

**PLANKTONIC COPEPODS OF THE GENUS *Oncaea*
Philippi (POECILOSTOMATOIDA: ONCAEIDAE) FROM
THE WATERS OFF SOUTHERN BRAZIL.**

BERSANO, J.G.F.¹ & G.A. BOXSHALL²

¹ Departamento de Oceanografia, Fundação Universidade do Rio Grande (FURG), Caixa Postal 474, Rio Grande, CEP 96201-900, RS, Brasil

² Department of Zoology, The Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom

ABSTRACT

A new species, *Oncaea waldemari*, is described based on material collected at depths of 0 to 75m off the coast of southern Brazil. It is one of the most abundant epipelagic representatives of the genus *Oncaea* in the area. It appears to be most closely related to *Oncaea brocha* Heron, found in the southwestern Pacific-Antarctic area. The presence of the small form *Oncaea venusta* forma *venella* in Brazilian waters is reported for the first time, previous records of this species refer to the large form, *O. venusta* forma *typica*.

Key words: Copepoda, taxonomy, *Oncaea*, new species, Brazil.

INTRODUCTION

Copepods of the genus *Oncaea* occur frequently in zooplankton samples from the southwestern Atlantic Ocean. Little is known, however, about the taxonomic composition and geographical distribution of oncaeids in Brazilian waters. Available information on Brazilian oncaeids was summarized by Björnberg (1981), in Boltovskoy's Atlas of the Zooplankton of the southwestern Atlantic. She listed eleven *Oncaea* species and provided a key to these species and to species of the related genera *Conaea* Giesbrecht, 1902 and *Lubbockia* Claus, 1863. The listed species included both tropical forms, such as *O. venusta* Philippi, 1843, and antarctic species, such as *O. curvata* Giesbrecht, 1902.

Zooplankton samples containing many oncaeids were taken during cruises of the *RV Atlantico Sul* undertaken as part of the Project ECOPEL-CIRM (Study of the Pelagic Ecosystem of Southern Brazil) in winter 1988 (7-15 September), summer 1990 (6-21 February) and autumn 1991 (18 June - 2 July). *Oncaea* was represented by several species, one of which is new and another is new to Brazilian waters. The new species which is abundant in near-surface (0-75m) waters, is described below.

MATERIALS AND METHODS

Zooplankton samples were taken with a cylindrical-conical closing net (mesh 150 μ m), vertically towed in five depth horizons (0-25m, 25-50m, 50-100m, 100-200m and 200-500m) at 27 stations in waters of the southern Brazilian Shelf (31°40'S to 33°45'S 51°00'W to 52°20'W). Material was initially fixed in 4% formaldehyde in seawater. After sorting the *Oncaea* specimens were transferred to 70% ethanol for preservation. Specimens were dissected in lactophenol and were examined as temporary preparations on Leitz Diaplan or Olympus BH-2 Differential Interference Contrast microscopes. Most appendages were drawn with the aid of a camera lucida, using oil immersion.

Specimens were also examined using Scanning Electron Microscopy. Material was dehydrated through graded acetone, critical point dried, mounted on stubs and sputter coated with gold-palladium. Observations were made using a Hitachi S800 Microscope.

Systematics

Oncaea waldemari sp. nov.

Adult female mean body length 0.52 mm, not including setae on caudal rami, range 0.49 to 0.58mm (based on 20 specimens). Ratio of prosome to urosome length 1.7: 1 (Fig. 1A). Lateral profile of pedigerous somites smoothly rounded, without projecting tergite (Fig. 1C). Entire surface of dorsal cephalic shield pitted and ridged (Fig. 5B); ornamented with sensillae and integumental pores of varying sizes. Rostrum (Fig. 5B) with pair of lateral sensillae. Proportional lengths (%) of urosome somites and caudal rami 12:49:6:8:10:15. Genital double-somite 1.4 times longer than wide, greatest width anterior to mid-level, lateral margins smoothly rounded (Fig. 1B); ornamented with 3 pairs of integumental pores on dorsal surface, 2 anterior to gonopores, 1 posterior (Fig 5A). Paired gonopores located about 35% of distance along genital double-somite (Fig. 1B, 5A); each gonopore closed by operculum formed by sixth leg, armed with 3 spinous processes (Fig. 5D). Anal somite two thirds as long as caudal rami; about 1.5 times wider than long; ornamented with pair of small

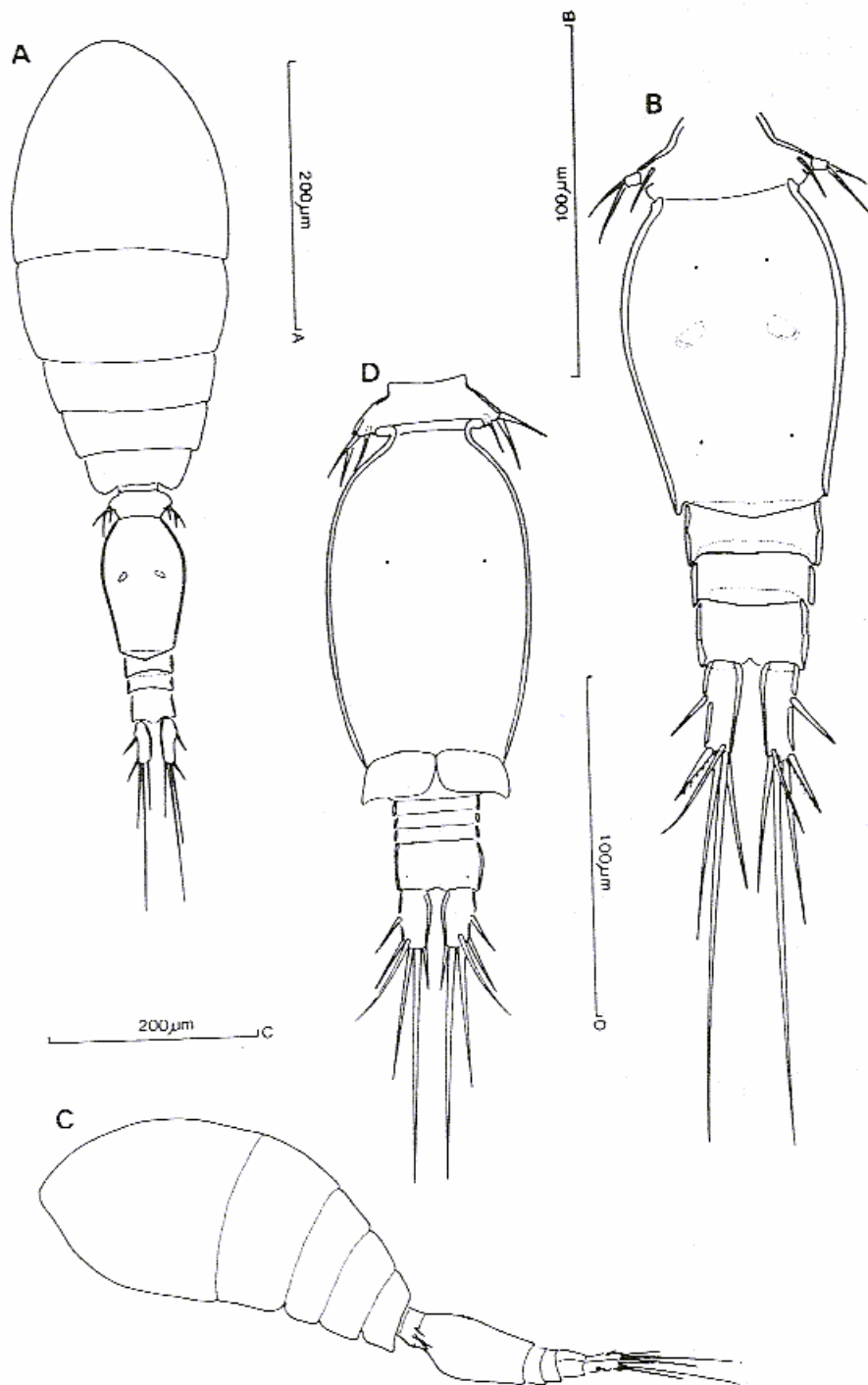


Fig. 1. *Oncaea waldemari* sp.nov. A. Adult female, dorsal; B, Female urosome, dorsal; C, Female, lateral; D, Male urosome, ventral.

and pair of large integumental pores dorsally, to each side of anal cleft, and pairs of pores on lateral and ventral surfaces (Fig. 5E). Anal operculum weakly developed, ornamented with minute denticles along free posterior margin (Fig. 5C); pair of sensilla located lateral to operculum. Caudal rami 2.6 times longer than wide; lateral seta (II) located about 38% of distance along ramus; dorsal seta (VII) just shorter than innermost distal seta (VI), outermost seta (III) spiniform, distal major setae (IV and V) plumose, seta V about 27% longer than seta IV.

Antennule (Fig. 2A) 6-segmented; relative lengths of segments (%) measured along posterior non-setiferous margin 8:26:41:10:4:11. Setation formula 3, 8, 4, 2 + 1 aesthetasc, 2 + 1 aesthetasc, 6 + aesthetasc. Aesthetasc on segment 4 originating in large depression in surface (Fig. 6C).

Antenna (Fig. 3A) 3-segmented, comprising long coxobasis plus 2-segmented endopod; first endopodal segment about 1.4 times longer than apical segment. Apical segment double, comprising fused second and third endopodal segments. Coxobasis bearing single spiny seta at inner distal angle, unornamented. First endopodal segment unarmed, ornamented with row of tiny denticles along inner margin and 2 denticles plus 2 integumental pores near apex of convex outer margin. Apical segment with proximal group of 4 short,

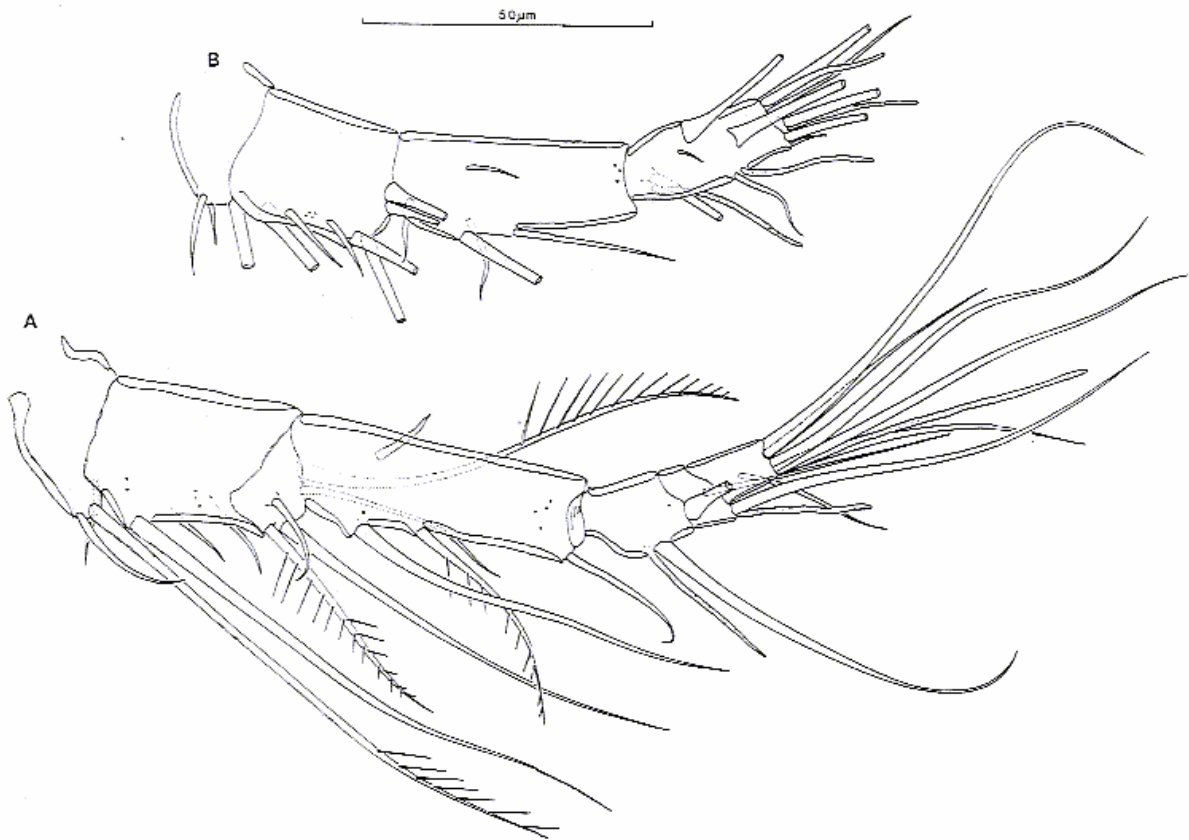


Fig. 2. *Oncaea waldermari* sp. nov. A, Female antennule; B, Male antennule, with long setation elements drawn cut off.

spiniform setae on inner margin and distal group of 5 strong claw-like elements and 2 slender setae.

Labrum with bilobed free posterior margin, ornamented with row of denticles along convex sections of posterior margin.

Mandible (Fig. 3B) consisting of coxa bearing 5 distal elements on gnathobase: dorsal spinulate seta, slender spinulate seta, multicusped blade, simple blade, unilaterally setulate seta.

Maxillule (Fig. 3C) indistinctly bilobed, with 7 setae. Inner lobe (derived from praecoxal arthrite) bearing 1 medial and 2 distal elements; outer lobe (derived from palp) bearing 4 elements, increasing in length from inner to outer. Segment of maxillule with entirely smooth integument (Fig. 6B) Ornamentation of setation elements as figured.

Maxilla (Fig. 3D) comprising stout syncoxa and distal basis. Syncoxa unarmed, surface pitted (Fig. 6B) ornamented with spinule row and 2 integumental pores. Surface of syncoxal integument finely pitted. Basis drawn

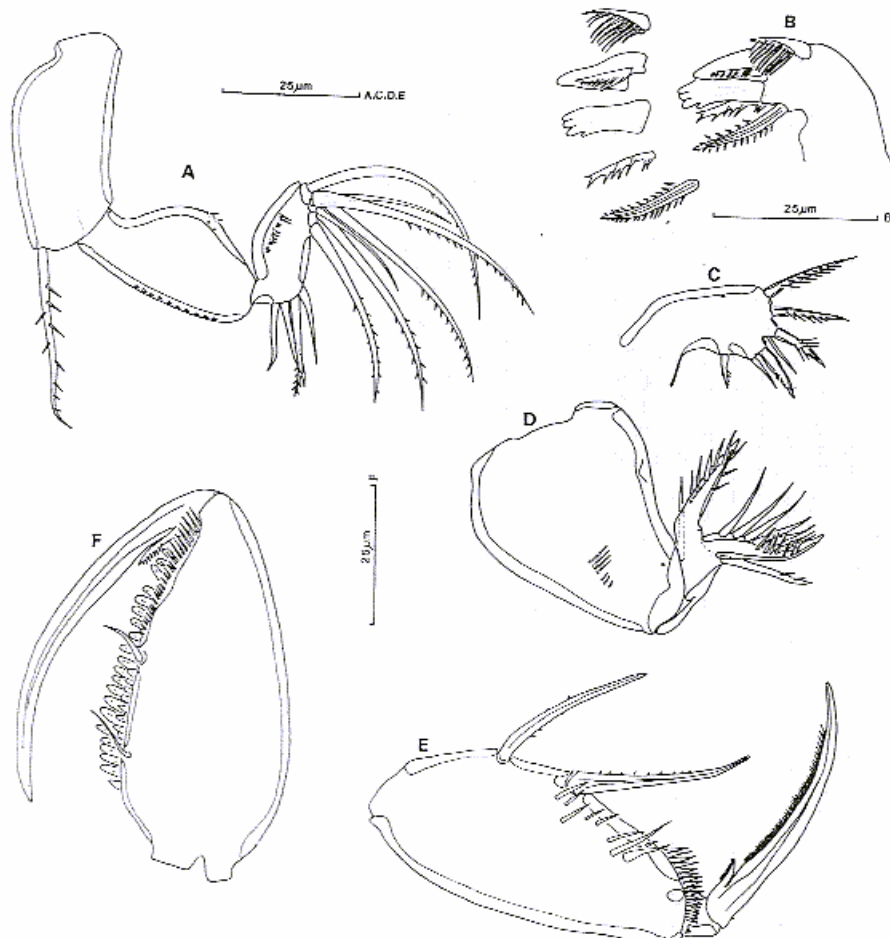


Fig. 3. *Oncaea waldermari* sp. nov. A, Antenna; B, Mandible, with inset detail of distal margin elements; C, Maxillule; D, Maxilla; E, Female maxilliped (syncoxa not shown); F, Male maxilliped (syncoxa not shown).

out into spinulate distal process, carrying second spinulate spine and 2 slender seta-like elements.

Maxilliped 4-segmented. Syncoxa small, unarmed. Basis robust (Fig. 3E) armed with 2 long inner margin setae, each ornamented with spinules; distal seta slightly longer than proximal; surface of basis pitted (Fig. 6A), irregular row of large spinules present near inner margin of basis. First endopodal segment small, free and unarmed. Distal claw incorporating distal part of endopod; armed with short seta proximally on inner margin; ornamented with comb-like row of spinules along most of curved concave margin.

Swimming legs 1 to 4 (Fig. 4A-D) joined by intercoxal sclerites, biramous, with 3-segmented rami. Spine and seta formula as follows:

	Coxa	Basis	Exopod segments			Endopod segments		
			1	2	3	1	2	3
Leg 1	0-0	1-1	1-0;	1-1;	III, I, 4	0-1;	0-1;	I, 5
Leg 2	0-0	1-0	1-0;	1-1;	III, I, 5	0-1;	0-2;	I, II, 3
Leg 3	0-0	1-0	1-0;	1-1;	II, I, 5	0-1;	0-2;	I, II, 2
Leg 4	0-0	1-0	1-0;	1-1;	II, I, 5	0-1;	0-2;	I, II, 1

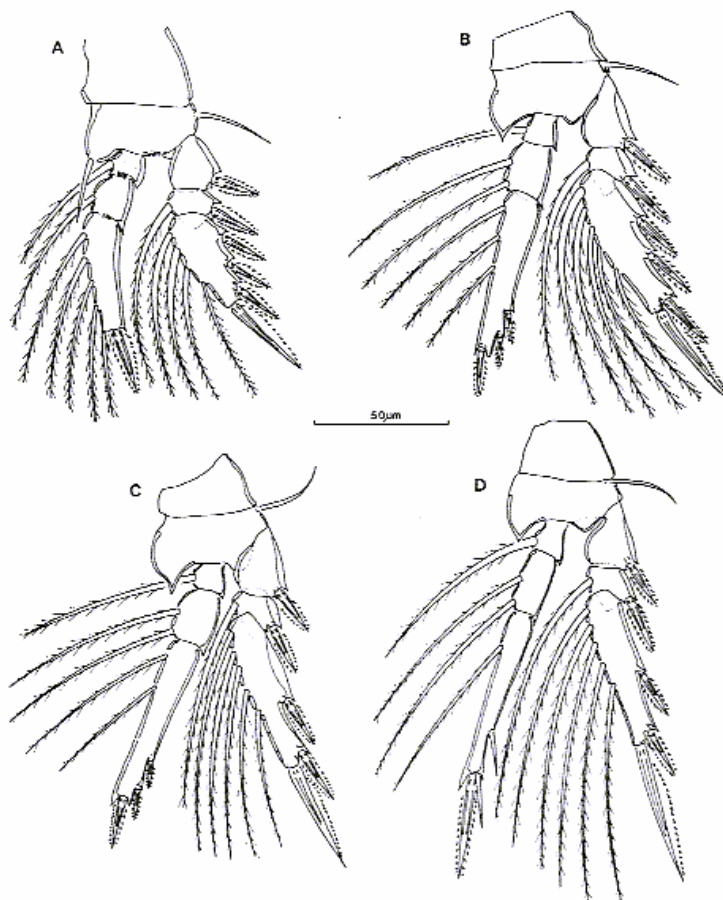


Fig. 4. *Oncaea waldemari* sp. nov. A, Leg 1; B, Leg 2; C, Leg 3; D, Leg 4.

Exopods with all outer margin spines bilaterally serrate, terminal spines serrate on outer margin plumose on inner margin; all inner margin setae plumose. terminal spines on exopods just shorter than third segment in all legs. Endopods with inner margin setae plumose, distal spines serrate and outer margin spines serrate (leg 2) or naked (legs 3 and 4). Lateral margins of all endopodal segment ornamented with rows of pinnules. Second and third endopods with conical terminal process present between distal margin spines; apex of process with large integumental pore (Fig. 6D). Tip of fourth endopod lacking any projection between distal spines.

Leg 5 (Fig. 1B) with exopodal segment fused to somite, not separate basally, forming short exopodal lobe. Outer protopodal seta short, located on surface of somite dorsal to origin of exopodal lobe. Exopodal lobe with 2 apical setae.

Leg 6 (Fig. 5D) represented by plate closing gonopores; armed with 3 spinous processes.

Male similar to female in body form; mean body length 0.38mm, with a range of 0.36 to 0.41mm, based on 10 specimens. Urosome 6-segmented (Fig. 1D), comprising fifth pedigerous somite, large genital somite, plus 4 free abdominal somites. Genital somite nearly twice as long as wide, with evenly rounded convex lateral margins. First to third abdominal somites all very short, subequal in length. Anal somite about twice as wide as long; ornamented with pair of sensillae and 3 pairs of integumental pores, as in female. Caudal rami about 1.2 times longer than anal somite; about 1.7 times longer than greatest width. Setation similar to that of female but with lateral seta (II) located just proximal to mid point of lateral margin.

Appendages as for female except antennules, maxillipeds and sixth legs. Antennules (Fig. 2B) 4-segmented, apical segment representing fused distal 3 segments of female. Relative lengths of segments, measured along posterior non-setiferous margin: 7, 25, 42, 26; segmental setation pattern: 3, 7, 5, 11 + 3 aesthetascs. Maxillipeds (Fig. 3F) more robust than in female: comprising unarmed syncoxa, powerful basis armed with 2 short setae on inner margin and ornamented with 2 rows of rounded spinules along inner margin and a row of pointed spinules in distal half of inner margin; distal claw about as long as basis, claw incorporating endopodal segment proximally, armed with short spinulate inner spine. Sixth legs represented by large, unarmed opercular plates (= genital lappets) closing off paired gonopores at posterior margin of genital somite (Fig. 1D).

Type Material:

Holotype female, 19 paratype females, 10 paratype males. Locality data: Station #309 3 females, depth 0-25m; Station #319 17 females and 10 males, depth 0-25m. Holotype female, 12 paratype females and 5 paratype males deposited in collections of The Natural History Museum, Registration numbers BM(NH) 1994.6213 (holotype), 1994.6214-6223 (paratypes); 5 paratypes of each sex deposited in collections of the University of São Paulo (USP).

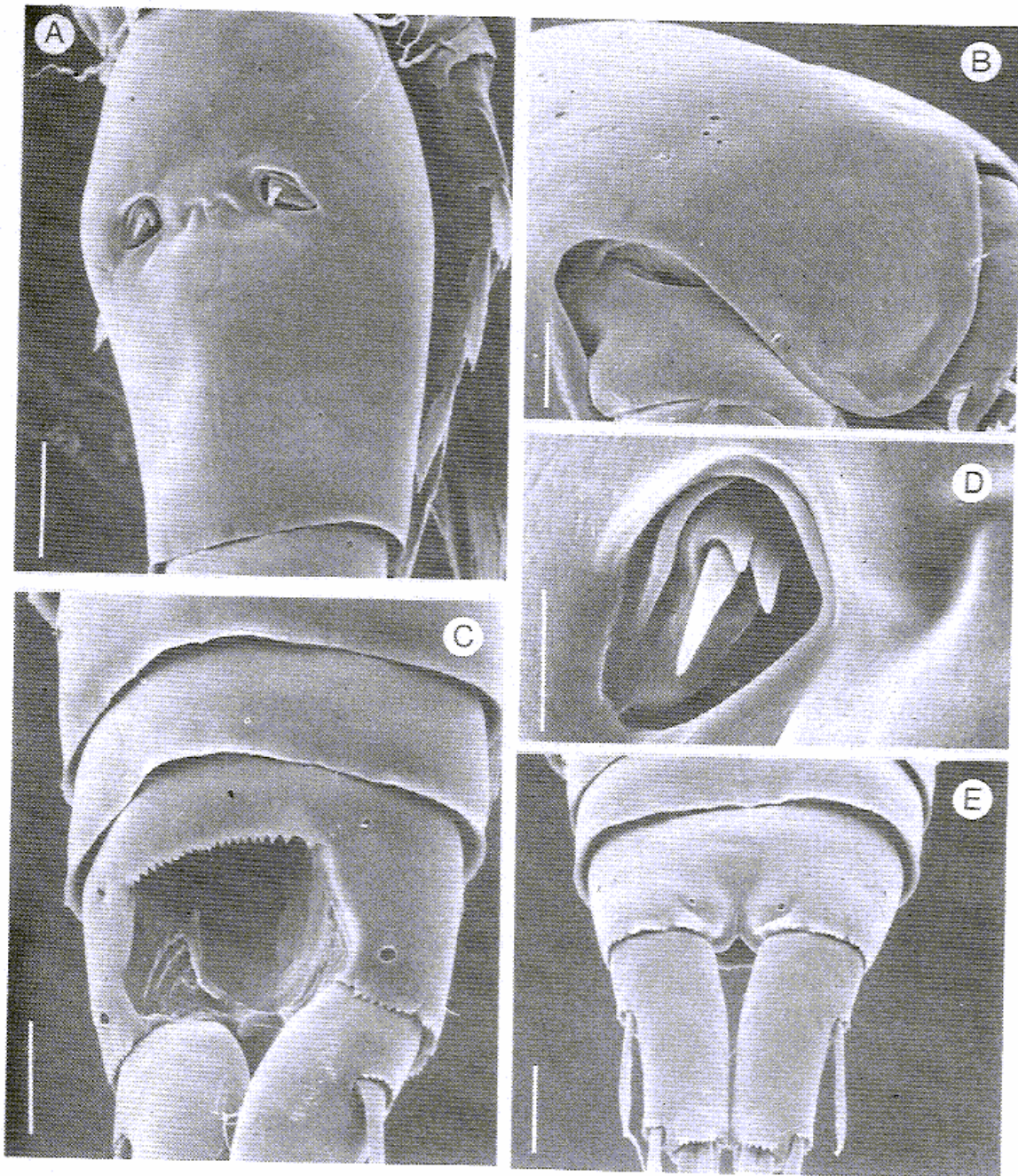


Fig 5. *Oncaea waldemari* sp.nov. A, Female genital double-somite, dorsal view; B, Rostrum and anterior part of dorsal cephalic shield, frontal view; C, Anal somite, dorsal view showing anal operculum and associated sensillae and pores; D, Female sixth leg closing genital aperture, dorsal; E, Anal somite and caudal rami, ventral. Scale bars A = 20 μ m, B, C = 10 μ m, D = 5 μ m, E = 10 μ m.

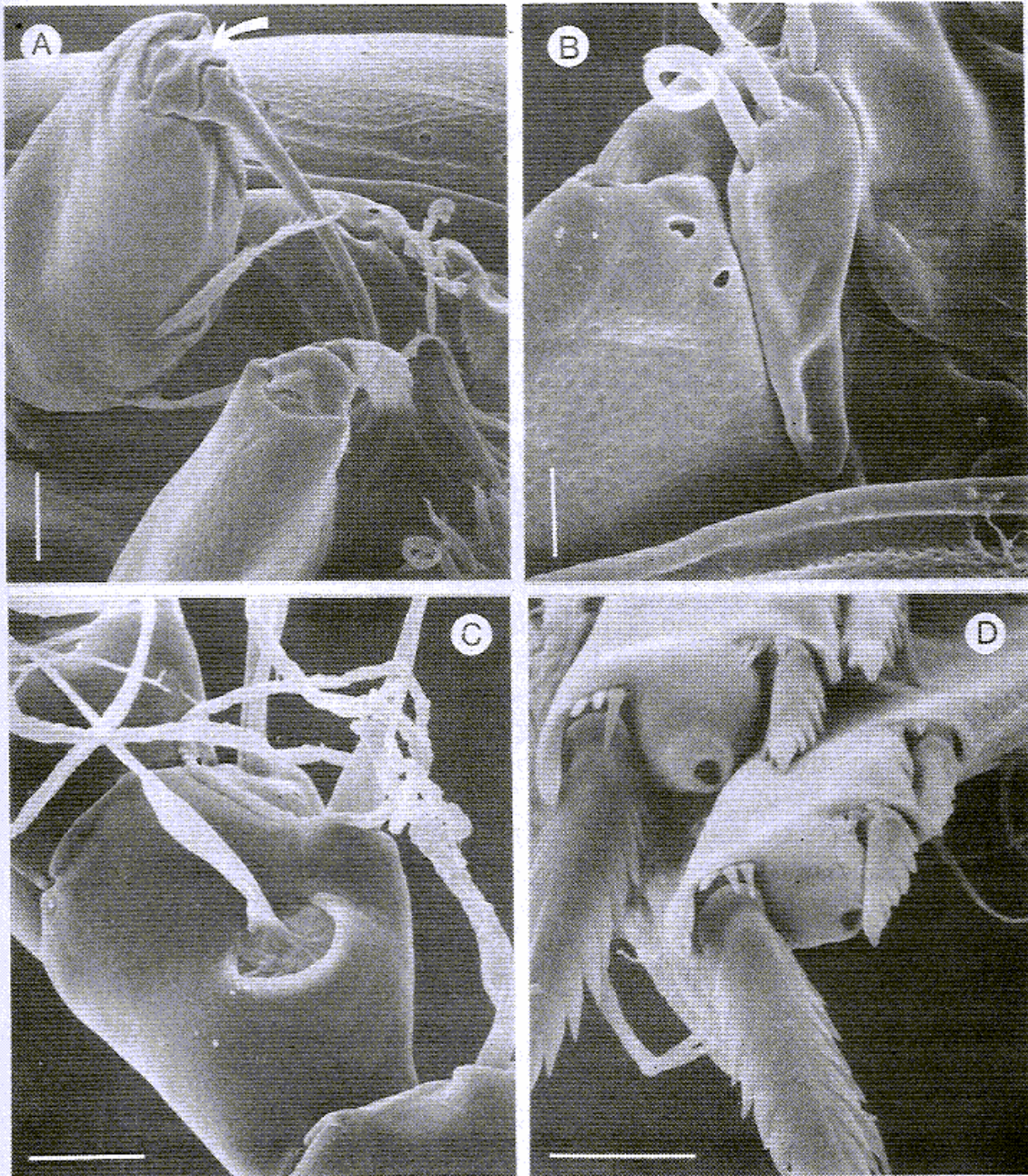


Fig. 6. *Oncaea waldemari* sp.nov. A, Female maxillipeds, ventrolateral view showing basal setae and free endopodal segment (arrowed); B, Maxillule and maxilla, lateral view showing maxillule origin partly hidden beneath anterior labrum; C, Fourth segment of female antennule, showing large origin of aesthetasc; D, Conical terminal processes on endopods of second and third swimming legs, showing apical pores. Scale bars A = 10 μ m, B-D = 5 μ m.

Other Material: 43 specimens, station #318, depth 50-75m: 62 specimens, station #359 depth 0-20m: 71 specimens, station #448, depth 10-18m: 4 specimens, station #316, depth 0-18m: 37 specimens, station #333, depth 25-50m: 37 specimens, station#257, depth 25-50m.

Etymology: The new species is named in honour of our colleague Waldemar José Apolinário Amaral of the Zooplankton Laboratory at FURG.

Remarks

Oncaea is a large genus, containing about 80 species, more than half of which have been described in the last 20 years (Böttger-Schnack & Boxshall, 1990; Boxshall, 1977; Boxshall & Böttger, 1987; Gordejeva, 1975; Heron, 1977; Heron *et al.*, 1984; Humes, 1988; Malt, 1982). The new species is characterised by: the short apical segment of the antenna (less than 2.5 times longer than wide, and shorter than the subapical segment), the second pedigerous somite does not project dorsally, the cephalosome is not swollen laterally, the third endopodal segment of leg 4 is longer than the first and second endopodal segments combined and it lacks a terminal conical projection, and the fifth leg is fused to the body. This combination of characters places the new species in a small group together with *O. petila* Heron, 1977, *O. ovalis* Shmeleva, 1967, *O. brocha* Heron 1977 and *O. compacta* Heron, 1977.

It differs from *O. petila* and *O. ovalis* in the length of the terminal spine on the third exopodal segment of leg 1. This spine is longer than the segment in these two species and about the same length in the new species. In addition, the caudal rami are about 1.5 times longer than the anal somite in the new species whereas they are shorter than the anal somite in *O. petila* and about the same length as the anal somite in *O. ovalis*. The new species can be distinguished from *O. compacta* in several characters: the more posterior location of the gonopores on the female genital double-somite of *O. compacta*, the shape of the apical antennary segment, and the length of the basal setae on the female maxilliped. In *O. compacta* the proximal seta is markedly shorter than the medium-length distal seta whereas in the new species both setae are long.

The new species appears to be most closely related to *O. brocha* which was described from the southwest Pacific-Antarctic area (Heron, 1977). It differs from *O. brocha* most significantly in length ratio of the caudal rami and anal somite. In the new species the caudal rami are 1.5 times longer than the anal somite but in *O. brocha* they are slightly shorter than the anal somite. The genital double-somite has evenly rounded convex margins in the new species but is rounded anteriorly and tapering posteriorly in *O. brocha*.

In gross body form *O. waldemari* also resembles the common species *O. media* Giesbrecht, 1892 and *O. curta* Sars, 1916. It can be readily distinguished from *O. media* by the armature of the endopod of the fourth pair of legs. In *O. media* all 3 of the distal spines are ornamented bilaterally with

serrate membranes. In addition the inner distal spine of this fourth endopod is only slightly longer than the outer distal spine. It is more difficult to separate *O. waldemari* from *O. curta*. One of the difficulties in interpretation is that *O. curta* belongs to a complex of closely related species which Boxshall (1977) erroneously proposed to regard as a single polymorphic species. The most important difference between these two species is the form of the antenna. The third antennal segment is more slender in *O. curta* (2.5 times longer than wide) and its 2 groups of setation elements are separated by a gap that is much greater than the width of the segment, whereas in *O. waldemari* this segment is 2.0 times longer than wide and the gaps between the groups of setation elements is less than the width of the segment. The inner margin of the second antennal segment is serrated in *O. waldemari* whereas it is smooth in *O. curta*. Another difference is the relative length of the 2 spines on the maxilliped basis in the female. In *O. curta* the distal spine is 1.5 times longer than the proximal spine whereas in *O. waldemari* these spines are subequal.

Oncaea venusta forma *venella* Farran 1929

Adult female body length ranging from 0.85 to 0.92mm, with a mean of 0.89mm (based on 10 specimens); mean length of adult male 0.61mm, with a range of 0.58 to 0.63mm (based on 5 specimens).

Material: 10 females and 5 males from station #333, depth 25-50m.

Remarks

The small form of *Oncaea venusta* was first described by Farran (1929) based on material from the *Terra Nova* expedition. The large form (forma *typica*) had a total length of 1.08 to 1.16 mm in the female whereas the smaller form (forma *venella*) measured only 0.92 to 1.07mm. Both forms occurred in the North Temperate Atlantic, Tropical Atlantic and South Temperate Atlantic. The presence of two size forms has been noted subsequently by Farran (1936), Sewell (1947), Tanaka (1960), Ferrari (1975) and Boxshall (1977). Farran (1936) gave a much smaller body size - range of 0.84 to 0.91mm - for females of forma *venella* taken during the Great Barrier Reef expedition. Sewell (1947) similarly reported a smaller size for the *venella* females, 0.85 to 0.91mm. Tanaka (1960) merely reported on Sewell's results and commented that only the *typica* form occurs in Japanese waters. Ferrari (1975) gave size ranges for both sexes of the *venella* form: 0.93 to 0.99mm (mean = 0.95mm) for females and 0.57 to 0.63mm (mean = 0.60mm) for males. In comparison Ferrari found *typica* sizes of 1.10 to 1.20mm (mean = 1.16mm) for females and 0.76 to 0.86mm (mean = 0.80mm) for males. Boxshall (1977) showed a bimodal size distribution for *O. venusta* females from the northeastern Atlantic: the smaller form ranged in length from 0.81 to about 1.05mm (with the mode at 0.98mm),

and the larger form ranged from 1.05 to 1.27mm (with the mode at 1.13mm). Boxshall concluded that these size forms corresponded with the *venella* and *typica* forms of *O. venusta* respectively.

Björnberg (1981) gave length range of 1.01 to 1.40mm for female *O. venusta* in Brazilian waters. We infer from this that only the larger *typica* form was included in the samples on which her work was based. The material from off Rio Grande has a size range of 0.85 to 0.92 mm in the female and 0.58 to 0.63mm in the male, and is here identified as *O. venusta* forma *venella*, the first record of this taxon from Brazilian waters.

ACKNOWLEDGEMENTS

This work was carried out during the tenure of a scholarship awarded to JGFB as part of a collaborative project established under the auspices of the Darwin Initiative for the Survival of Species, and held at The Natural History Museum, London. We would like to thank Waldemar José Apolinário Amaral for collecting the material, Anette Kummel Duarte for making the material available for study, Charrid Resgalla Jr. and Dr. Mónica Montú for their help throughout this project.

REFERENCES

- BJÖRNBERG, T.K.S. 1981. Copepoda. In, Boltovskoy, D. (Ed.) Atlas del Zooplancton del Atlantico Sudoccidental y metodos de trabajo con el zooplancton marino. pp. 587-679.
- BÖTTGER-SCHNACK, R. & G.A. BOXSHALL. 1990. Two new *Oncaea* species (Copepoda: Poecilostomatoida) from the Red Sea. J. Plankton Res. 12: 861-871.
- BOXSHALL, G.A. 1977. The planktonic copepods of the northeastern Atlantic ocean: some taxonomic observations on the Oncaeidae (Cyclopoida). Bull. Br.Mus. nat. Hist (Zool.). 31: 101-155.
- BOXSHALL, G.A. & R. BÖTTGER. 1987. Two new species of *Oncaea* (Copepoda: Poecilostomatoida) from the Red Sea and a redescription of *O. atlantica* Shmeleva. J. Plankton Res. 9: 553-564.
- FARRAN, G.P., 1929. Copepoda. Nat.Hist. rep. Br. antarct. Terra Nova Exped. (Zool.) 8: 203-306.
- FARRAN, G.P. 1936. Copepoda. Scient. Rep. Gt. Barrier Reef Exped. 5: 73-142.
- FERRARI, F.D. 1975. Taxonomic notes of the genus *Oncaea* (Copepoda: Cyclopoida) from the Gulf of Mexico and northern Caribbean sea. Proc. Biol. Soc. Wash. 88: 217-232.
- GORDEJEVA, K.T. 1975. Pelagic Cyclopoida (Copepoda) from the tropic Atlantic and South Seas. Zool. Zh. 54: 776-779. (in Russian)

- HERON, G.A. 1977. Twenty-six species of Oncaeidae (Copepoda: Cyclopoida) from the Southwest Pacific-Antarctic area. In, Pawson, D.L. (Ed.) Biology of the Antarctic Seas, VI. Antarctic Res. Ser. 26: 37-96.
- HERON, G.A.; ENGLISH, T.S. & D.M. DAMKAER. 1984. Arctic Ocean Copepoda of the genera *Lubbockia*, *Oncaea* and *Epicalymma* (Poecilostomatoida: Oncaeidae), with remarks on distributions. J. Crust. Biol. 14: 23-61.
- HUMES, A.G. 1988. *Oncaea praeclara* n. sp. (Copepoda: Poecilostomatoida) from deep-sea hydrothermal vents in the eastern Pacific. J. Plankton Res. 10:475-485.
- MALT, S.J. 1982. New and little known species of Oncaeidae (Cyclopoida) from the Northeastern Atlantic. Bull. Br. Mus. nat. Hist. (Zool.) 42: 185-205.
- SEYMOUR SEWELL, R.B. 1947. The free-swimming planktonic Copepoda. Systematic Account. Scient. Rep. John Murray Exped (Zool.) 8: 1-303.
- TANAKA, O. 1960. Pelagic Copepoda. Spec. Publs. Seto Mar. Biol. Lab. 10:1-95.