

BEAUFORTIA

BULLETIN ZOOLOGICAL MUSEUM
UNIVERSITY OF AMSTERDAM

Vol. 54, no. 2

November 18, 2004

A NEW SPECIES OF *NEANTHES* (ANNELIDA, POLYCHAETA, NEREIDIDAE)
FROM BRAZIL, AND SOME REMARKS ON *NEANTHES BRUACA*
LANA & SOVIERZOSKI, 1987

TATIANA MENCHINI STEINER* & CINTHYA SIMONE GOMES SANTOS**

**Departamento de Zoologia, Instituto de Biologia, UNICAMP, C.P. 6109, Barão Geraldo, Campinas, São Paulo, Brasil, 13083-970. E-mail: tatims@unicamp.br*

***Centro de Estudos do Mar, UFPR, Av. Mira Mar s/n, C.P. 50002, Pontal do Sul, 83255-000, Pontal do Paraná, Paraná, Brasil. E-mail: csgomes@ufpr.br*

ABSTRACT

A new species of Nereididae, *Neanthes ceciliae* n. sp., is described based on a large number of specimens, providing details about morphological variations in juveniles, adults and epitokes. *Neanthes ceciliae* n. sp. differs from its congeneric species in the number of conical paragnaths and morphology of the parapodia. *Neanthes bruaca* Lana & Sovierzoski (1987) is redescribed based on type material and additional specimens from São Paulo, Paraná and Santa Catarina. The morphology of the parapodia is detailed and additional characters are added to the diagnosis.

Key words: Polychaeta, Nereididae, *Neanthes*, Brazil, systematics, new species

INTRODUCTION

There are 72 known species in the genus *Neanthes* Kinberg, 1866, six of which have been recorded along the Brazilian coast. Hansen (1882) recorded *N. macrocephala* from Rio de Janeiro. Rullier & Amoureux (1979) found *N. caudata* on the south coast of Bahia, and Santos (1996) reported the same species from Atol das Rocas, northeast coast. Rullier & Amoureux (1979) recorded *N. indica brunnea*, similar to *N. ceciliae* n. sp. *Neanthes bruaca* Lana & Sovierzoski (1987) was originally described from material collected in São Paulo and Paraná, and recently from Santa Catarina

(Santos, pers. obs.). Morgado (1988) recorded *N. arenaceodentata* in São Paulo. *Neanthes succinea*, a cosmopolitan species which might in fact constitute a species complex, has been recorded widely along the Brazilian coast (Orensanz & Gianuca, 1974; Lana, 1984; Paiva, 1993; Santos & Amaral, 1980; Santos et al., 1994; Amaral & Morgado, 1994; Amaral et al., 1990; Bemvenuti, 1983; Corbisier, 1991; Duarte & Nalesso, 1996; Ferreira, 1989; Irving, 1991; Lana, 1986; Morgado, 1980; Tararam, 1994).

Neanthes ceciliae n. sp. is described and illustrated based on a large number of specimens, providing details of morphological variations in juveniles,

adults and epitokes. *Neanthes bruaca* is redescribed based on characters related to the morphology of the parapodia in posterior chaetigers, important for its diagnosis.

MATERIALS AND METHODS

The specimens collected in São Paulo State (except for MCBM-BPO-239) were obtained from the northern coast as part of a project to study intertidal benthic macrofauna along the São Sebastião Channel (23°41'S-23°53'S 45°14'W-45°30'W). The project was carried out from 1995 to 1997. The sampling included 16 beaches, characterized by fine and very fine sand (Segredo, Barequeçaba, Grande and Cigarras). The sediment in São Francisco and Engenho d'Água beaches is composed of medium and coarse sand, mixed with rock fragments. Araçá and Barra Velha beaches have very fine grains with a high percentage of silt and clay, with some shell fragments in Araçá. Coarse and very coarse sand characterise Pontal da Cruz, Porto Grande, Siriúba, Perequê and Garapocaiá beaches.

Specimens of *Neanthes bruaca* from Paranaguá Bay, Paraná State (25°20'S-25°35'S 48°20'W-48°45'W) were obtained in the sublittoral zone in the entire bay, in sandy to silty sediments. In Santa Catarina State the material was collected in the sublittoral zone in Baía Norte (27°00'S-27°30'S 48°30'W), Florianópolis, and Sambaqui and Anhatomirim beaches. In northeastern Brazil, *N. bruaca* was collected in the continental shelf of Sergipe State, in sandy sediment. Specimens of *N. ceciliae* n. sp. from the northeastern coast were obtained in the rocky intertidal zone of Paripueira Beach (Alagoas State) and Natal (Rio Grande do Norte State).

For scanning electron microscopy photos (SEM), the specimens, previously fixed in 4% seawater-formalin and preserved in 70% ethanol, were washed with distilled water and then immersed in 1% osmium (prepared with distilled water) for 1 hour at low temperature. Specimens were transferred to distilled water and then to a solution of 2% tannic acid for 15 min. and finally washed again in distilled water. They were then immersed in 50, 60 and 70% ethanol (5 min. each), 80, 90 and 95% ethanol (15 min. each) and in absolute ethanol, in 3 changes (15, 30 and 60

min.). Critical point drying was done at 37°C and 70 BAR; venting of carbon dioxide was done at 5°C. For coating, specimens were washed 7 times with argonium and, later on, at 2 X 10⁻¹ mbar, 40 mA, for 180 s, the samples were covered with gold (44 nm). Specimens were observed with a JEOL JSM5800LV scanning electron microscope.

The terms adopted to show parapodial parts are based on Hylleberg et al. (1986) and Bakken (2002).

The type material is deposited at the Centro de Estudos do Mar, Pontal do Sul, Paraná State, Brazil (MCBM-BPO and MCEM-BPO) and the Museu de História Natural da Universidade Estadual de Campinas, Campinas, São Paulo State, Brazil (MHN-BPO and MHN-BPO-ST).

SYSTEMATICS

Genus *Neanthes* Kinberg, 1866

TYPE SPECIES. - *Neanthes vaali* Kinberg, 1866.

DIAGNOSIS. - Prostomium with one pair of antennae and two pairs of eyes. Conical paragnaths are present on both rings, but can be absent in some areas. Notopodial chaetae homogomph falcigers, neuropodial chaetae heterogomph spinigers and falcigers and heterogomph falcigers.

Neanthes bruaca Lana & Sovierzoski, 1987

Figs. 1-6

Neanthes bruaca Lana & Sovierzoski, 1987: 678-683, figs. 1-4.

MATERIAL. - Holotype: MCBM-BPO-234, Peças Island, Laranjeiras Bay, Paraná State, Brazil, 14-XII-1983, 4 m, sand and silt, coll. P.C. Lana.

Paratype series: MCBM-BPO-233 (1 spec.), Paranaguá Bay, Paraná State, Brazil, 28-V-1982; MCBM-BPO-235 (1 spec.), Peças Island, Laranjeiras Bay, Paraná State, Brazil, 14-XII-1983, 5 m, silt and sand, coll. P.C. Lana; MCBM-BPO-236 (1 spec.), Paranaguá Bay, Paraná State, Brazil, 05-VI-1986, 12 m, fine sand with silt and clay, coll. P.C. Lana; MCBM-BPO-237 (1 spec.), 26°51'00"S 48°13'01"W, Paraná State, Brazil, 02-VIII-1982, 50 m, silt and clay, coll. P.C. Lana; MCBM-BPO-238 (1 spec.), 24°44'00"S 45°55'00"W, Paraná State, Brazil, 18-VIII-1982, 68 m, sand with silt and clay, coll. P.C. Lana; MCBM-BPO-239 (2 spec.), Anchieta Island, Ubatuba, São Paulo State, Brazil, 15-IX-1982, 20-40

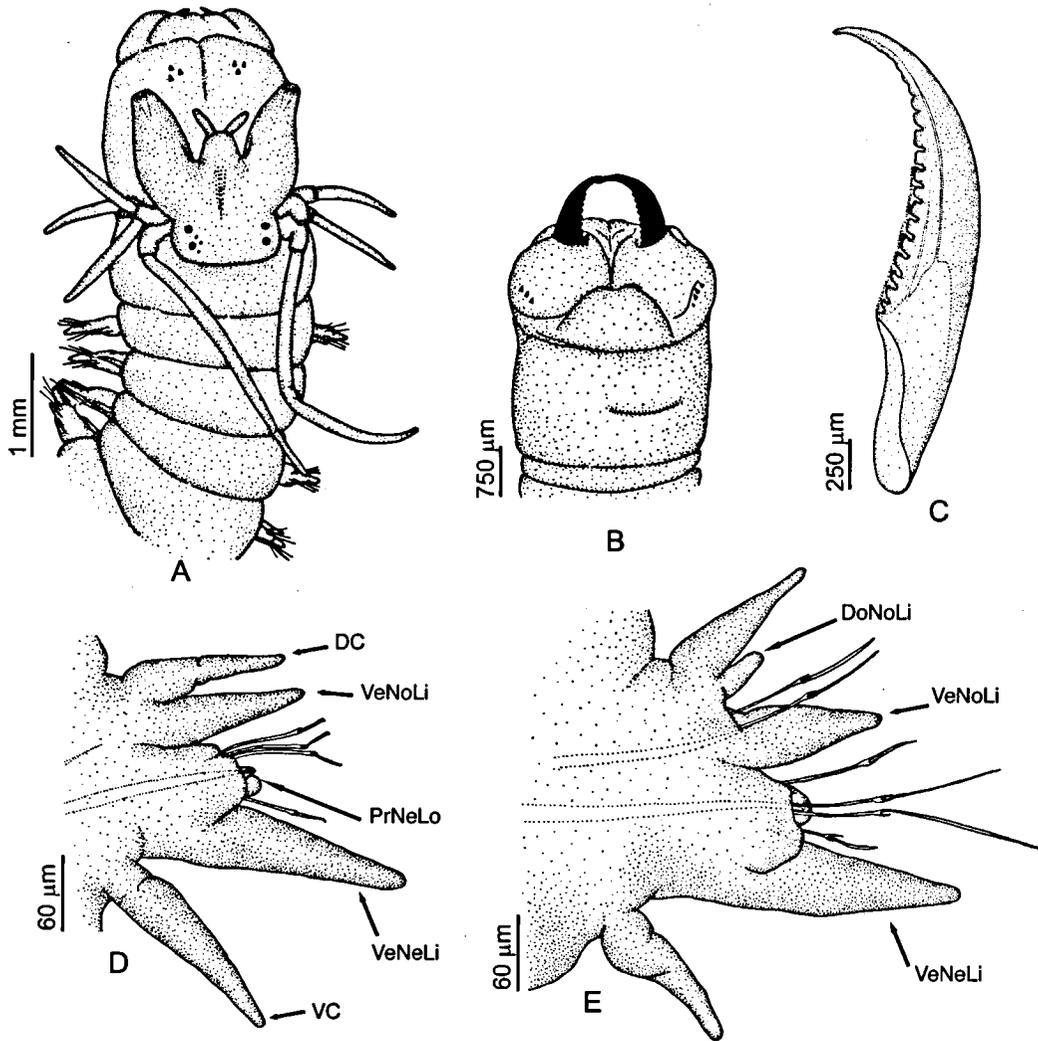


Fig. 1. *Neanthes bruaca*. A, anterior body (dorsal view). B, pharynx (ventral view). C, jaw. D, parapodium 2 (posterior view). E, parapodium 5 (posterior view). DC = dorsal cirrus, DoNoLi = dorsal notopodial ligule, PrNeLo = pre-chaetal neuropodial lobe, VC = ventral cirrus, VeNeLi = ventral neuropodial ligule, VeNoLi = ventral notopodial ligule.

m, medium silt, coll. E.H. Morgado.

Additional material: MCEM-BPO 1295 (11 spec.), internal continental shelf, Sergipe State, Brazil, 01-III-1997, sublittoral, sandy bottom, coll. M.V. Almeida; MCEM-BPO 1296 (10 spec.), internal continental shelf, Sergipe State, Brazil, 01-III-1997, sublittoral, silt and sand, coll. M.V. Almeida; MHN-BPO-ST 20 (1 spec.), Barra Velha Beach, São Sebastião Channel, São Paulo State, Brazil, 24-IX-1992, intertidal, sand with silt and clay, coll. A.C.Z. Amaral; MHN-BPO-ST 21 (1 spec.), Araçá Beach, São Sebastião Channel, São Paulo State, Brazil, 05-VI-1996, intertidal, sand with silt and clay, coll. A.C.Z. Amaral; MHN-BPO-ST23 (1 spec.), 23°41'148"S 45°16'106"W, 13-II-2001, 15 m, coll. A. Fransozo (specimen examined under SEM); MCEM-BPO 1222 (1 spec.), Laranjeiras Bay, Paraná State, Brazil, 21-X-1999, 2 m, sand and silt, coll. O. Negrello; MCEM-BPO 1223 (1 spec.), Laranjeiras Bay, Paraná State,

Brazil, 15-III-2001, 2 m, sand and silt, coll. O. Negrello; MCEM-BPO 1224 (2 spec.), Laranjeiras Bay, Paraná State, Brazil, 2 m, sand and silt, coll. O. Negrello; MCEM-BPO 1225 (1 spec.), Laranjeiras Bay, Paraná State, Brazil, 2 m, sand and silt, coll. O. Negrello; MCEM-BPO 1300 (1 spec.), Paranaguá Bay, nearby Governador Island, Paraná State, Brazil, 10-X-2001, 2 m, sand and silt, coll. C.S.G. Santos; MCEM-BPO 1301 (7 spec.), Baixio do Perigo, Laranjeiras Bay, Paraná State, Brazil, 10-X-2001, 2 m, sand and silt, coll. C.S.G. Santos, A.R.S. Garraffoni; MCEM-BPO 1302 (1 spec.), Peças Island, South, Laranjeiras Bay, Paraná State, Brazil, 10-X-2001, 2 m, sand and silt, coll. C.S.G. Santos, A.R.S. Garraffoni; MCEM-BPO 1297 (2 spec.), Matinhos Beach, Paraná State, Brazil, 03-VII-97, sublittoral, sandy bottom, coll. J.R. Botelho; MCEM-BPO 1298 (1 spec.), Sambaqui, Norte Bay, Florianópolis, Santa Catarina State, X-2000, sublittoral, coll. A. Blankesteyn; MCEM-BPO 1299

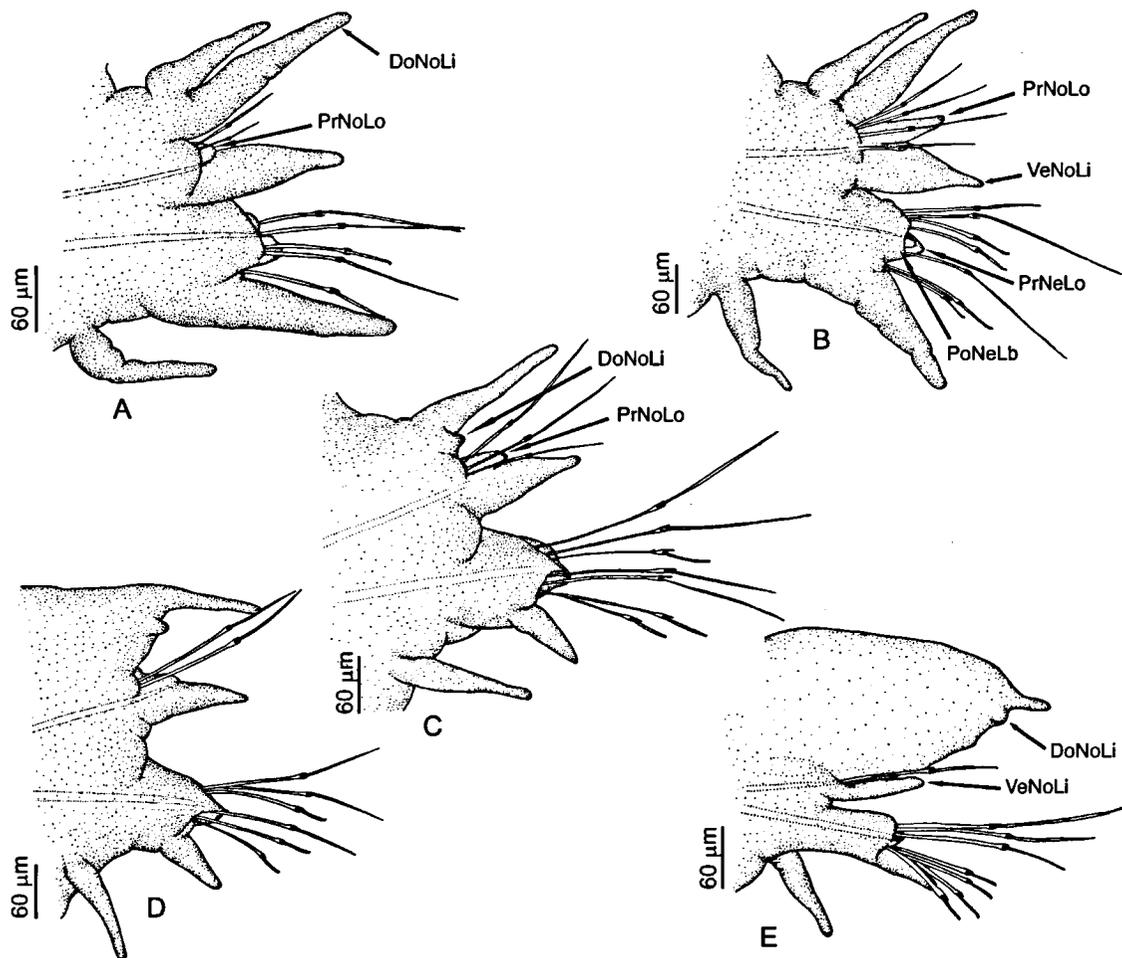


Fig. 2. *Neanthes bruaca*. Parapodia (posterior view). A, chaetiger 6. B, chaetiger 11. C, chaetiger 25. D, chaetiger 61. E, chaetiger 208. PrNoLo = pre-chaetal notopodial lobe. Other abbreviations as in Fig. 1.

(2 spec.), Anhatomirim, Florianópolis, Santa Catarina State, X-2000, sublittoral, coll. A. Blankesteyn.

DESCRIPTION. - Holotype incomplete, 44 mm long, 1.2 mm wide (including parapodia), 79 chaetigers. Complete specimens 45-70 mm long, 1-1.7 mm wide (including parapodia), 200-300 chaetigers. The longest specimen is 95 mm long, 240 chaetigers, incomplete (MCEM-BPO 1222). Specimens delicate, slender, rounded in cross section and slightly inflated in anterior chaetigers, slightly flattened dorso-ventrally in median and posterior regions. First four to five chaetigers with parapodia smaller than subsequent chaetigers.

Prostomium longer than wide, anterior end tapering, bearing one pair of frontal antennae (Figs. 1A, 3A). Palps stout and pyriform, longer than prostomium; palpostyles short and subconical. Four pairs of anterior cirri (= tentacular

cirri), three pairs subequal in length reaching the first chaetiger; one pair postero-dorsal reaching chaetigers four to six. Two pairs of round black eyes on posterior half of prostomium. Peristomium same length as adjacent chaetigers. Jaws amber-coloured, with 12-17 teeth, the most apical teeth separate from each other, the basal teeth united by thin layer of chitin (Fig. 1C). Small conical paragnaths in groups of three to eight on Areas IV (row) and three to eight on Area VI (circular group), absent in remaining Areas (Figs. 1A, B, 3B).

Chaetigers 1 and 2 sesquiritramous (Figs. 1D, 3C), small internal aciculum in notopodium, dorsal cirrus (DC) slightly shorter than ventral notopodial ligule (VeNoLi); post-chaetal neuropodial lobe absent; pre-chaetal neuropodial lobe (PrNeLo) rounded, slightly longer; ventral neuropodial ligule (VeNeLi) well developed, larg-

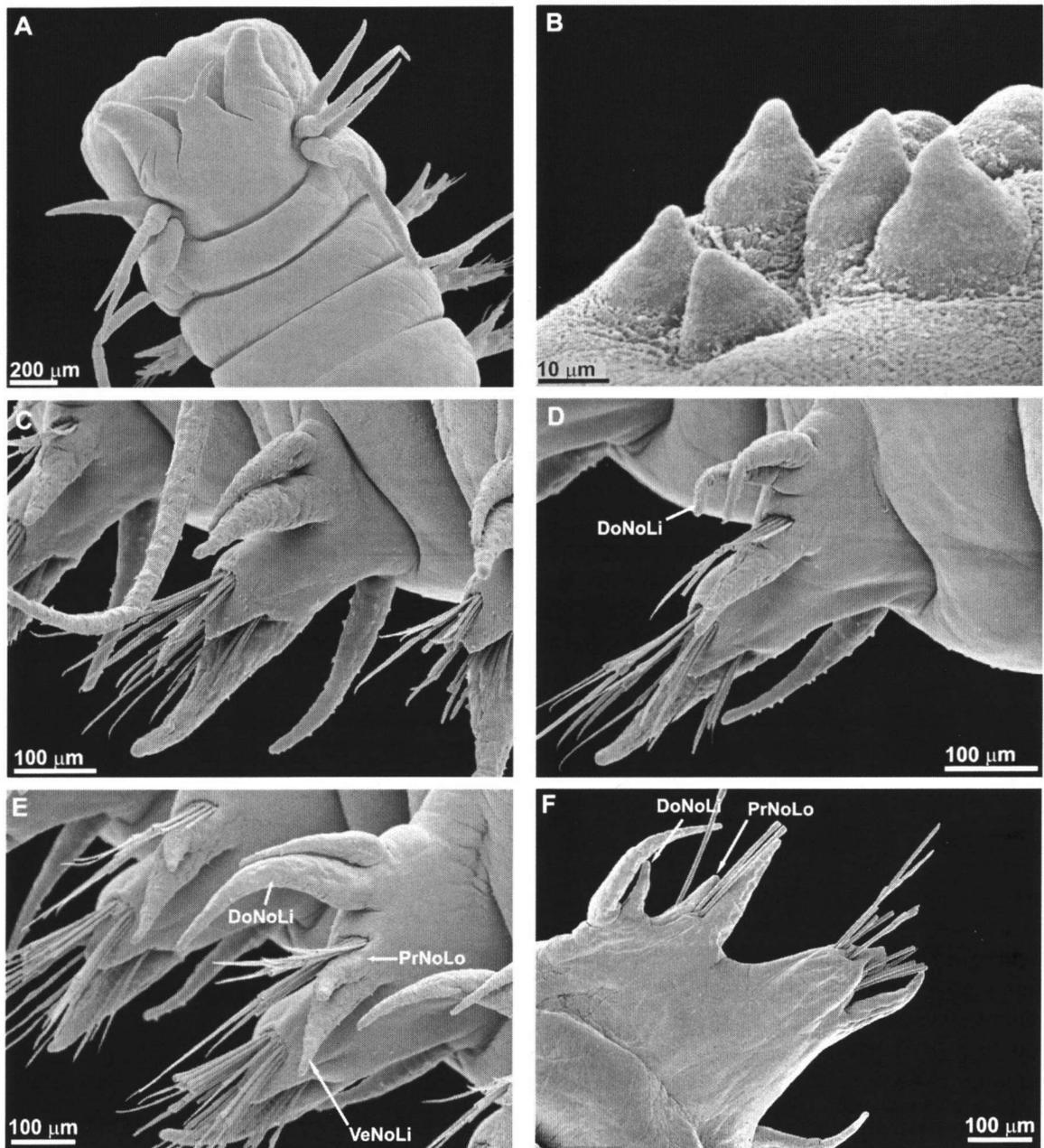


Fig. 3. *Neanthes briuca*. A, anterior body (dorsal view). B, paragnaths (Area VI). C, parapodium 2 (anterior view). D, parapodium 6 (anterior view). E, parapodia 9 and 10 (anterior view). F, parapodium 30 (posterior view). Abbreviations as in Figs. 1 and 2.

er than ventral notopodial ligule (VeNoLi) and ventral cirrus (VC) longer than dorsal cirrus. Biramous parapodia from chaetiger 3; notopodium composed of dorsal ligule (DoNoLi) emerging near dorsal cirrus, from chaetiger 5 or 6 (Figs. 1E, 2A, 3D), longer than dorsal cirrus until chaetiger 11-13 (Figs. 2B, 3E), gradually shorter in chaetigers 16-34 (Figs. 2C, 3F), and papilliform

until pygidial region (Figs. 2D, 2E, 4A), absent in posteriormost chaetigers. Ventral notopodial ligules (VeNoLi) slightly longer than dorsal cirri through the median region and longer and more slender toward posterior region. Pre-chaetal notopodial lobe (PrNoLo) present from chaetigers five to seven (Fig. 2A), well developed in chaetigers 11-16 (Fig. 2B), gradually less promi-

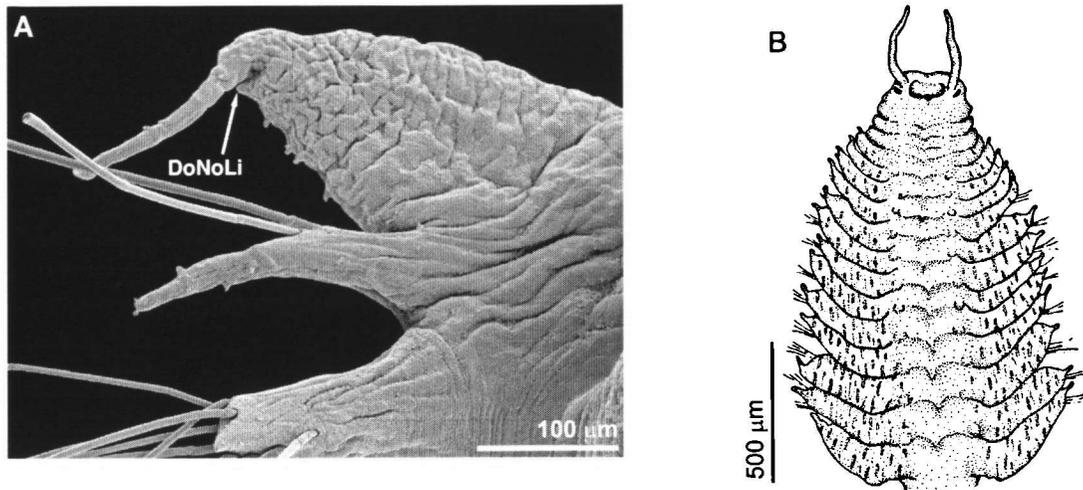


Fig. 4. *Neanthes bruaca*. A, parapodium 160 (anterior view). B, pygidium. Abbreviations as in Fig. 1.

ment (Fig. 2C) toward chaetiger 60 (Fig. 2D) and inconspicuous near end of body (Figs. 2E, 4A). Cirriform dorsal cirri as long as ventral cirri until chaetiger 50 (Fig. 2C), shorter in following chaetigers (Fig. 2E). Superiormost region of notopodia slightly enlarged from chaetiger 60 (Fig. 2D); around chaetiger 100, this region is enlarged and highly vascularised, with dorsal cirri displaced distally (Figs. 2E, 4A). Neuropodial prechaetal lobe (PrNeLo) slightly prominent until chaetiger 50, absent thereafter; post-chaetal lobe absent along whole body. Aciculum neuropodial in a triangular projection. Ventral neuropodial ligule (VeNeLi) cirriform, well developed in anterior region, slender in median and posterior region, always longer than PrNeLo. Ventral cirri longer than dorsal cirri until chaetiger 6, shorter and more slender in the following chaetigers.

Three to six homogomph spinigers chaetae in notopodium (Figs. 5B, C, H) and in supra-acicular neuropodial bundle (Figs. 5D, 6A); one to five heterogomph spinigers in subacicular bundle of neuropodium (Figs. 5E, 6B, C); one to five heterogomph falcigers in both supra- (Figs. 5A, G) and subacicular (Figs. 5F, 6D) bundles of neuropodium, with the subacicular ones more stout. Blades vary in length along the body but do not show any particular pattern of difference. Chaetae shorter in anterior and posterior chaetigers. One pair of smooth, short anal cirri (Fig. 4B), with one pair of pigmented patches in some specimens.

NOTES. - Specimens from the northeastern region are smaller and more delicate when compared to material from south and southeast; otherwise they are all morphologically similar. In two individuals the eyes are not well defined and are formed by small patches occupying a wider area than the eyes normally do.

The number of paragnaths in Area VI seems to be related to the size of specimens: larger specimens have more paragnaths. We observed similarly sized specimens where the numbers of paragnaths differed. Moreover, detailed observation might reveal very tiny and/or weakly chitinised paragnaths, which are difficult to see.

The DoNoLi can appear on chaetiger 5 or 6: in chaetiger 5 it is always shorter than the dorsal cirrus (Fig. 1E); when appearing on chaetiger 6 the DoNoLi is conspicuously longer (Fig. 2A). In longer specimens the DoNoLi is papilliform around chaetiger 34 (MCBM-BPO 235), but in smaller individuals (MCBM-BPO 233 and 234) this condition starts around chaetigers 16-20. Apparently, this is a size-dependent character.

The PrNoLo, viewed under light microscopy, seems to be pre-chaetal, however under SEM it is possible to verify that the projection is almost below the bundle of chaetae (Fig. 3E).

The homogomph spinigers of both parapodial rami are identical throughout and have the edge of the shaft with a short, wide spine and short fringe (Fig. 6A) seen only under SEM. The shaft of heterogomph spinigers and falcigers are iden-

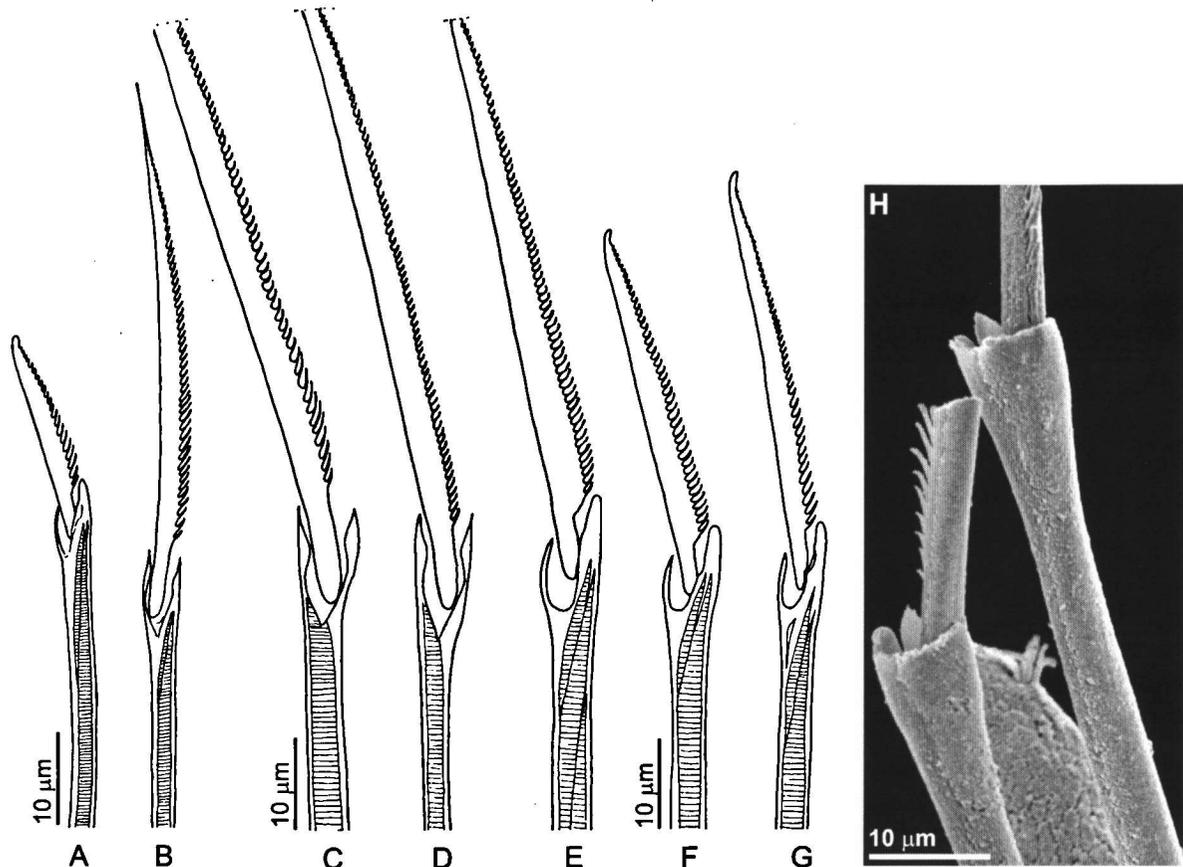


Fig. 5. *Neanthes bruaca*. Chaetae. A, supra-acicular neuropodial heterogomph falciger (chaetiger 2). B, notopodial homogomph spiniger (chaetiger 6). C, notopodial homogomph spiniger. D, supra-acicular neuropodial homogomph spiniger. E, subacicular neuropodial heterogomph spiniger. F, subacicular neuropodial heterogomph falciger. G, supra-acicular neuropodial heterogomph falciger. H, notopodial homogomph spinigers (chaetiger 27). Figs. C, D, G, chaetiger 15. Figs. E, F, chaetiger 20.

tical in shape. They also have a fringe as seen on homogomph chaetae and a more prominent spine, which gives the heterogomph aspect. Heterogomph chaetae have distal end of the shaft laterally compressed in anterior chaetigers (Figs. 6B, D) and inflated in the rest of the body (Fig. 6C).

DISCUSSION. - Most of the features described here were originally pointed out by Lana & Sovierzoski (1987). Nevertheless, some details can be added. According to the original description (Lana & Sovierzoski, 1987), the expansion of the uppermost part of parapodia occurs only in posterior chaetigers. However, their figure (Lana & Sovierzoski, 1987, fig. 2F) illustrates a median parapodium, probably between chaetigers 24 and 50. In the type material, as illustrated here, the expansion appears in median chaetigers (Fig. 2D),

around chaetiger 50, being more conspicuous in posterior parapodia (Fig. 2E). In fact 2/3 of the body bears this feature.

The DoNoLi does not disappear in chaetigers 15-25, as described by Lana & Sovierzoski (1987). From chaetigers 16-34 (depending on the size of the individual) until the end of the body, the DoNoLi is papilliform.

The PrNoLo, seen from chaetigers 5-7, is distinctly smaller from chaetiger 17 on, and absent from chaetiger 60 on, not earlier as stated by Lana & Sovierzoski (1987).

Of the several species of Nereididae, *Neanthes micromma* (Harper, 1979) and *Neanthes succinea* (Frey & Leuckart, 1847) are similar to *N. bruaca* by having notopodial ligule in posterior parapodia enlarged, foliaceous, with terminal dorsal cirri. Moreover, *N. micromma* also presents very few conical paragnaths and small eyes. *Neanthes bruaca* dif-

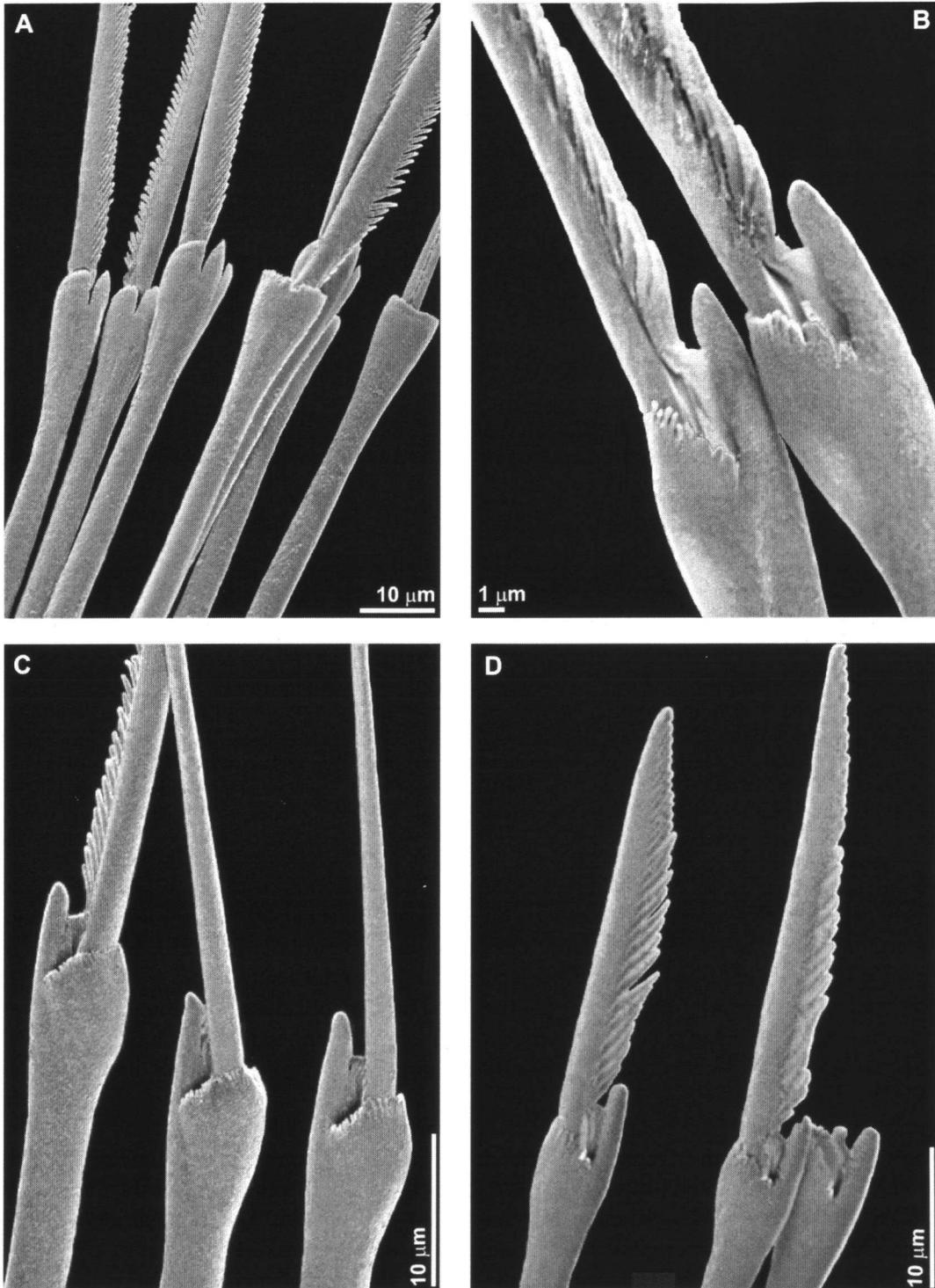


Fig. 6. *Neanthes bruaca*. Chaetae. A, supra-acicular neuropodial homogomph spinigers. B, subacicular neuropodial heterogomph spinigers (chaetiger 3). D, subacicular neuropodial heterogomph spinigers. C, subacicular neuropodial heterogomph falcigers (chaetiger 1). Figs. A, C, chaetiger 28.

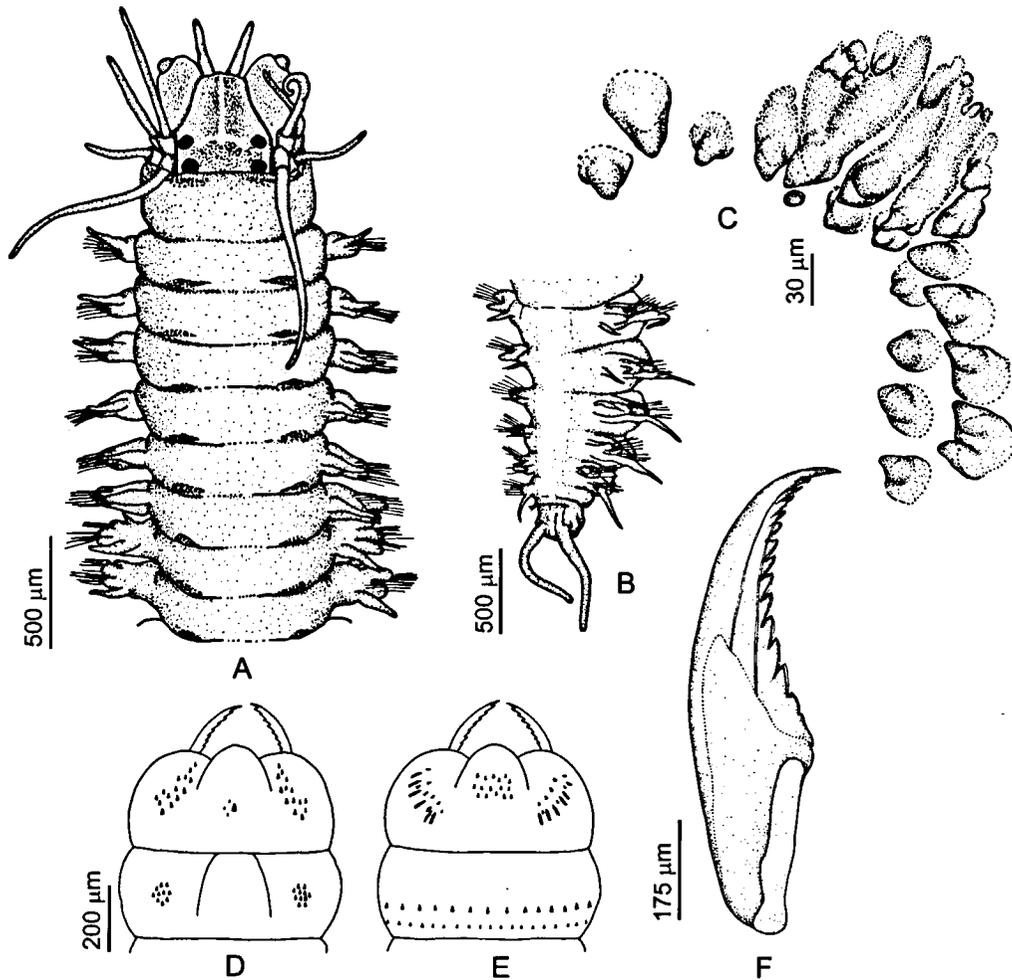


Fig. 7. *Neanthes ceciliae* n. sp. (atoke). A, anterior body (dorsal view). B, pygidium. C, paragnaths (Area IV). D, pharynx (dorsal view). E, pharynx (ventral view). F, jaw.

fers from the former by the absence of paragnaths on Areas VII-VIII and from the latter by the numerous paragnaths occurring in all Areas of pharynx, by the dark brown dorsal color and the larger eyes.

OCCURRENCE. - Intertidal to 50 m, in fine sand with silt and clay.

DISTRIBUTION. - Brazil: southeast coast: São Paulo State (Ubatuba and São Sebastião); south coast: Paraná State (Laranjeiras and Paranaguá Bay), Santa Catarina State (North Bay in Florianópolis); northeastern coast: Sergipe State (continental shelf).

***Neanthes ceciliae* n. sp.**

Figs. 7-14

MATERIAL. - Holotype: MHN-BPO 84/0, Araçá Beach, São Sebastião Channel, São Paulo State, Brazil, 27-XI-1996, intertidal, sand with silt and clay mixed with shell fragments, coll. A.C.Z. Amaral.

Paratype series: MHN-BPO 84/1 to 84/12 (12 spec.), Engenho d'Água Beach, São Sebastião Channel, São Paulo State, Brazil, intertidal, sand mixed with stones, coll. A.C.Z. Amaral; MHN-BPO 84/1, 25-XI-1996; MHN-BPO 84/2, 20-V-1996; MHN-BPO 84/3, 20-V-1996; MHN-BPO 84/4 to 84/8, 20-V-1996; MHN-BPO 84/9, 08-IV-1997; MHN-BPO 84/11, 07-XI-1995; MHN-BPO 84/12, 24-IX-1995; MHN-BPO 84/13 (1 spec.), São Francisco Beach, São Sebastião Channel, São Paulo State, Brazil, 27-VIII-1996, intertidal, sand mixed with stones, coll. A.C.Z. Amaral; MHN-BPO 84/14 to 84/17 (4 spec.), Engenho d'Água and São Francisco Beaches, São Sebastião Channel, São Paulo

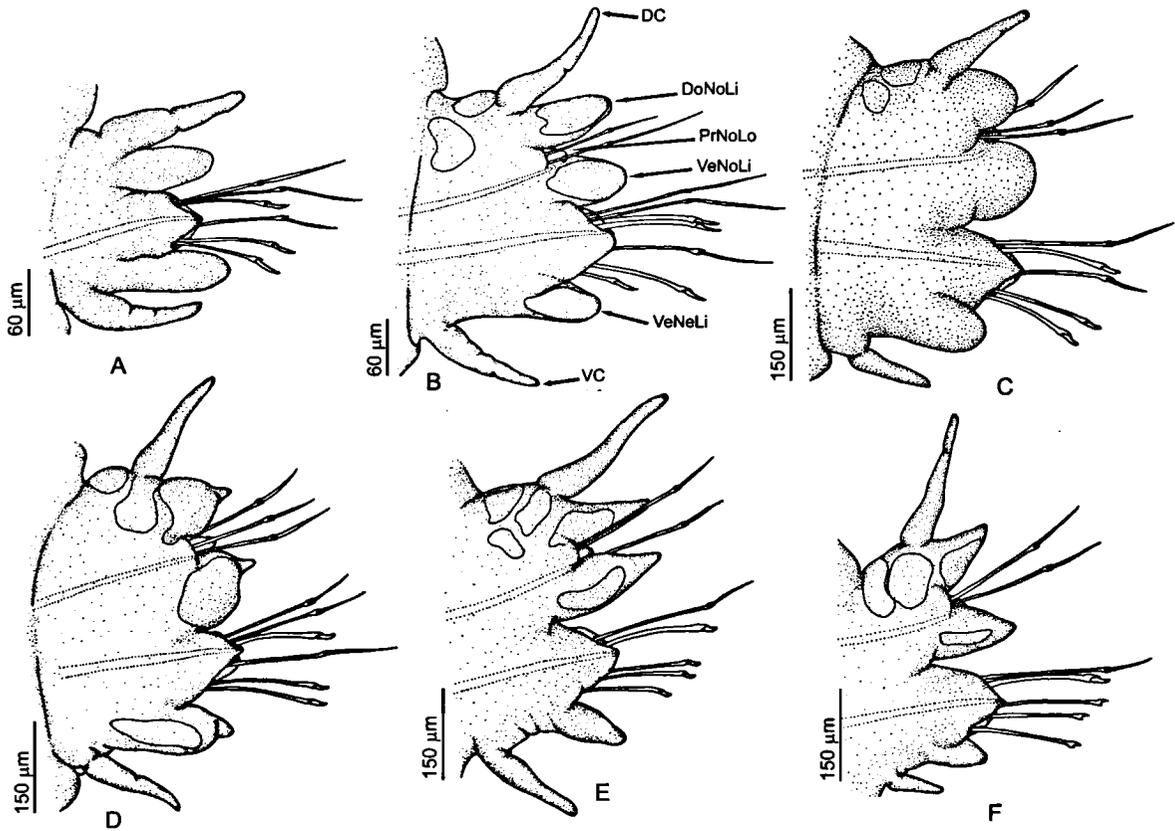


Fig. 8. *Neanthes ceciliae* n. sp. (atoke). Parapodia (posterior view): A, chaetiger 2. B, chaetiger 5. C chaetiger 10. D, chaetiger 11. E, chaetiger 38. F, chaetiger 57. Abbreviations as in Figs. 1 and 2.

State, Brazil, 9 and 10-XII-1996, intertidal, sand mixed with stones, coll. A.C.Z. Amaral; MHN-BPO 84/18 to 84/22 (5 spec.), Engenho d'Água Beach, São Sebastião Channel, São Paulo State, Brazil, intertidal, sand mixed with stones, coll. A.C.Z. Amaral; MHN-BPO 84/18, 20-I-1997; MHN-BPO 84/19 to 84/21, 09-XI-1996; MHN-BPO 84/22, 19-III-1996; MCEM-BPO 1032 (2 spec.), Santa Rita Beach, Rio Grande do Norte State, Brazil, VIII-1995, intertidal, sand with stones and algae, coll. C.S.G. Santos; MCEM-BPO 1033 (3 spec.), Pipa Beach, Rio Grande do Norte State, Brazil, VIII-1995, intertidal, sand with stones and algae, coll. C.S.G. Santos; MCEM-BPO 1034 (1 spec.), Meio Beach, Natal City, Rio Grande do Norte State, Brazil, VIII-1995, intertidal, in a 'beach rock', coll. C.S.G. Santos; MCEM-BPO 1035 (2 spec.), Meio Beach, Rio Grande do Norte State, Brazil, VIII-1995, intertidal, sand with stones and algae, coll. C.S.G. Santos; MCEM-BPO 1031 (2 spec.), Paripuera Beach, Alagoas State, Brazil, VIII-1995, intertidal, stones and sand with mud, coll. C.S.G. Santos. Specimens for SEM: MHN-BPO 84/10, Engenho d'Água Beach, São Sebastião Channel, São Paulo State, Brazil, 20-V-1996, intertidal, sand mixed with stones, coll. A.C.Z. Amaral. MHN-BPO 84/23, São Francisco Beach, São Sebastião Channel, São Paulo State, Brazil, VI-1997, intertidal, sand mixed with stones, coll. A.C.Z. Amaral; MHN-

BPO 84/24, Araçá Beach, São Sebastião Channel, São Paulo State, Brazil, 02-X-2001, rocky shore between algae, coll. T.M. Steiner. MHN-BPO 84/25, São Sebastião Channel, São Paulo State, Brazil, intertidal, coll. A.C.Z. Amaral.

ATOKOUS ADULTS, DESCRIPTION. - Holotype complete, 16 mm long, 1.6 mm wide (including parapodia), 64 chaetigers. Paratype series with complete animals 15-20 mm long, 1.2-2 mm wide, and 58-71 chaetigers; most of them with 65-67 chaetigers. The longest complete animal (MHN-BPO 84/1) is 30 mm long and 2.3 mm wide, with 67 chaetigers. Body short, ovoid in transverse section, inflated in first chaetigers.

Prostomium as long as wide (Figs. 7A, 10A). Two pairs of eyes arranged in rectangle. Antennae smooth, one half as long as prostomium, globular palps and rounded palpostyles, shorter than antennae. Prostomium with dark green transverse band between eyes; scattered light brown spots on entire prostomium, palps

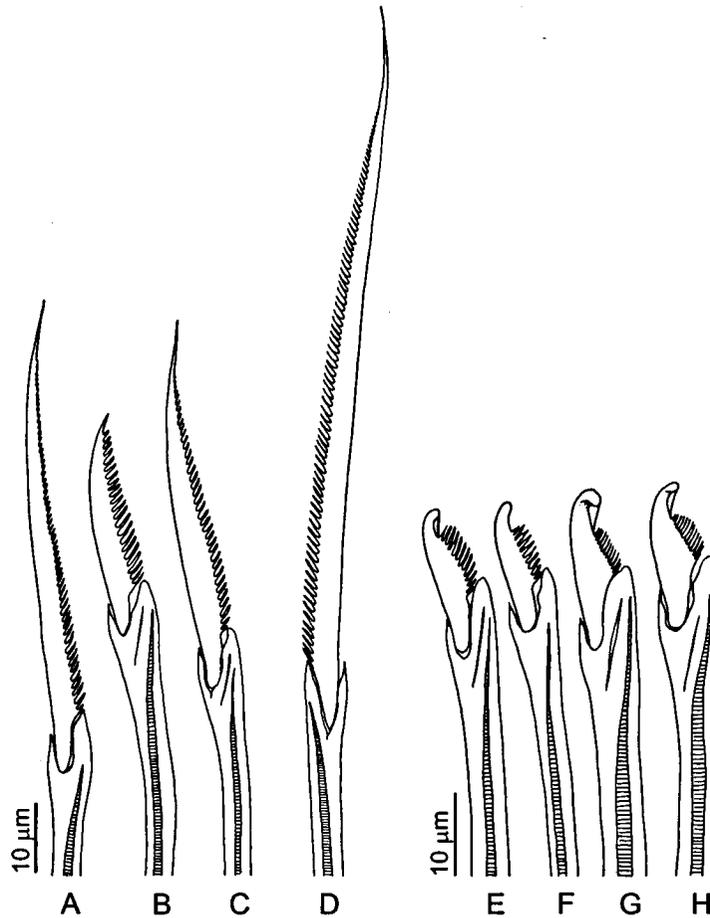


Fig. 9. *Neanthes ceciliae* n. sp. (atoke). Chaetae: A, subacicular neuropodial heterogomph spiniger. B, subacicular neuropodial heterogomph falciger. C, subacicular neuropodial heterogomph spiniger. D, notopodial homogomph spiniger. E, supra-acicular neuropodial heterogomph falciger. F, subacicular neuropodial heterogomph falciger. G, supra-acicular neuropodial heterogomph falciger. H, subacicular neuropodial heterogomph falciger. Figs. A, B, chaetiger 5. Figs. C, D, E, F, chaetiger 9. Figs. G, H, chaetiger 40.

and dorsum of anterior chaetigers. First 10-15 chaetigers with one pair of long dark pigment patches on dorsolateral region of each segment (Fig. 7A), sometimes continuing along entire body. Four pairs of smooth anterior (= peristomial) cirri, postero-dorsal pair longer than others, reaching chaetigers 3-4; antero-dorsal pair of medium size; and two pairs located ventrally, shorter than others. Pharynx with one pair of light brown jaws, each with 9-14 teeth (Fig. 7F). Paragnaths light brown, weakly chitinised (Figs. 7D, E): Area I = one to four conical paragnaths (when two, in transverse row; when three, arranged in triangle; when four, arranged in square), one of them always largest than others, and some very small, sometimes difficult to see;

Area II = 9-14, in two curved rows; Area III = 12-20, in two to three irregular rows arranged in square; Area IV = 12-20, in two curved rows, some as smooth bars with one distal cone (Fig. 7C); Area V = 0, rarely 1; Area VI = 8-12, in a circular group; Areas VII-VIII = one distal row with 12-15 and one basal row with 15-20 small paragnaths. Peristomium slightly longer than following chaetigers.

Bases of dorsal (DC) and ventral (VC) cirri and distal ends of ligules with internal tissues orange (Figs. 8B-F). Notopodium of anterior chaetigers with cirriform dorsal cirrus (Fig. 8A), slightly longer than ligules, slender and twice as long as ligules towards the end of the body (Fig. 8F). Ventral cirrus cirriform, as long as the dorsal cir-

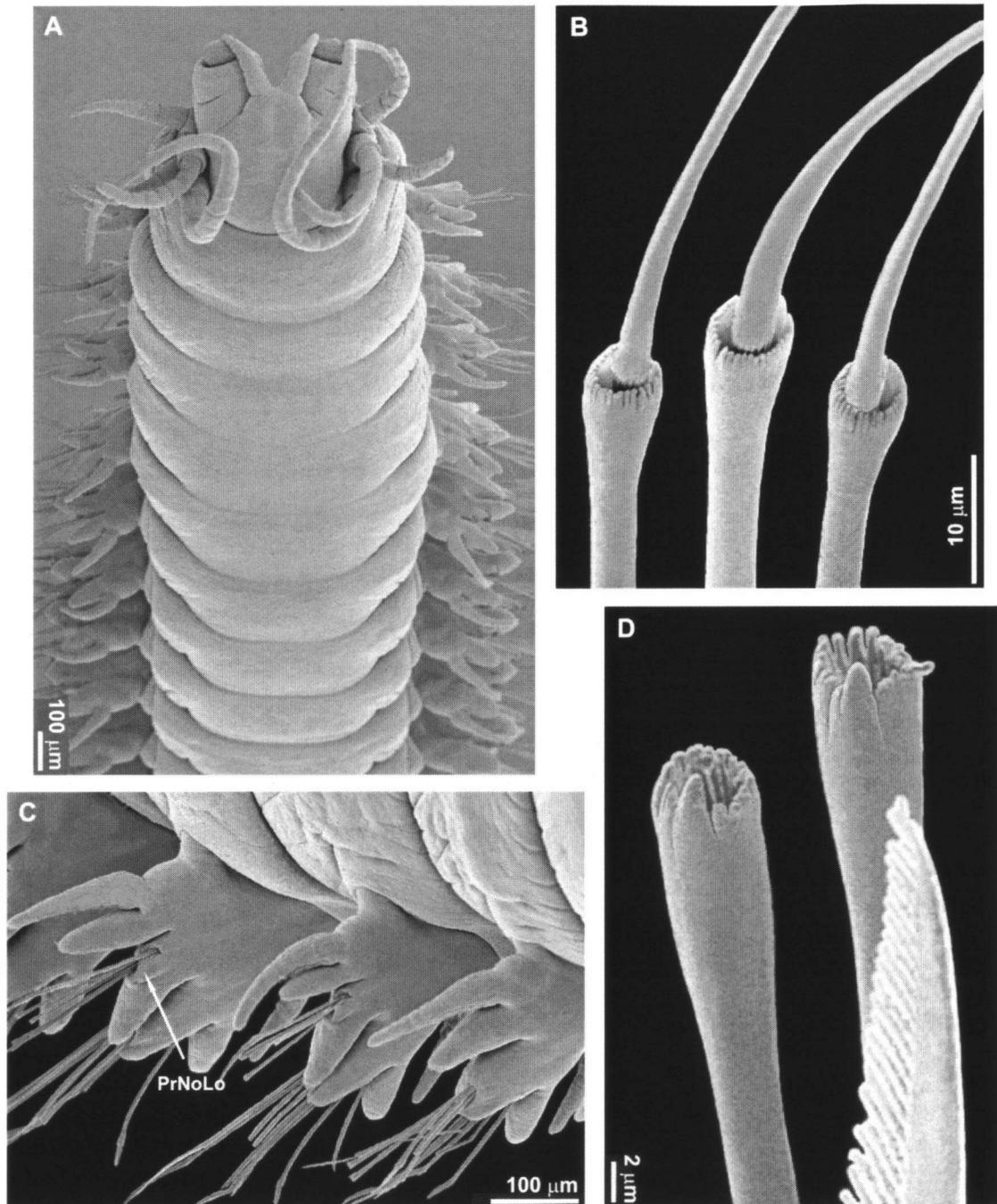


Fig. 10. *Neanthes ceciliae* n. sp. (atoke). A, anterior body (dorsal view). B, notopodial homogomph spinigers chaetae (chaetiger 17). C, parapodia 2 to 4 (anterior view). D, supra-acicular neuropodial homogomph spinigers shaft and neuropodial heterogomph falciger blade (chaetiger 2). Abbreviations as in Fig. 2.

rus in the first chaetigers, gradually shorter along the body. All parapodia similar in size; notopodium of posterior chaetigers slightly larger than neuropodium. Parapodia 1 and 2 with ventral notopodial (VeNoLi) and ventral neuropodial

(VeNeLi) ligules digitiform and same size; neuropodial acicula forming triangular lobes, shorter than ligules (Figs. 8A, 10C). Notopodium of chaetigers 3-7 with rounded and digitiform ligules (Figs. 8B, 10C) and short, rounded pre-

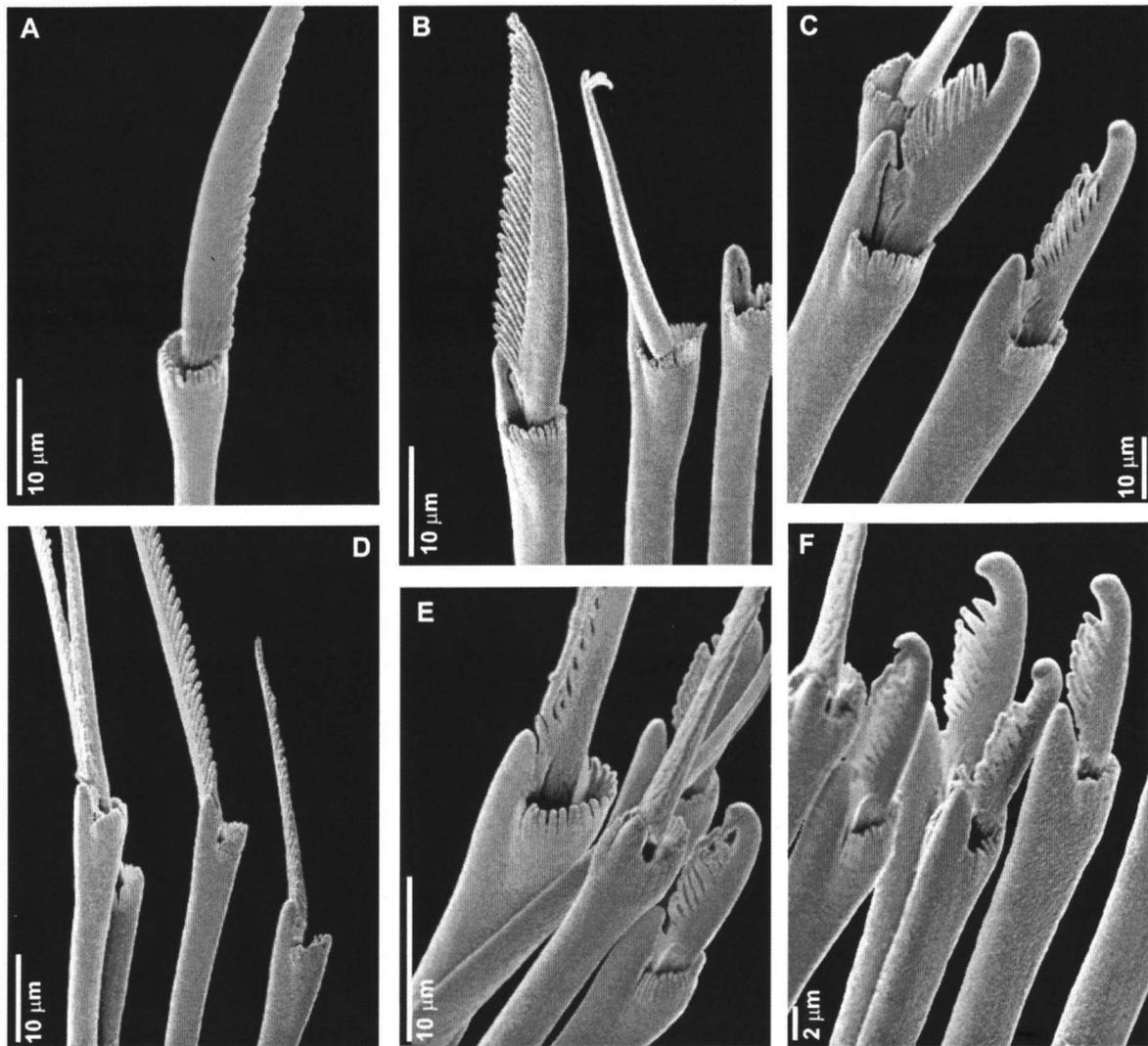


Fig. 11. *Neanthes ceciliae* n. sp. (atoke). Chaetae: A, supra-acicular neuropodial homogomph spiniger. B, supra-acicular neuropodial heterogomph falcigers (chaetiger 2). C, supra-acicular neuropodial heterogomph falcigers. D, subacicular neuropodial heterogomph spinigers and heterogomph falciger (chaetiger 1). E, subacicular neuropodial heterogomph spinigers. F, subacicular neuropodial heterogomph falcigers. Figs. A, C, E, F, chaetiger 17.

chaetal lobe (PrNoLo), inconspicuous in posterior chaetigers (Fig. 8F). Neuropodia without pre- and post-chaetal lobes, and acicula forming a triangular projection that is as long as or slightly shorter than ventral neuropodial ligule (VeNeLi), which is digitiform and shorter than the notopodial ligules after chaetiger 20. Parapodia 7-10 with rounded, inflated ligules (Fig. 8C). From chaetigers 11 to 19-21, ligules gradually triangular, from tip to base (Fig. 8D); from chaetigers 20-22 towards end of body all ligules are triangular (Figs. 8E-F).

All notopodial chaetae homogomph spinigers

(Figs. 9D, 10B). Neuropodial supra-acicular bundle of chaetae with homogomph spinigers (Figs. 10D, 11A) and heterogomph falcigers, with distal ligament present from chaetiger 8 (Figs. 9E, 11C) and gradually increasing in size throughout (Fig. 9G); subacicular bundle of chaetae with heterogomph spinigers (Figs. 9A, C, 11D, E) and falcigers (Figs. 9F, H, 11F); subacicular falcigers with distal ligament from chaetiger 30 (Fig. 9H). Falcigers of chaetigers 1 to 6-7 with long and minutely serrated blades in supra- (Figs. 10D, 11B) and subacicular (Figs. 9B, 11D) bundles, lig-

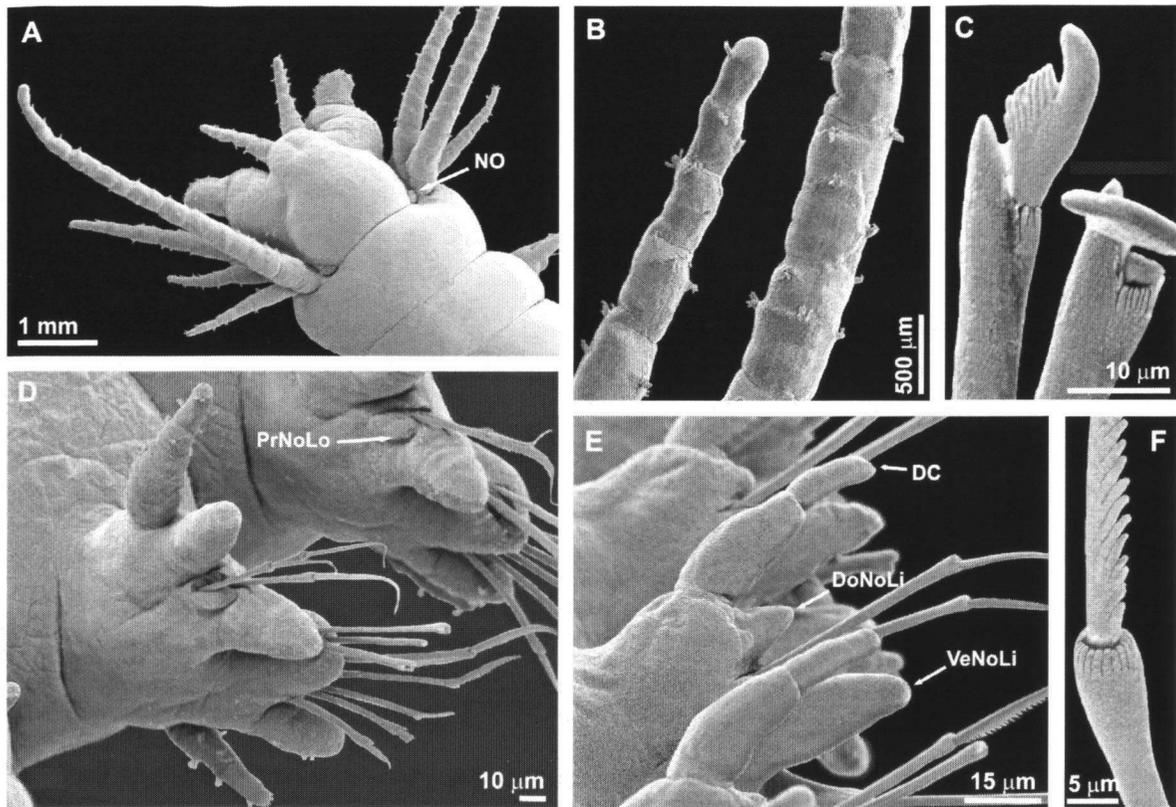


Fig. 12. *Neanthes ceciliae* n. sp. (juvenile). A, anterior body (dorsal view). B, detail of tentacular (= anterior) cirri. C, subacicular neuropodial heterogomph falcigers (chaetiger 23). D, parapodia 4 and 5. E, notopodium of parapodia 27 and 28. F, notopodial homogomph spiniger (chaetiger 4). NO = nuchal organ. Abbreviations as in Figs. 1 and 2.

ament absent, replaced by the chaetae described above. Supra-acicular falcigers are robust in comparison to other chaetae. Posterior part of body with chaetae slightly wider. Pygidium with two long, smooth, anal cirri, as long as the three last chaetigers (Fig. 7B).

NOTES. - Most of the specimens from São Paulo State show one paragnath in Area I; three specimens have two, two have three, and only one specimen has four paragnaths, the largest one always being located at the right side. Only one specimen (MHN-BPO-84/1), the largest and longest of the paratype series (and having gametes in the coelomatic cavity), has a large paragnath in Areas I and V. All specimens from the northeastern region lack paragnaths in Area I and have one paragnath in Area V. In spite of these differences, the colour pattern, shape of the lobes and ligules, as well as kind of chaetae of both types are the same. Most specimens have all

paragnaths light brown; only one specimen has dark brown paragnaths. In an inverted pharynx, the rows of paragnaths from Areas VII-VIII appear irregularly distributed.

Only two specimens of the paratype series have the dorsolateral dark spots along the entire body and not restricted to the anterior region; the parapodial internal tissues of these two animals are darker in the posterior region. It is possible that the dark spots continue towards the end of the body in live animals and disappear when fixed.

A constant number of chaetigers, 65-67, was observed in most of the complete animals, even the largest paratype (MHN-BPO 84/1).

The chaetae of heterogomph falcigers and spinigers have similar shafts. One side of the blade has a fringe. The supra-acicular heterogomph falcigers have a longer spine (Figs. 11B, C) than the subacicular spinigers and falcigers (Figs. 11E, F).

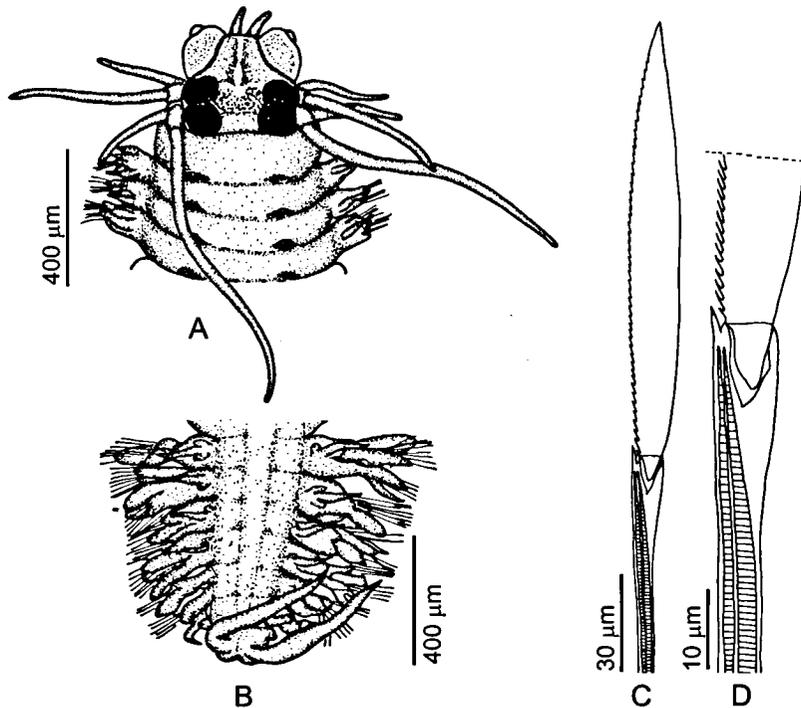


Fig. 13. *Neanthes ceciliae* n. sp. (epitoke). A, anterior body (dorsal view). B, pygidium. C, paddle-shaped chaeta. D, shaft (detail of distal end).

ATOKOUS JUVENILES. - Only one complete juvenile is present in the paratype series (MHN-BPO 84/24), being 3.5 mm long, 0.4 mm wide, with 33 chaetigers was observed; it showed some morphological differences from adults. Two other specimens, 5 and 10 mm long, with 36 and 50 chaetigers, respectively, were also collected, but morphological differences were not included.

The general appearance of the body is similar to adults, but is short and slightly fusiform, because of its shorter length. The colour pattern and pigmentation are identical to adults, but some morphological aspects of the anterior part of the body differ: anterior cirri and antennae are slightly longer, palps are inflated and palpostyles are rounded and not retracted (Fig. 12A). Viewed with SEM photos, the segmentation on cirri and antennae is obvious (Fig. 12B). Dorsal and ventral cirri of the anterior region are smooth, from chaetiger 25 both are bi-articulate (Fig. 12E). One pair of nuchal organs is located at the base of the prostomium (Fig. 12A) and is clearly present in juveniles. The nuchal organs are present in adults, but it is inconspicuous. Ciliary tufts are clearly present, dispersed irregularly on the antennae and the anterior (= peristomial cirri)

(Fig. 12A), dorsal and ventral cirri (Fig. 12D).

In individuals of this size class, the anterior and median parapodia do not differ from the adult (Fig. 12D). In juveniles, the posterior chaetigers have the DoNoLi reduced and triangular (Fig. 12E), while in adults only the three last chaetigers have this shape. The shape of ligules and lobes varies as follows: parapodia one to five with elongate and digitiform ligules, rounded and inflated in chaetigers six and seven. From chaetigers 8-14 the ligules are gradually triangular, from tip to base (Fig. 11D). From chaetiger 15 toward the end of the body, the ligules are triangular.

Juveniles have the same pattern of chaetae as adults. The only difference is the spine in the heterogomph chaetae, which is more prominent (Fig. 12C); the fringe is shorter.

The specimen has no trace of anal cirri.

EPITOKOUS ADULTS. - Of the 25 specimens from the São Paulo State, 13 have gametes in the coelomic cavity. Only three, the shortest ones, have a complete metamorphosis for the reproductive stage, showing important morphological alterations on the prostomium, parapodia and chaetae.

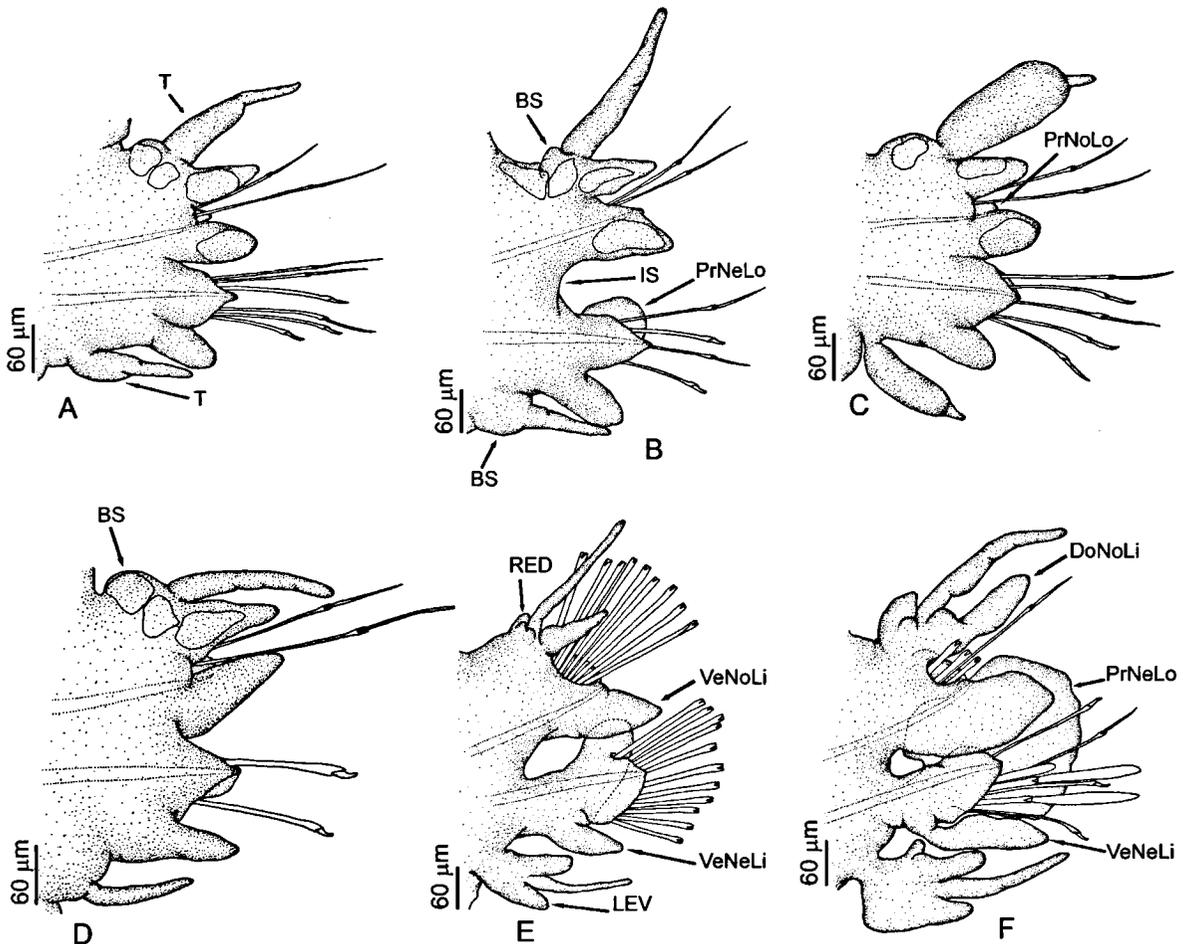


Fig. 14. *Neanthes ceciliae* n. sp. (epitoke). Parapodia (posterior view): A, chaetiger 6. B, chaetiger 40. C, chaetiger 6. D, chaetiger 19. E, chaetiger from posterior region (shaft of chaetae omitted). F, posterior region. BS = basal swelling, IS = interramal space, LEV = lateral expansion of ventral cirrus, RED = rounded expansion of dorsal cirrus, T = cirri thicken slightly. Other abbreviations as in Figs. 1 and 2. Figs. A, B, specimen MHN-BPO 84/1. Figs. C, E, specimen MHN-BPO 84/3. Figs. D, F, specimen MHN-BPO 84/2.

Based on observations of 10 specimens which show, to some degree, changes in the eyes and parapodia, it is possible to verify that the metamorphosis begins when the eyes increase in size, and then the ventral and dorsal cirri thicker in the first six chaetigers (Fig. 14A). Between chaetigers 20 and 35, the bases of dorsal and ventral cirri thicken slightly and the distance between the noto- and neuropodia increases. In this region, the dorsal cirri can be twice as long as the ligules (Fig. 14B). The beginning of metamorphosis of the parapodial lobes occurs in this region. It starts when the neuropodial pre-chaetal lobe (PrNeLo) enlarges. There are no changes in posterior chaetigers, which change only at a later stage. The largest paratype (MHN-BPO-84/1)

shows all these modifications clearly.

The following description is based on three specimens which are totally modified for reproduction (MHN-BPO-84/2 to 84/4).

The longest and only complete specimen is 10.8 mm long and has 62 chaetigers. The three specimens are 1-1.3 mm wide. The body is ovoid in transverse section, inflated in the first chaetigers. The colour pattern and pigmentation are the same as atokous specimens, as well as the length of the antennae, prostomium and palps. Because of the great enlargement of the eyes (which remain round) the prostomium (which remains the same size), and consequently the palps and antennae are curved downward; the palps are slightly globous (Fig. 13A). The anterior

peristomial cirri are longer, reaching chaetiger 5-7. The body shows two distinct parts: 1) composed of the first 18-20 chaetigers, with short, light brown parapodia (the morphological characters are relatively similar to the atokous specimens); 2) from chaetiger 20 to the end of the body, light yellow to white, with wider parapodia, greatly expanded lobes and ligules and paddle-shaped chaetae (Figs. 13C, D). In relation to parapodial morphology, three different regions were observed; the first and the second regions correspond to part one, and the third to part two.

First region: chaetigers one to six (Fig. 14C)

The dorsal and ventral cirri are wide, almost digitiform, distally papilliform and conical, twice as long as notopodial ligules. The shapes and lengths of ligules, and chaetae are the same as in atoke. The ventral cirri are narrower than the dorsal.

Second region: chaetigers 7 to 19-21 (Fig. 14D)

This region is located where the parapodia are inflated (chaetigers 7 to 10) and where the ligules are gradually triangular (chaetigers 11 to 19-21). Epitokous animals show no significant alterations. There are fewer chaetae. The only evident difference is in the shape of the dorsal and ventral cirri, which are slightly more slender, with the base rounded and inflated.

Third region: chaetigers 20 to posterior end (Figs. 14E, F)

In atokous specimens, this region corresponds to parapodia where ligules are triangular (from chaetigers 20-22). The ventral cirri are longer and more slender, and have two lateral expansions. The dorsal cirri form three short, rounded expansions at the base. The ventral notopodial ligule (VeNoLi) is longer than the dorsal (DoNoLi) and is triangular. The small pre-chaetal notopodial lobe (PrNoLo) expands laterally to shelter a large bundle of paddle-shaped chaetae. The pre-chaetal neuropodial lobe (PrNeLo) forms an upwardly directed auricular expansion. The dorsal notopodial (DoNoLi) and the ventral neuropodial (VeNeLi) ligules do not expand, but are gradually longer until the end of the body.

NOTES. - The paratype MHN-BPO-84/3, is in an advanced stage of metamorphosis. The basal expansions of the dorsal and ventral cirri are larger (Fig. 14F). The DoNoLi and VeNeLi are

longer and the PrNeLo is more expanded, and its superior part is inserted under the VeNoLi.

The paratype MHN-BPO-84/2 has all atokous chaetae from chaetigers 22-23 replaced by paddle-shaped chaetae, although the specimen has not reached the greatest point of metamorphosis (Fig. 14E). On the other hand, the specimen MHN-BPO-84/3 has fewer paddle-shaped chaetae.

The distribution of paragnaths does not vary from atokes, and the pygidium has one pair of smooth, inflated anal cirri (Fig. 13B).

DISCUSSION. - *Neanthes ceciliae* n. sp. is similar to *N. indica brunnea* Day (1957), *N. agulhana* Day (1963) and *N. maculata* Wu, Ruiping & Yang (1985) in general body shape, colour, and shape of parapodial lobes and ligules. However, some differences can be seen in Table 1.

Neanthes indica brunnea has one longitudinal row of paragnaths in Area I. A few additional differences can be observed in the paragnath distribution. Also, the PrNoLo of this species is longer and the dorsal and ventral cirri are relatively shorter than *N. ceciliae* n. sp. A pair of dorsolateral dark spots also occur in *N. indica brunnea*, but it appears on chaetiger 3 and is present on only a few segments. Also a clear PrNeLo is present in this species and absent in *N. ceciliae*.

Neanthes agulhana differs from *N. ceciliae* n. sp. with respect to the absence of paragnaths in Area I, as well as the presence of one simple row of paragnaths in Areas V, VII-VIII. The parapodial ligules in *N. agulhana* are longer and acuminate, as in *N. maculata*. Wu et al. (1985) did not mention the presence of supra-acicular homogomph spinigers in anterior chaetigers, as well as subacicular heterogomph spinigers in median and posterior chaetigers. However, the genus *Neanthes* is characterised by the presence of both chaetae. The three species have longer anterior cirri than in *N. ceciliae* (in *N. maculata* these may reach chaetiger 7).

OCCURRENCE. - Intertidal. Beaches with medium and coarse sand mixed with rocky fragments; beaches with very fine sand and silt and clay mixed with shell fragments. In rocky shore: among algae.

Table 1. Comparison of *Neanthes ceciliae* with allied species.

Paragnaths/ Areas	<i>Neanthes ceciliae</i> n. sp.	<i>N. indica brunnea</i> Day, 1957	<i>N. agulhana</i> Day, 1963	<i>N. maculata</i> Wu, Ruiping & Yang, 1985
I	1-4 2 (1 transverse row) 3 (triangle) 4 (square) 2-3	(1 longitudinal row)	0	1-3
II	9-14 (2 curved rows)	(2 curved rows)	8-9 (2 rows)	6-12 (2 curved rows)
III	12-20 (2-3 irregular transverse rows)	7-10 (circular group)	5-6 (in a crescent)	6-18 (2 transverse rows)
IV	12-20 (2 curved rows)	(2-3 curved rows)	10 (in curve)	10-18 (2-3 rows)
V	0-1	0	0	0-1
VI	8-12 (circular group)	6-7 (2 transverse rows)	2-4 (transverse row)	2-4 (transverse row)
VII-VIII	- 1 row of 12 to 15 large paragnaths - 1 row of 15 to 20 small paragnaths	2-3 irregular rows	1 simple row of 3-5 paragnaths	1 simple row of 5-7 paragnaths

ETYMOLOGY. - The species is named in honor of the Brazilian researcher, Antonia Cecilia Z. Amaral, specialist in polychaete systematics and ecology.

ACKNOWLEDGEMENTS

We express our gratitude to the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) through the Program BIOTA/FAPE-SP, the Coordenação de Apoio de Pessoal de Nível Superior (CAPES), the Fundação de Amparo à Pesquisa (FAEP/UNICAMP) and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for financial support; to the Departamento de Zoologia, IB, UNICAMP and Centro de Biologia Marinha, Universidade de São Paulo (USP) for technical support; to the Faculty of the Postgraduate Course of the Departamento de Zoologia, IB, USP; to the following colleagues for the donation of some specimens examined: Marcus Vinícius de Almeida (Universidade Federal de Sergipe), José Roberto Botelho (Universidade Federal de Pernambuco), Orlei Negrello (Universidade Federal do Paraná) and Arno Blankensteyn (Universidade Federal de Santa Catarina). CSGS thanks Rosângela Gondim (Universidade Federal do Rio Grande do Norte) and Tereza Callado (Universidade Federal de Alagoas) for hosting her during the collections. Janet Reid revised the English text.

REFERENCES

- AMARAL, A.C.Z. & E.H. MORGADO, 1994. Alteraciones en la fauna de anelidos poliquetos de Araçá, São Sebastião (São Paulo, Brasil). Rev. Acad. Colomb. Cienc. **19**: 147-152.
- AMARAL, A.C.Z., E.H. MORGADO, P.P. LOPES, L.F. BELUCIO, F.P.P. LEITE & C.P. FERREIRA, 1990. Composition and distribution of the intertidal macrofauna of sandy beaches on São Paulo coast. Publ. ACIESP, São Paulo **3**: 258-279.
- BAKKEN, T., 2003. A new species of *Neanthes* (Polychaeta: Nereididae) from Southern Australia. Mem. Mus. Victoria **59**: 327-331.
- BEMVENUTI, C.E., 1983. Efeitos da predação sobre as características estruturais de uma comunidade macrozoobentônica numa Enseada Estuarina da Lagoa dos Patos, R.S. Brasil: 1-120 (MSci thesis, Universidade do Rio Grande, Rio Grande, Brasil).
- CORBISIER, T.N., 1991. Benthic macrofauna of sandy intertidal zone at Santos estuarine system, São Paulo, Brazil. Bolm. Inst. oceanogr. S. Paulo **39**: 1-13.
- DAY, J.H., 1957. The polychaete fauna of South Africa. Part 4. New species and records from Natal and Mozambique. Ann. Natal Mus. **14**: 59-129.
- DAY, J.H. 1963. The polychaete fauna of South Africa. Part 8. New species and records from grab samples and dredgings. Bull. Br. Mus. (Nat. Hist.) Zool. **10**: 384-445.
- DUARTE, L.F.L. & R.C. NALESSO, 1996. The sponge *Zygomycale parishii* (Bowerbank) and its endobiotic fauna. Est. Coast. Shelf Sci. **42**: 139-151.
- FERREIRA, C.P., 1989. Manguezais do Estado do Pará: fauna de galerias perfuradas por Teredos em toras de *Rhizophora*: 1-160 (PhD thesis, Universidade Estadual de Campinas, São Paulo, Brasil).
- HANSEN, A., 1882. Recherches sur les Annélides recueillies par M. le Professeur Eduard van Beneden pendant son

- voyage au Brésil et à la Plata. Acad. Roy. Sci. Belg. Bruxelles, Mém. **44**: 1-29.
- HYLLEBERG, J., A. NATEEWATHANA & S. BUS-SARAWIT, 1986. Polychaetes of Thailand, Nereidae. Part. 1. *Perinereis* and *Pseudonereis* with notes on species of commercial value. Phuket Mar. Biol. Center **43**: 1-22.
- IRVING, M.A., 1991. Estrutura da macroinfauna bêntica da zona entremarés de Sepetiba (Rio de Janeiro, Brasil): Aspectos descritivos e metodológicos: 1-179 (PhD thesis, Universidade de São Paulo, São Paulo, Brasil).
- LANA, P.C., 1984. Anelídeos poliquetas errantes do litoral do Estado do Paraná: 1-275 (PhD thesis, Universidade de São Paulo, São Paulo, Brasil).
- LANA, P.C., 1986. Macrofauna bêntica de fundos sublitorais não consolidados da Baía de Paranaguá (Paraná). Nerítica **1**: 79-89.
- LANA, P.C. & H.H. SOVIERZOSKI, 1987. *Neanthes bruaca* n. sp. e *Nereis broa* n. sp. (Nereididae: Polychaeta) da costa sudeste do Brasil. Arq. Biol. Tecnol. **30**: 677-688.
- MORGADO, E.H., 1980. A endofauna de *Schizoporella unicomis* (Johnston, 1847) (Bryozoa), no littoral norte do Estado de São Paulo: 1-118 (MSci thesis, Universidade Estadual de Campinas, São Paulo, Brasil).
- MORGADO, E.H., 1988. Anelídeos poliquetos do sublitoral da região de Ubatuba, São Paulo, compreendida entre as ilhas Anchieta e Vitória: 1-180 (Universidade Estadual de Campinas, São Paulo, Brasil).
- ORENSANZ, J.M. & N.M. GIANUCA, 1974. Contribuição ao conhecimento dos anelídeos poliquetas do Rio Grande do sul, Brasil. I. Lista sistemática preliminar e descrição de três novas espécies. Comun. Mus. Ciênc. PUCRS **4**: 1-37.
- PAIVA, P.C., 1993. Anelídeos poliquetas da plataforma continental norte do Estado de São Paulo. I. Padrões de densidade e diversidade específica. Bolm. Inst. oceanogr. S. Paulo **41**: 69-80.
- RULLIER, F. & L. AMOUREUX, 1979. Annelides Polychètes. In: Résultats scientifiques des campagnes de la Calypso, fasc. 11. Campagne de la Calypso au large des côtes atlantiques de l'Amérique du Sud (1961-1962). I. 33. Ann. Inst. Océanogr. **55**: 145-206.
- SANTOS, C.S.G., 1996. Nereididae (Annelida, Polychaeta) da Costa Nordeste do Brasil (20S - 18oS): 1-170 (MSci thesis, Universidade Federal do Paraná, Paraná, Brasil).
- SANTOS, M.A. & A.C.Z. AMARAL, 1980. Anelídeos poliquetos do estuário do Rio Sergipe, Brasil. Rev. Nordestina Biol. **3**: 234.
- SANTOS, M.A., C.S.G. SANTOS & C.M. OLIVEIRA, 1994. Polychaeta in the estuary of the Piauí River, Sergipe, Brazil. Mém. Mus. Hist. nat. Paris **162**: 541-547.
- TARARAM, A.S., 1994. Distribuição espacial e temporal da macrofauna bentopelágica em marisma da região de Cananéia (SP, Brasil): 1-169 (PhD thesis, Universidade de São Paulo, São Paulo, Brasil).
- WU, B., S. RUIPING & J. YANG, 1985. The Nereidae (polychaetous annelids) for the Chinese Coast. Ocean Press, Beijing 1-234.

Received: October 1, 2002