



On *Polycirrus changbunker* sp. nov. (Annelida: Terebelliformia: Polycirridae), a new species of polycirrid worms from southwestern Atlantic

JOÃO MIGUEL DE MATOS NOGUEIRA^{1,3*}, PLÍNIO FERREIRA VAN DEURSEN^{1,4}, NATÁLIA RANAURO^{1,5} & ORLEMIR CARRERETTE^{1,2,6}

¹Laboratório de Poliquetologia (LaPol), Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, Rua do Matão, travessa 14, n. 101, 05508-090, São Paulo, SP, Brazil;

²Laboratório de Ecologia e Evolução de Mar Profundo, Departamento de Oceanografia Biológica, Instituto Oceanográfico, Universidade de São Paulo, Praça do Oceanográfico, 191, 05508-120, São Paulo, SP, Brazil, São Paulo, Brazil

³✉ nogueira@ib.usp.br; <https://orcid.org/0000-0002-8450-4294>

⁴✉ pinovd@gmail.com; <https://orcid.org/0000-0002-9417-6255>

⁵✉ nataliaranauro@ib.usp.br; <https://orcid.org/0000-0002-3533-7311>

⁶✉ orlemir@gmail.com; <https://orcid.org/0000-0003-2031-603X>

*Correspondence: ✉ nogueira@ib.usp.br

Abstract

Polycirrus changbunker sp. nov. is herein described, from specimens collected off the states of Paraná (type locality, southern Brazil), São Paulo (southeastern Brazil), and Pernambuco and Paraíba (northeastern Brazil). Members of *Polycirrus changbunker* sp. nov. present 31–43 pairs of notopodia, bearing pinnate and narrowly-winged chaetae, neuropodia beginning on segment 9, bearing type 1 uncini sensu Glasby & Glasby (2006) throughout, paired ventro-lateral glandular pads on segments 3–13, and nephridial and genital papillae on segments 3–8. A full description for members of *Polycirrus changbunker* sp. nov. is herein provided, together with a comparison with the individuals of the most similar congener species.

Key words: “Polychaeta”, new species, taxonomy, morphology, southeastern Brazil

Introduction

Polycirrids are a well defined group of terebelliform polychaetes, characterized by the presence of (1) at least two types of buccal tentacles; (2) a circular upper lip, frequently folded in three lobes; (3) segment 2 distinctly narrower than following segments, constricting the anterior end right after the mouth; (4) paired ventro-lateral glandular pads on anterior segments, separated from each other within pairs by mid-ventral groove, (5) which extends from the first segments after the mouth to posterior end; (6) absence of branchiae; (7) bilobed notopodia, bearing (8) pinnate and/or winged notochaetae, with wings of variable width; and (9) thin and usually distinctly small uncini of two types sensu Glasby & Glasby (2006), depending on the presence of a posterior handle directed downwards and an elongate neck (Fitzhugh *et al.* 2015; Hutchings *et al.* 2017).

The group was initially described as a subfamily of Terebellidae (Malmgren 1867) and so it has been considered for almost 150 years (Hessle 1917; Fauvel 1927; Day 1967; Fauchald 1977; Hutchings & Glasby 1986; Glasby *et al.* 2004; Nogueira *et al.* 2010), until Nogueira *et al.* (2013), after a phylogenetic analysis based on morphological characters only, suggested that all the subfamilies of Terebellidae considered by that time originated independently along the evolution of terebelliforms. Thus, all those groups should be raised to familiar level.

Recently, Stiller *et al.* (2020) studied the relationships within Terebelliformia, by means of a combination of molecular and morphological data, and restored the subfamilial status for Polycirridae. However, although Stiller *et al.* (2020) used a much more comprehensive set of taxa than previous studies (Colgan *et al.* 2001; Rousset *et al.* 2003; Glasby *et al.* 2004), many important species are still missing, including nearly all

telothelepodids, and we have questions in regards to their interpretation of several morphological characters. For that reason, we prefer to keep the previous classification, as proposed by Nogueira *et al.* (2013), at least for the time being.

The internal relationships among members of Polycirridae was the subject of another phylogenetic study based on morphological characters (Fitzhugh *et al.* 2015), which confirmed the monophyly of the family, but did not find monophyletic genera within the group, except for *Hauchiella* Levinsen, 1893, with only two species known by that time. Instead, all the genera of Polycirridae currently considered, *Amaeana* Hartman, 1959, *Hauchiella* and *Lysilla* Malmgren, 1866 and the monotypics *Biremis* Polloni, Rowe & Teal, 1973 and *Enoplobranchus* Verrill, 1879 are nested within *Polycirrus* Grube, 1850, with the species of *Amaeana* and *Lysilla* mixed up in an apomorphic clade (Fitzhugh *et al.* 2015). The authors however, preferred to keep the traditional taxonomic classification of polycirrids in six genera, instead of synonymising them all in *Polycirrus*, at least until molecular studies are performed, to test the morphological results.

In a recent phylogenetic study of Terebelliformia, combining both molecular and morphological data, Stiller *et al.* (2020) also found *Polycirrus* to be paraphyletic, although the authors did not include the type species of the genus (*P. medusa* Grube, 1850) in their study.

Polycirrus is the most diverse genus of the family, currently with 84 valid species (Read & Fauchald 2020), seven of which were originally described from Brazilian specimens (Carrerette & Nogueira 2013). In the present paper, we describe another species of *Polycirrus*, from animals commonly found on rocky shores off the northern coast of the state of São Paulo through the years, in field classes of the course in Biological Sciences of Instituto de Biociências, Universidade de São Paulo (IB-USP), and also in collections our team made from the state of Paraná, southern Brazil, through the states of Paraíba and Pernambuco, northeastern Brazil.

Material and methods

The specimens studied are lodged in the Museu de Zoologia da Universidade de São Paulo (MZUSP) and Museu de Zoologia da Universidade Estadual de Campinas (ZUEC, UNICAMP). This published work and the nomenclatural acts it contains have been registered in ZooBank, the online registration system for the ICZN. The new species was registered at Zoobank under the LSID: urn:lsid:zoobank.org:act:3086AF05-5799-43C3-B2F5-0EC6BB0E8A6F.

Specimens were studied using stereomicroscopes and voucher representatives were photographed under stereo-, light and scanning electron microscopes. Notochaetae and neuropodia were removed from different regions of the body of representatives, mounted on slides with Aquatex®, and examined and photographed using compound microscope. For SEM examination, the specimens were dehydrated in a series of ethanol solutions in progressively stronger concentrations, from 70–100 %, then critical-point dried, sputter-coated with gold, and examined at the Laboratório de Microscopia Eletrônica, Instituto de Biociências, Universidade de São Paulo (IB-USP). Photos under stereo- and compound microscopes were taken at the Laboratório de Poliquetologia (LaPol), IB-USP. Under stereomicroscope, the specimens were kept in position with a glass coverslip and photographed from a Petri dish with a black base. Mounted images, integrating several focal planes, were produced with Helicon Focus version 5.3. All photos were edited with Adobe Photoshop CS6 software.

The description below was made from all the specimens examined, data of the holotype is provided inside parentheses, after the range of variation observed among the specimens for each character.

Our type series includes specimens from two localities, separated by ~600 km. This is because, although we collected hundreds of specimens in Paranaguá, most of that material was lost, except for the animals which were photographed alive, and for that reason were designated as the holotype and paratypes 1 and 2 (which was also examined under SEM). So, in order to include more specimens in the type series, we also designated as paratypes the complete specimens recently obtained from Praia do Araçá, São Sebastião, which were also studied alive and match perfectly the characters of the holotype and paratypes 1 and 2. The material from northeastern Brazil was also studied alive and match perfectly the characters of the type specimens, but since no molecular studies were yet performed, we prefer not to include them in the type series, because they come from places more than 3,000 km away from the type locality (Fig. 1).

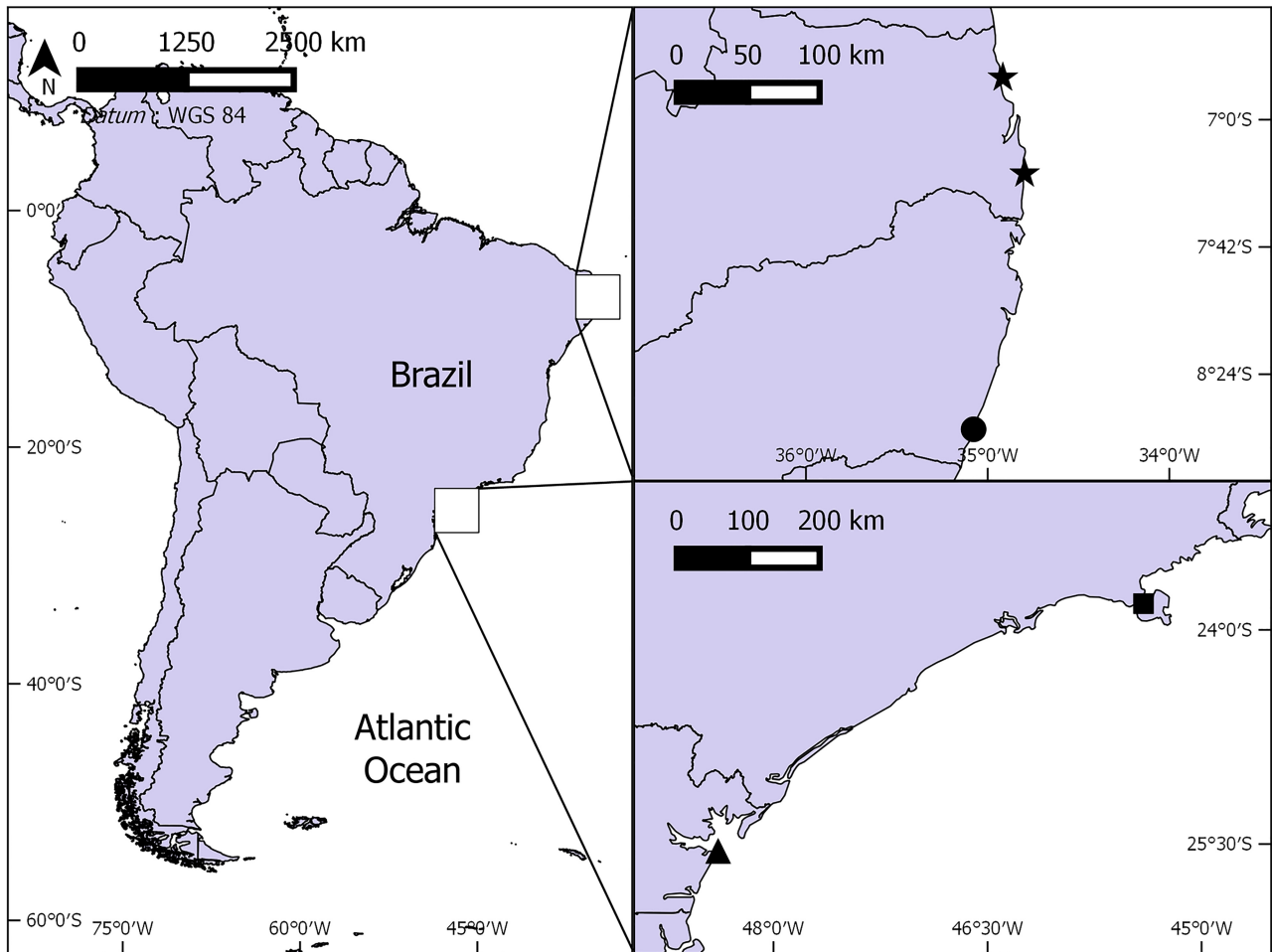


FIGURE 1. Distribution of *Polycirrus changbunker* sp. nov. ▲ = Paranaguá Bay (type locality; state of Paraná); ■ = São Sebastião (state of São Paulo); ● = Almirante Tamandaré (southern Pernambuco); ★ = Conde (southern Paraíba) and Rio Tinto (northern Paraíba).

Taxonomy

Family Polycirridae Malmgren, 1867

Genus *Polycirrus* Grube, 1850

Type species: *Polycirrus medusa* Grube, 1850, by monotypy.

Description. Transverse prostomium attached to dorsal surface of upper lip; basal part as thick crest, eyespots absent; distal part either as flaring lobes at base of upper lip, or extending along upper lip until near anterior border of lip; prostomium frequently extending ventrally, terminating laterally to mouth. Buccal tentacles of two types at least, short ones thin, uniformly cylindrical, long tentacles expanded at tips, spatulate, or more specialized, with subdistal cylindrical swelling and pointed to blunt tip. Peristomium forming lips; lips expanded, upper lip large, frequently circular and convoluted, folded into three lobes; swollen lower lip, only mid-ventral or cushion-like across ventrum, sometimes extending posteriorly through a few segments. Segment 1 visible all around, or reduced to completely hidden; segment 2 distinctly narrower than following segments, usually with rectangular or pentagonal mid-ventral shield at beginning of mid-ventral groove, sometimes extending anteriorly through segment 1 until near posterior margin of lower lip. Anterior segments with paired ventro-lateral pads, separated from each other within pairs by mid-ventral groove. Body wall

frequently papillated throughout, papillae distinctly larger and more abundant on ventro-lateral pads of anterior segments; pads usually from segments 2 or 3 to near termination of notopodia, from almost smooth to highly corrugated or tessellated. Notopodia extending for variable number of segments; bilobed, elongate notopodia, post-chaetal lobes sometimes longer. Notochaetae winged, wings of variable width, usually conspicuous under light microscopy, or pinnate, sometimes both types present on same parapodium, one in each row. Neuropodia beginning from: (1) anterior segments; (2) posterior thoracic segments; (3) 1–2 last segments with notopodia; or (4) only after notopodia terminate, sometimes leaving gap of some achaetous segments. Neurochaetae as avicular uncini of types 1 or 2, rarely both types present, type 1 on thoracic chaetigers and type 2 on abdomen. Nephridial and genital papillae usually present, anteriorly to bases of notopodia, only on anterior segments or until termination of notopodia, or near it. Pygidium smooth or with rounded ventral papilla (Fitzhugh *et al.* 2015; Nogueira *et al.* 2015; Hutchings *et al.* 2017), but this character largely depends on fixation.

Remarks. *Polycirrus* is the most diverse genus of Polycirridae and, as occurs with many other taxa of polychaetes, several species were described centuries ago, with brief original descriptions, not including important taxonomic characters, considering the current criteria, and in several cases the type material is lost or has never been formally designated. As a result, several species were later reported from localities very far away from the original type localities, rendering those taxa a mistaken cosmopolitan distribution (Hutchings & Kupriyanova 2018).

In order to solve that problem, Glasby & Hutchings (2014) reviewed and redescribed all the species known by that time, of which type material could be located. In the case of *P. medusa* Grube, 1850, the type species of the genus, a neotype was designated from the type locality. In the cases of species which type material could not be located, there was no material available from the corresponding type localities and the original descriptions did not provide enough information to clearly characterize those taxa, they were designated to as “*species inquirenda*” (Glasby & Hutchings 2014).

Since the study by Glasby & Hutchings (2014), 16 additional species were described (Nogueira *et al.* 2015; Cepeda & Lattig 2016; Lavesque *et al.* 2020), resulting in 84 valid species in this genus so far (Read & Fauchald 2020). Out of those, seven species were described from Brazilian material and six additional species described from other localities have been identified among Brazilian material, but those records are doubtful, since no descriptions were provided and the material was not deposited in any permanent collection (Amaral *et al.* 2013; Carrerette & Nogueira 2013).

Representatives of a new species of *Polycirrus* were obtained in field classes of the course in Biological Sciences of IB-USP, as well as in several collections for biodiversity projects carried out by our laboratory team, from the state of Paraná, southern Brazil, through Paraíba, northeastern Brazil. Initially, few specimens were obtained and in poor state of preservation; for that reason, that species was not included in a recent paper which described four new species of *Polycirrus* from Brazilian waters (Carrerette & Nogueira 2013). But more specimens were obtained in samples through the years and finally we have material enough to be confident of the characters of the species, as well as the intraspecific variation observed among these animals. The description of that new species is given below.

***Polycirrus changbunker* sp. nov. (Figs 2–6)**

Polycirrus sp. Alves 2008: 119–124, Figs 44–45.

Polycirrus sp. nov. Carrerette 2015: 45–48, Figs 14–16.

Blankensteyn 1988: 83–85, Figs 20, 24.

Material examined. Type series. Holotype and paratypes 1–2 from Pontal do Sul (25°32'56.2"S 48°23'18.4"W), Paranaguá Bay, state of Paraná, 10 Jul 2014, 2–4 m, artificial pier; holotype (MZUSP 4032) complete female, in excellent state of preservation, ~15 mm long, 0.8 mm wide, with 64 segments, notopodia present until segment 43 (41 pairs); paratype 1 (ZUEC 21354) also complete and in excellent state, 11 mm long, 0.9 mm wide, with 50 segments, notopodia present until segment 33 (31 pairs); paratype 2 (MZUSP 4033) also complete and in excellent state, mounted on SEM stub. Paratypes 3–8 coll. Praia do Araçá (23°48'58"S, 45°24'25"W), São Sebastião, state of São Paulo, 23 Oct 2018, intertidal, on rocks, among algae, sponges and other biological substrates, all complete and in good or excellent state of preservation; paratype 3 (MZUSP 4034) ~13 x 0.5

mm, with 51 segments, notopodia until segment 33 (31 pairs); paratype 4 (ZUEC 21355) ~18 x 0.8 mm, 63 segments, notopodia until segment 35 (33 pairs); paratype 5 (ZUEC 21356) ~12 x 0.9 mm, 53 segments, notopodia until segment 33 (31 pairs); paratype 6 (MZUSP 4035) ~18 x 0.9 mm, 78 segments, notopodia until segment 43 (41 pairs); paratype 7 (ZUEC 21357) ~15 x 0.8 mm, 64 segments, notopodia until segment 45 (43 pairs); paratype 8 (MZUSP 4036) ~21 x 0.95 mm, 70 segments, notopodia until segment 38 (36 pairs).

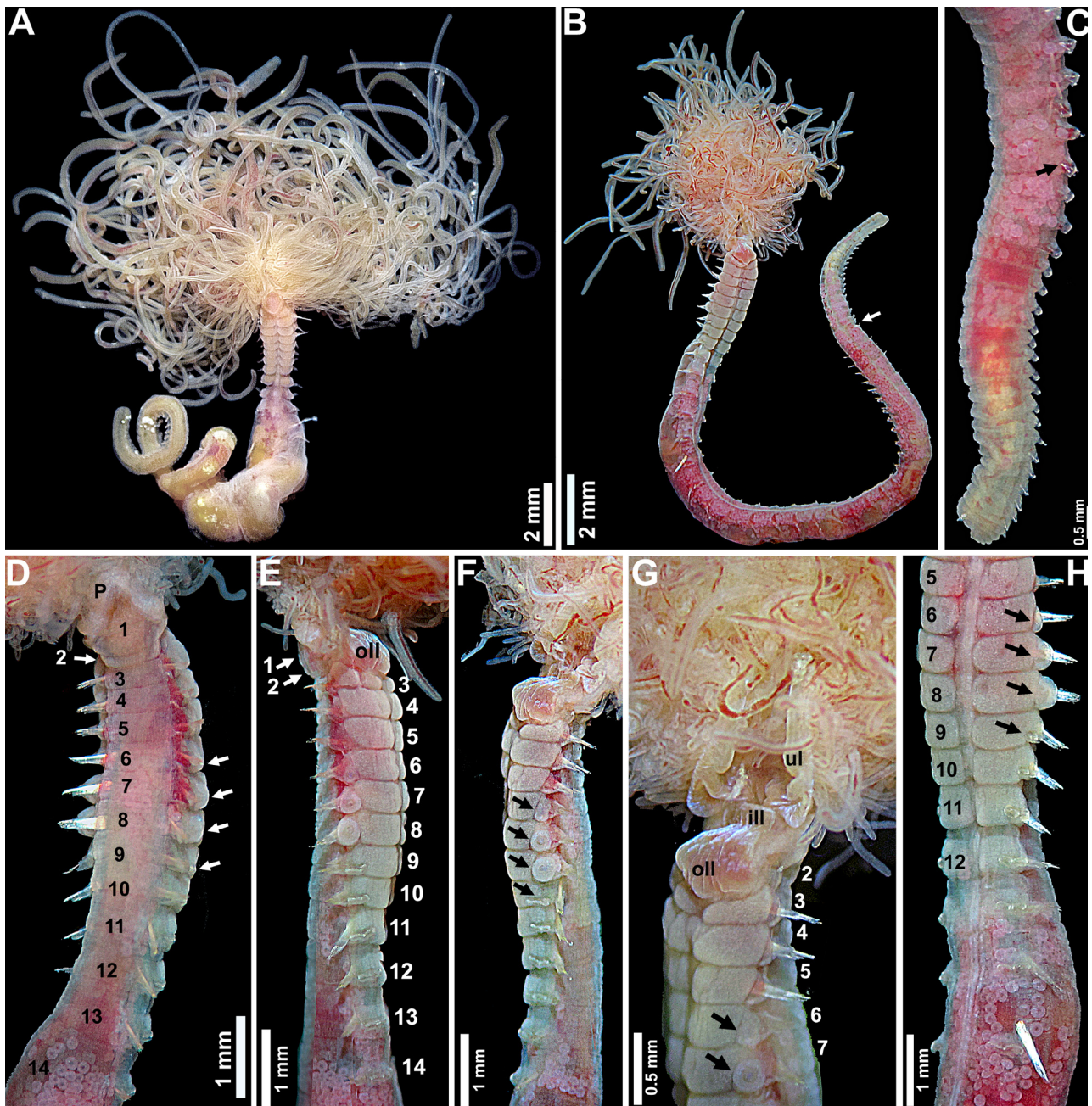


FIGURE 2. *Polycirrus changbunker* sp. nov., alive, (A) Paratype 1 (ZUEC 21354), (B–H) Holotype (MZUSP 4032). (A–B). Entire worms, arrow in (B) points to last notopodium; (C). Posterior end, arrow points to last notopodium; (D–F). Anterior end in dorsal, right and left lateral views, respectively; (G). Close up of the anterior end, in left lateral view; (H). Termination of the ventro-lateral glandular pads. Numbers refer to segments, unspecified arrows on segments 3–8 point to nephridial and genital papillae, on segment 9, to first neuropodium; ill = inner region of the lower lip; oll = outer region of the lower lip; P = basal part of prostomium; ul = upper lip.

Additional material. State of Paraná (southern Brazil): coll. Pontal do Sul (25°32'56.2"S 48°23'18.4"W), Paranaguá Bay, 10 Jul 2014, 2–4 m, artificial piers, 215 specs (not preserved, see below). State of São Paulo (southeastern Brazil): São Sebastião, Praia do Araçá (23°48'58"S 45°24'25"W), on rocks, among algae,

sponges and other biological substrates, 3 specs (MZUSP 4037, ZUEC 21358), coll. 23 Oct 2018. State of Pernambuco (northeastern Brazil): Almirante Tamandaré, Recife dos Carneiros (08°42'10"S 35°04'40"W), intertidal, on rocks, among algae, sponges and other biological substrates, 1 spec. (MZUSP 4038), coll. 15 Jan 2014. State of Paraíba (northeastern Brazil): Conde, Praia de Jacumã (07°17'48"S 34°47'50"W), intertidal, on rocks, among algae, sponges and other biological substrates, 1 spec. (MZUSP 4039), coll. 29 Jan 2010; Rio Tinto, Barra de Mamanguape (06°46'08"S 34°55'01"W), intertidal, on rocks, among algae, sponges and other biological substrates, 1 spec. (MZUSP 4040), coll. 11 Aug 2011.

Description. Cylindrical body, slightly stouter anteriorly, swollen dorsally at mid-thorax, with thin and fragile body wall, from segment 13 to slightly before termination of notopodia, then uniformly cylindrical, tapering posteriorly (Figs 2A–H; 3A–F; 4A, D–E, G). In life, body with strong orange to red pigmentation, with whitish ventro-lateral pads (Fig. 2A–H); preserved specimens without pigmentation (Fig. 3A–F). Complete specimens with 50–78 segments (64), longest specimen paratype 8, ~21 mm long, ~0.95 mm wide anteriorly, with 70 segments, but paratype 6, although shorter, has 78 segments, and the holotype is ~15 mm long and 0.8 mm wide, with 64 segments. Transverse prostomium attached to dorsal surface of base of upper lip; basal part as thick, inverted V-shaped crest, extending ventrally and terminating laterally to mouth; distal part convoluted, extending along upper lip and terminating near its anterior margin (Figs 2D; 3A–F). Buccal tentacles of two types, long tentacles slightly expanded for long extension distally, cylindrical, deeply grooved; short tentacles uniformly cylindrical (Figs 2A–B, D–G; 3A–F; 4A–E). Peristomium forming lips; triangular upper lip, hood-like, longer than wide and heavily ciliated; swollen lower lip, divided in two parts, inner region as short rectangular cushion, not always visible, outer region as large pentagonal to circular cushion, extending posteriorly through segments 1 and 2, reaching anterior margin of segment 3 (Figs 2A–B, E–G; 3B–F; 4A–C, E). Segment 1 only present dorsally, triangular; segment 2 narrower than following segments, covered ventrally by expanded outer region of lower lip (Figs 2D–G; 3A–F; 4C–E). Ventro-lateral pads of anterior segments present until segment 13, last 2 pairs progressively less developed, last pair very reduced, frequently inconspicuous; pads swollen, rectangular, frequently with transverse groove at mid-length and several longitudinal grooves (Figs 2A–B, E–H; 3B–F; 4A–E), but some paratypes have apparently smooth pads (see below). Notopodia extending for 31–43 segments (41), until segments 33–45 (43), variation in number apparently related to size, but all specimens with region with notopodia corresponding to $\frac{2}{3}$ to $\frac{3}{4}$ of total body length, due to abdominal segments being densely packed (Fig. 2B–C). Elongate, bilobed notopodia, posterior lobe longer, digitiform, distally pointed (Figs 2D–H; 3A–F; 4A, D–F; 6A); first three pairs of parapodia (= notopodia), on segments 3–5, progressively longer, but distinctly shorter than following pairs; parapodia of segments 6–8 distinctly larger, due to genital papillae present ventrally to base; from segment 9, neuropodia present at same position as papillae of preceding segments, neuropodia progressively wider on first 6–7 segments, then of uniform width to end, as raised pinnules from mid-body; last pairs of notopodia distinctly shorter (Figs 2D–H; 3A–F; 4E–F, H–I). Notopodia with pinnate chaetae in anterior row and narrowly-winged chaetae in posterior row, with wings only at tips; chaetae of anterior row much shorter, $\sim\frac{1}{3}$ – $\frac{1}{4}$ length of chaetae of posterior row, with long spines, only free from each other distally (Figs 5A–C; 6A–D). Neuropodia with type 1 uncini *sensu* Glasby & Glasby (2006) throughout, with short neck; short, triangular and slightly hooked heel, directed posteriorly; narrow and slightly curved base, anteriorly pointed; almost inconspicuous dorsal button, at base of main fang; crest with single elongate and sharp tooth on first row above main fang, surrounded by single row of shorter, irregularly sized teeth at base (Figs 4H–I; 5D–G; 6E–H). Tiny, frequently inconspicuous nephridial papillae ventral to notopodia of segments 3–5, distinctly larger genital papillae on segments 6–8, spherical, progressively more developed (Figs 2D–H; 3B–F; 4E–F). Pygidium smooth after preservation (Fig. 4A, G), apparently with ventral papillae in life (Fig. 2A–C).

Biology. Although many polycirrids do not build tubes and live freely, crawling over the substrate, members of *P. changbunker* **sp. nov.** are tubicolous, living inside self-made tubes, among sponges, algae and similar substrata.

When we collected live specimens, they were sorted from the substrate and put to relaxation on a petri dish with sea water and a few menthol crystals. The specimens of *P. changbunker* **sp. nov.** put to relaxation immediately started to secrete copious amounts of mucus and in a few minutes new tubes were completely formed. Because of that, in one of our first collections, in Pontal do Sul, state of Paraná, the type locality, the specimens were not cleaned from that new mucus before fixation and that resulted in the loss of more than 200 specimens, which we were unable to clean from the mucus after preservation.

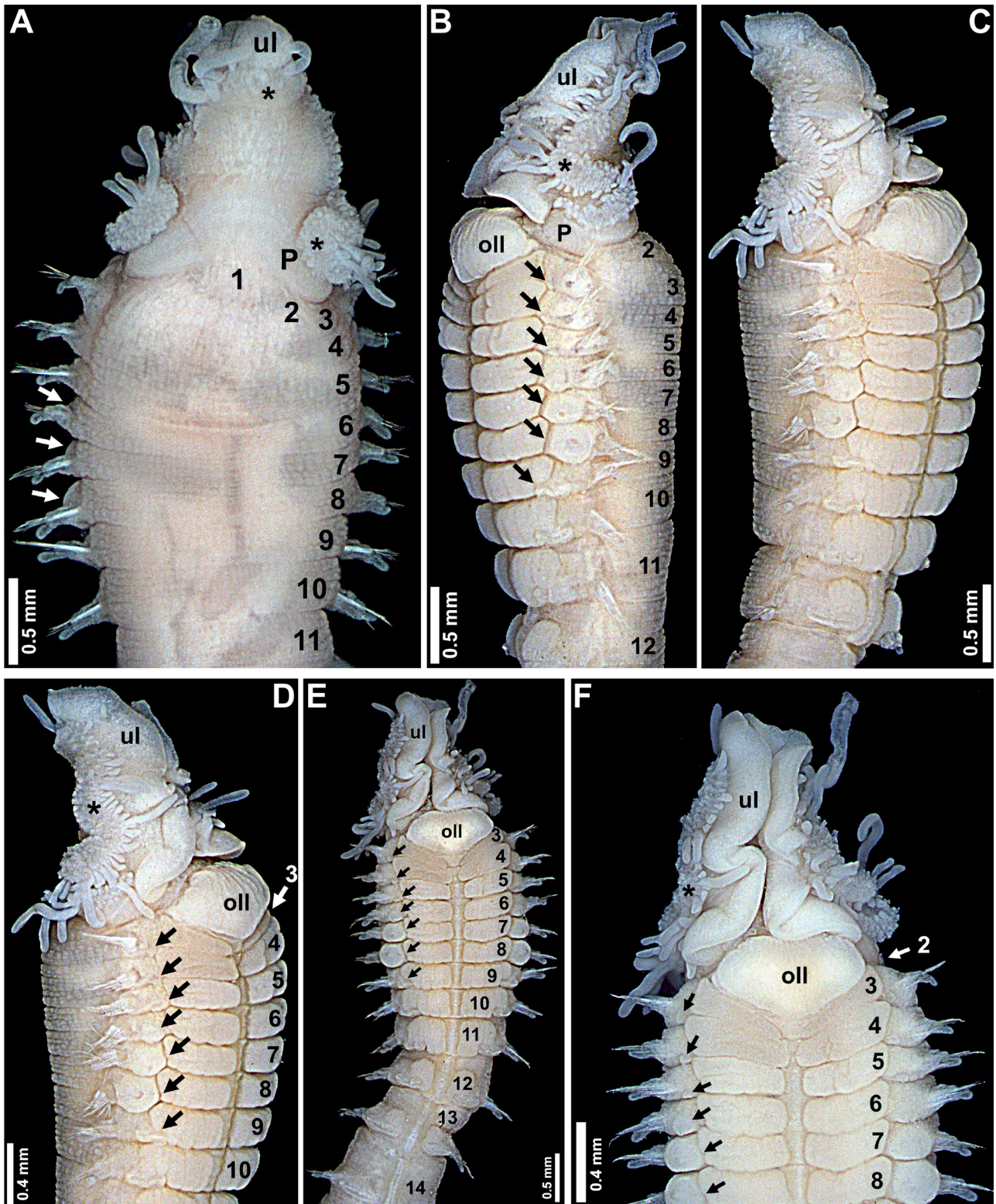


FIGURE 3. *Polycirrus changbunker* sp. nov., preserved, Paratype 1 (ZUEC 21354). (A–C, E). Anterior end in dorsal, left and right lateral, and ventral views, respectively; (D, F). Close ups of the anterior end, in right lateral and ventral views, respectively. Numbers refer to segments, unspecified arrows on segments 3–8 point to nephridial and genital papillae, on segment 9, to first neuropodium; oll = outer region of the lower lip; P = basal part of prostomium; ul = upper lip; * = distal part of prostomium.

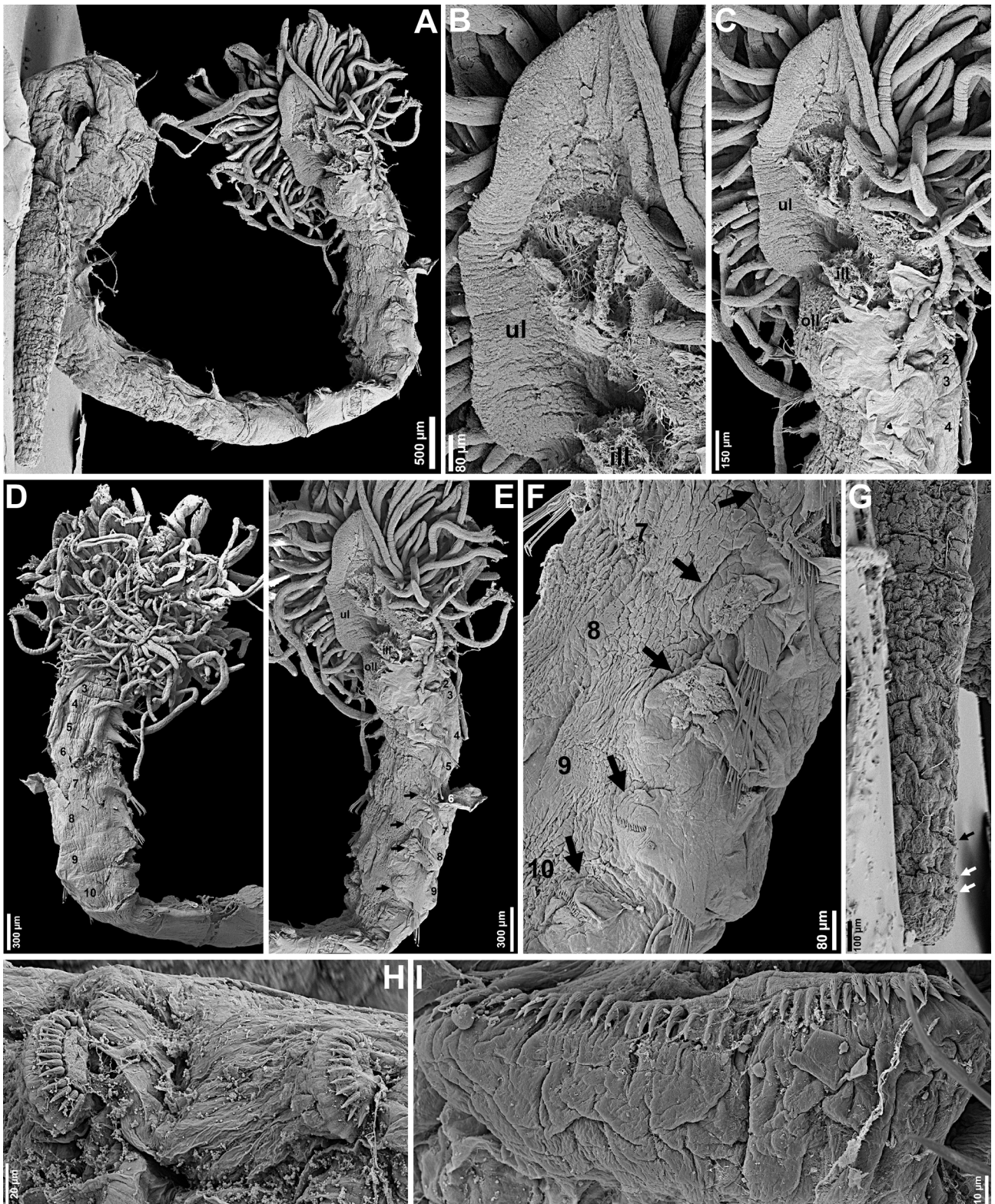


FIGURE 4. *Polycirrus changbunker* sp. nov., SEM, Paratype 2 (MZUSP 4033). (A). Entire worm; (B). Close up of the upper lip; (C). Close up of the anterior end, in left ventro-lateral view; (D–E). Anterior end, in dorsal and left ventro-lateral views, respectively; (F). Close up of left parapodia of segments 7–10; (G). Posterior end, in ventral view, arrows point to last neuropodia; (H–I). Neuropodia from anterior and mid-body segments, respectively. Numbers refer to segments, unspecified arrows on segments 3–8 point to nephridial and genital papillae, on segments 9 and 10, to neuropodia; ill = inner region of the lower lip; oll = outer region of the lower lip; ul = upper lip.

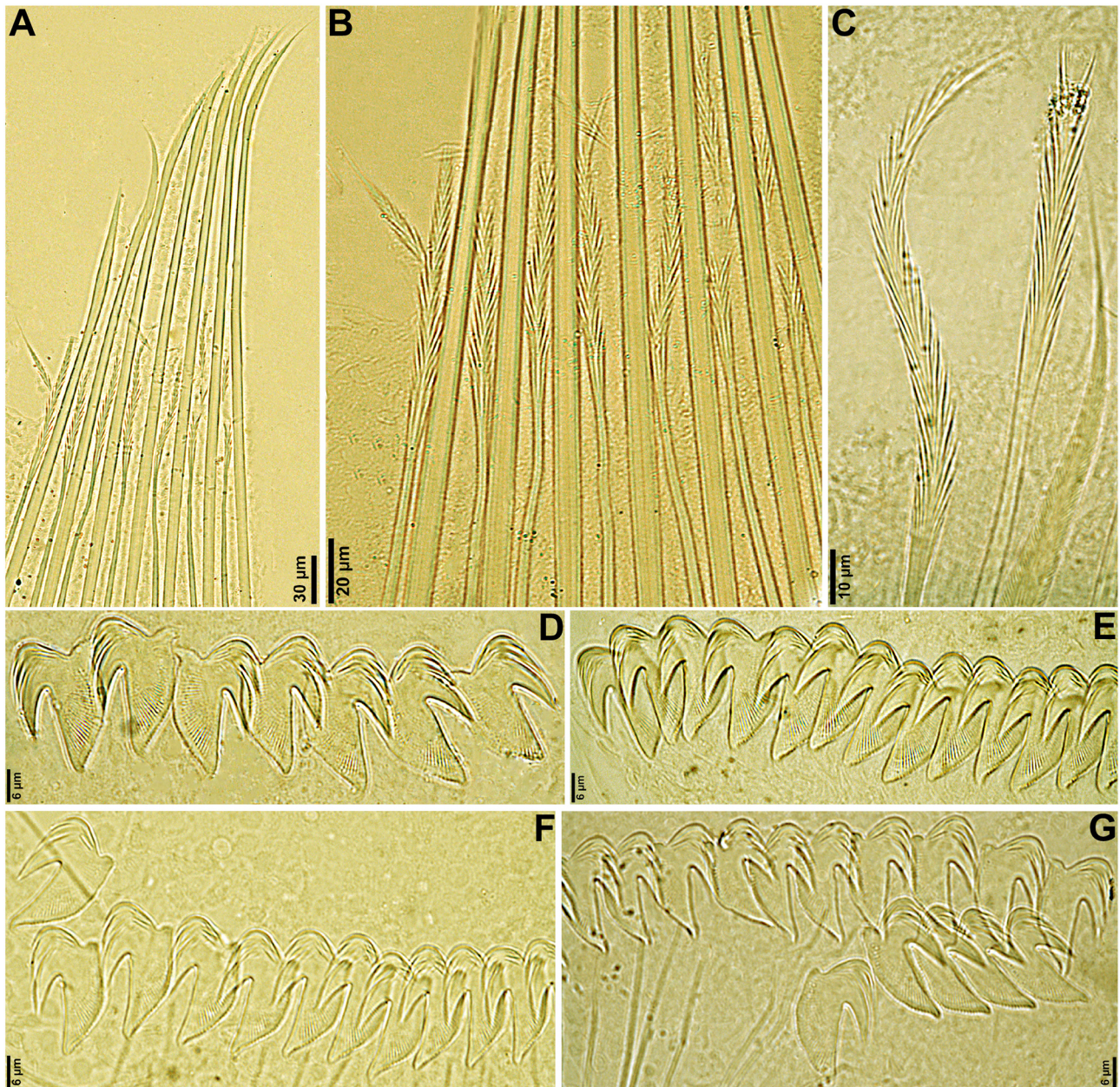


FIGURE 5. *Polycirrus changbunker* **sp. nov.**, Holotype (MZUSP4032). (A). Notochaetae, segment 6; (B–C). Notochaetae of anterior row, segment 6, under progressively higher magnifications; (D–G). Uncini of segments 9, 10, 16 and 28, respectively.

Variation. Among the specimens of *P. changbunker* **sp. nov.** studied, we noticed variation on body general dimensions, number of pairs of notopodia, and extension and morphology of the glandular ventro-lateral pads of anterior segments. The body dimensions and number of pairs of notopodia present seem to be related to each other, as larger specimens have more pairs of notopodia, however our longest specimen (paratype 8) is not the one with more pairs of notopodia (paratype 6).

The extension and morphology of paired ventro-lateral pads of anterior segments seem to be related to the state of preservation of the specimens. Pads are present until segment 13, but the last two pairs are much smaller than preceding ones and the last pair, in particular, is frequently almost inconspicuous. In addition, those pads are remarkably swollen and usually corrugated, presenting one transverse groove at mid-length and several longitudinal grooves, but specimens with almost completely smooth pads were observed and that, as well as the clear visualization of the pads of segment 13, may be due to the condition of preservation of the body wall.

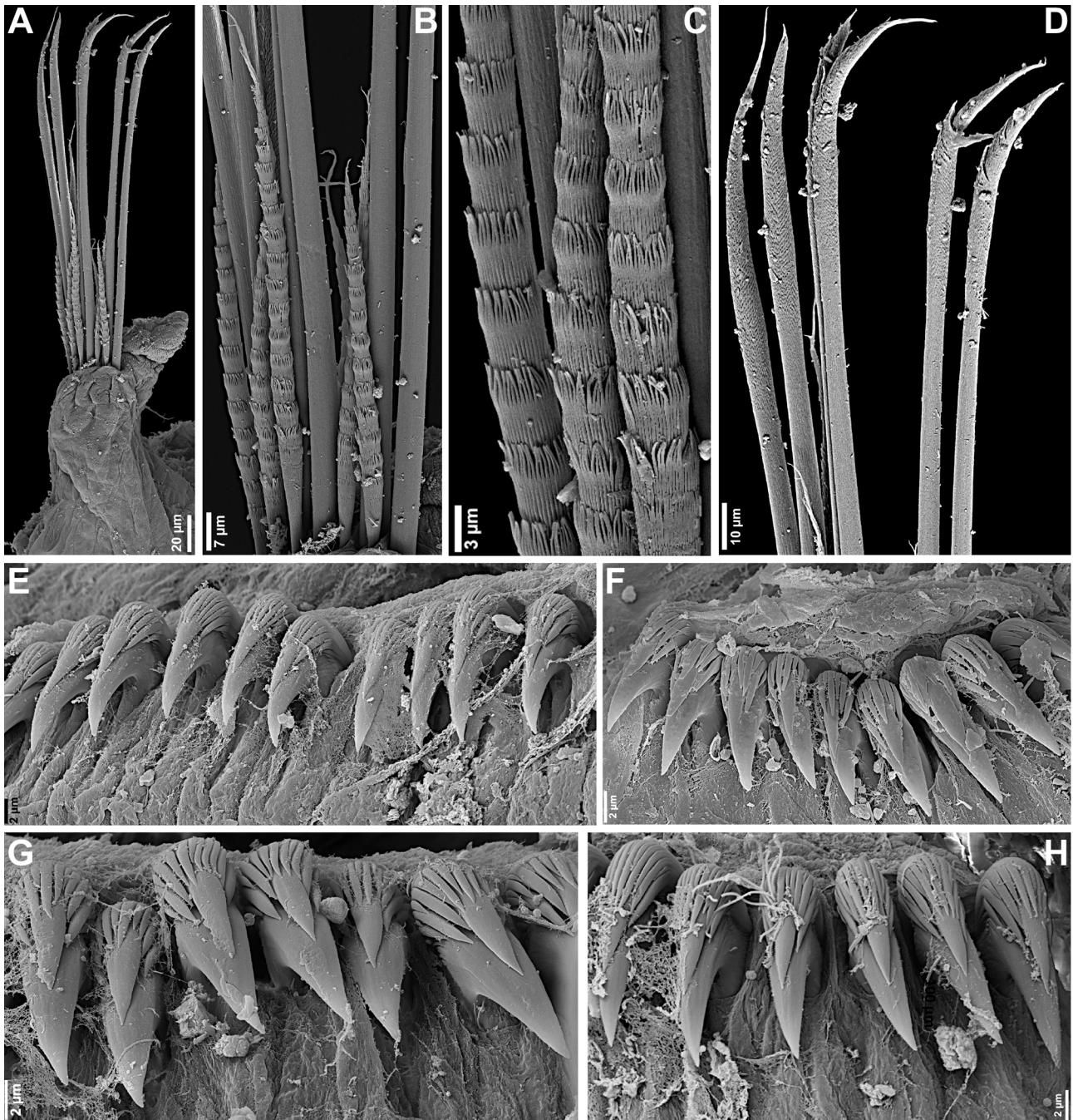


FIGURE 6. *Polycirrus changbunker* sp. nov., SEM, Paratype 2 (MZUSP 4033). (A). Notochaetae, segment 10; (B–C). Notochaetae of anterior row, segment 10, under progressively higher magnifications; (D). Tips of notochaetae of posterior row, segment 10. (E–H). Uncini of anterior (2), mid-body and posterior segments, respectively.

In regards to the presence of nephridial and genital papillae, genital papillae are almost always conspicuous, large and spherical, making the parapodia of segments 6–8 remarkably larger than those of segments 3–5. Nephridial papillae are not visible in many specimens, especially after preservation, but they are conspicuous in some individuals (Fig. 3B–F).

Remarks. Members of *P. changbunker* sp. nov. belong to a very limited number of species of *Polycirrus* which members have a large number of pairs of notopodia (greater than 22 pairs), with longer post-chaetal lobes, and neuropodia beginning from anterior segments, bearing type 1 uncini sensu Glasby & Glasby (2006). To this group also belong the members of *P. arenivorus* (Caullery, 1915), *P. californicus* Moore, 1909, *P. coibensis* Glasby & Hutchings, 2014, *P. perplexus* Moore, 1923, and *P. swakopianus* Augener, 1918.

Members of *P. arenivorus*, which was originally described from France, differ from individuals of *P. changbunker* **sp. nov.** in having ventro-lateral glandular pads extending until segment 18, only 29 pairs of notopodia, extending until segment 31, bearing narrowly-winged notochaetae only, and neuropodia beginning from segment 12 (Glasby & Hutchings 2014). In contrast, among members of *P. changbunker* **sp. nov.**, the glandular pads extend through segment 13, there are 31–43 pairs of notopodia, with pinnate chaetae in anterior row and narrowly-winged chaetae in posterior row, and neuropodia begin from segment 9.

Individuals of *P. californicus*, known from California, USA, have ventro-lateral pads extending to segment 14, 28 pairs of notopodia, extending through segment 30, bearing narrowly-winged notochaetae only, neuropodia beginning from segment 7, and nephridial and genital papillae on segments 5–10 (Glasby & Hutchings 2014). In contraposition, members of *P. changbunker* **sp. nov.**, in addition to what was said above, have nephridial and genital papillae on segments 3–8.

In the case of *P. coibensis*, described from the Pacific side of Panama, animals of that species present three types of buccal tentacles, the longest distally foliaceous, ventro-lateral glandular pads extending through segment 10, and notochaetae of posterior row with wider wings, present from the base of the chaetae (Glasby & Hutchings 2014). Individuals of *P. changbunker* **sp. nov.**, in contrast, have only two types of buccal tentacles, the longest slightly expanded distally, cylindrical, and the narrowly-winged notochaetae only have wings at tips.

Members of *P. perplexus*, which was also described from Californian specimens, have ventro-lateral pads extending through segment 14, only narrowly-winged notochaetae are present, and the neuropodia begin from segment 10 (Glasby & Hutchings 2014).

Finally, members of *P. swakopianus*, originally described from Namibia, have ventro-glandular pads extending through segment 10, only 26 pairs of notopodia, bearing narrowly-winged notochaetae only, neuropodia beginning from segment 7, and not conspicuous nephridial and genital papillae (Glasby & Hutchings 2014).

Etymology. Our new species is named in apposition to the classic rock Brazilian band Chang Bunker, on which PFvD plays electric bass.

Distribution. The type locality is off Pontal do Sul, Paranaguá Bay, state of Paraná, southern Brazil, and some paratypes came from off São Sebastião, state of São Paulo, southeastern Brazil, but animals of this species were also found among material from off the states of Pernambuco and Paraíba, northeastern Brazil (Fig. 1), so these animals most likely occur through large extension off the South American Atlantic coast, from southern to northeastern Brazil.

Acknowledgements

We are grateful to the Centro de Estudos do Mar, Universidade Federal do Paraná (CEM / UFPR) for all the support provided for the collection at Pontal do Sul, especially Paulo Lana and Maikon Di Domenico. The material from off northeastern Brazil was collected by the Project ‘BIOTA/FAPESP - Diversity of Polychaeta (Annelida) on hard substrates off northeastern Brazil, states of Paraíba and Pernambuco’, funded by FAPESP (proc. 2010/52116-4). The collection of material off São Paulo was funded by Instituto de Biociências, Universidade de São Paulo. The specimens deposited at ZUEC are part of a project funded by FAPESP (Biota/FAPESP, proc. 2018/10313-0). JMMN currently receives a productivity grant from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), level 2. NR currently receives a PhD fellowship from CNPq (proc. 140725/2018-0). OC currently receives a post-doc fellowship from FUSP/Shell do Brasil (proc. 2019/3310).

References

- Alves, T.M. (2008) *Contribuição ao conhecimento taxonômico de Terebellidae e Trichobranchidae (Annelida: Polychaeta) da Região Sudeste-Sul do Brasil*. M. Sc. Dissertation, Instituto de Biociências, Universidade de São Paulo, 176 pp.
- Amaral, A.C.Z., Nallin, S.A.H. & Steiner, T.M. (2013) Catálogo das espécies de Annelida Polychaeta do Brasil. Available from: http://www.ib.unicamp.br/museu_zoologia/sites/www.ib.unicamp.br/museu_zoologia/files/Catálogo_Polychaeta_Brasil_

Amaral_et_al_2013_1a.pdf (accessed 6 December 2020)

- Augener, H. (1918) Polychaeta. *Beitrage zur Kenntnis der Meeresfauna Westafrikas*, 2 (2), 67–625.
- Blankensteyn, A. (1988) *Terebellidae e Trichobranchidae (Annelida: Polychaeta) da Costa Sudeste do Brasil (24°–27°S)*. M. Sc. Dissertation, Instituto de Ciências Biológicas, Universidade Federal do Paraná, 128 pp.
- Carrerette, O. (2015) *Diversidade de poliquetas sedentários das famílias Terebellidae, Thelepodidae, Polycirridae, Trichobranchidae e Sabellidae (Annelida) no litoral brasileiro, entre os estados de São Paulo e Paraíba*. Ph. D. Thesis, Instituto de Biociências, Universidade de São Paulo, 364 pp.
- Carrerette, O. & Nogueira, J.M.M. (2013) Four new species of *Polycirrus* Grube, 1850 (Polychaeta: Terebellidae) from Campos Basin, southeastern Brazil. *Zootaxa*, 3626 (1), 146–172.
<https://doi.org/10.11646/zootaxa.3626.1.6>
- Caullery, M. (1915) Sur les térébelliens de la sousfamille Polycirridae Malmgr. 1. Délimitation des genres. 11. *Polycirrus arenivorus* n. sp. *Bulletin de la Société Zoologique de France*, 40, 239–248.
- Cepeda, D. & Lattig, P. (2016) A new species of Polycirridae (Annelida: Terebellida) and three new reports for Cantabrian and Mediterranean Seas. *Cahiers de Biologie Marine*, 57 (4), 371–387.
- Colgan, D.J., Hutchings, P.A. & Brown, S. (2001) Phylogenetic relationships within the Terebellomorpha. *Journal of the Marine Biological Association of the United Kingdom*, 81 (5), 765–773.
<https://doi.org/10.1017/S002531540100457X>
- Day, J.H. (1967) *A monograph on the Polychaeta of Southern Africa*. British Museum, Natural History Museum Library, London, 878 pp.
<https://doi.org/10.5962/bhl.title.8596>
- Fauchald, K. (1977) The polychaete worms: Definitions and keys to the orders, families and genera. *Natural History Museum of Los Angeles County, Science Series*, 28, 1–188.
- Fauvel, P. (1927) *Polychètes Sedentaires & Addenda aux Polychètes Errantes. Faune de France*. Lechevalier, Paris, 494 pp.
- Fitzhugh, K., Nogueira, J.M.M., Carrerette, O. & Hutchings, P. (2015) An assessment of the status of Polycirridae genera (Annelida: Terebelliformia) with the evolutionary transformation series of characters within the family. *Zoology Journal of Linnean Society*, 2015, 1–36.
<https://doi.org/10.1111/zoj.12259>
- Glasby, C.J. & Glasby, T.M. (2006) Two types of uncini in *Polycirrus* (Polychaeta: Terebellidae: Polycirrinae) revealed using geometric morphometrics. *Journal of Natural History*, 40 (5–6), 237–253.
<https://doi.org/10.1080/00222930600627137>
- Glasby, C.J. & Hutchings, P.A. (2014) Revision of the taxonomy of *Polycirrus* Grube, 1850 (Annelida: Terebellida: Polycirridae). *Zootaxa*, 3877 (1), 1–117.
<https://doi.org/10.11646/zootaxa.3877.1.1>
- Glasby, C.J., Hutchings, P.A. & Hall, K. (2004) Assessment of monophyly and taxon affinities within the polychaete clade Terebelliformia (Terebellida). *Journal of the Marine Biological Association of the United Kingdom*, 84 (5), 961–971.
<https://doi.org/10.1017/S0025315404010252h>
- Grube, A.E. (1850) Die Familien der Anneliden. *Archiv für Naturgeschichte, Berlin*, 16 (1), 249–364.
- Hartman, O. (1959) Catalogue of the Polychaetous annelids of the world. Part 2. Sedentaria. *Allan Hancock Foundation Occasional Papers*, 23, 355–628.
- Hessle, C. (1917) Zur Kenntnis der terebellomorphen Polychaeten. *Zoologiska Bidrag från Uppsala*, 5, 39–258.
- Hutchings, P.A. & Glasby, C.J. (1986) The Polycirrinae (Polychaeta: Terebellidae) from Australia. *Records of the Australian Museum*, 38, 319–350.
<https://doi.org/10.3853/j.0067-1975.38.1986.185>
- Hutchings P. & Kupriyanova E. (2018) Cosmopolitan polychaetes—fact or fiction? Personal and historical perspectives. *Invertebrate Systematics*, 32, 1–9.
<https://doi.org/10.1071/IS17035>
- Hutchings, P., Nogueira, J.M.M. & Carrerette, O. (2017) Terebellidae Johnston, 1846. In: Schmidt-Rhaesa, A. (Chief Ed.), Beutel, R.G., Kristensen, N.P., Leschen, R., Purschke, G., Westheide, W. & Zacchus, F. (Eds.), *Handbook of Zoology Online. A Natural History of the Phyla of the Animal Kingdom*. DeGruyter, Berlin, pp. 1–64.
- Lavesque, N., Hutchings, P., Daffe, G. & Londoño-Mesa, M.H. (2020) Revision of the French Polycirridae (Annelida, Terebelliformia), with descriptions of eight new species. *Zootaxa*, 4869 (2), 151–186.
<https://doi.org/10.11646/zootaxa.4869.2.1>
- Levinsen, G.M.R. (1893) *Annulata, Hydroidae, Anthozoa, Porifera*. Videnskabelige Udbytte ad Kanonbaaden Hauchs, Togter, pp. 321–464.
- Malmgren, A.J. (1866) Nordiska Hafs-Annulater. *Öfversigt af Königlich Vetenskapsakademiens förhandlingar, Stockholm*, 22 (5), 355–410.
- Malmgren, A.J. (1867) *Annulata Polychaeta Spetsbergiæ, Grœnlandiæ, Islandiæ et Scandinaviæ. Hactenus Cognita. Ex Officina Frenckelliana, Helsingforslæ*, 127 pp.
<https://doi.org/10.5962/bhl.title.13358>
- Moore, J.P. (1909) Polychaetous annelids from Monterey Bay and San Diego, California. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 61, 235–295.

- Moore, J.P. (1923) The polychaetous annelids dredged by the U.S.S. "Albatross" off the coast of Southern California in 1904. IV. Spionidae to Sabellariidae. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 75, 179–259.
- Nogueira, J.M.M., Fitzhugh, K. & Hutchings, P. (2013) The continuing challenge of phylogenetic relationships in Terebelliformia (Annelida: Polychaeta). *Invertebrate Systematics*, 27, 186–238.
<https://doi.org/10.1071/IS12062>
- Nogueira, J.M.M., Hutchings, P. & Carrerette, O. (2015) Polycirridae (Annelida, Terebelliformia) from Lizard Island Group, Great Barrier Reef, Australia. *Zootaxa*, 4019 (1), 437–483.
<https://doi.org/10.11646/zootaxa.4019.1.17>
- Nogueira, J.M.M., Hutchings, P.A. & Fukuda, M.V. (2010) Morphology of terebelliform polychaetes (Annelida: Polychaeta: Terebelliformia), with a focus on Terebellidae. *Zootaxa*, 2460, 1–185.
<https://doi.org/10.11646/zootaxa.2460.1.1>
- Polloni, P.T., Rowe, G.T. & Teal, J.M. (1973) *Biremis blandi* (Polychaeta: Terebellidae), new genus, new species, caught by D.S.R.V. "Alvin" in the Tongue of the Ocean, new providence, Bahamas. *Marine Biology*, 20 (2), 170–175.
<https://doi.org/10.1007/BF00351456>
- Read, G. & Fauchald, K. (Eds) (2020) World Polychaeta database. *Polycirrus* Grube, 1850. Available from: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=129710> (accessed 6 December 2020)
- Rousset, V., Rouse, G.W., Féral, J.-P., Desbruyères, D. & Pleijel, F. (2003) Molecular and morphological evidence of Alvinellidae relationships (Terebelliformia, Polychaeta, Annelida). *Zoologica Scripta*, 32 (2), 185–197.
<https://doi.org/10.1046/j.1463-6409.2003.00110.x>
- Stiller, J., Tilic, E., Rousset, V., Pleijel, F. & Rouse, G.W. (2020) Spaghetti to a Tree: a robust phylogeny for Terebelliformia (Annelida) based on transcriptomes, molecular and morphological data. *Biology*, 94, 73.
<https://doi.org/10.3390/biology9040073>
- Verrill, A.E. (1879) *Preliminary check-list of the marine Invertebrata of the Atlantic coast, from Cape Cod to the Gulf of St. Lawrence*. [Prepared for the United States Commission of Fish and Fisheries.]. Tuttle, Morehouse & Taylor, New Haven, 32 pp.