

# Two new species of *Cossura* (Cossuridae, Annelida) from the terminal lobes of the Congo River deep-sea fan

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*Two new species of Cossura Webster & Benedict, 1887 were found in material collected during sampling from the terminal lobes of the Congo deep-sea fan. They were described using light and scanning electron microscopy. Cossura platypus sp. nov. has 15–17 thoracic chaetigers, a prostomium longer than it is wide, with a widely rounded anterior margin, an abruptly expanded posterior prostomial ring the same length as the peristomium, without a mid-ventral notch, a branchial filament attached to the midlength of chaetiger 3, and a pygidium with three anal cirri. Cossura platypus sp. nov. is similar to C. brunnea Fauchald, 1972 but differs in the shape of the prostomium, which is widely rounded anteriorly in C. platypus sp. nov. and is broadly triangular in C. brunnea; furthermore, C. platypus sp. nov. is uniformly pale, whereas C. brunnea has dark pigmentation. Cossura candida Hartman, 1955 differs from C. platypus sp. nov. in the conical shape of the prostomium and 24–35 thoracic chaetigers. Cossura flabelligera sp. nov. has 16–19 thoracic chaetigers, a conical prostomium, and a branchial filament arising from the posterior part of chaetiger 2; the entire body, including the chaetae, is covered by a thick mucous sheath similar to the tunic of flabelligerids. Cossura flabelligera sp. nov. resembles C. longocirrata Webster & Benedict, 1887 in the position of the branchial filament, the shape of the prostomium, and the number of thoracic chaetigers; it differs in having a thick mucous sheath. This character seems to be unique for the Cossuridae.*

**Keywords:** Annelida, polychaetes, Cossuridae, *Cossura*, *Cossura platypus*, *Cossura flabelligera*, West Africa, Congo lobes, deep sea fan  
Zoobank identifier: LSID urn:lsid:zoobank.org:pub:ED1510A9-8963-4B97-9F2F-B2E201526098

Submitted 2 November 2016; accepted 16 January 2017; first published online 15 February 2017

## INTRODUCTION

The Cossuridae is a small family of polychaetes that are easily recognized by a single branchial filament arising mid-dorsally from one of the anterior-most segments. The family currently contains only a single genus with 26 valid species (WoRMS Editorial Board 2016). A single cossurid species, *Cossura costa* Kitamori, 1960, has been recorded from West African waters (Day, 1967; Lange *et al.*, 2014). This paper describes two cossurid species from the terminal lobes of the Congo deep-sea fan. This region covers an area of 2500 km<sup>2</sup> at a depth of 4700–5100 m and an offshore distance of 750–800 km. It is a unique alluvial area in the world ocean fed by a submarine canyon and a channel-levee system that presently deposits large amounts of organic carbon originating from the Congo River by turbidity currents (Rabouille *et al.*, 2016).

## MATERIALS AND METHODS

The Congo lobe project was built upon two sampling efforts during two oceanographic cruises on board the RV

‘Pourquoi Pas?’ equipped with the ROV ‘Victor 6000’: WACS (West Africa cold seeps) from 27.1.2011 to 28.2.2011 and CONGOLOBE from 12.12.2011 to 10.1.2012. For a detailed description of sampling sites and collecting methods, see the work of Rabouille *et al.* (2016). Sediment samples were taken in layers up to 25 cm deep and washed through sieves with 250, 300, 500 and 1000 µm mesh sizes. Animals were preserved in 4% formaldehyde solution in seawater and transferred to 80% ethanol. Specimens were examined with a stereomicroscope, and staining with methylene blue was used to enhance the contrast of small details. Some of the specimens were temporarily mounted in glycerol and studied with a compound microscope. Stacks of images were combined using Helicon Focus software to achieve completely focused images. A few specimens were critical-point dried, coated and examined using a Camscan S2 scanning electron microscope (SEM). The type specimens are deposited in the National Museum of Natural History, Paris (MNHN).

## RESULTS

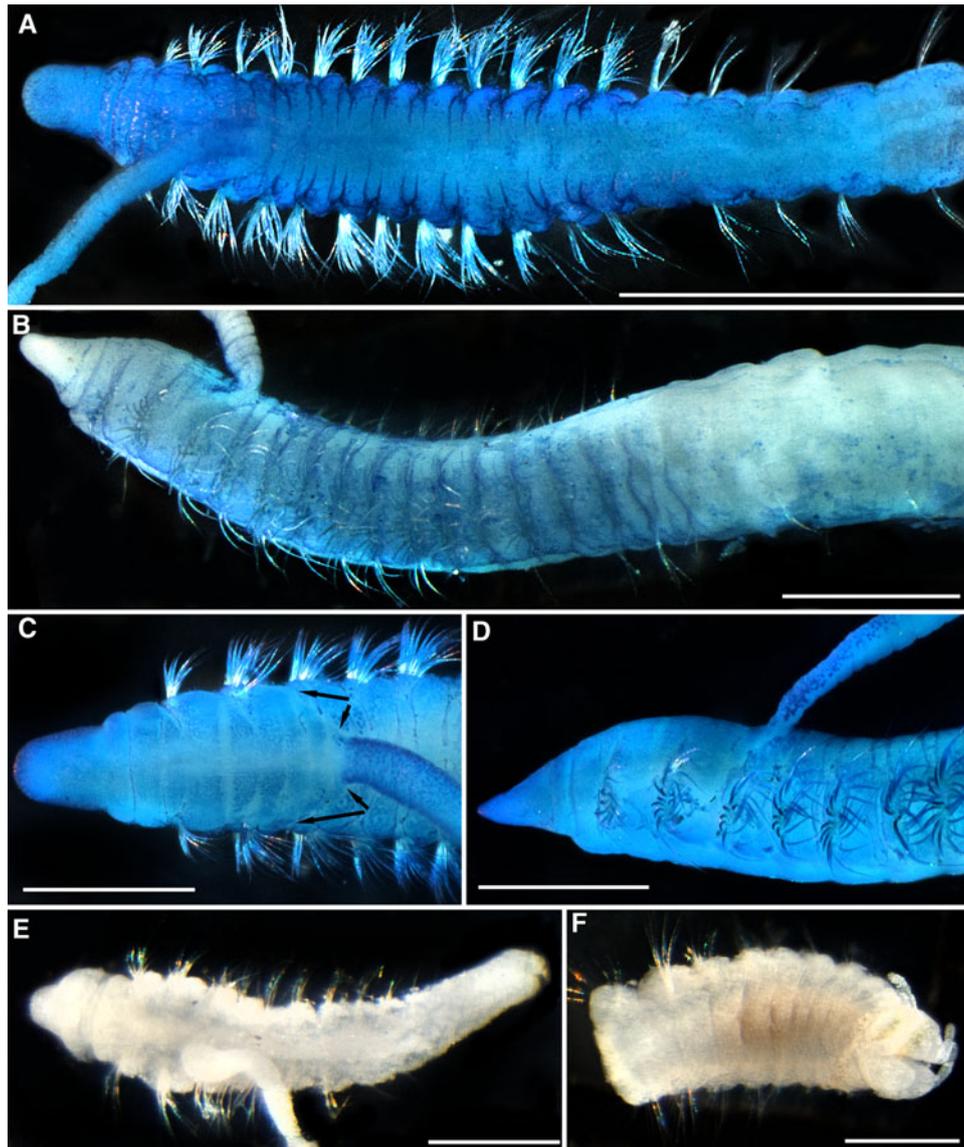
### SYSTEMATICS

Family COSSURIDAE Day, 1963  
Genus *Cossura* Webster & Benedict, 1887  
*Cossura platypus* sp. nov.  
(Figures 1 & 2)

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**Fig. 1.** *Cossura platypus* sp. nov., (A–D) methylene blue staining. (A) holotype, (MNHN-IA-TYPE 1779), dorsal view; (B) paratype, (MNHN-IA-TYPE 1781), lateral view; (C) paratype, (MNHN-IA-TYPE 1780), anterior end, dorsal view; arrows mark epithelial fold extending from posterior border of chaetiger 2 to base of branchial filament; (D) paratype, (MNHN-IA-TYPE 1780), anterior end, lateral view; (E) paratype, (MNHN-IA-TYPE 1782), juvenile, dorsal view; (F) paratype, (MNHN-IA-TYPE 1783), posterior end with pygidium. Scale bars: A, 1 mm; B, 500 μm; C, D, 300 μm; E, F, 200 μm.

#### TYPE MATERIAL

**Holotype:** (MNHN-IA-TYPE 1779). RV ‘Pourquoi Pas?’, WACS cruise, ROV ‘Victor 6000’, dive 425, 4.2.2011, 10:39:18, large blade cores, GCL1, layer 0–5 cm, fraction 500 μm, location REGAB, 05°47.984’S 009°42.475’E, depth 3154 m.

**Paratypes:** (MNHN-IA-TYPE 1780), 19 specimens, RV ‘Pourquoi Pas?’, WACS cruise, ROV ‘Victor 6000’, dive 425, 4.2.2011, 10:39:18, large blade cores, GCL1, layer 0–5 cm, fraction 500 μm, location REGAB, 05°47.984’S 009°42.475’E, depth 3154 m; (MNHN-IA-TYPE 1781), 21 specimens, RV ‘Pourquoi Pas?’, WACS cruise, ROV ‘Victor 6000’, dive 427, 8.2.2011, 11:00:06, large blade cores, GCL4, layer 0–5 cm, fraction 1000 μm, location REGAB, 05°47.866’S 009°42.685’E, depth 3156 m; (MNHN-IA-TYPE 1782), 9 specimens, RV ‘Pourquoi Pas?’, WACS cruise, ROV ‘Victor 6000’, dive 427, 9.2.2011, 02:35:00, large blade cores, GCL7, layer 1–3 cm, fraction 250 μm, location REGAB, 05°48.761’S 009°42.360’E,

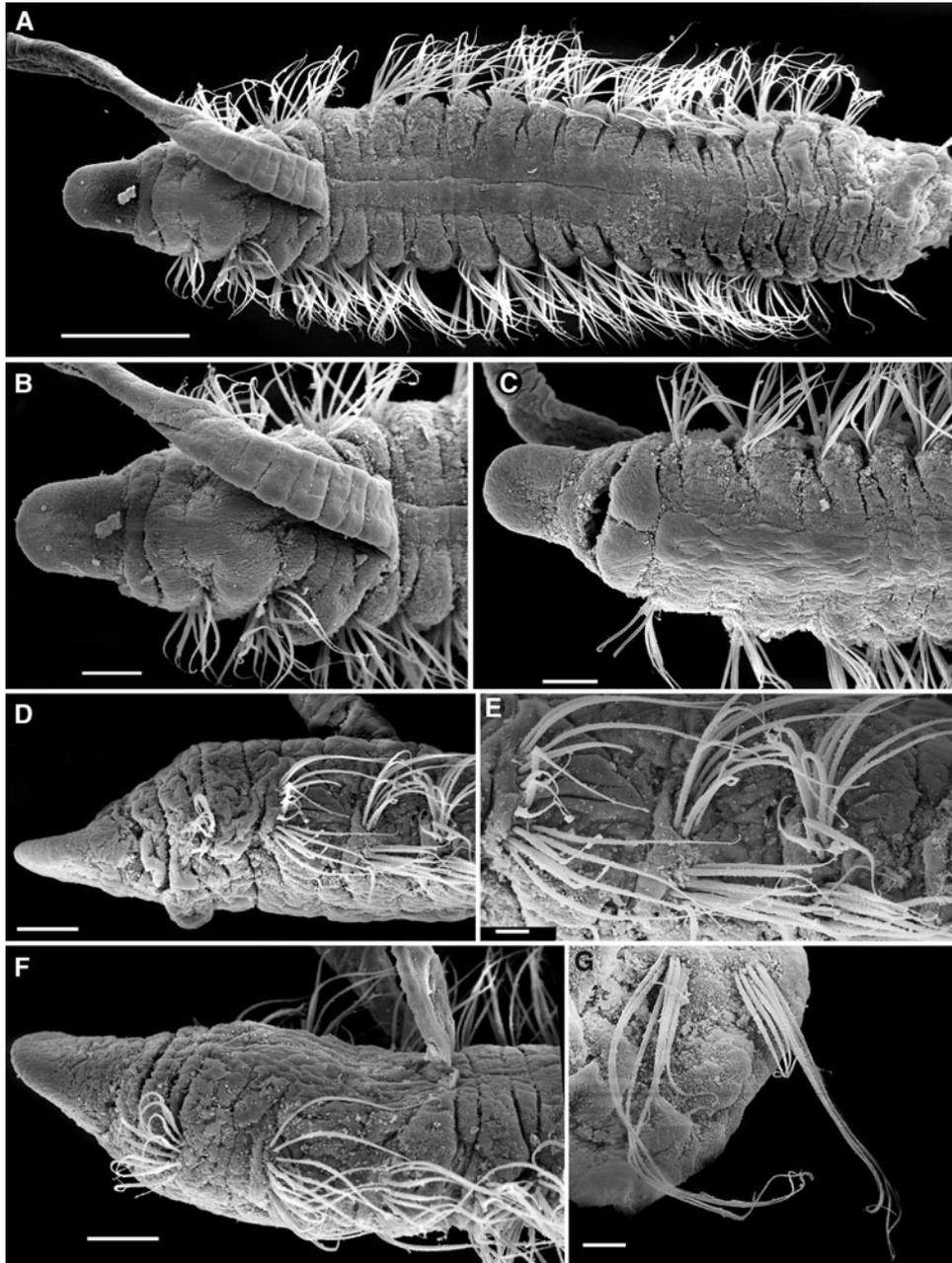
depth 3285 m; (MNHN-IA-TYPE 1783), 1 specimen, RV ‘Pourquoi Pas?’, WACS cruise, ROV ‘Victor 6000’, dive 427, 9.2.2011, 02:35:00, large blade cores, GCL7, layer 5–10 cm, fraction 300 μm, location REGAB, 05°48.761’S 009°42.360’E, depth 3285 m.

#### ETYMOLOGY

The name refers to the shape of the prostomium, which in dorsal view resembles a platypus beak.

#### DESCRIPTION

Colour in alcohol uniform white or pale yellowish, chaetae light golden. Holotype with 17 chaetigers, 15 thoracic, 400 μm wide (Figure 1A). All specimens incomplete, most represented by short fragments of 16–19 segments, one posterior fragment with pygidium. Thoracic width up to 450 μm; 14–17 thoracic chaetigers with or without sharp border between body regions; 12–14 anterior chaetigers



**Fig. 2.** *Cossura platypus* sp. nov., SEM, (A) paratype, (MNHN-IA-TYPE 1780), dorsal view; (B) same specimen, anterior end, dorsal view; (C) paratype, (MNHN-IA-TYPE 1780), ventral view; (D) paratype, (MNHN-IA-TYPE 1780), anterior end, lateral view; (E) same specimen, parapodia of chaetigers 2–4; (F) paratype, (MNHN-IA-TYPE 1780), anterior end, lateral view; (G) paratype, (MNHN-IA-TYPE 1780), abdominal parapodia, anterior view. Scale bars: A, 300  $\mu\text{m}$ ; B–D, F, 100  $\mu\text{m}$ , E, G, 30  $\mu\text{m}$ .

swollen, with lateral and dorsal inflations and wide intersegmental furrows; dorsal groove located mid-dorsally (Figures 1A & 2A). Segments becoming longer in the abdominal region (Figure 1A, B).

Prostomium triangular in lateral view, longer than it is wide, with widely rounded anterior margin, lateral margins almost parallel or converging at small angle (Figures 1A, C, D & 2A–D, F). Prostomial furrow more or less developed depending on muscle contraction. Posterior prostomial ring abruptly expanded, same length as peristomium, without mid-ventral notch (Figures 1C & 2A, B). One specimen with everted proboscis with 10 buccal tentacles. Nuchal organs not observed.

Branchial filament attached to midlength of chaetiger 3 (Figures 1B–D & 2A, B, D). In stained specimens, a triangular

fold of epithelium extending from posterior border of chaetiger 2 to base of filament (Figure 1C).

Chaetiger 1 with uniramous parapodia, all subsequent segments bearing biramous parapodia; parapodial rami situated very close to each other (Figures 1B, D & 2D–F). All chaetae hirsute capillaries with smooth shafts, arranged in two indistinct rows. Noto- and neurochaetae in thorax of the same width, chaetae in anterior row are wider (shaft 6  $\mu\text{m}$ , hirsute part 10  $\mu\text{m}$  thick) and shorter than chaetae in posterior row (shaft 4  $\mu\text{m}$ , hirsute part 6  $\mu\text{m}$  thick) (Figures 1D & 2D–F). First chaetiger bearing 10–11 chaetae; in subsequent segments notopodia bearing 6–9 and neuropodia 9–11 chaetae. Abdominal chaetae few, slender (4  $\mu\text{m}$  thick) capillaries in both rami; upper

notochaetae and lower neurochaetae twice as long as remaining chaetae (Figure 2G).

Pygidium divided by vertical cleft, with three short simple cirri, no intercirral processes (Figure 1F).

Juveniles with 11–12 chaetigers, differing from adults by smaller number of thoracic chaetigers; prostomium shorter, separated from peristomium by wide furrow; branchial filament arising from segmental border between chaetigers 2 and 3 (Figure 1E).

#### DISTRIBUTION

South-east Atlantic Ocean, Congo deep-sea fan.

#### REMARKS

This species is most similar to *Cossura brunnea* Fauchald, 1972 described from the Pacific Ocean between Mexico and Oregon. Also reported from the US Atlantic slope (New England to North Carolina), *C. brunnea* is found from depths of 1600 to 2200 m (Hilbig, 1996). It is similar to *C. platypus* sp. nov. in the attachment of the branchial filament and the number of thoracic chaetigers. The main difference is the shape of the prostomium, which is broadly triangular and together with the peristomium forms an evenly tapering cone in *C. brunnea*. In *C. platypus* sp. nov. the prostomium is widely rounded anteriorly and the posterior prostomial ring is abruptly expanded. Another characteristic of *C. brunnea* is the dark pigmentation of the body, whereas *C. platypus* sp. nov. is uniformly pale. The anterior and posterior chaetae are more similar in thickness in *C. platypus* sp. nov. than in *C. brunnea*. *Cossura coasta* recorded in West African waters differs from *C. platypus* sp. nov. in its conical prostomium and the presence of only short coarse chaetae in the neuropodia, while *C. platypus* sp. nov. has long and short chaetae in both rami; the number of thoracic chaetigers is unknown for this species. In the first description of *C. coasta* anal cirri are shown as distally branched (Kitamori, 1960); however, in specimens from South Africa, they are simple (Day, 1967). It could mean that another, undescribed cossurid species probably inhabits African waters. *Cossura rostrata* Fauchald, 1972 has similar distribution of short and long chaetae; it differs from *C. platypus* sp. nov. in the conical shape of the prostomium and 19–21 thoracic chaetigers followed by 10–15 intermediary segments of similar shape, while in *C. platypus* sp. nov. the segments become longer in the abdominal region. *Cossura candida* Hartman, 1955 differs from *C. platypus* sp. nov. in the conical shape of the prostomium and 24–35 thoracic chaetigers. The description of *C. delta* Reish, 1958 is quite short, without indication of the number of thoracic chaetigers; however, supposedly it could be 18–25, because curved limbate chaetae which are limited to the thoracic region in distribution are present in 18–25 chaetigers. In *C. delta* the prostomium is conical with thickened chaetae present in neuropodia only, whereas in *C. platypus* sp. nov. they present in both rami. *Cossura keablei* Zhadan, 2015, described from Fiji, is similar in the shape of the prostomium, but the branchial filament is attached to the anterior part of chaetiger 3, the posterior prostomial ring has a midventral notch, and this species has 22–26 thoracic chaetigers. *Cossura duplex* Tamai, 1986 is similar in the number and shape of thoracic chaetigers but differs in the conical shape of the prostomium and the coarse, flattened thoracic neurochaetae. In *C. bansei* Hilbig, 1996 the branchial filament arises from the posterior border of chaetiger 3,

sometimes appearing to originate on chaetiger 4; this species has a conical prostomium and 20–31 thoracic chaetigers.

Family COSSURIDAE Day, 1963

Genus *Cossura* Webster & Benedict, 1887

*Cossura flabelligera* sp. nov.

(Figures 3–5)

#### TYPE MATERIAL

Holotype: (MNHN-IA-TYPE 1784), RV ‘Pourquoi Pas?’, CONGOLOBE cruise, ROV ‘Victor 6000’, dive 491, 3.1.2012, 19:36:21, large blade cores, GCL2bis, layer 0–5 cm, fraction 1000 µm, location CoL C, 06°42.092’S 005°29.306’E, depth 4846 m. Paratypes: (MNHN-IA-TYPE 1785), 1 specimen, RV ‘Pourquoi Pas?’, CONGOLOBE cruise, ROV ‘Victor 6000’, dive 491, 3.1.2012, 19:36:21, large blade cores, GCL2bis, layer 0–5 cm, fraction 1000 µm, location CoL C, 06°42.092’S 005°29.306’E, depth 4846 m; (MNHN-IA-TYPE 1786), 6 specimens, RV ‘Pourquoi Pas?’, CONGOLOBE cruise, ROV ‘Victor 6000’, dive 491, 3.1.2012, 04:56:23, large blade cores, GCL5, layer 5–10 cm, fraction 500 µm, location CoL C, 06°42.080’S 005°29.287’E, depth 4846 m; (MNHN-IA-TYPE 1787), 21 specimens, RV ‘Pourquoi Pas?’, CONGOLOBE cruise, ROV ‘Victor 6000’, dive 492, 5.1.2012, 02:58:38, large blade cores, GCL1, layer 5–10 cm, fraction 500 µm, location CoL B, 06°25.248’S 005°49.707’E, depth 4719 m.

#### ETYMOLOGY

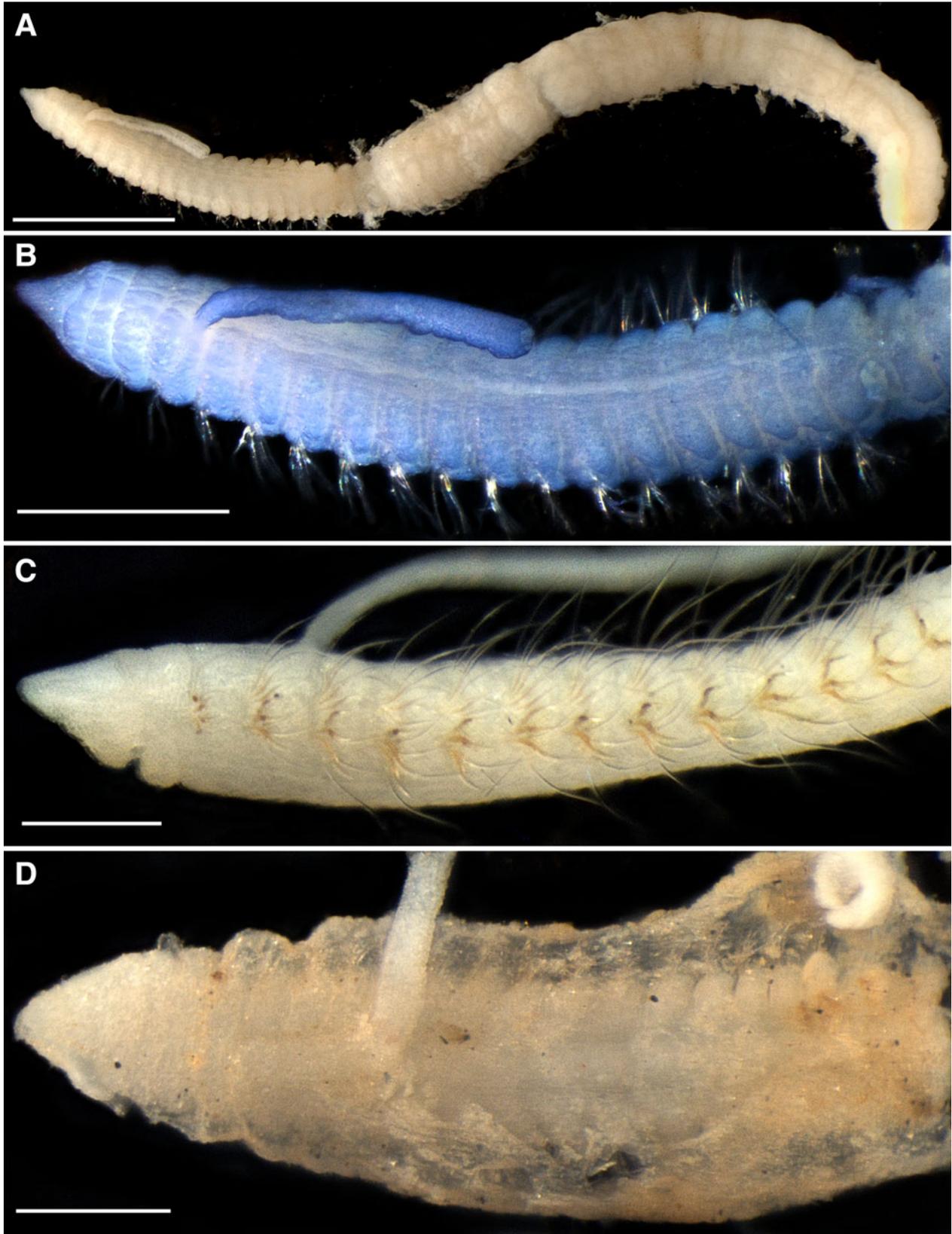
The name refers to the polychaete genus *Flabelligera* having a thick mucous cover which resembles the most remarkable character of this cossurid species – the mucous sheath.

#### DESCRIPTION

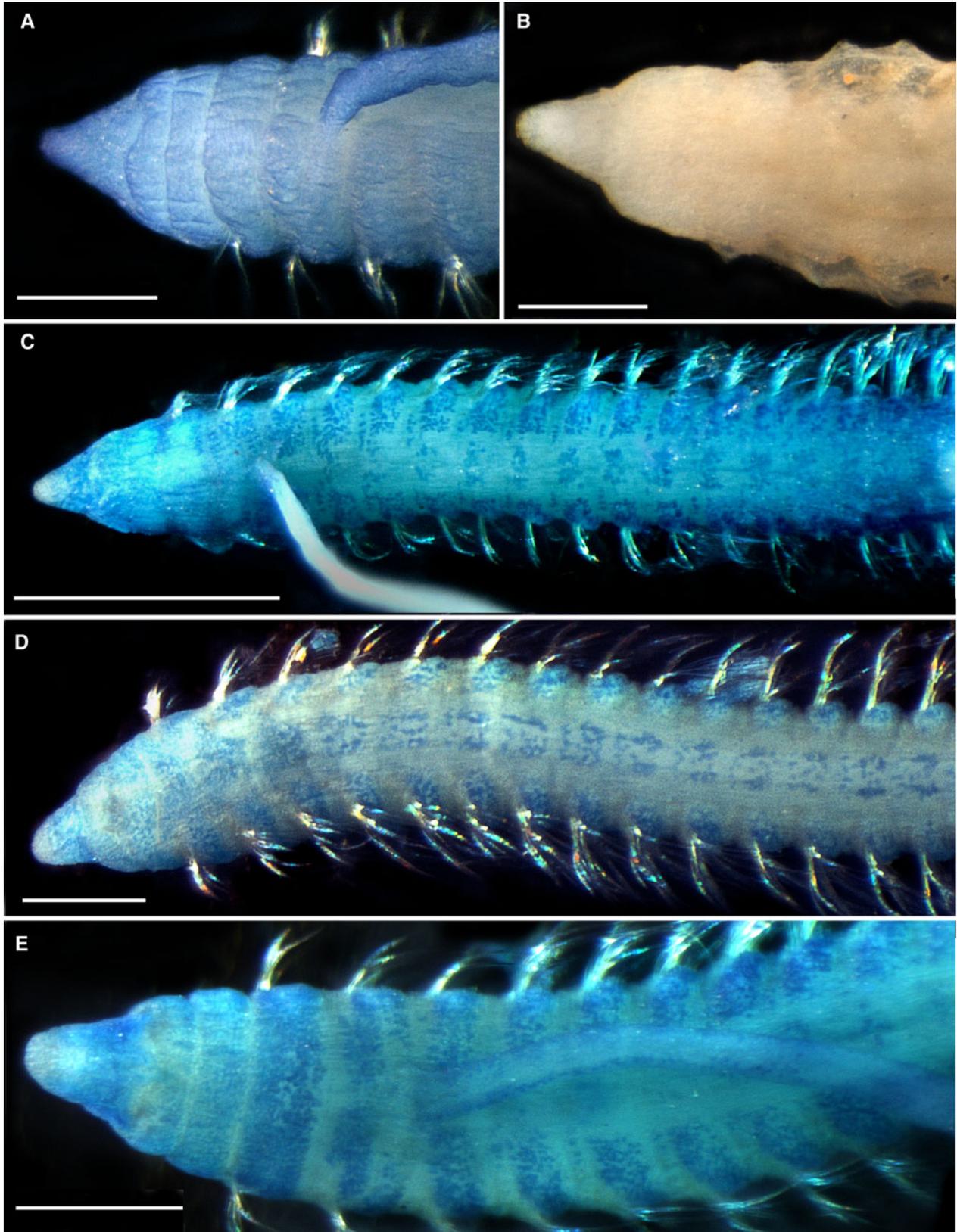
Colour in alcohol uniformly white or pale yellowish, chaetae golden to brown (Figure 3A, C). Holotype 6.5 mm long, with 17 thoracic chaetigers, 340 µm wide, abdomen covered by a sheath (Figure 3A). All specimens incomplete, represented by short fragments with 18–40 chaetigers. Bodies of most specimens including chaetae covered by thick mucous sheath resembling tunic of flabelligerids (Figures 3D, 4B & 5A–C). Thoracic width up to 350 µm, 16–19 thoracic chaetigers. Thoracic segments not inflated in smaller specimens, slightly inflated in larger ones, with wide intersegmental furrows and middorsal groove (Figures 3B & 4C, E). Segments becoming longer and thicker in the abdominal region (Figure 3A).

Prostomium conical, with rounded tip, about as long as wide; lateral margins straight to slightly concave, posterior prostomial ring same length as peristomium, without midventral notch (Figures 3D, 4A–E & 5C). Nuchal organs not seen. Branchial filament arising from posterior part of chaetiger 2 (Figures 3B, C, 4A, C, E & 5D).

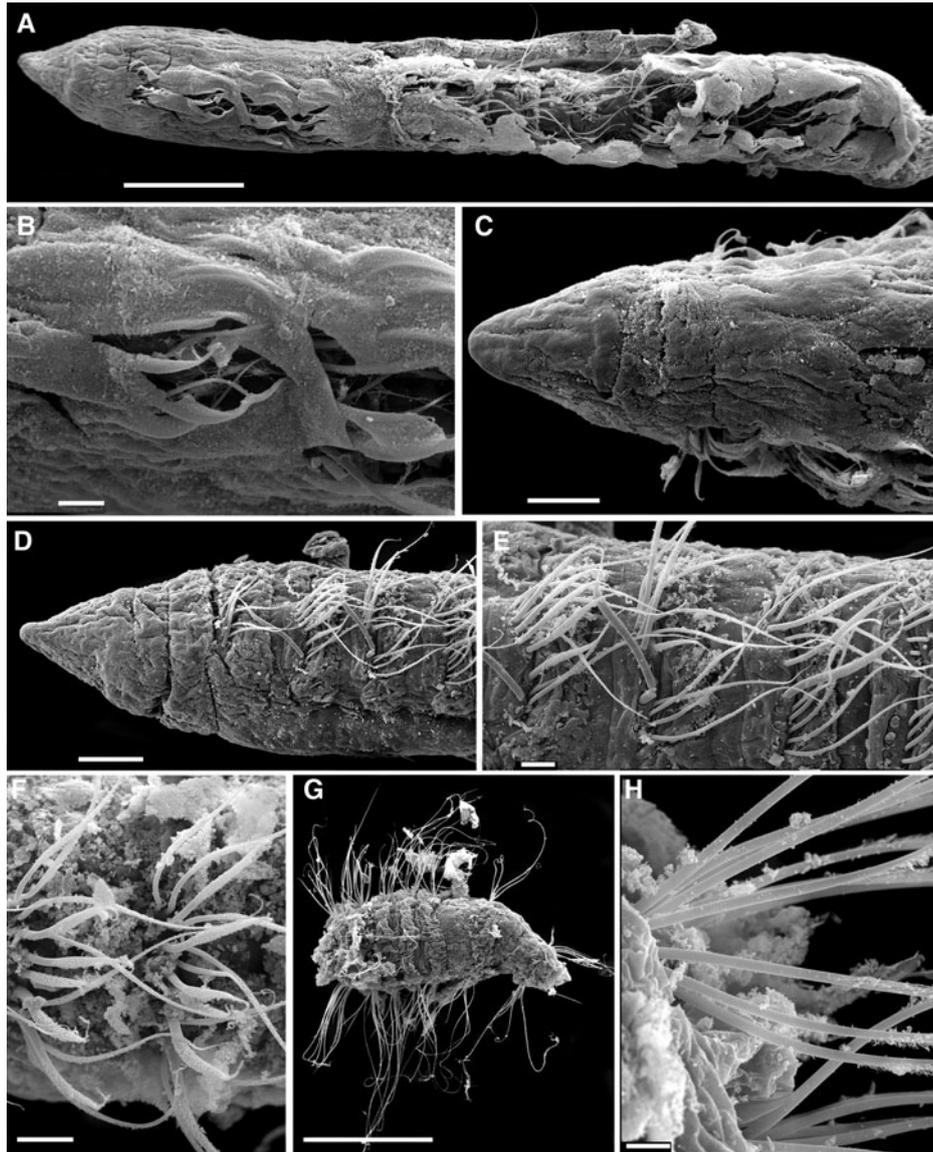
Chaetiger 1 with uniramous parapodia, all subsequent segments with biramous parapodia; chaetae emerging from low lobes; parapodial rami situated very close to each other. All chaetae hirsute capillaries with smooth shafts, arranged in two distinct rows; anterior chaetae in each thoracic segment thicker and shorter than posterior chaetae (Figures 3C & 5D–F). First chaetiger bearing three thicker anterior and four thinner posterior chaetae. In other segments, four neurochaetae of anterior row notably thicker (shaft 9 µm, hirsute part 11 µm thick) than four anterior notochaetae (shaft 6 µm, hirsute part 8 µm thick); posterior chaetae 4 µm



**Fig. 3.** *Cossura flabelligera* sp. nov., A–C, mucous sheath removed; (A) holotype, (MNHN-IA-TYPE 1784), dorsal view; (B) paratype, (MNHN-IA-TYPE 1785), dorsal view, methylene blue staining; (C) paratype, (MNHN-IA-TYPE 1787), lateral view; (D) paratype, (MNHN-IA-TYPE 1786), dorsal view, covered with mucous sheath. Scale bars: A, 1 mm; B, 500  $\mu$ m; C, 200  $\mu$ m; D, 300  $\mu$ m.



**Fig. 4.** *Cossura flabelligera* sp. nov., A, C–E, mucous sheath removed, methylene blue staining; (A) paratype, (MNHN-IA-TYPE 1785), anterior end, dorsal view; (B) paratype, (MNHN-IA-TYPE 1786), anterior end, dorsal view; (C) paratype, (MNHN-IA-TYPE 1787), dorsal view; (D) paratype, (MNHN-IA-TYPE 1787), ventral view; (E) paratype, (MNHN-IA-TYPE 1787), anterior end, dorsal view. Scale bars: A, B, D, E, 200  $\mu\text{m}$ ; C, 500  $\mu\text{m}$ .



**Fig. 5.** *Cossura flabelligera* sp. nov., SEM, A–C, with mucous sheath, D–H, mucous sheath removed, (A) paratype, (MNHN-IA-TYPE 1787), lateral view; (B) same specimen, surface of mucous sheath close up view; (C) paratype, (MNHN-IA-TYPE 1787), anterior end, dorsal view; (D) paratype, (MNHN-IA-TYPE 1787), anterior end, lateral view, (E) same specimen, parapodia of chaetigers 2–5; (F) paratype, (MNHN-IA-TYPE 1787), parapodia of chaetigers 3–4; (G) paratype, (MNHN-IA-TYPE 1787), piece of abdomen, dorsal view; (H) same, close-up. Scale bars: A, G, 300  $\mu$ m; B, D, 100  $\mu$ m; C, E, F, 30  $\mu$ m; H, 10  $\mu$ m.

thick, five chaetae in each ramus (Figures 3C & 5D–F). Abdominal chaetae 3–5 long slender capillaries in both rami, 2.5–3  $\mu$ m thick (Figure 5G, H). Pygidium not found.

Tip of prostomium unstained in methylene blue, solid stripes on dorsal side of chaetigers 1–3, lateral and median patches on dorsal sides, smaller lateral and larger median patches on ventral sides of other chaetigers (Figure 4C–E).

#### DISTRIBUTION

South-east Atlantic Ocean, Congo deep-sea fan.

#### REMARKS

*Cossura flabelligera* sp. nov. is similar to *C. longocirrata* Webster & Benedict, 1887, which according to Fournier & Petersen (1991), is an arctic-boreal species distributed in the North Atlantic. *Cossura flabelligera* sp. nov. is similar in the position of the branchial filament, the shape of the prostomium, the number of thoracic chaetigers, and the shape and

distribution of the chaetae. The main difference distinguishing *C. flabelligera* sp. nov. from *C. longocirrata* is the thick mucous sheath covering the entire body including the chaetae. Moreover, the noto- and neurochaetae are similar in thickness in *C. longocirrata* but the neurochaetae are thicker in *C. flabelligera* sp. nov. *Cossura heterochaeta* Orensanz, 1976 is similar to *C. flabelligera* sp. nov. in its conical prostomium, position of the branchial filament and presence of thickened anterior chaetae, but there are two types of anterior thickened chaetae in *C. heterochaeta* – with and without an arista – whereas in *C. flabelligera* sp. nov., they uniformly have aristas. In addition, *C. flabelligera* sp. nov. has more anterior segments (16–19 instead of 12–14 as in *C. heterochaeta*). *Cossura coasta* has a branchial filament arising from chaetiger 3 and only coarse thick chaetae in the neuropodia, but in *C. flabelligera* sp. nov., the branchial filament arises from chaetiger 2, and the neuropodia contain both thick and slender chaetae. Some cossurid species

produce mucous continuously along the entire length of the body, resulting in the presence of a partial mucous coating that may be encrusted with sediment particles but probably does not represent a proper tube. Except for some mucous among the chaetae, preserved cossurids are typically free of any surrounding or attached tubelike structures (Hilbig, 1996). The *Flabelligera*-like tunic of *Cossura flabelligera* sp. nov. seems to be a character unique for this species.

## ACKNOWLEDGEMENTS

We thank the captain and crew of the RV 'Pourquoi Pas?', the team of the ROV 'Victor', and the chief scientists of the cruises, Karine Olu (IFREMER Centre Bretagne, Institut Carnot Ifremer-EDROME Laboratoire Environnement Profond) and Christophe Rabouille (Laboratoire des Sciences du Climat et de l'Environnement, CNRS), for collecting and providing us with the material. We thank Patrick Briand, Philippe Noël, Olivier Mouchel and Jozée Sarrazin for their help on board during the WACS cruise and Manuella Rabiller, Erwan Guillon, Lenaïck Menot for faunal sorting and identifications of the polychaete families. We are grateful to Tarik Meziane and Laure Corbari (MNHN) for their help with deposition of type material and Andrew Gebruk (Shirshov Institute of Oceanology, Moscow) for involving us in this project. Two anonymous reviewers improved the manuscript.

## FINANCIAL SUPPORT

This study was supported by grants 15-04-05875 and 16-04-00343 from the Russian Foundation of Basic Research. The scanning electron microscopy investigations were supported by the Russian Scientific Foundation, grant 14-50-00029. The electron microscopy was performed at the User Facilities Center of M.V. Lomonosov Moscow State University.

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