004).

Larvae of Opolophoridae and Bresiliidae are common in Brazilian oceanic waters (Fernandes *et al.* 2006), although full larval descriptions and keys are still rare. Larval descriptions in Caridea include both laboratory-reared and field-collected specimens, some times revealing inconsistency in larval development (Villamar & Brusca 1988, González-Gordillo & Rodríguez 2000, Wehrtmann & Albornoz 2003). Interspecific and intraspecific differences in larval morphology between geographically separated populations are also common and should be considered prior to taxonomical and phylogenetic studies (Clarke & Webber 1991, Pohle 1991).

Works concerning larval morphology based upon laboratory-reared specimens depend on the catch of at least one ovigerous female alive, which could be identified with some degree of certainty after hatch. This is the best way to avoid misidentification, except if there is no consensus about the taxonomic position of the species. In addition, to collect and to keep alive an ovigerous female of deep oceanic species, for example, depends on the previous knowledge of adult distribution, physiological constraints and reproductive cycle. Among the known Caridea, for example, larval descriptions are common mainly in the families Hippolytidae (e.g., Pike & Williamson 1961, Ewald 1969, Shield 1978, Haynes 1985, Wehrtmann & Albornoz 1998, 2003, Thatje & Bacardit 2000, Yang *et al.* 2001), Crangonidae (e.g., Haynes 1985, Villamar & Brusca 1988, Jagadisha *et al.* 2000, González-Gordillo & Rodríguez 2000, Li & Hong 2003), Palaemonidae (e.g., Lebour 1925, Fielder 1970, Williamson 1972, Fincham 1979, Santos *et al.* 2004), Processidae (Jagadisha & Sankolli 1977, Williamson 1980) and Alpheidae (e.g., Knowlton 1973, Bhuti *et al.* 1977). Other families include only few studies on larval morphology, as Lysmatidae (e.g., Calado *et al.* 2004), Campylonotidae (Thatje *et al.* 2001) and Pandalidae (Haynes 1985). Additional literature concerning larval development in caridean larvae can be found in González-Gordillo *et al.* (2001).

In contrast to laboratory-reared larvae, planktonic specimens were used as a fast and easy way to describe larval morphology. Unfortunately, it is hard to ascribe a planktonic larva to any given species, even when there is complete correspondence among adult and larval distribution. In this sense, the field-collected larva represents a

good way to study morphology in a more inclusive taxon, as genus or family, but rarely at the species level. Extensive works on larval morphology based upon planktonic specimens were conducted mainly by Gurney (e.g., 1924, 1927, 1936a, 1936b, 1937, 1938, 1939a, 1939b, 1942), Gurney & Lebour (1941), Williamson (e.g., 1957a, 1957b, 1962, 1967a, 1967b, 1982), Bourdillon-Casanova (1960), Barnich (1996), Schwamborn (1997), Báez (1997) and Fernandes *et al.* (2006).

Among the 110 species of Caridea recorded in Brazilian waters, there are about nine of Opolophoridae and two of Bresiliidae (Young 1998, Cardoso & Young 2005, Coelho *et al.* 2006). Informations concerning larval development in these two families are available mainly from plankton-collected specimens. Gurney & Lebour (1941) and Gurney (1942) described some stages of *Acanthephyra*, *Oplophorus*, and *Systellaspis* (Oplophoridae), and *Discias* (Bresiliidae) collected in the plankton of North and South Atlantic. The absence of full larval descriptions for many Opolophoridae and Bresiliidae lead us to concentrate on the morphology of the larvae collected in the SAO. The aim of this study is to describe the larvae of these families from the plankton of South Atlantic Ocean between Rio Real (BA – 12°S) and Cabo de São Tomé (RJ – 22°S).

Materials and Methods

Samples were taken at 114 oceanographic stations in the winter of 1999 during oceanographic cruise of the RV *Thalassa* along Brazilian Central coast, between Rio Real (12°S) and Cabo de São Tomé (22°S) (Figure 1). This study is a part of the Program called REVIZEE (Assessment of the Sustainable Living Resources Potential of the Exclusive Economic Zone). Oblique hauls were done to the maximum depth of 200 m using a bongo net with 330 and 500 µm mesh size. Only decapod larvae collected with 500 µm mesh were used in this study. After hauls were brought onboard, the samples were immediately preserved in 4% buffered formaldehyde.

In the laboratory, larvae of Opolophoridae and Bresiliidae were sorted from the samples, placed in 70% ethanol, and permanently stored in the collection of the Zoology Department, Federal University of Rio de Janeiro, Brazil (DZUFRJ).

Total length (TL), measured from the rostral tip to the posteriormost edge of the telson excluding setae, and rostral length (RL), measured from the rostral tip to the point of eye-stalk insertion of all the specimens collected, were estimated under a Zeiss Stemi SV6 stereoscope with a micrometer ruler

(precision 0.1 mm). Larval stages were estimated according to the degree of development of the larval appendages (Williamson, 1962; Haynes, 1985). Larval appendages were dissected under an Olympus SZX12 stereoscope. Illustrations of the larvae and their appendages were made using a Zeiss Stemi SV6 stereoscope and a Zeiss Axiostar Plus optical microscope, all equipped with drawing tubes.

The terminology used for the differentiation of the larval phases and the larval morphology corresponds to that suggested by Gurney (1942), Williamson (1960, 1968, 1982), Boschi (1981), Haynes (1985), Clark *et al.* (1998) and Thatje *et al.* (2001). The setae were classified according to Garm (2004) and Cardoso & Young (2005).

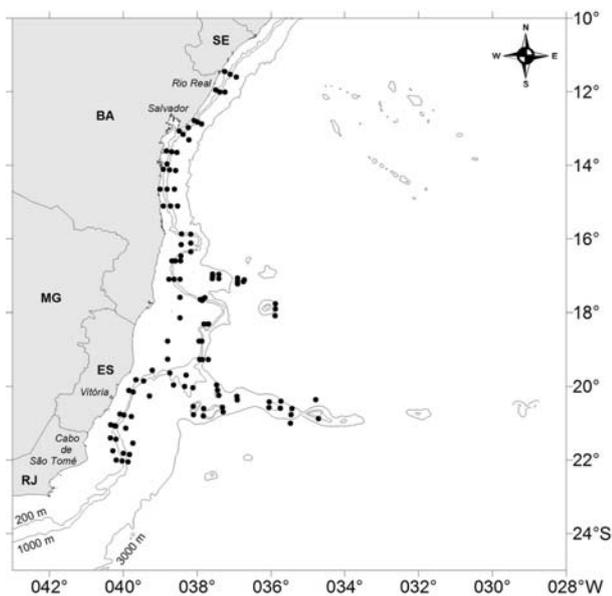


Figure 1. Study site and the 114 sampling stations (black circles).

Systematics

Suborder PLEOCYEMATA Burkenroad, 1963

Infraorder CARIDEA Dana, 1852

Family OPLOPHORIDAE Dana, 1852

Genus *Acantheephyra* A. Milne-Edwards, 1881

Ephyra – Roux 1831: 24. [junior homonym of *Ephyra* Péron & Lesueur, 1810 (Coelenterata), and also junior homonym of *Ephyra* Duponchel, 1829 (Lepidoptera). Type-species: *Alpheus pelagicus* Risso, 1816, by subsequent designation.

Miersia – Kingsley 1880, 1879: 416, pl. 14 [substitute name of *Ephyra* Roux, 1831]. Type-species: *Alpheus pelagicus* Risso, 1816, by subsequent designation.

Acantheephyra A. Milne-Edwards 1881, 11(4): 12. Type-species: *Acantheephyra armata* A. Milne-Edwards, 1881, by original designation.

Bentheocaris – Bate 1888, 24: 723, figs 3-4, pl. 123.

Type-species: *Bentheocaris stylostratis* Bate, 1888, by subsequent designation.

Caricyphus – Bate 1888, 24: 714, fig. 3, pl. 121.

Type-species: *Caricyphus cornutus* Bate, 1888, by subsequent designation.

Acantheephyropsis – Riggio 1895, 14: 246. Type-species: *Acantheephyra pulchra* A. Milne-Edwards, 1890 [= *Acantheephyra eximia* Smith, 1884], by monotype.

Hoplocaricyphus – Coutière 1907, 104: 7. Type-species: *Hoplocaricyphus similis* Coutière, 1907 [= *Alpheus pelagicus* Risso, 1816], by monotype.

REMARKS – The family Oplophoridae Dana, 1852 is comprised of 13 species grouped in seven genera: *Acantheephyra* Milne-Edwards, 1881; *Ephyrina* Smith, 1885; *Janicella* Chace, 1986; *Meningodora* Smith, 1882; *Notostomus* A. Milne-Edwards, 1881; *Oplophorus* H. Milne-Edwards, 1837; and *Systellaspis* Bate, 1888 (Ramos-Porto & Coelho 1998, Cardoso & Young 2005). Larvae are known for some species of *Acantheephyra*, *Oplophorus* and *Systellaspis* (Gurney & Lebour 1941). The oplophorid larvae are usually grouped according to the amount of yolk in the eggs and also egg size. *Acantheephyra* and *Notostomus* are known to have small eggs, with little yolk, and many larval stages before metamorphosis. On the other hand, *Oplophorus*, *Systellaspis*, *Ephyrina* and *Hymenodora* have big eggs with high amount of yolk and usually abbreviated or direct development (Gurney & Lebour 1941, Gurney 1942, Williamson 1962, Cardoso & Young 2005)

Acantheephyra sp1.

(Figures 2 – 6)

MATERIAL EXAMINED. – Bahia State, REVIZEE, R.V. Thalassa, st. T5020, 14.65°S, 038.61°W, 0-200 m, 1 *zoea* (DZUFRJ 1073); st. T5065, 17.1°S, 038.62°W, 0-200 m, 3 *zoea* (DZUFRJ 386). Royal-Charlotte seamount, st. T5029, 15.87°S, 038.18°W, 0-200 m, 2 *zoea* (DZUFRJ 1001); st. T5031, 16.35°S, 038.17°W, 0-200 m, 1 *zoea* (DZUFRJ 1012); st. T5060, 16.6°S, 038.45°W, 0-200 m, 1 *zoea* (DZUFRJ 691); st. T5061, 16.6°S, 038.59°W, 0-200 m, 1 *zoea* (DZUFRJ 2050); st. T5062, 16.6°S, 038.68°W, 0-40 m, 1 *zoea* (DZUFRJ 2051). “Arquipélago dos Abrólhos”, st. T5052, 18.3°S, 037.68°W, 0-200 m, 1 *zoea* (DZUFRJ 2047); st. T5057, 17.68°S, 037.87°W, 0-65 m, 1 *zoea* (DZUFRJ 2048); st. T5058, 17.65°S, 037.91°W, 0-200 m, 1 *zoea* (DZUFRJ 2049); st. T5063, 17.59°S, 038.46°W, 0-20 m, 1 *zoea* (DZUFRJ 2052). Hotspur

seamount, st. T5042, 17.77°S, 035.88°W, 0-200 m, 7 *zoea* (DZUFRJ 1028). – Espírito Santo State, REVIZEE, R.V. Thalassa, st. T5046, 19.27°S, 037.86°W, 0-200 m, 1 *zoea* (DZUFRJ 745); st. T5086, 20.0°S, 038.34°W, 0-200 m, 4 *zoea* (DZUFRJ 1095); st. T5092, 19.56°S, 039.22°W, 0-60 m, 1 *zoea* (DZUFRJ 2053); st. T5094, 19.7°S, 038.3°W, 0-65 m, 1 *zoea* (DZUFRJ 1049); st. T5095, 19.96°S, 037.47°W, 1 *zoea* (DZUFRJ 2054); st. T5096, 20.1°S, 037.45°W, 7 *zoea* (DZUFRJ 817); st. T5097, 20.24°S, 037.42°W, 0-200 m, 1 *zoea* (DZUFRJ 2055); st. T5105, 20.27°S, 036.92°W, 0-200 m, 1 *zoea* (DZUFRJ 2057); st. T5110, 21.0°S, 035.47°W, 0-200 m, 1 *zoea* (DZUFRJ 2059). Vitória seamount, st. T5100, 20.8°S, 037.83°W, 0-60 m, 4 *zoea* (DZUFRJ 803); st. T5101, 20.6°S, 037.82°W, 0-200 m, 1 *zoea* (DZUFRJ 2056). Jaseur seamount, st. T5107, 20.4°S, 035.73°W, 0-200 m, 1 *zoea* (DZUFRJ 2058). Davis seamount, st. T5113, 20.87°S, 034.71°W, 0-200 m, 1 *zoea* (DZUFRJ 1215); st. T5114, 20.36°S, 034.78°W, 0-200 m, 5 *zoea* (DZUFRJ 948).

DIAGNOSIS – Rostrum dorsally compressed, shorter than antennules and serrated on lateral margin from the base to the middle point; third somite humped and with small dorsal spine; postero-lateral spine on fifth somite curved; dorso-lateral spine on sixth somite acute.

DESCRIPTION – *Zoea* IV (Fig. 2), TL=3.6 mm; RL=0.5 mm; body bent on the third somite in about a right angle (Fig. 2A); carapace short with two small dorsal process and serrated on the posterior margin; supraorbital spine absent; pterygostomial spine followed by three small spines; antero-ventral margin with 4 spines (Fig. 2B); rostrum dorsally compressed, about half the length of antennules, and serrated on lateral margin from the base to near the middle point; pleura of first and second abdominal somites serrated; third somite humped and with small dorsal spine; postero-lateral spine on fifth somite curved; dorso-lateral spine on sixth somite acute; antennule (Fig. 2C) with a two-jointed peduncle; ventral margin with a curved spine; exopod shorter than endopod and bearing five aesthetascs; endopod with three apical simple setae; antenna (Fig. 2D) shorter than the antennules; peduncle with an apical spine; exopod scale-like with an outer spine and 15 plumose marginal setae; endopod bulb-like, with an apical setae; mandible (Fig. 2E) with no palp; incisor process with three teeth; molar process with two rows of small teeth

and three spines towards incisor process; maxillule (Fig. 2F) with three plumose and five pappose setae on the coxal endite, and two simple and five cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 2G) with four endites that bear 6,3,3,3 pappose setae; exopod with ten plumose marginal setae; endopod with seven (2,2,1,2) pappose setae; first maxilliped (Fig. 2H) with 16 pappose setae on the protopod and an outer small epipod; exopod with five apical plumose setae; endopod four-jointed, with one simple and ten pappose setae (4,1,3,3); second maxilliped (Fig. 2I) with eight pappose setae on the protopod; exopod with six long, apical, plumose setae; endopod five-jointed, with four simple and six pappose setae (3,1,0,2,4); third maxilliped (Fig. 2J) with one simple and one pappose setae on the protopod; exopod with eight plumose setae; endopod five-jointed, with two simple and six pappose setae (1,1,0,3,3); first and second pereopods (Figs. 2K, 2L) biramous but not chelate, and with 6 plumose setae on the exopod; endopod of first and second pereopods five-jointed, the first with two simple and five pappose setae (1,0,0,3,3), and the second with two simple and four pappose setae (1,0,0,3,2); third to fifth pereopods absent; uropod (Fig. 2M) as long as telson; lateral margin of telson (Fig. 2N) parallel and bearing two spines; posterior margin with 6+6 spines.

– *Zoea* V? (Fig. 3), TL=4.8 mm; RL=0.7 mm; larva very similar to previous stage, except the degree of appendages development; antennule (Fig. 3A) with a two-jointed peduncle; ventral margin with a curved spine; exopod shorter than endopod and bearing five aesthetascs; endopod with three apical simple setae; antenna (Fig. 3B) shorter than the antennules; peduncle with an apical spine, that bears one median small spinulle; exopod scale-like with an outer spine and 19 marginal plumose setae; endopod bulb-like, with an apical setae; maxillule (Fig. 3C) with three plumose and five pappose setae on the coxal endite, and 3 simple and 5 cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 3D) with four endites that bear 6,4,3,5 pappose setae; exopod with 13 plumose marginal setae; endopod with eight (3,2,1,2) pappose setae; first maxilliped (Fig. 3E) with 17 pappose setae on the protopod and an outer epipod; exopod with five apical plumose setae; endopod four-jointed, with 11 pappose setae (4,1,3,3); second maxilliped (Fig. 3F) with ten pappose setae on the protopod; exopod with six long, apical, plumose setae; endopod five-jointed, with one apical serrated, three simple and eight

pappose setae (3,1,0,3,5); third maxilliped (Fig. 3G) with two simple and one pappose setae on the protopod; exopod with eight plumose setae; endopod

five-jointed, with one apical serrated, seven simple and six pappose setae (2,1,2,5,4); first pereopod (Fig. 3H) with two simple and one pappose setae on

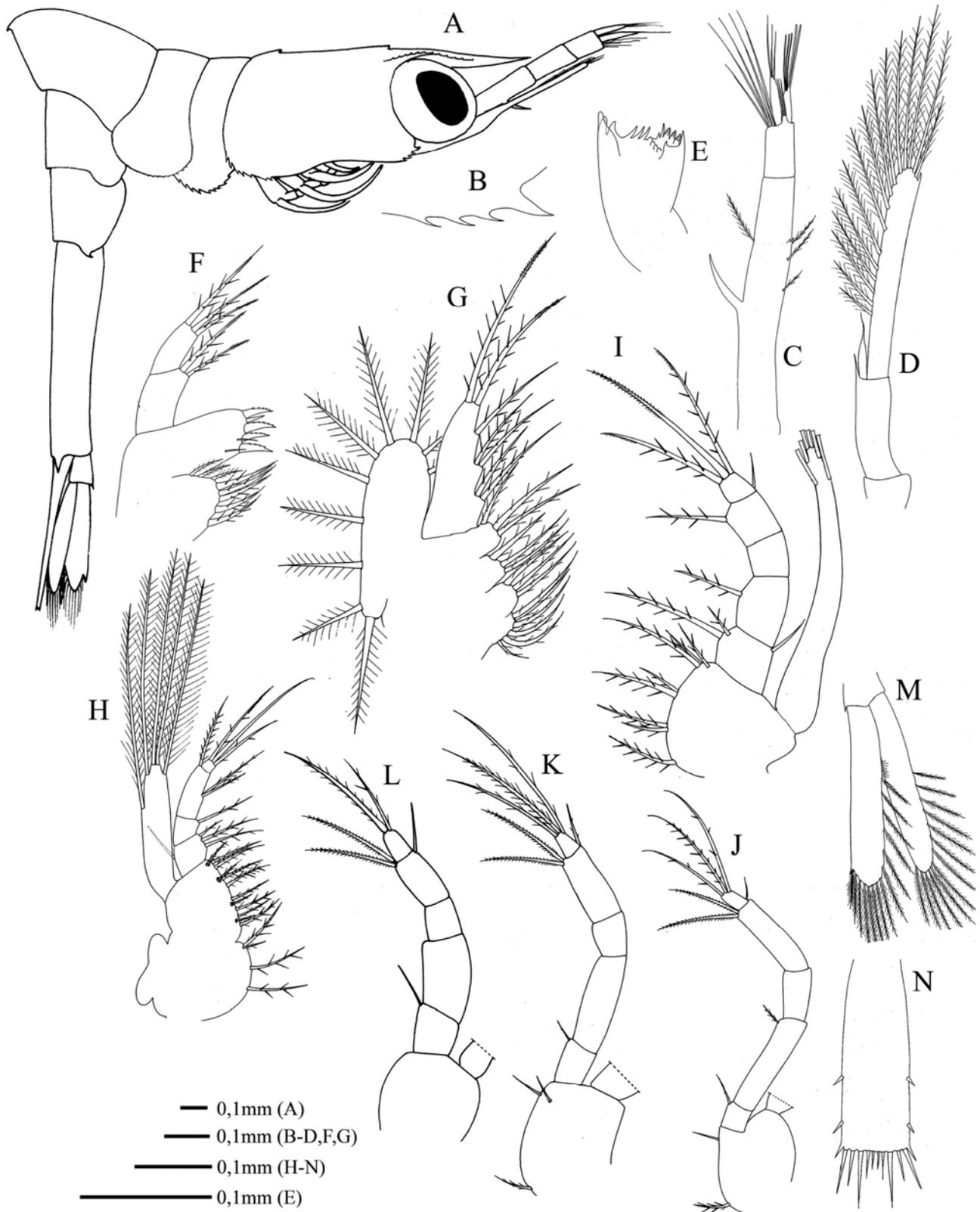


Figure 2. *Acanthephyra* sp.1, zoea IV (DZUFJR817). A, lateral view; B, carapace, antero-ventral margin; C, antennule; D, antenna; E, mandible; F, maxillule; G, maxilla; H, first maxilliped; I, second maxilliped; J, third maxilliped; K, first pereopod; L, second pereopod; M, uropod; N, telson.

the protopod; exopod with eight plumose setae; endopod five-jointed, with one apical serrated, four pappose and five simple setae (1,0,2,4,3); second pereopod (Fig. 3I) with three simple setae on the protopod; exopod with six plumose setae; endopod five-jointed, with seven one apical serrated, two pappose and four simple setae (2,0,0,3,2); third pereopod (Fig. 3J) biramous but unjointed, the exopod with three plumose setae and the endopod

with one simple and one pappose setae; fourth and fifth pereopods (Fig. 3K) as small buds.

– *Zoea VIII?* (Fig. 4), TL=6.0 mm, RL=0.8 mm; larva larger than previously, the body bent in about 180° (Fig. 4A); pterygostomial spine followed by five small spines; rostrum with 2/3 of the length of antennules; antennule (Fig. 4B) with a two-jointed peduncle; ventral margin with a curved spine; exopod shorter than endopod and bearing four

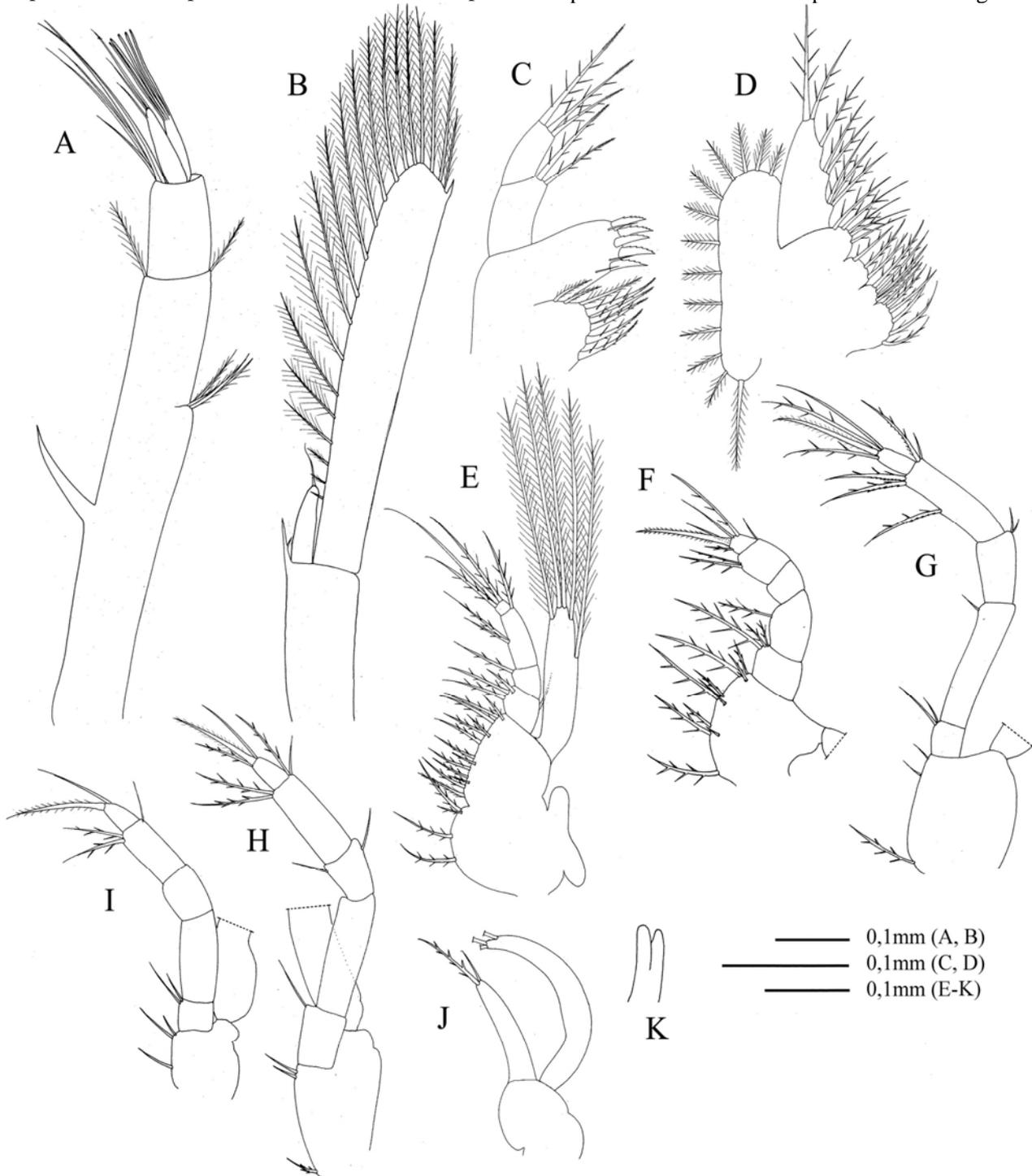


Figure 3. *AcanthePHYRA* sp.1, *zoea V?* (DZUFJR386). A, antennule; B, antenna; C, maxillule; D, maxilla; E, first maxilliped; F, second maxilliped; G, third maxilliped; H, first pereopod; I, second pereopod; J, third pereopod; K, fourth and fifth pereopods.

aesthetascs; endopod damaged; antenna (Fig. 4C) as long as antennules; peduncle with an apical spine; exopod scale-like with an outer spine and 22 marginal setae; endopod stout, about half length of exopod; maxillule (Figs. 4D, E) with ten pappose setae on the coxal endite, and three simple and six cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 4F) with four endites that bear 7,4,6,5 pappose setae; exopod with 27 marginal plumose setae; endopod with nine pappose setae (3,2,1,3); first maxilliped

(Fig. 4G) with 17 pappose setae on the protopod and an outer epipod; exopod with five apical plumose setae; endopod four-jointed, with ten pappose setae (3,1,3,3); second maxilliped (Fig. 4H) with nine pappose setae on the protopod; exopod with six plumose setae; endopod five-jointed, with six simple and seven pappose setae (3,1,1,3,5); third maxilliped (Fig. 4I) with one simple setae on the protopod; exopod with eight plumose setae; endopod five-jointed, with seven simple and four pappose setae (1,1,1,5,3); endopod of first pereopod (Fig. 4J) with

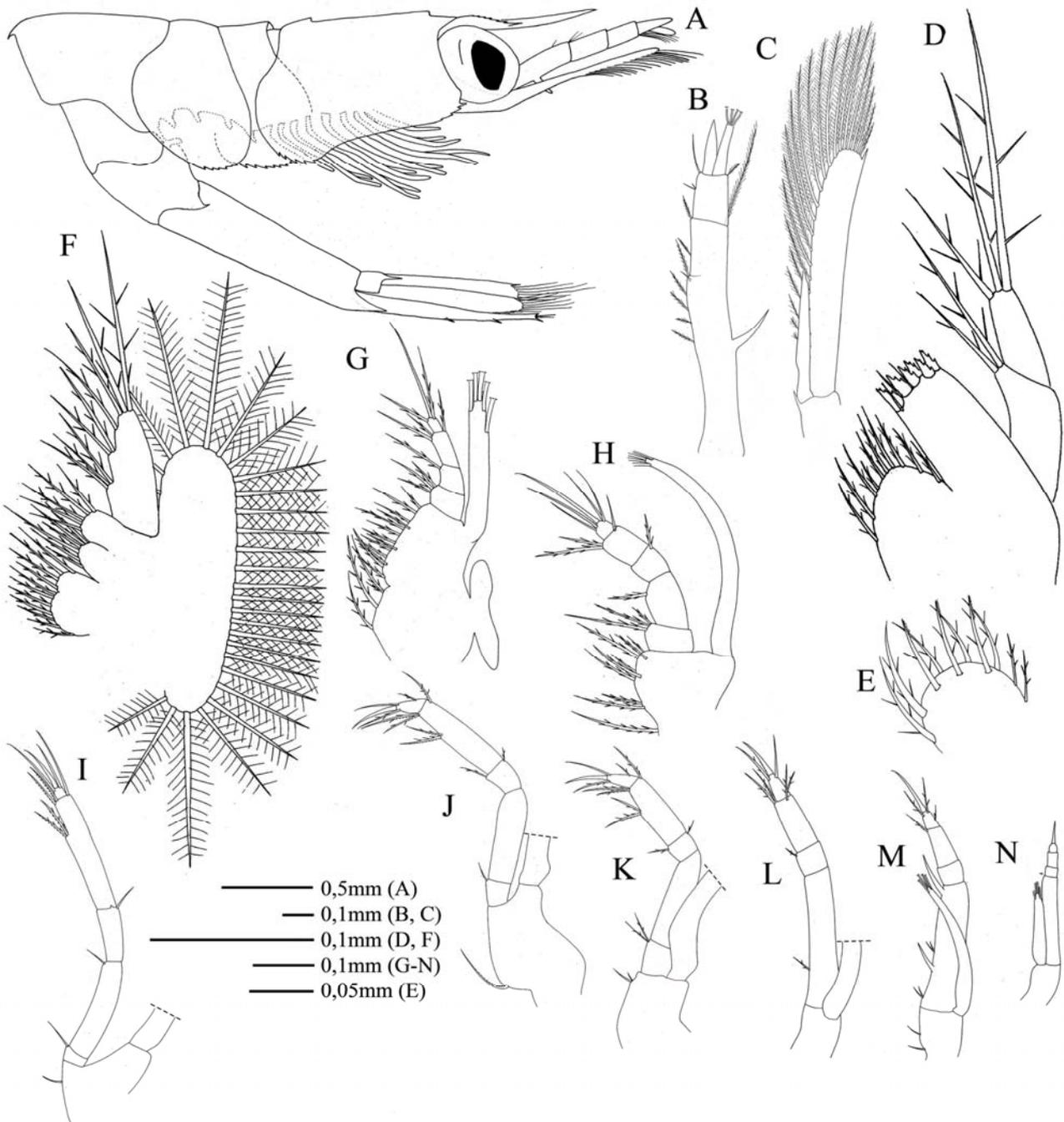


Figure 4. *Acanthephyra* sp.1, zoea VIII? (DZUFJR1215). A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxillule, coxal endite; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, second pereopod; L, third pereopod; M, fourth pereopod; N, fifth pereopod.

12 pappose setae (1,0,2,5,4); endopod of second pereopod (Fig. 4K) with 13 pappose setae (2,0,2,5,4); exopod of first and second pereopods with 12 plumose setae each; third pereopod (Figure 4L) larger than previously, the exopod with two additional plumose setae; endopod four-jointed, with nine pappose setae (1,1,3,4); fourth and fifth pereopods (Figs. 4M, N) biramous and with four plumose setae on the exopod; endopod of fourth pereopod with two strong curved spines and three apical pappose setae; pleopods as small buds; telson laterally compressed, with no spines on its lateral margin, and with 5+5 spines on posterior margin.

– *Zoea X?* (Figs. 5 and 6), TL=6.6 mm, RL=1.2 mm; larva very similar to previously (Fig. 5A); pterygostomian spine followed by five small spines (Fig. 5B); postero-ventral margin of carapace with 11 small spines; antennule (Fig. 5C) with a three-jointed peduncle, that bear six plumose and eight simple setae; ventral margin with a curved spine; exopod the same length of endopod and smooth; antenna (Fig. 5D) as long as antennules; peduncle with no apical spine; exopod scale-like with an outer spine and 30 marginal plumose setae; endopod damaged but longer than exopod; mandible (Fig. 5E) with seven spines and three teeth on incisor process; maxillule (Fig. 5F, G) with two simple, three plumose and eight pappose setae on the coxal endite; basal endite with three simple and six cuspidate setae; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 5H) with four endites that bear 6,4,6,5 pappose setae; exopod with 30 marginal plumose setae; endopod with nine pappose setae (3,2,1,3); first maxilliped (Fig. 5I) with 22 pappose setae on the protopod and an outer epipod; exopod with five apical plumose setae; endopod four-jointed, with ten pappose setae (3,1,3,3); second maxilliped (Fig. 6J) with two simple, two plumose and eight pappose setae on the protopod; exopod with six plumose setae; endopod five-jointed, with two simple and 11 pappose setae (3,1,1,3,5); third maxilliped (Fig. 6K) with one simple and two pappose setae on the protopod; exopod with 11 plumose setae; endopod five-jointed, with two simple and eight setae (2,0,0,5,3); first pereopod (Fig. 6L) with one simple and one pappose setae on the protopod; exopod with 16 plumose setae; endopod five-jointed, with two simple and ten pappose setae (2,0,1,6,3); second pereopod (Fig. 6M) with one pappose and two simple setae on the protopod; exopod with 11 plumose setae; endopod five-jointed, with an inner spine on the second article, and two simple and 14 pappose setae (2,2,2,6,4); third pereopod (Fig. 6N) with no setae on the protopod; endopod five-jointed, with a spine on the third article, and two simple and

six pappose setae (0,1,0,4,3); fourth pereopod (Fig. 6O) with three simple setae on the protopod; endopod five-jointed, with one spine on the first and second articles, and two simple and eight pappose setae (2,0,2,3,3); exopod of third and fourth pereopods with six plumose setae; fifth pereopod (Fig. 6P) with one simple seta on the protopod; endopod four-jointed, with one spine on the first and second articles, and two simple and four pappose setae (0,1,2,3); exopod with four plumose setae; pleopods biramous, but not setose; uropod (Fig. 6Q) biramous and setose; telson (Figs 6R, S) with 5+5 spines on posterior margin and 3+3 small spines near the margin.

Acanthephyra sp.2

(Figures 7 and 8)

MATERIAL EXAMINED – Espírito Santo State, REVIZEE, R.V. Thalassa, st. T5096, 20.10°S, 037.45°W, 1 *zoea* (DZUFRJ 1213). Davis seamount, st. T5098, 20.54°S, 038.10°W, 0-50 m, 2 *zoea* (DZUFRJ 893).

DIAGNOSIS – Rostrum smooth, dorsally compressed, and longer than antennules; third somite humped but with no dorsal spine; fifth somite with no postero-lateral spine; sixth somite with no dorso-lateral spine.

DESCRIPTION – *Zoea* IV (Fig. 7), TL=6.5 mm; RL=1.1 mm; body bent in about a right angle (Fig. 7A); carapace with a dorsal organ immediately after the insertion of rostrum and serrated on the posterior margin; supraorbital spine absent; pterygostomian spine followed by three small spines; rostrum smooth, dorsally compressed, and longer than antennules; first somite with ventral margin of pleura serrated; third somite humped but with no dorsal spine; fifth somite with no postero-lateral spine; sixth somite with no dorso-lateral spine; antennule (Fig. 7B) with a three-jointed peduncle; ventral margin with a curved spine; exopod shorter than endopod; antenna (Fig. 7C) as long as antennules; peduncle with an apical spine; exopod scale-like with an outer spine and 22 marginal plumose setae; endopod stout, with an apical setae and about 2/3 the length of exopod; maxillule (Fig. 7D) with seven pappose setae on the coxal endite and four cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 7E) with three endites that bear 6,5,5 pappose setae; exopod with 13 marginal plumose setae; endopod with seven pappose setae (2,2,1,2); first maxilliped (Fig. 7F) with 12 pappose setae on

the protopod and an outer epipod; exopod with four plumose setae; endopod four-jointed, with seven pappose setae (2,1,1,3); second and third maxilliped damaged; first to third pereopods biramous and with

setose exopods (this appendages were damaged and the number of setae in each exopod could not be seen); fourth and fifth pereopods as small buds; pleopods absents; telson laterally compressed with

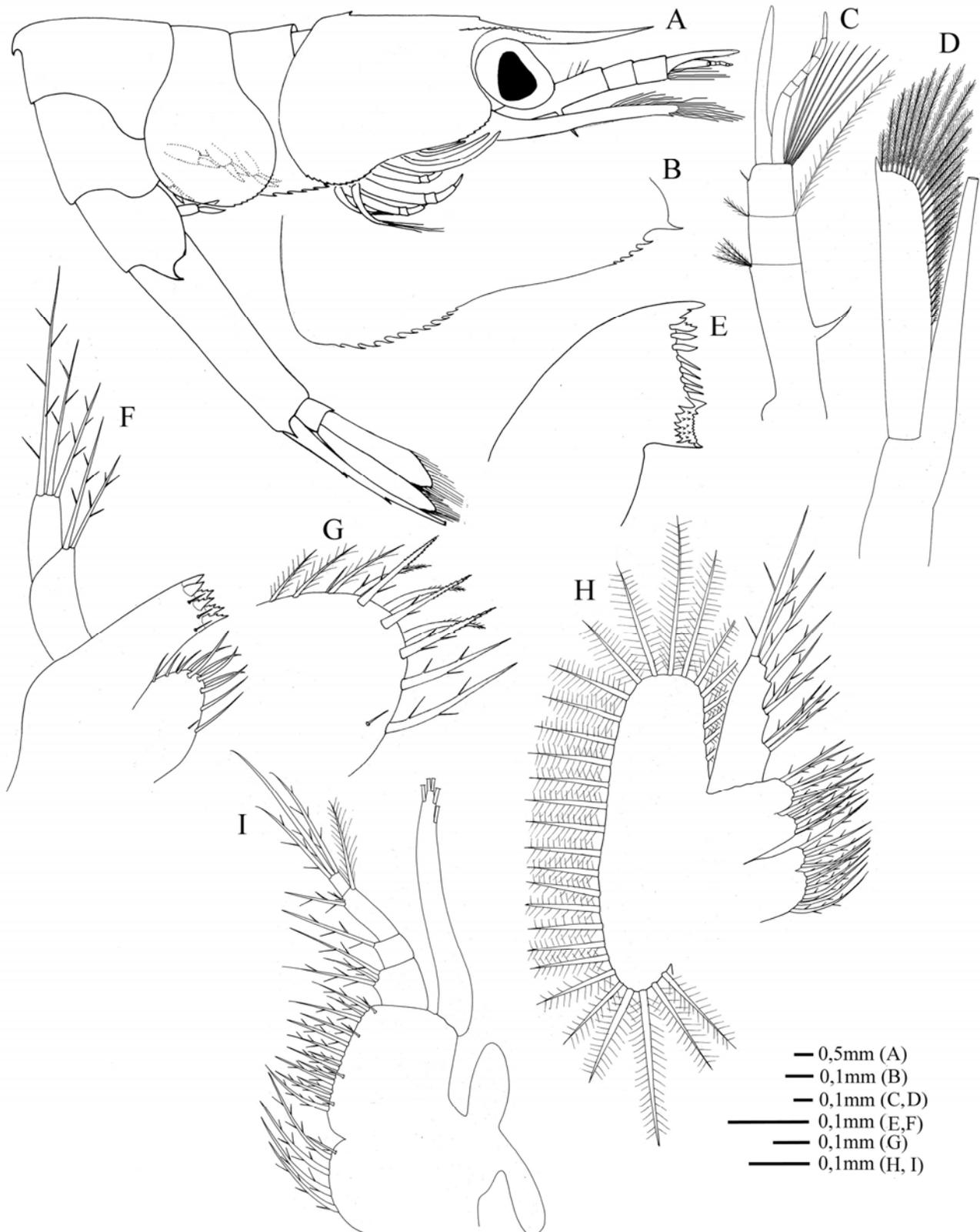


Figure 5. *Acanthephyra* sp.1, zoea X? (DZUFRJ1028). A, lateral view; B, carapace, antero-ventral margin; C, antennule; D, antenna; E, mandible; F, maxillule; G, maxillule, coxal endite; H, maxilla; I, first maxilliped.

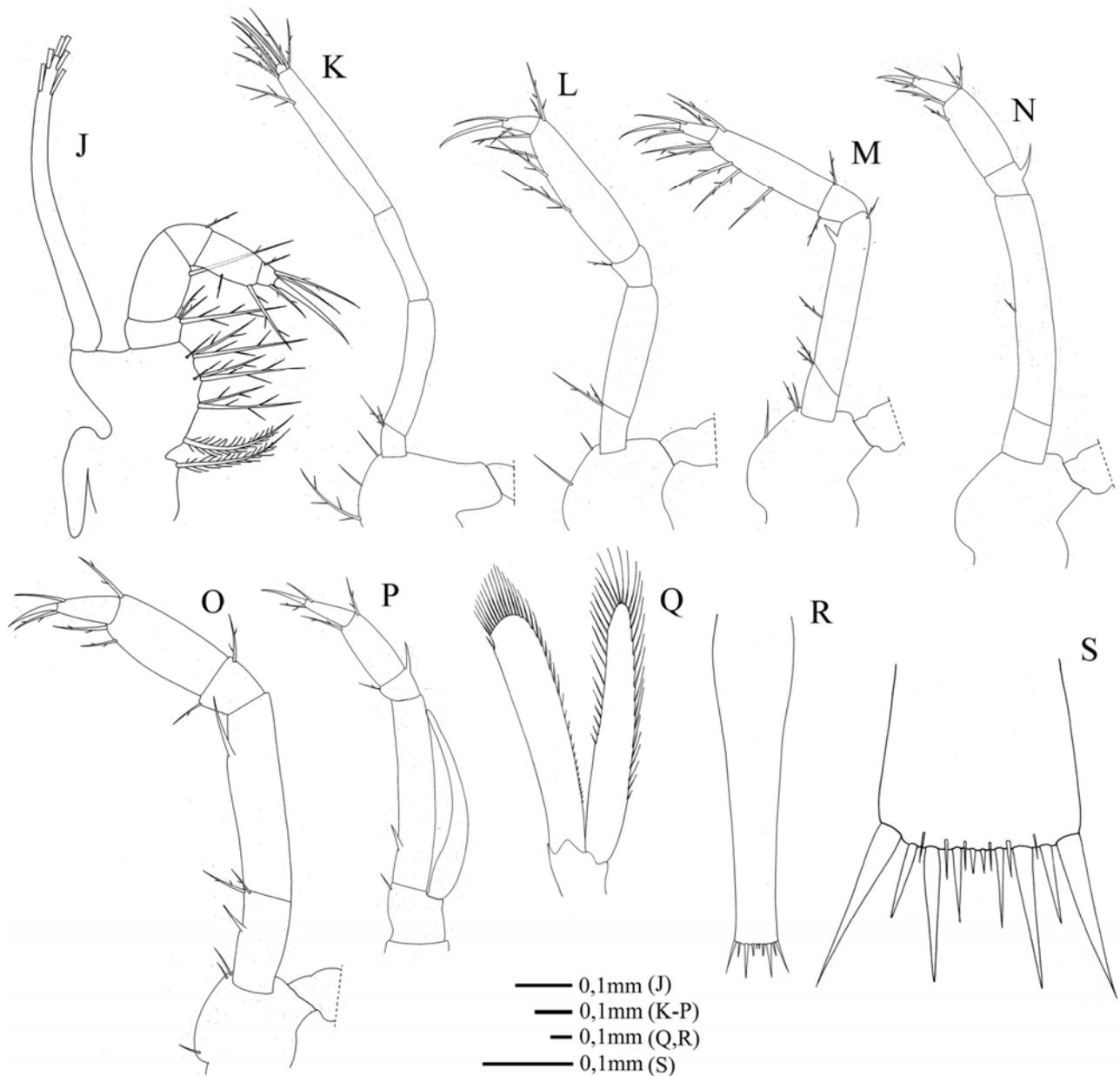


Figure 6. *AcanthePHYRA* sp.1, zoea X? (DZUFRJ1028). J, second maxilliped; K, third maxilliped; L, first pereopod; M, second pereopod; N, third pereopod; O, fourth pereopod; P, fifth pereopod; Q, uropod; R, telson; S, telson, posterior margin.

two lateral spines and 6+6 on the posterior margin.
 – *Zoea* VII? (Fig. 8), TL=9.8 mm, RL=2.0 mm; larva very similar to previous stage (Fig. 8A); all the appendages, except pleopods, well developed and biramous; antennule (Fig. 8B) with a three-jointed peduncle; ventral margin with a serrated spine; exopod shorter than endopod; antenna (Fig. 8C) shorter than antennules; peduncle with an apical spine; exopod scale-like with an outer spine and 35 marginal plumose setae; endopod stout, with an apical setae and about half the length of exopod; mandible (Fig. 8D) with 14 and 11 teeth respectively on the molar and incisor processes; maxillule (Fig. 8E) with six simple and eight pappose setae on the coxal endite, and three simple

and five cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 8F) with three endites that bear 13,7,5 pappose setae; exopod with 32 marginal plumose setae; endopod with nine pappose (2,2,1,4) setae; first maxilliped (Fig. 8G) with one plumose, seven simple, and 12 pappose setae on the protopod; exopod with eight plumose setae; endopod four-jointed, with eight pappose setae (3,1,1,3); second maxilliped (Fig. 8H) with one plumose and six pappose setae on the protopod; exopod with four plumose setae; endopod five-jointed, with two simple and 11 pappose setae (4,2,0,2,5); third maxilliped (Fig. 8I) with two pappose setae on the protopod; exopod with ten plumose setae; endopod

five-jointed, with two simple and 11 pappose setae (2,2,0,5,4); first pereopod (Fig. 8J) with one simple seta on the protopod; exopod with ten plumose setae; endopod five-jointed, with two simple and four pappose setae (2,0,0,2,2); second pereopod (Fig. 8K) with eight plumose setae on the exopod; endopod five-jointed with two simple and four pappose (2,0,0,2,2); third pereopod (Fig. 8L) with no setae on the protopod; exopod with eight plumose setae; endopod five-jointed, with two simple and three pappose setae (1,0,0,2,2); fourth and fifth pereopods (Figs. 8M, N) biramous but non-setose; pleopods absents; telson (Fig. 8O) parallel-side, with two lateral spines and 6+6 posterior.

Acanthephyra sp.3

(Figures 9 – 11)

MATERIAL EXAMINED – Bahia State, REVIZEE, R.V. Thalassa, st. T5054, 18.77°S, 037.95°W, 0-60 m, 1 *zoea* (DZUFRJ 428); st. T5056, 17.64°S, 037.84°W, 0-200 m, 2 *zoea* (DZUFRJ 724). – Espírito Santo State, REVIZEE, R.V. Thalassa, st. T5045, 19.27°S, 037.7°W, 0-200 m, 1 *zoea* (DZUFRJ 828). Davis seamount, st. T5114, 20.36°S, 034.78°W, 0-200 m, 4 *zoea* (DZUFRJ 947, 1216).

DIAGNOSIS – Rostrum dorsally compressed, longer than antennules and serrated on lateral margin from the base to the middle point; third somite humped

but with no dorsal spine; postero-lateral spine on fifth somite curved; dorso-lateral spine on sixth somite absent.

DESCRIPTION – *Zoea* V? (Fig. 9), TL=7.4 mm; RL=1.3 mm; body bent on the third somite in about a right angle (Fig. 9A); carapace short with two small dorsal process and serrated on the posterior margin; supraorbital spine absent; pterygostomian spine followed by five small spines; rostrum dorsally compressed, longer than antennules, and serrated on lateral margin from the base to near the middle point; pleura of first and second abdominal somites serrated; third somite humped but with no dorsal spine; postero-lateral spine on fifth somite curved; dorso-lateral spine on sixth somite absent; antennule (Fig. 9B) with a three-jointed peduncle; ventral margin with a serrated spine; exopod shorter than endopod; antenna (Fig. 9C) shorter than antennules; peduncle with a long, apical spine; exopod scale-like with an outer spine and 13 marginal plumose setae; endopod stout, with an apical setae and about half the length of exopod; mandible (Fig. 9D) with nine and five teeth respectively on the molar and incisor processes; maxillule (Fig. 9E) with six pappose setae on the coxal endite; basal endite with three simple and three cuspidate setae; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 9F) with four endites that bear 8,4,4,3 pappose setae; exopod with eight marginal plumose setae; endopod with nine

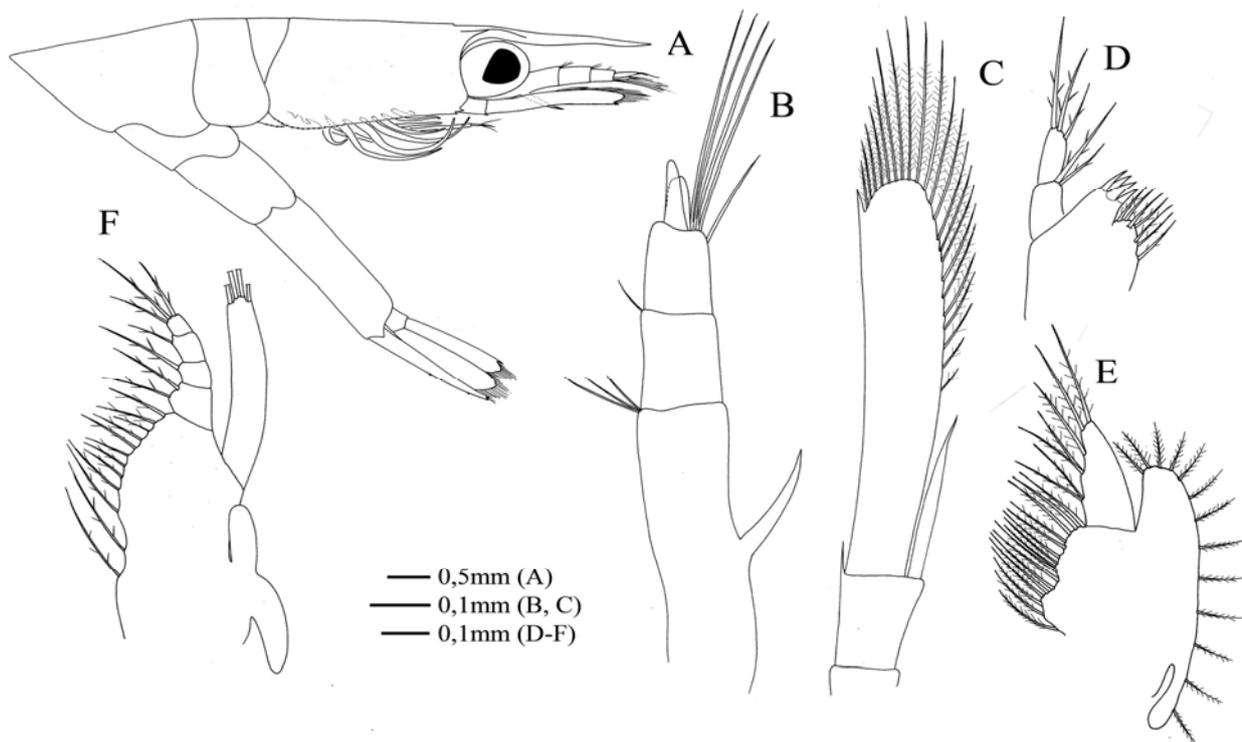


Figure 7. *Acanthephyra* sp.2, *zoea* IV (DZUFRJ006). A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxilla; F, first maxilliped.

pappose setae (3,2,1,3); first maxilliped (Fig. 9G) with one plumose and 11 pappose setae on the protopod; exopod with four apical plumose setae; endopod four-jointed, with two simple and five pappose setae (2,1,1,3); second maxilliped (Fig. 9H) with one plumose and nine pappose setae on the

protopod; exopod with five plumose setae; endopod five-jointed, with two simple and nine pappose setae (3,1,0,2,5); third maxilliped (Fig. 9I) with one simple setae on the protopod; exopod with five plumose setae; endopod five-jointed, with one simple and seven pappose setae (2,1,0,2,3); first

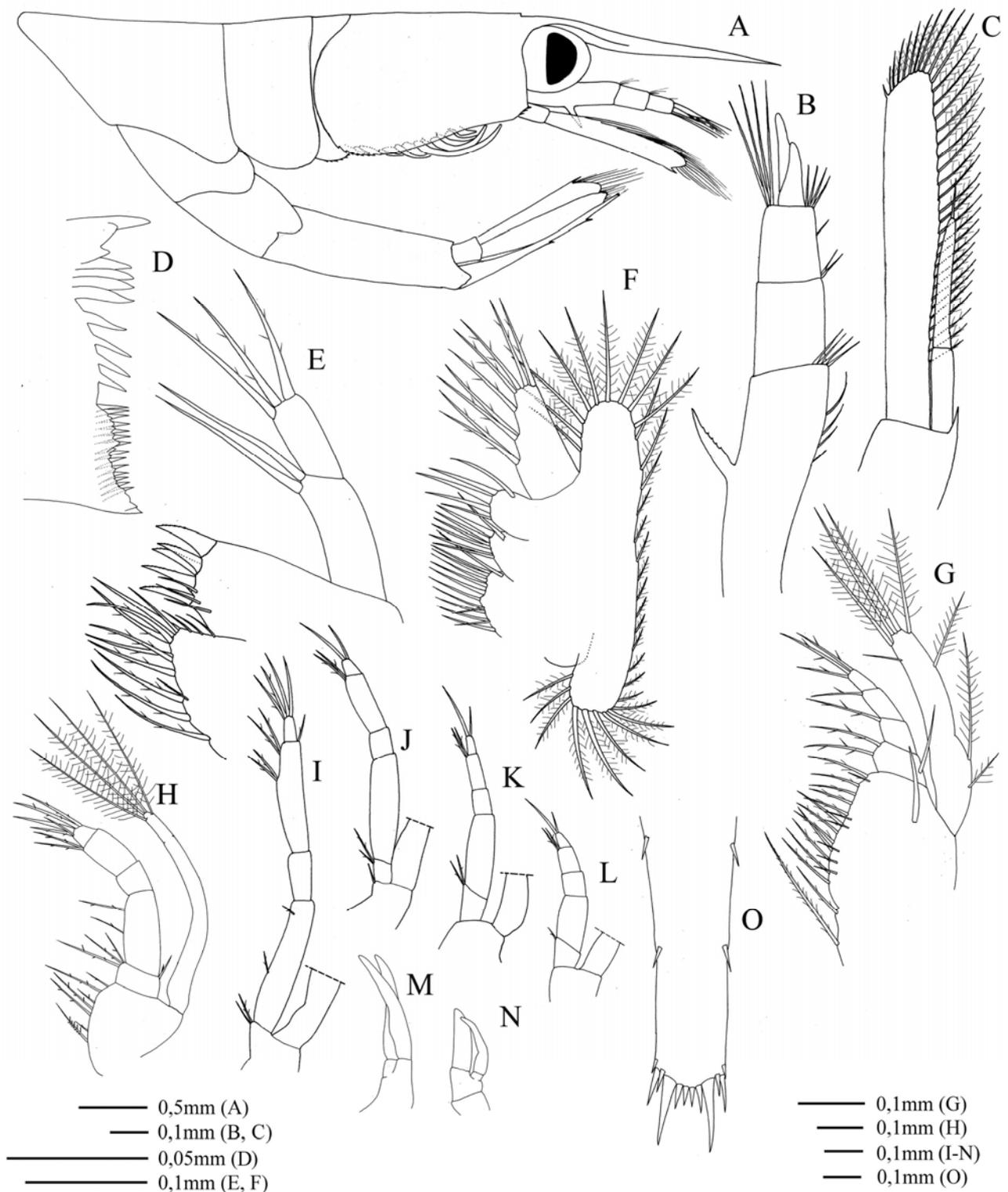


Figure 8. *Acanthephyra* sp.2, zoea VII? (DZUF RJ1447). A, lateral view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, second pereopod; L, third pereopod; M, fourth pereopod; N, fifth pereopod; O, telson.

pereopod (Fig. 9J) biramous but not chelate, and with six plumose setae on the exopod; endopod five-jointed, with one simple and seven pappose setae (2,1,0,2,3); second pereopod damaged; third pereopod (Fig. 9K) biramous but not completely developed; exopod with four plumose setae; endopod single-jointed with two apical simple setae; fourth and fifth pereopods absent; pleopods (Fig. 9L) as small buds; uropod (Fig. 9M) as long as telson; lateral margin of telson (Fig. 9N) parallel and bearing two spines; posterior margin with 6+6 spines.

– *Zoea* VI? (Fig. 10), TL=9.4 mm; RL=1.7 mm; larva very similar to previous stage (Fig. 10A), but larger and with more developed appendages; antennule (Fig. 10B) with a three-jointed peduncle; ventral margin with a serrated spine; exopod shorter than endopod; antenna (Fig. 10C) as long as antennules; peduncle with an apical spine; exopod scale-like with an outer spine and 27 marginal plumose setae; endopod stout, two-jointed, with an apical simple setae and about half the length of exopod; maxillule (Fig. 10D) with two simple and nine pappose setae on the coxal endite; basal endite with four simple and four cuspidate setae; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 10E) with four endites that bear 11,4,7,6 pappose setae; exopod with 34 marginal plumose setae; endopod with nine pappose setae (3,2,1,3); first maxilliped (Fig. 10F) with seven simple and 13 pappose setae on the protopod; exopod with seven plumose setae; endopod four-jointed, with seven pappose setae (2,1,1,3); second maxilliped (Fig. 10G) with 11 pappose setae on the protopod; exopod with eight plumose setae; endopod five-jointed, with two simple and 11 pappose setae (4,2,0,2,5); third maxilliped (Fig. 10H) with no setae on the protopod; exopod with 14 plumose setae; endopod five-jointed, with two simple and nine pappose setae (0,1,0,5,5); first pereopod (Fig. 10I) with one simple setae on the protopod; exopod with 16 plumose setae; endopod five-jointed, with six pappose setae (2,0,0,1,3); second pereopod (Fig. 10J) with no setae on the protopod; exopod with 12 plumose setae; endopod five-jointed, with four pappose setae (1,0,0,1,2); third pereopod (Fig. 10K) with no setae on the protopod; exopod with eight plumose setae; endopod four-jointed, with one simple seta on the third article; fourth pereopod (Fig. 10L) biramous and with two plumose setae on the exopod; fifth pereopod (Fig. 10M) small and uniramous; telson (Fig. 10N) with two lateral and 5+5 posterior spines.

– *Zoea* VII? (Fig. 11), TL=10.0 mm; RL=1.8 mm; similar to previous stage (Fig. 11A); antennule (Fig. 11B) with a three-jointed peduncle;

ventral margin with a serrated spine; exopod shorter than endopod and with one apical setae; endopod with three apical setae; antenna (Fig. 11C) longer than antennules; peduncle with no apical spine; exopod scale-like with an outer spine and 31 marginal plumose setae; endopod stout, two-jointed, with two apical setae and about half the length of exopod; maxillule (Fig. 11D) with five simple and six pappose setae on the coxal endite, and four simple and five cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 11E) with four endites that bear 9,4,7,5 pappose setae; exopod with 31 marginal plumose setae; endopod with eight pappose setae (2,2,1,3); first maxilliped (Fig. 11F) with 21 pappose setae on the protopod; exopod with one simple and five plumose setae; endopod four-jointed, with 2,1,2,3 pappose setae; second maxilliped (Fig. 11G) with 11 pappose setae on the protopod; exopod with eight plumose setae; endopod five-jointed, with two simple and ten pappose setae (4,2,0,2,4); third maxilliped (Fig. 11H) with one simple setae on the protopod; exopod with 12 plumose setae; endopod four-jointed, with one simple and seven pappose setae (0,0,4,4); first pereopod (Fig. 11I) with no setae on the protopod; exopod with 14 plumose setae; endopod five-jointed, with one simple and five pappose setae (0,0,0,3,3); second pereopod (Fig. 11J) with no setae on the protopod; exopod with 12 plumose setae; endopod five-jointed, with one simple and five pappose setae (1,1,0,2,2); third and fourth pereopod (Figs. 11K, L) biramous and with no setae on the protopod; exopods with six plumose setae; endopod of third pereopod four-jointed, with two apical simple setae; endopod of fourth pereopod two-jointed, with two apical simple setae; fifth pereopod (Fig. 11M) uniramous but longer than before; pleopods biramous; telson similar to previously.

AcanthePHYRA sp.4

(Figures 12 and 13)

MATERIAL EXAMINED – Bahia State, “Arquipélago dos Abrolhos”, REVIZEE, R.V. Thalassa, st. T5052, 18.30°S, 037.68°W, 0-200 m, 2 *zoea* (DZUFJRJ 753). – Espírito Santo State, st. T5078, 21.08°S, 040.21°W, 0-200 m, 1 *zoea* (DZUFJRJ 2061); st. T5095, 19.96°S, 037.47°W, 1 *zoea* (DZUFJRJ 2062); st. T5096, 20.10°S, 037.45°W, 1 *zoea* (DZUFJRJ 1449). Jaseur seamount, st. T5107, 20.40°S, 035.73°W, 0-200 m, 1 *zoea* (DZUFJRJ 2063). Davis seamount, st. T5113, 20.87°S, 034.71°W, 0-200 m, 1 *zoea* (DZUFJRJ 813). – Rio de Janeiro State, “Cabo de São Tomé”, st. T5072, 21.82°S, 040.00°W, 0-200 m, 1 *zoea* (DZUFJRJ 2060).

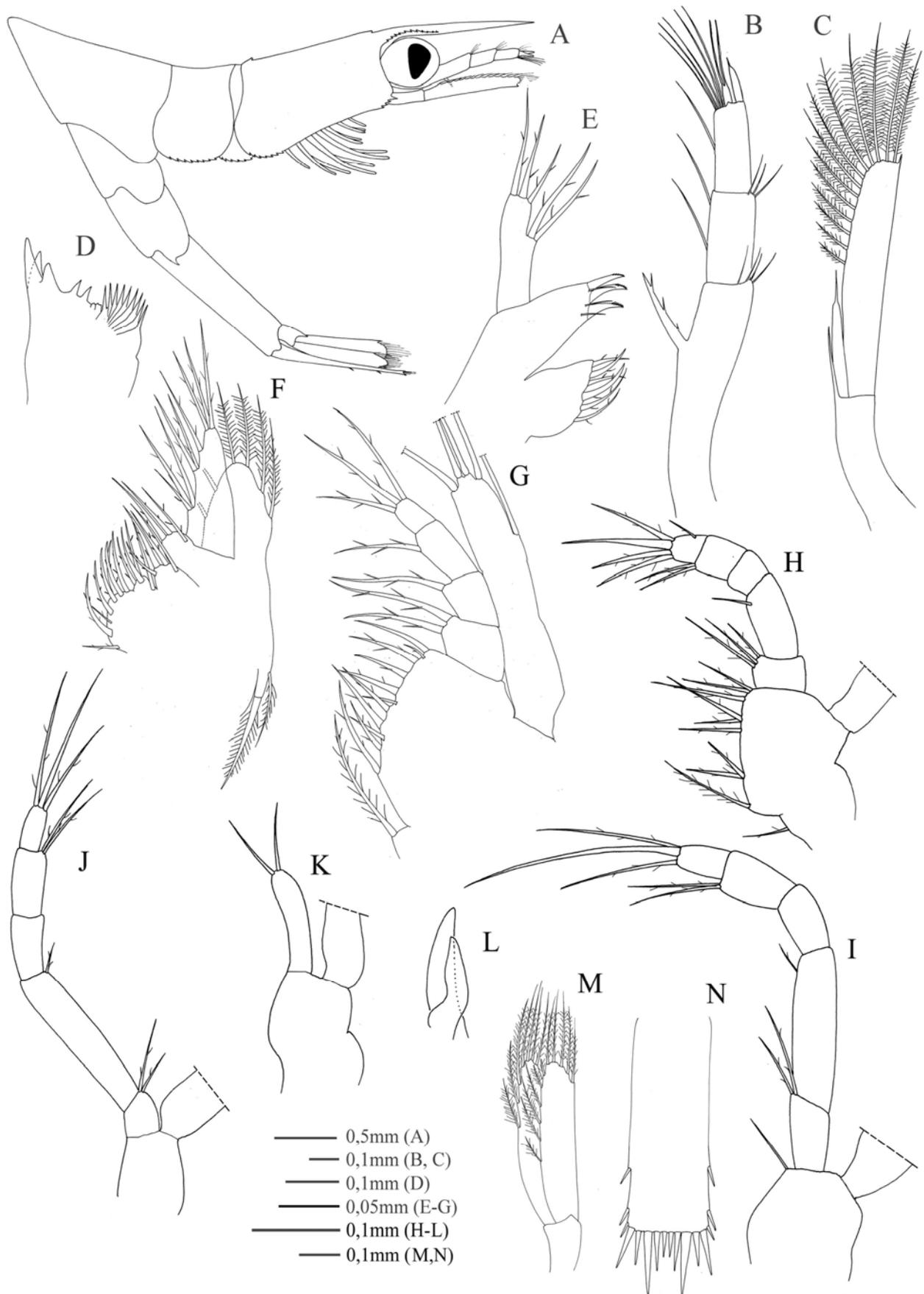


Figure 9. *AcanthePHYRA* sp.3, zoea V? (DZUFRJ724). A, lateral view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, second pereopod; L, third pereopod; M, uropod; N, telson.

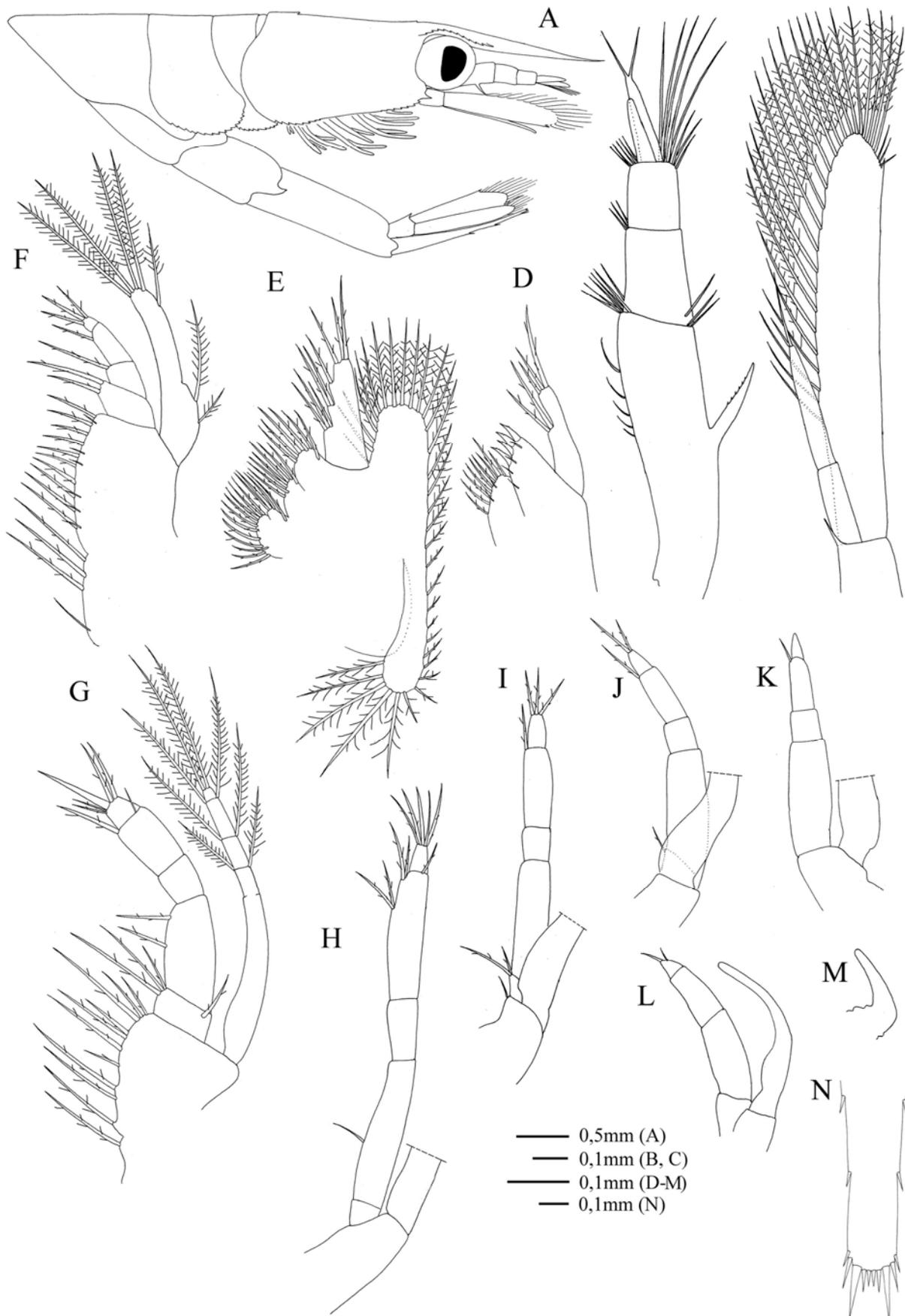


Figure 10. *Acanthephyra* sp.3, zoea VI (DZUFRJ149). A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxilla; F, first maxilliped; G, second maxilliped; H, third maxilliped; I, first pereopod; J, second pereopod; K, third pereopod; L, fourth pereopod; M, fifth pereopod; N, telson.



Figure 11. *AcanthePHYRA* sp.3, zoea VII? (DZUF RJ576). A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxilla; F, first maxilliped; G, second maxilliped; H, third maxilliped; I, first pereopod; J, second pereopod; K, third pereopod; L, fourth pereopod; M, fifth pereopod.

DIAGNOSIS – Rostrum dorsally compressed, shorter than antennules and serrated on lateral margin from the base to the tip; third somite humped but with no dorsal spine; postero-lateral spine on fifth somite absent; dorso-lateral spine on sixth somite small.

DESCRIPTION – *Zoea* III (Fig. 12), TL=3.4 mm; RL=0.5 mm; body bent on the third somite in about a right angle (Fig. 12A); carapace short with two small dorsal process and serrated on the posterior margin; supraorbital spine absent; pterygostomian spine followed by five small spines; rostrum dorsally compressed, longer than antennules, and serrated on lateral margin from the base to near the middle point; pleura of first and second abdominal somites serrated; third somite humped but with no dorsal spine; postero-lateral spine on fifth somite absent; dorso-lateral spine on sixth somite small; antennule (Fig. 12B) with a three-jointed peduncle; ventral margin with a spine; exopod shorter than endopod (the tip of appendage was damaged so the setae could not be seen); antenna (Fig. 12C) shorter than antennules; peduncle with an apical serrated spine; exopod scale-like with an outer spine and 11 marginal plumose setae; endopod stout, single-jointed, with an apical simple setae and about one third the length of exopod; mandible (Fig. 12D) with five teeth on the incisor process; maxillule (Fig. 12E) with five pappose setae on the coxal endite and five cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 12F) with four endites that bear 5,3,3,4 pappose setae; exopod with nine marginal plumose setae; endopod with nine pappose setae (3,2,1,3); first maxilliped (Fig. 12G) with 11 pappose setae on the protopod; exopod with four plumose setae; endopod four-jointed, with nine pappose setae (2,1,2,4); second maxilliped (Fig. 12H) with two simple, two pappose and three plumose setae on the protopod; exopod with five plumose setae; endopod five-jointed, with ten pappose setae (3,1,0,3,3); third maxilliped (Fig. 12I) with no setae on the protopod; exopod with five plumose setae; endopod five-jointed, with two simple and three pappose setae (0,0,0,2,3); first pereopod (Fig. 12J) biramous but not chelate, and with four plumose setae on the exopod; second to fifth pereopods absent; pleopods absent; uropod not fully developed, the endopod shorter than exopod; lateral margin of telson (Fig. 12K) parallel and bearing one spine; posterior margin with 6+6 spines.

– *Zoea* IV (Fig. 13), TL=6.1 mm; RL=1.0 mm; body bent on the third somite in about a right angle (Fig. 13A); carapace short with two small dorsal process and serrated on the posterior margin;

supraorbital spine absent; pterygostomian spine followed by five small spines; rostrum dorsally compressed, longer than antennules, and serrated on lateral margin from the base to near the middle point; pleura of first and second abdominal somites serrated; third somite humped but with no dorsal spine; postero-lateral spine on fifth somite curved; dorso-lateral spine on sixth somite absent; antennule (Fig. 13B) with a three-jointed peduncle; ventral margin with a serrated spine; exopod shorter than endopod and with two apical aesthetascs; endopod with two apical simple setae; antenna (Fig. 13C) shorter than antennules; peduncle with one apical serrated spine; exopod scale-like with an outer spine and 18 marginal plumose setae; endopod stout, single-jointed, with one apical simple setae and about one third the length of the exopod; maxillule (Fig. 13D) with seven pappose setae on the coxal endite and five cuspidate setae on the basal endite; endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 13E) with four endites that bear 6,4,4,4 pappose setae; exopod with 13 marginal plumose setae; endopod with ten pappose setae (3,2,2,3); first maxilliped (Fig. 13F) with three plumose, six simple and eight pappose setae on the protopod; exopod with five plumose setae; endopod four-jointed, with five simple and six pappose setae (4,1,3,3); second maxilliped (Fig. 13G) with one plumose and seven pappose setae on the protopod; exopod with five plumose setae; endopod five-jointed, with five simple and seven pappose setae (4,1,0,3,4); third maxilliped (Fig. 13H) with no setae on the protopod; exopod with six plumose setae; endopod five-jointed, with two simple and four pappose setae (0,0,0,2,4); first pereopod (Fig. 13I) biramous but not chelate, and with six plumose setae on the exopod; second pereopod damaged; third pereopod (Fig. 13J) biramous but not completely developed; fourth and fifth pereopods absent; pleopods as small buds; uropod as long as telson; lateral margin of telson (Fig. 13K) parallel and bearing two spines; posterior margin with 6+6 spines.

REMARKS – The first larval description in the Oplophoridae was done by Bate (1888), who described a new species – *Caricyphus serratmarginis* – based upon a larva very similar to that of *Acanthephyra* sp.1. Both larvae had a pterygostomian spine followed by three small spines, the posterior margin of the carapace was serrated, the pleural margin was serrated on the first and second somites, third somite humped and with small dorsal spine, rostrum dorsally compressed and serrated from the base to the middle length, lateral margin of telson with two spines, postero-lateral

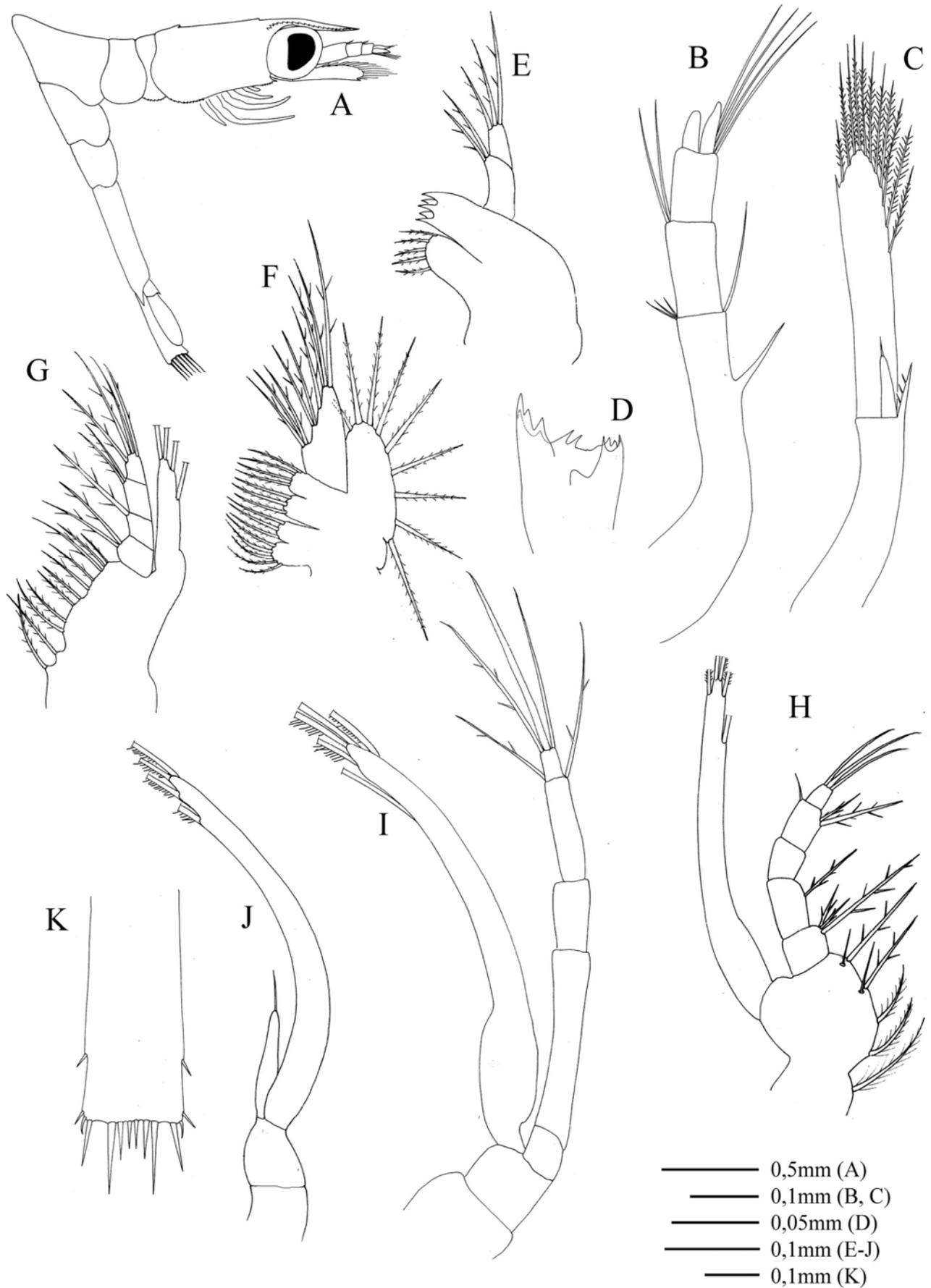


Figure 12. *Acanthephyra* sp.4, zoea III (DZUFRJ753). A, lateral view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, telson.

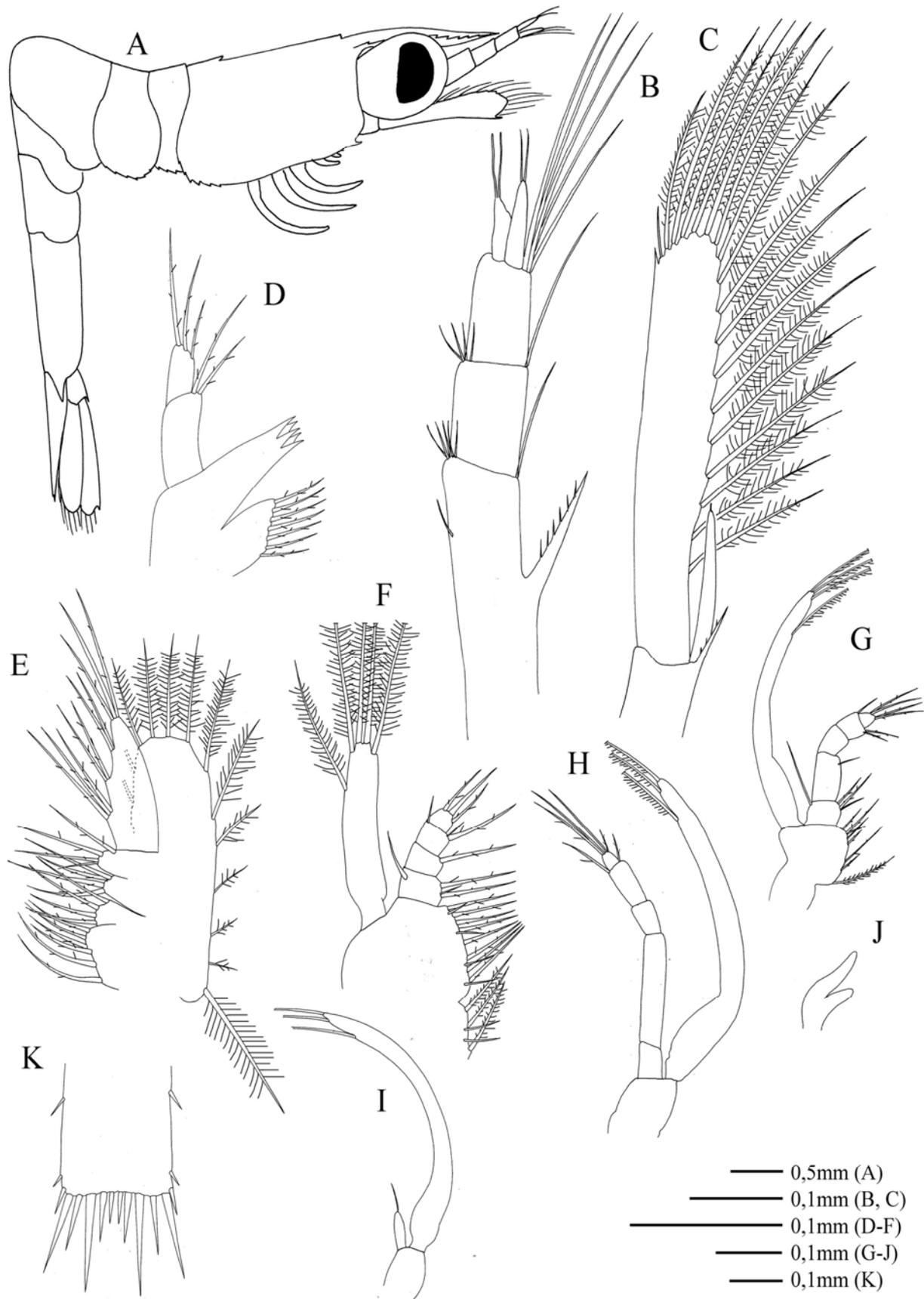


Figure 13. *Acantheephyra* sp.4, zoea IV (DZUFRJ1449). A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxilla; F, first maxilliped; G, second maxilliped; H, third maxilliped; I, first pereopod; J, second pereopod; K, telson.

spine present on the fifth somite and dorso-lateral spine present on the sixth somite. The other *Acantheephyra* larvae described here are also very similar, but have no dorsal spine on third somite. Dorsal spine on the hump of third somite is also present in the larvae described by Gurney & Lebour (1941) as *Species C*, besides all the diagnostic characters for *Acantheephyra* sp.1. Gurney & Lebour (1941) also noted the similarity between these larvae of *Species C* and that of *Acantheephyra purpurea* and *Discias* sp. (Family Bresiliidae). The larvae of Bresiliidae share many similarities with those of Oplophoridae (*Acantheephyra*), mainly regarding to the rostrum, the carapace and the abdominal somites. For example, Ortmann (1893) described *Anisocaris dromedaries* as a new species of Oplophoridae based upon a larva of Bresiliidae, and Holthuis (1993) in reviewing the Oplophoridae considers the genus *Anisocaris* as a junior synonym of the genus *Discias*. According to Gurney & Lebour (1941) and Gurney (1942), the genus *Discias* has a modified chela on the first pereopod, what puts the larvae of *Species C* closest to *Acantheephyra*.

The larval development is partially known until now for two species of *Acantheephyra*: *A. purpurea* A. Milne-Edwards, 1881 and *A. pelagica* (Risso, 1816) (Kemp 1906, 1907, Lebour 1941). These larvae share the following characters with those larvae described here: third somite humped, rostrum dorsally compressed and serrated (exc. *Acantheephyra* sp.2), two dorsal process present in the carapace, posterior margins of carapace serrated (exc. *A. pelagica*), ventral margin of pleura on first and second somites serrated (exc. *A. pelagica*), ventral spine present on the antennal peduncle (exc. *A. pelagica*), pterygostomial spine present and followed by three to five small spines, supraorbital spine absent, postero-lateral spine on fifth somite (exc. *Acantheephyra* sp.2 and sp.4), small epipods on the first and second maxillipeds. Besides the lack of registers of *Acantheephyra purpurea* and *A. pelagica* in Brazil, the larvae of such species can be distinguished from those described herein by the absence of dorsal spine on third somite (present in *Acantheephyra* sp.1), the presence of postero-lateral spine on fifth somite (absent in *Acantheephyra* sp.2 and sp.4), and the presence of dorso-lateral spine on sixth somite (absent in *Acantheephyra* sp.3).

There are six other genera of Oplophoridae registered in Brazil (Cardoso & Young 2005). The larvae of *Janicella spinicauda* (= *Oplophorus spinicauda* A. Milne-Edwards, 1883), *Oplophorus spinosus* (= *H. grimaldii* Coutiere, 1905 (= *Palaemon spinosus* Brullé, 1839)) and *Systellaspis debilis* were described by Gurney & Lebour (1941) and do not

resemble those of *Acantheephyra*. The long rostrum, compressed laterally and not dorsally, and serrated on the dorsal and ventral margins instead of lateral ones, the triangular scaphocerite, and the abbreviated development, with early appearance of appendages normally found later, are useful characters to diagnostic these larvae. Unfortunately, larvae of *Ephyrina*, *Meningodora* and *Notostomus* remain unknown. The high amount of yolk in the eggs of *Ephyrina* and *Meningodora* suggest abbreviated development like *Oplophorus* and *Systellaspis* (Williamson 1962). The eggs of *Notostomus* have little yolk as *Acantheephyra*, but the former genus is not as abundant as the latter and has only one species registered until now in Brazil (*N. elegans* A. Milne-Edwards, 1881) against four species in *Acantheephyra* (Cardoso & Young 2005). The most abundant larvae found in the present study – *Acantheephyra* – could be ascribed to the most abundant species of Oplophoridae in Brazil – *A. eximia* Smith, 1884. The other three larvae of *Acantheephyra* (sp.2, sp.3 and sp.4) remain unidentified and probably belong to the other three species registered in the same area: *A. acutifrons* Bate, 1888; *A. quadrispinosa* Kemp, 1939; and *A. stylostratis* (Bate, 1888).

Genus *Janicella* Chace, 1986

Janicella Chace 1986, 432: 43. – Holthuis 1993: 36, fig. 15. Type-species: *Oplophorus spinicauda* A. Milne-Edwards, 1883, by original designation.

REMARKS. – *Janicella* includes only one species until now: *J. spinicauda* (A. Milne-Edwards, 1883) (Chace 1986). The occurrence of this species in Brazil was done for the first time by Cardoso & Young (2005), when the total number of Oplophoridae increases to thirteen. The larval development was described by Gurney & Lebour (1941).

Janicella spinicauda (A. Milne-Edwards, 1883) (Figures 14 and 15)

Oplophorus spinicauda A. Milne-Edwards 1883: pl. 30. – Chace 1940, 25(2): 184, fig. 54.

Janicella spinicauda – Chace 1986: 44, figs. 23, 24. – Cardoso & Young 2005, 1031: 39, figs. 29-33.

MATERIAL EXAMINED. – Espírito Santo State, REVIZEE, R.V. Thalassa, st. T5077, 21.13°S, 039.94°W, 0-200 m, 1 zoea (DZUFRJ 838).

DIAGNOSIS – Carapace short; supraorbital spine absent; rostrum laterally compressed, longer than

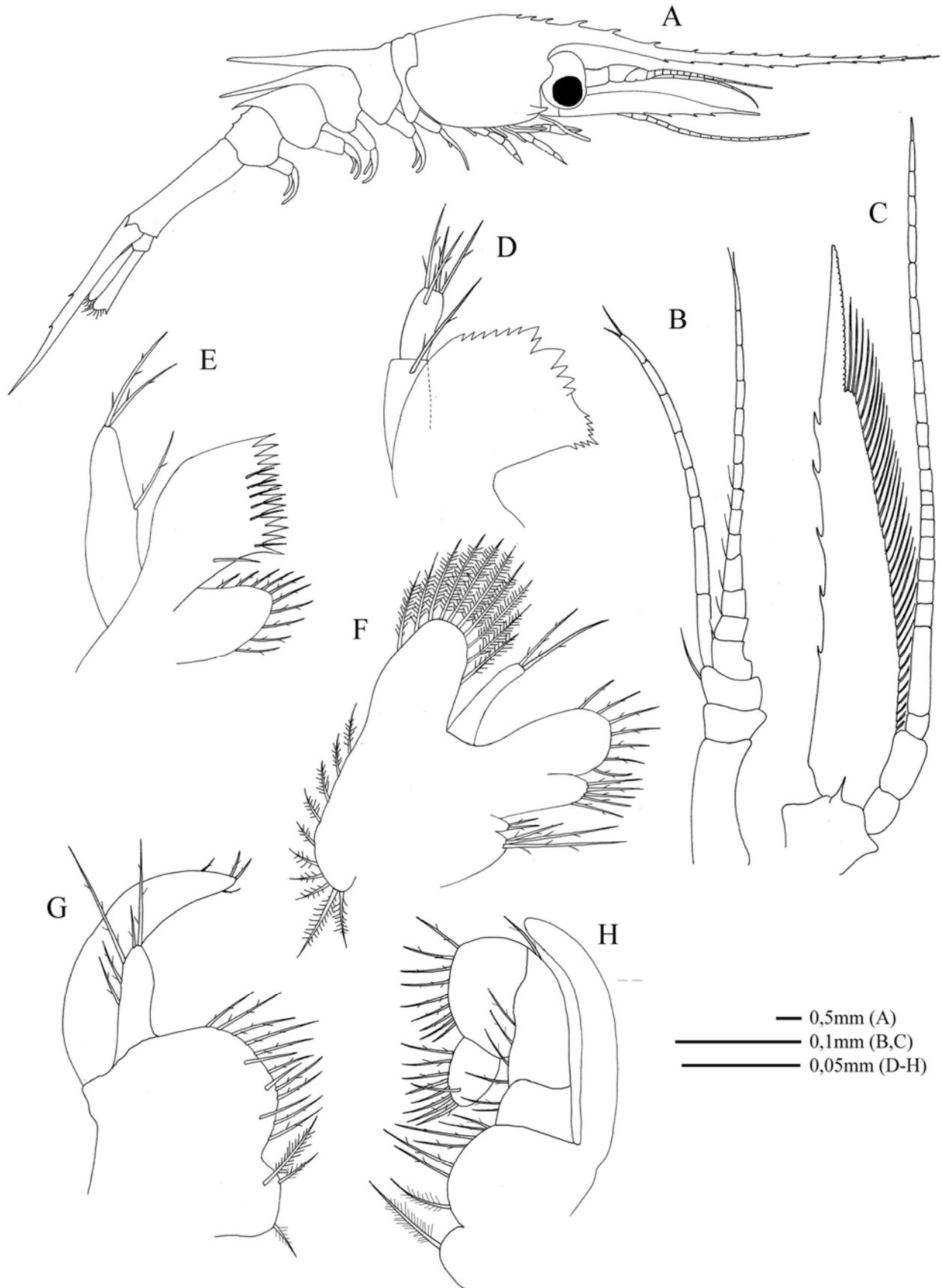


Figure 14. *Janicella spinicauda* (A. Milne-Edwards), decapodid (DZUFRJ838). A, lateral view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped.

antennules and serrated on ventral and dorsal margins; mandibular palp present; dorsal spine on second to fourth abdominal somites, that on the second the longest; first to fourth pereopod with exopodit.

DESCRIPTION – Decapodid (Figs. 14 and 15), TL=18.3 mm; RL=6.7 mm; body straight or little curved (Fig. 14A); carapace short, strong, with three dorsal spines immediately after the insertion of rostrum; pterygostomian spine strong; supraorbital spine absent; rostrum laterally compressed, longer than antennules and serrated on ventral and dorsal margins; first somite shorter than second; sixth somite the longest and with dorso-lateral spine; dorsal spine on second to fourth somites, that on the second the longest; fifth somite with two dorsal

small teeth; scaphocerite triangular; antennules (Fig. 14B) with a three-jointed peduncle, the last article with a simple seta on the inner margin; endopod and exopod with many small articles and with two small simple setae on the last articles; antenna (Fig. 14C) well developed, with an apical spine on the peduncle; exopod triangular, with five small spines on the outer margin, one apical strong and serrated spine; and 34 marginal plumose setae; endopod longer than exopod and with many small articles; mandible (Fig. 14D) with a two-jointed palp that bears five pappose setae (1,4); maxillule (Fig. 14E) with ten pappose setae on the coxal endite and seven simple and 12 cuspidate setae on the basal endite; endopod well developed, with three pappose setae; maxilla (Fig. 14F) with four endites, that bear 3,2,5,7 pappose setae; first maxilliped (Fig. 14G)

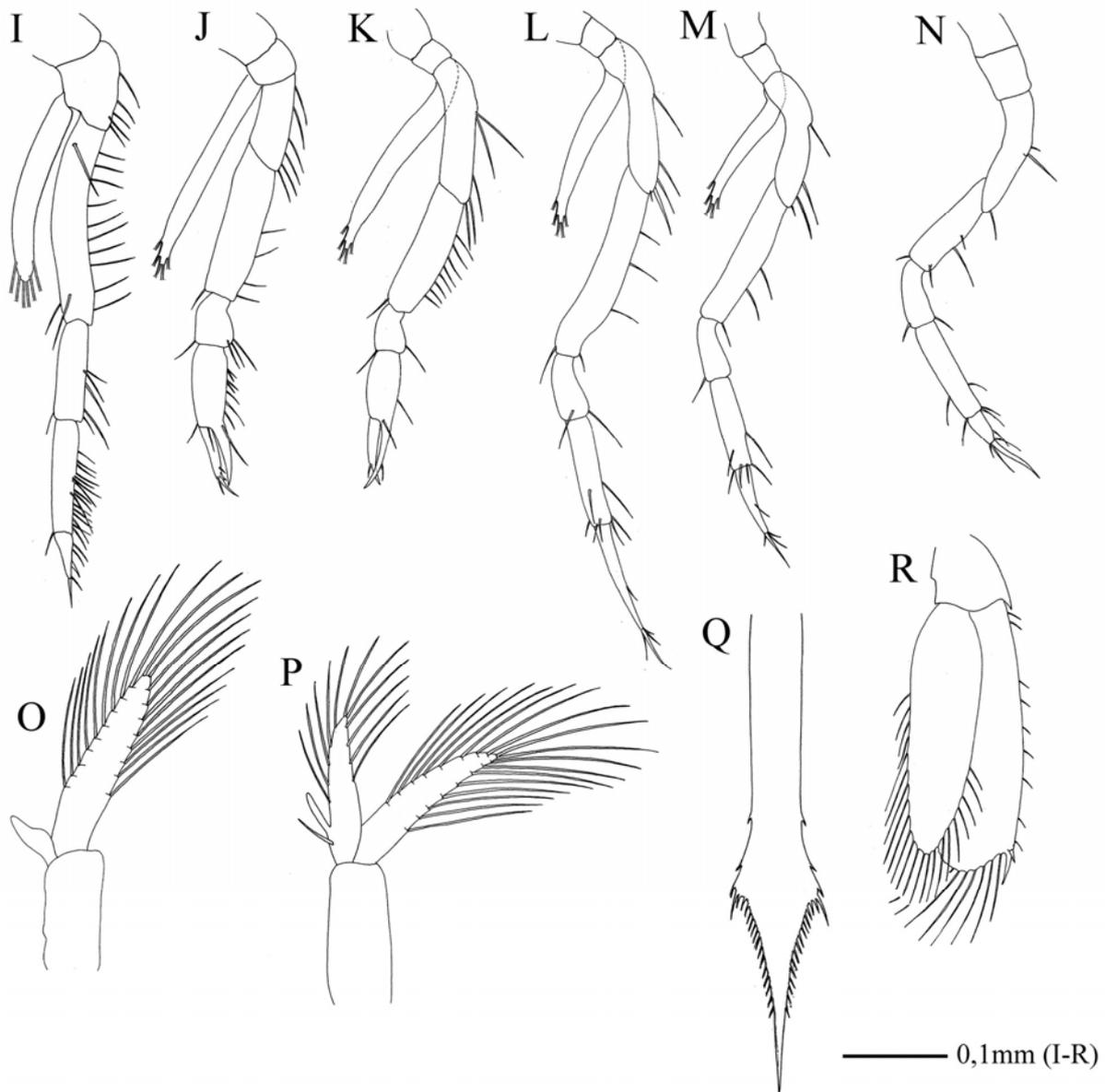


Figure 15. *Janicella spinicauda* (A. Milne-Edwards), decapodid (DZUFJRJ838). I, third maxilliped; J, first pereopod; K, second pereopod; L, third pereopod; M, fourth pereopod; N, fifth pereopod; O, first pleopod; P, second pleopod; Q, telson; R, uropod.

with three plumose and 13 pappose setae on the protopod; exopod with four small simple setae; endopod uniramous and bearing five pappose setae; second maxilliped (Fig. 14H) with two plumose and six pappose setae on the protopod; exopod with no setae; endopod four-jointed with 25 pappose setae (2,5,9,9); third maxilliped (Fig. 15I) biramous, with five pappose setae on the protopod; exopod with six plumose setae; endopod four-jointed, with five pappose setae on the distal article; first (Fig. 15J) and second pereopod (Fig. 15K) chelate, the exopodit bearing five plumose setae; third pereopod (Fig. 15L) the longest; exopodit of third and fourth pereopod (Fig. 15M) with five plumose setae; fifth pereopod (Fig. 15N) uniramous; first pleopod (Fig. 15O) with reduced endopod and well developed exopod; second (Fig. 15P) to fifth pleopods setose and well developed; uropod (Fig. 15R) biramous, the endopod smaller than the exopod; telson (Fig. 15Q) with divergent margin in the middle and with convergent ones toward the end; divergent margins with three spines; convergent margins with 16 spines.

REMARKS – The larval development of *Janicella spinicauda* was described by Gurney & Lebour (1941) as *Hoplophorus spinicauda* A. Milne-Edwards, 1883 [= *Oplophorus spinicauda*] from larvae collected in the oceanic region of Rio de Janeiro, during the *Discovery Plankton Expedition* (station 710: 21° 45'S, 039° 50'; 0 – 294m). According to Gurney & Lebour (1941) the larvae of distinct species of *Oplophorus* (including in that time those larvae of *Janicella*) share many characters and are not easily distinguished. Chace (1986) in reviewing the diagnosis of the *Oplophorus* has created the new genus *Janicella* to accommodate *Oplophorus spinicauda* mainly because the presence of one dorsal spine on second somite, absence of dorsal tooth on fifth somite and absence of appendix masculina on the male second pleopod. Of these three characters, the appendix masculina could not be seen in larvae and only the other two characters are useful. The absence of tooth in the fifth somite on the adults could be exclusive of such stage, since the larvae exhibit two small dorsal teeth. The presence of one dorsal spine on the second somite is the single character among those used by Chace (1986) to distinguish *Janicella spinicauda* that can be seen in the larval stages. In addition, the three dorsal spines on carapace, the proportion between dorsal spines on abdomen (that on the second the longest), the telson and the rostrum of larvae and

adults are very similar and useful to distinguish the species.

According to Chace (1986), there are many characters shared between adults of the genera *Janicella* and *Oplophorus*, like absence of posterolateral spines on the fourth and fifth somites, and presence of a spine on the outer margin of antennal scale. These characters can also be found in the larvae described here. Gurney & Lebour (1941) also described a larva of *Oplophorus spinosus* (Brullé, 1839) that has rostrum at least twice the length of carapace, the dorsal and ventral margins serrated; dorsal papillae on the eyestalk; scaphocerite triangular with five outer spines; palp of mandibles two-jointed; and telson ending in a spine flanked by small spines. In contrast, *Janicella spinicauda* larvae can be distinguished from those of *Oplophorus spinosus* mainly by the presence of dorsal spine on second somite and absence of exopodit on fifth pereopod.

Similarities between adults of *Janicella* and *Systellaspis* were also revealed by Chace (1986), like sixth abdominal somite twice the length of fifth and telson ending in a spinous process. *Systellaspis debilis* larvae described by Gurney & Lebour (1941) and that of *Janicella spinicauda* have rostrum laterally compressed and serrated on ventral and dorsal margin, but not in the first, second and third stages. Larvae of *S. debilis* distinguish from those of *J. spinicauda* also in the length of rostrum smaller than length of carapace, scaphocerite without outer spines and presence of setose exopodite from first to fifth pereopods.

Family BRESILIIDAE Rathbun, 1902

Genus *Discias* Rathbun, 1902

Anisocaris – Ortmann 1893, 2: pl. IV, fig.3.

Discias Rathbun 1902, 4: 290, figs. 1-4, pl. 12.

Type-species: by monotypy, *Discias serrifer* Rathbun, 1902.

REMARKS. – According to Martin & Davis (2001), the family Bresiliidae is traditionally grouped with Disciadidae, Agostocarididae, Alvinocarididae and Mirocarididae to form a merophyletic clade – Bresilioidea. Holthuis (1993) considers Disciadidae as a junior synonym of Bresiliidae, which included the genera *Bresilia* Calman, 1896, *Discias* Rathbun, 1902, *Lucaya* Chace, 1939, *Tridiscias* Kensley, 1983 and *Pseudocheles* Chace & Brown, 1978. The family Bresiliidae can also be related to the Oplophoridae if we consider larval characters (Gurney 1942). Until now in Brazil, only one genus

– *Discias* – and two species (*D. atlanticus* Gurney, 1939 and *D. serratiostris* Lebour, 1949) have been recorded, mainly in the northeastern coastal areas (Coelho *et al.* 2006).

The larvae of Bresiliidae are much similar to those of *Acanthephyra* and can be distinguished by the following characters: rostrum smooth, as long as the carapace; first to fifth pereopod with well-developed exopodit; and chela of first pereopod with a modified dactylus.

***Discias* sp.**
(Figures 16 – 18)

MATERIAL EXAMINED – Bahia State, REVIZEE, R.V. Thalassa, st. T5032, 16.95°S, 037.58°W, 0-200 m, 1 *zoea* (DZUFRJ 736). – Espírito Santo State, Vitória Seamount, REVIZEE, R.V. Thalassa, st. T5098, 20.54°S, 038.10°W, 0-50 m, 1 *zoea* (DZUFRJ 1452)

DIAGNOSIS – rostrum smooth and as long as carapace; pterygostomian spine followed by small spines; posterior margin of carapace serrated; pleural margin of first and second somites serrated; third abdominal somite with an oil-filled hump, but with no dorsal spine; dactylus of first pereopod rounded and with four apical setae.

DESCRIPTION – *Zoea* IV (Fig. 16), TL=4.9 mm; RL=0.8 mm; body bent about 180° on third somite (Fig. 16A); carapace with two small dorsal organs and serrated on the posterior margin; pterygostomian spine followed by four small spines (Fig. 16B); supra-orbital spine absent; pleural margin of first and second somites serrated; third abdominal somite with an oil-filled hump, but with no dorsal spine; fifth somite with postero-lateral spine; sixth somite with no dorso-lateral spine; antennule (Fig. 16C) with a three-jointed peduncle; ventral margin with a serrated spine; exopod shorter than endopod and with two apical setae; endopod damaged and with no setae; antenna (Fig. 16D) shorter than antennules; peduncle with one apical spine; exopod scale-like with an outer spine and 20 marginal plumose setae; endopod stout, single-jointed, with one apical simple setae and about one third the length of exopod; maxillule (Fig. 16E) with three cuspidate setae on the basal endite (coxal endite damaged); endopod two-jointed, with 2,3 pappose setae; maxilla (Fig. 16F) with four endites that bear 5,3,4,4 pappose setae; exopod damaged; endopod with nine pappose setae (3,2,1,3); first maxilliped (Fig. 16G) with one plumose, four simple and eight pappose setae on the protopod; exopod with five

plumose setae; endopod four-jointed, with two simple and seven pappose setae (3,1,2,3); second maxilliped (Fig. 16H) with two plumose and six pappose setae on the protopod; exopod with six plumose setae; endopod five-jointed, with ten pappose setae (3,0,0,3,4); third maxilliped (Fig. 16I) with one simple setae on the protopod; exopod with six plumose setae; endopod five-jointed, with one simple and five pappose setae (0,0,0,2,4); first pereopod (Fig. 16J) biramous but with non-setose exopod; second (Fig. 16K) and third pereopod (Fig. 16L) uniramous and as small buds; fourth and fifth pereopods absents; uropod (Fig. 16M) biramous and setose; telson (Fig. 16N) parallel-side and with three lateral spines; posterior margin of telson with 6+6 spines.

– *Zoea* IX? (Figs. 17 and 18), TL=14.1 mm; RL=2.3 mm; larva similar to previously (Fig. 17A); pterygostomian spine followed by five small spines; antennule (Fig. 17B) with a three-jointed peduncle; ventral margin with a serrated spine; exopod the same length of endopod; antenna (Fig. 17C) with one apical spine on the peduncle; exopod scale-like with an outer spine and 47 marginal plumose setae; endopod three-jointed, longer than exopod and with no setae; maxillule (Fig. 17D) with two simple, six pappose and 14 plumose setae on the coxal endite; basal endite with 12 simple and six cuspidate setae; endopod two-jointed, with 3,3 pappose setae; maxilla (Fig. 17E) with four endites that bear 12,4,10,9 pappose setae; exopod with 51 plumose setae; endopod with ten pappose setae (3,3,1,3); first maxilliped (Fig. 17F) with 26 pappose setae on the protopod; exopod with four apical, one sub-apical and nine proximal plumose setae; endopod four-jointed, with one simple and eight pappose setae (3,1,2,3); second maxilliped (Fig. 18G) with two plumose and nine pappose setae on the protopod; exopod with six plumose setae; endopod five-jointed, with one simple and 11 pappose setae (2,3,0,2,5); third maxilliped (Fig. 18H) with one simple setae on the protopod; exopod with 14 plumose setae; endopod five-jointed, with one simple and 14 pappose setae (1,2,0,7,5); first pereopod (Fig. 18I) with a modified chela, the dactylus rounded and the propodus broader; exopod with 13 plumose setae; endopod five-jointed, with one simple and 11 pappose setae (2,2,0,4,4); second pereopod (Fig. 18J) biramous, chelate, with one simple seta on the protopod and 14 plumose setae on the exopod; endopod five-jointed, with one simple and nine pappose setae (1,0,0,5,4); third pereopod (Fig. 18K) biramous, the five-jointed endopod bearing seven pappose setae (0,2,0,3,2); fourth pereopod (Fig. 18L) biramous and with no

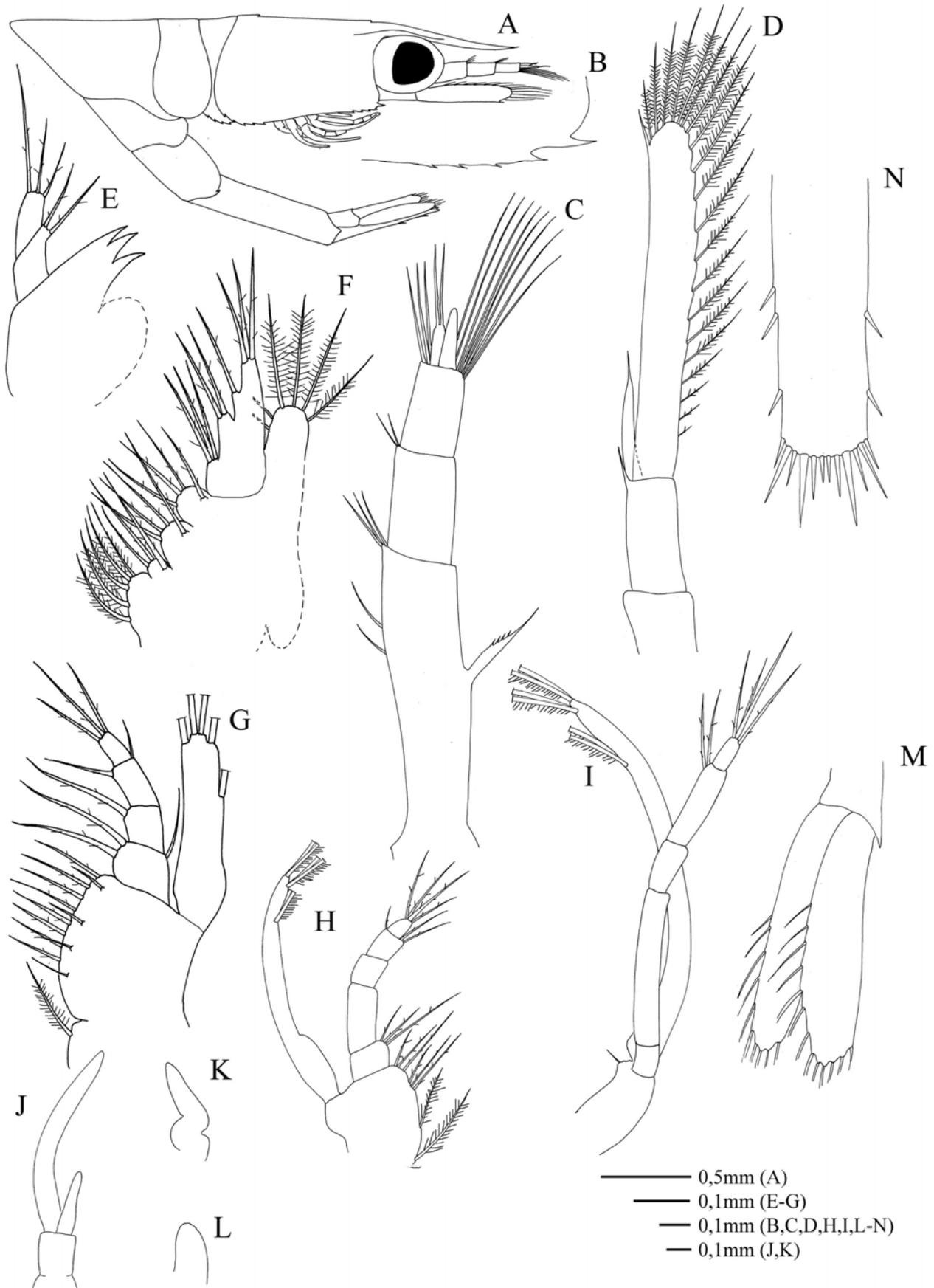


Figure 16. *Discias* sp., zoea IV (DZUFRJ1452). A, lateral view; B, carapace, antero-ventral margin; C, antennule; D, antenna; E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, second pereopod; L, third pereopod; M, uropod; N, telson.

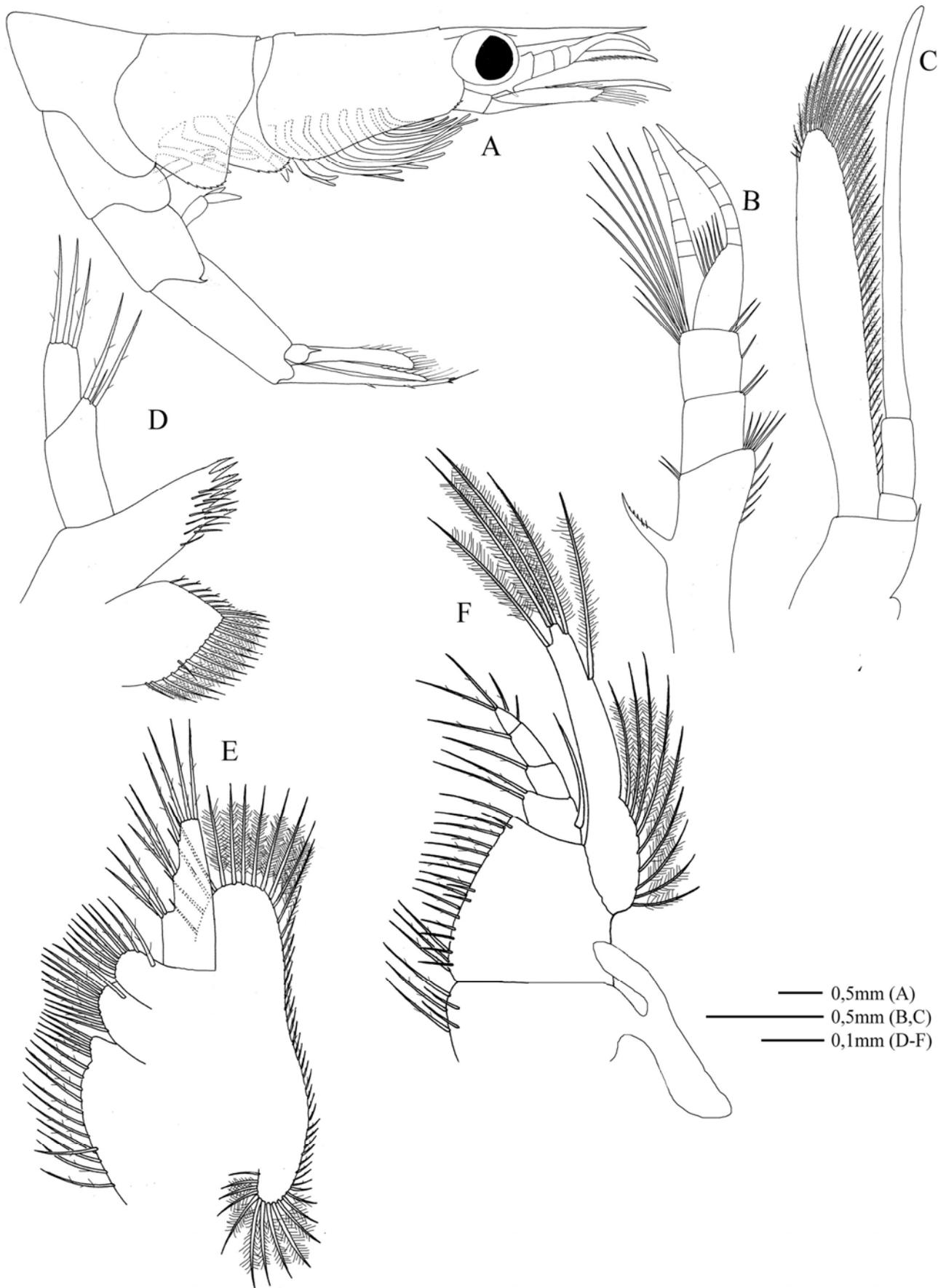


Figure 17. *Discias* sp., zoea IX? (DZUF RJ736). A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxilla; F, first maxilliped.

setae on the protopod; endopod four-jointed, the first article with two strong spines and the second article with one strong spine; fifth pereopod (Fig. 18M) biramous; endopod with two strong spines on the

first article; first pleopod (Fig. 18N) non-setose and with reduced endopod; uropod (Fig. 18O) well developed and setose; telson (Fig. 18P) parallel-side, with three lateral and 4+4 posterior spines.



Figure 18. *Discias* sp., zoea IX (DZUF RJ736). G, second maxilliped; H, third maxilliped; I, first pereopod; J, second pereopod; K, third pereopod; L, fourth pereopod; M, fifth pereopod; N, first pleopod; O, uropod; P, telson.

REMARKS – Gurney & Lebour (1941) and Gurney (1942) described the larvae of *Discias atlanticus* and revealed many characters also present in the larvae described herein, such as rostrum smooth reaching the antennal tip; third somite humped; fifth somite with small postero-lateral spine; and, sixth somite with no dorso-dorsal spine. Differences with the species described here include the number of apical setae on the modified dactylus; the number of spines on posterior margin of telson; and number of spines on the endopod of fourth and fifth pereopods. Gurney & Lebour (1941) also described a larva of Species D which resembles those of *Discias* sp. mainly because the presence of hump on the third somite, postero-lateral spine on fifth somite, modified dactylus of first pereopod, posterior margin of carapace and pleural margin on first and second somites serrated. In contrast, the larvae of Species D have a rostrum with lateral margin serrated against a smooth rostrum in *Discias atlanticus* and *Discias* sp.

Other larvae described before share important characters with the larvae of *Discias* sp. Ortmann (1893) described the larvae of *Anisocaris*

dromedarius collected during the *Plankton Expedition* and noted a modified dactylus on the chela of the first pereopod. This modified chela is one distinctive character of the genus *Discias* (Criales & Lemaitre 1997) and according to Holthuis (1993) the genus *Anisocaris* is a junior-synonym of *Discias*. Two other larvae resemble that described herein as *Discias*: Species C of Gurney & Lebour (1941) and *Anisocaris* sp. of Gurney (1942), although that described by Gurney & Lebour (1941) do not have a modified chela on first pereopod (Table I). In the description of Species C and D, Gurney & Lebour (1941) argued that there are distinct resemblances between the larvae of *Discias* and that of *Acantheephyra*, although there are very important differences. Gurney (1942) suggested that these two larvae belong to the same family, though to different genera. The absence of a modified chela in Species C – diagnostic character of *Discias* – and the presence in Species D suggest these larvae do not belong to the same family and the similarities are convergences among Oplophoridae (*Acantheephyra*) and Bresiliidae (*Discias*).

Table I. Morphological comparison between zoea larvae described before and that of *Discias* described in the present study.

Species	Species C	Species D	<i>Discias atlanticus</i>	<i>Discias</i> sp.	<i>Anisocaris dromedarius</i>	<i>Anisocaris</i> sp.
Author	Gurney & Lebour (1941)	Gurney & Lebour (1941)	Gurney & Lebour (1941)	Present study	Ortmann (1893)	Gurney (1942)
Rostrum	Serrated	Serrated	Smooth	Smooth	Smooth?	Serrated
Ch1	Non- modified	Modified	Modified	Modified	Non- modified	Non- modified
DS3	Present	Absent	Absent	Absent	Present?	Present
PL5	Present	Present	Present	Present	Absent?	Present
Epipods	Presents	Presents	Absents	Absents	?	Absents

Ch1: Chela of first pereopod; DS3: Dorsal spine on third abdominal somite; PL5: Postero-lateral spine on fifth abdominal somite; Epipods: epipods on 1-5 pereopods. “?”: Characters not fully described in the text by the author.

Acknowledgements

The authors would like to thanks B. Peixoto, E. Almeida and A. Bonecker for their assistance in the laboratory, and also to the Integrated Laboratory of Zooplankton and Ichthyoplankton of the Zoology Department (Federal University of Rio de Janeiro, Brazil).

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Received April 2007

Accepted July 2007

Published online September 2007