
TAXONOMY

***Terebellides irinae* sp. n., a New Species of *Terebellides* (Polychaeta: Terebellidae) from the Arctic Basin**

S. Yu. Gagaev

Zoological Institute, Russian Academy of Sciences, St. Petersburg, 199034 Russia

e-mail: gagaev24@yahoo.com

Received May 21, 2009

Abstract—A new polychaete species of the family Terebellidae, *Terebellides irinae* sp. n., has been described from materials collected in the Canadian Basin by the international Hidden Ocean 2005 expedition on board the US Coast Guard icebreaker (WAGB-20) *Healy*. The new species differs from other closely related species by its underdeveloped ventral branchial lobes that are at least two times shorter than the dorsal ones, sometimes reduced to barely noticeable cones and in that the aciculum-like neurochaetes of the 6th setigerous segment are curved at a right angle and have a thin capillaceous tip. Specimens of this polychaete worm are small, no more than 15 mm long.

Key words: Terebellidae, *Terebellides irinae* sp. n., polychaete, morphology, taxonomy, distribution.

DOI: 10.1134/S1063074009060042

The recent and most complete review on polychaetes of the Arctic Ocean [3] presents characteristics of two species of the *Terebellides* Sars, 1835: *T. stroemi* Sars, 1835 and *T. williamsae* Jirkov, 1987. In June–July 2005, several specimens of polychaetes of the genus *Terebellides* were collected in the Canada Basin; they differed by several traits from the Arctic species mentioned above and from the other known species of the genus. This allowed us to distinguish one more independent species.

Terebellides irinae sp. n.

Material. Holotype: Canada Basin, 73°04' N–157°12' W, Station 15, the US CGC (WAGB-20) *Healy*, July 24, 2005, depths of 2570–2678 m (no. 1/50553).

Paratypes: Canada Basin, 73°04' N–157°12' W, Station 15, the US CGC (WAGB-20) *Healy*, July 24, 2005, depths 2570–2678 m (no. 2/50554, 2 spec.); Canada Basin, 73°22' N–155°31' W, Station 5, US CGC (WAGB-20) *Healy*, July 6, 2005, depths 3847–3880 m (no. 3/50555, 2 spec.).

The holotype and four paratypes (all specimens intact) are deposited in the Laboratory of Marine Research of the Zoological Institute (ZIN) of the Russian Academy of Sciences, Saint Petersburg.

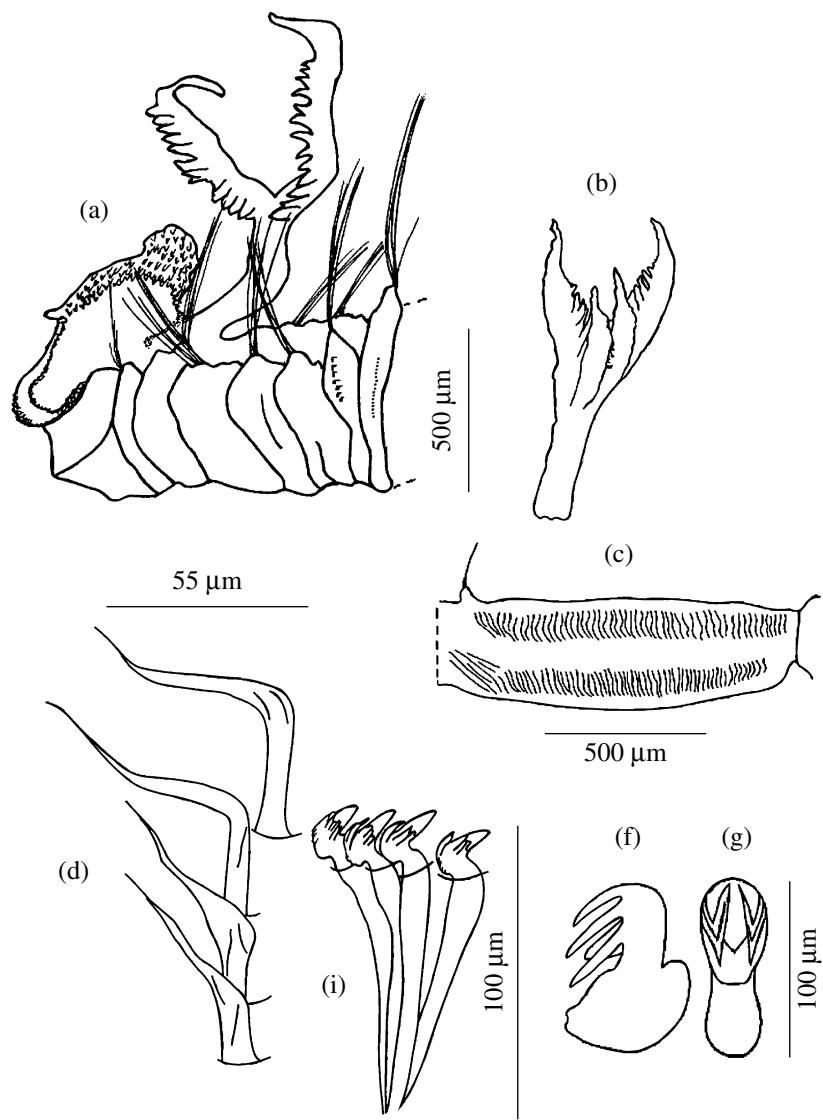
DIAGNOSIS

The ventral branchial lobes, in contrast to the dorsal lobes, are underdeveloped: from a half of the size of dorsal lobes to small cones that are hardly visible under a microscope at a great magnification (Fig. a, b). The branchial lobes are free for more than three quarters of their length, fused only basally, at the branchial stalk.

The ventral surface of the first thoracic setigerous segments is pale yellow in color, similar in its coloration to the rest of the body surface. The body is elongate and slender: the relation of the body length (L) to body width (S) is 23.3 ± 0.5 . The maximal size of the species is not above 15 mm. Egg cells 120–130 μm in diameter.

DESCRIPTION

Holotype: female with body length of 14.4 mm, body width 0.6 mm. The mouth segment has a large ventrolateral collar at the anterior edge, the next segment is formed ventrally as a half-moon (see Fig. a). Eyes absent. Lateral lobes on five segments insignificantly diminish in size from the 3rd to the 7th setigerous segment. Two branchial lobes borne on thin stalks and free along their entire length project dorsally from the 1st and the 2nd setigerous segments; two rudimentary ventral lobes behind the dorsal lobes are visible under microscope only at a great magnification (see Fig. a). The stalk is 0.6 mm high, the branchial lobe tip is 1 mm (one third of the lobe length), formed as a long thin feeler. Each of two anterior lobes bears 13 triangular projections. The thorax fringed from one side has 18 segments with hair-like notopodial setae; the setae are long, somewhat longer than body width of the worm and collected in bundles of 5 to 10 setae, with an exception of the first setigerous segment bearing 4 setae only. Neuropodial setae (neurochaetes) begin from the 6th setigerous segment; the first neuropodium has 7 aciculiform setae bent at a right angle, with a long hair-like tip (see Fig. d). The neuropodial setae of the following thoracic segments are hoe-shaped, sitting on long thin



Morphological characters of *Terebellides irinae* sp. n. (a) head end, lateral view; (b) branchia; (c) abdominal segment; (d) neuropodial setae of the 6th setigerous segment; (e) hoe-shaped neuropodial setae; (f) and (g) avicular setae of abdominal segments.

stalks with a bulb in the upper part; they are arranged in a row of 16–18 setae (see Fig. e). There are 27 abdominal setigerous segments; the first 12 of them are strongly elongated: the segments are twice as long as thick. Avicular setae on each parapodium are arranged rhipidately; their number decreases from 14 to 4 from the abdominal portion to the end of the body (see Fig. f, g). The anus is terminal, the integuments transparent. Coloration of glandular portions of the integuments of fixed specimens does not differ from that of the rest of the body, either with or without the use of staining agents. Body cavity is filled with eggs; their diameter about 120 µm.

Paratypes: the body length is from 6.6 (minimum) to 14.6 (maximum) mm, the body width from 0.3 to 0.6 mm, respectively. There are 18 thoracic segments.

The number of abdominal segments varies from 25 to 34, proportionally to the worm's size. The first 10–12 abdominal segments are strongly elongated, the segment length exceeds their thickness by more than twice. Irrespective of the size of the specimens, two of them have only two visible dorsal branchial lobes, the ventral lobes are rudimentary. Two other specimens have four distinctly visible branchial lobes; however, the ventral lobes were developed less than the dorsal ones and their length is about one half of the length of the dorsal lobes (see Fig. b). The number of triangular projections on dorsal lobes varies from 6 to 13. The ventral lobes have only rudimentary projections. In all the specimens, the branchial lobes are fused only basally: each branchial lobe (except rudimentary ones) ends in a long smooth feeler-like tentacle; the feeler varies in its length to make up from one third to one quarter of the lobe

Relationship between the body length (L) and width (S) in species of the genus *Terebellides* from the Arctic basin

Species	Ratio L/S	Number of specimens
<i>Terebellides stroemi</i>	9.2 ± 1.3	11
<i>T. williamsae</i>	15.8 ± 1.3	10
<i>T. irinae</i>	23.3 ± 0.5	5

length. The number of neuropodial acicular setae on the 6th setigerous segment varies from 4 to 9, depending on the size of the specimen, while the number of hoe-shaped setae on the following segments varies from 7 (in the smallest specimen) to 16 (in a larger specimen). The number of avicular setae in the abdominal portion decrease to the end of the body from 7–10 to 2–4, depending on the worm's size.

DIFFERENTIAL DIAGNOSIS

The genus *Terebellides* Sars, 1835 includes presently 37 valid species. The species *Terebellides irinae* sp. n. differs from species the *T. angulicomus* F. Müller, 1858, *T. totae* Bremec & Elias, 1999, and *T. carmenensis* Solis-Weiss, Fauchald & Blankensteyn, 1991, which occur at Brazil coasts [5, 21] by the absence of the dorsal cone on the 9th segment.

The new species has free branchial lobes; this character is significant for distinguishing this species from the species with half-fused branchial lobes: *T. californica* Williams, 1984 and *T. reishi* Williams, 1984 from the California Shelf [22]; *T. kobei* Hessle, 1917 from Japan waters, 7–930 m deep [13]; *T. lanai* Solis-Weiss, Fauchald & Blankensteyn, 1991 from Brazilian coasts [21]; *T. woolawa* Hutchings, & Peart, 2000 from Australia, Queensland; *T. kowinka* Hutchings, & Peart, 2000 from Australia and *T. narrabri* Hutchings, & Peart, 2000 from Australia [15]; *T. parvus* Solis-Weiss, Fauchald & Blankensteyn, 1991 shallow waters of the Western Atlantic [21]; *T. intoshi* Imajima & Williams, 1985, Eastern India, 314–2798 m deep [16]; *T. distincta* Williams, 1984, New England, continental slope [22]; *T. japonica* (Moore, 1903), Japan waters, 26–1530 m deep, and *T. brevis* Imajima & Williams, 1985, Japan waters, 110–314 m; *T. atlantis* Williams, 1984, New England, continental slope [16, 22]; *T. biaciculata* Hartmann-Schröder, 1992, Brasil coast [12]; *T. kobei* Hessle, 1917, Japan waters, 7–930 m [13]; *T. lobatus* Hartman & Fauchald, 1971, Western Atlantic, 520–5007 m [10]; *T. malvinensis* Bremec & Elias, 1999, Southern Atlantic [5]; *T. lineata* Imajima & Williams, 1985, Japan waters, 314–1650 m [16]; *T. mundora* Hutchings & Peart, 2000, Bass Strait, Victoria [15]; *T. ypsilon* Grube, 1878, Philippines, intertidal zone [8]; *T. horikoshii* Imajima & Williams, 1985, Japan waters, 105–1650 m [16]; *T. bisetosa* Hartmann-Schröder, 1965, Chile, 100–240 m [11]; *T. kerguelensis* McIn-

tosh, 1885, Antarctic und Subantarctic, 21–263 m [18]; *T. eurystethus* Chamberlin, 1919, west of Central and South America, 1424–6720 m [6]; *T. moori* Hessle 1917, Alaska, shelf; *T. longicaudatus* Hessle, 1917, South Georgia, 110–500 m [13] and *T. stroemi* Sars, 1835, western Norwegian, from 0 to 3000 m [20]. *T. irinae* sp. n. differs from *T. stroemi* also in that its first 10–12 abdominal segments are, at least, two times longer than thick. The ventral lobes of the branchiae in the new species can in no case be equal to the dorsal ones or exceed them in size, as it is characteristic of *T. stroemi*.

The new species *T. irinae* sp. n. is most similar to the species with branchial lobes that are free for two thirds of their length. One of them is *T. klemanni* Kinberg, 1867 (Brazilian waters, moderate depths) [17] with five branchial lobes, while the new species has four branchial lobes, the ventral lobes are differently developed. In the structure of branchia and by the presence of lateral lapets on segments 3rd to 7th, *T. irinae* sp. n. is similar to *T. sepulture* Garraffoni & Lana, 2003 (the southern Brazilian coast, 163–350 m deep) [7], but differs from that by its long feeler-like tips of the branchial lobes, by the structure of neuropodial setae and by the number of acicula (7–10, but not 5–6). From *T. williamsae* Jirkov, 1989 (Arctic Basin, 107–2500 m deep) [2], the new species distinguishes by a homogenous coloration of the integument: the absence of selective staining of segments, and also by the presence of smooth long feeler-like tips of the branchial lobes (from one quarter to one third of the lobe length); by acicular uncini on the 6th setigerous segment, these possess hair like tips bent at right angle; and by the body length not exceeding 15 mm. *T. ehlersi* McIntosh, 1885 (Fiji Is., 94–1225 m deep) [18] differs from *T. irinae* sp. n. by a branchial stalk that is significantly shorter than branchial lobes; the lobes in the new species are nearly equal in size, aciculi of the 6th segment are bent at about 135°, not at an angle of 90°. The species *T. pacifica* Kinberg, 1867 (Islands of Society, intertidal zone [17] and *T. korenii* Hansen, 1882 (Brazilian waters, moderate depths) [9] are not considered here because of their sparse description.

The available data allow us to present identification keys for three species of the *Terebellides* from the Arctic Basin.

Identification table for the genus *Terebellides* from the Arctic Basin.

1(4) Branchial lobes are free for two thirds of their length.

2(3) Glandular portions of fixed specimens differ in their color from the rest of the body surface. The ventral branchial lobes differ insignificantly from the dorsal lobes in their length: acicular neurochaetes of the 6th setigerous segment are bent at an angle greater than 90° and do not have thin hair-like tips. Body length not over 45 mm.....*T. williamsae* Jirkov, 1989.

3(2) Glandular portions of fixed specimens are similar in color to the entire body surface. The ventral bran-

chial lobes are underdeveloped: they are no less than twice shorter than dorsal ones, up to tiny hardly visible cones; acicular neurochaetes of the 6th setigerous segment are bent at a right angle and have thin hair-like tips. The worms are small, not longer than 15 mm..... *T. irinae* sp. n.

4(1) Branchial lobes fused at a half of their length. The ventral lobes are equal in length or are a bit longer than the dorsal branchial lobes. Big worms, up to 60 mm in length *T. stroemi* Sars, 1835.

Study of the juvenile forms of *T. stroemi* and *T. williamsae* from the Arctic Basin (the materials of all Arctic seas were studied, 34 samples) has shown that this ontogenetic stage has morphological characters that are in some details similar to those of *T. irinae* sp. n., viz., the ventral branchial lobes in *T. williamsae* are often developed significantly less than the dorsal ones. However, all branchial lobes in *T. stroemi* are more or less equally developed, although the length of the stalk, where the lobes attach, can be approximately equal to the length of the lobes, as in the new species. *T. stroemi* and *T. williamsae* become mature when they are 17 mm long, while *T. irinae* sp. n., at a length of 14 mm. At the same time, an analysis of the relationship between the body length of the worm to its width has shown that the ratio for each of the three Arctic species is a constant value, which significantly differs for different specimens and can be used as an additional metric character (see table).

DISCUSSION

Based on the above, we can assume that the new species appeared as a result of pedomorphosis. This assumption is confirmed by the fact that mature specimens of *T. irinae* sp. n. possess some characters of juvenile forms: they are no larger than 15 mm, have a lower number of abdominal segments than in the other two Arctic species and their branchial lobes are reduced to different extents (the ventral lobes are always no less than two times shorter than dorsal ones; the ventral lobes of the other two Arctic species are equal or insignificantly shorter than dorsal ones).

The specimen from the Greenland Sea, which I earlier identified as *T. stroemi*, looks like *T. irinae* sp. n. However, the low number of acicular setae of the 6th setigerous segment (only four), more developed lateral lappets, shorter feeler-like tips of branchial lobes, the absence of sex products, as well as a lack of material for analysis of intraspecific variability from this region have not allowed us yet to assign them to the same species.

The specimen collected by the drift expedition *Svernyi Polus* (SP-23) in the Canada Basin and identified by Zhirkov (1980) as *Terebellides* sp., can be most likely assigned to *T. irinae* sp. n., as it was found in the vicinity of the typical habitat of the new species with

similar ecological characteristics and has only two branchial lobes.

As to the *T. stroemi* documented by Bilyard and Carey [4] for the Canada Basin, we can assume that the specimens found by the authors at depths below 1000 m do not belong to the species. Most probably, the specimens correspond to *T. irinae* sp. n., while during the expedition of 2005 we did not find *T. stroemi* below 1000 m.

Etymology. The species is named in honor of my wife Irina L'vovna Bestuzheva, who devotedly helped me both on land and at sea during our life in the Arctic.

Biology. Mature females were recorded in July 2005 with a body length of no less than 13.6 mm (eggs 120–130 µm in diameter).

Geographical distribution and ecology. Arctic deep-water species. Found in Canada Basin at depths of 2570 to 3880 m.

The species dwells on fine disperse brown silts at a temperature of 0.5°C and salinity of 34.95 psu in taxocene of *Aglaophamus malmgreni*. The population density and biomass are 4 ± 2 spec/m² and 0.022 ± 0.012 g/m², correspondingly. The tube walls of silt are thin. It was first noted that the upper integuments of abdominal segments have a folding structure that becomes visible when stained with methylene blue and is characteristic of the species. Very likely, these foldings facilitate the forward motion of the body of the worm in the tubing. The body cavity of one worm contained a parasitic Nematode assigned to the order Mermitida (according to a verbal message from A.V. Shoshin).

ACKNOWLEDGMENTS

The author expresses his deepest gratitude to V.V. Potin, the Chief Custodian of the collection of the Department of Higher Worms (ZIN RAS) for a number of valuable comments and his technical support in my work on the article; to Dr. Biol. Sci. B.I. Sirenko and Cand. Biol. Sci. E.N. Egorova (both of the Laboratory of Marine Research of ZIN RAS) for their advice and suggestions; to Dr. E. Rachor (AWI) for the opportunity to work with the materials collected from aboard the R/V *Polarstern* and for his constant concern and assistance, as well as to the deck crew of the ice-cutter *Healy* their for assistance in collecting materials and their friendly relationship. The author highly appreciates the friendly assistance of and kind relations with all his colleagues during the cruise, and especially with the Benthos Group, comprised of B. Bluhm, K. Iken, and B. Holladay from the University of Alaska in Fairbanks (United States). The research was provided with means of Arctic Research Service (NOAA), NOAA's National Ocean Service, and support of the Alfred P. Sloan Fund. This article is a modest contribution to the implementation of the Census of Marine Life Project, in particular, with the support of an ArCOD mini grant and the

Unique Stock Collections grant of ZIN PAN (UFK ZIN, Reg. no. 2-2.20) of the ROSNAUKA on governmental contract.

REFERENCES

1. Zhirkov, I.A., On the fauna of Polychaeta in the Abyssal of the Canada Basin, *Biologiya Tsentral'nogo Arktycheskogo basseina* (Biology of the Central Arctic Basin), Moscow: Nauka, 1980.
2. Zhirkov, I.A., *Donnaya fauna morei SSSR* (Bottom Fauna of the Seas of the USSR), Moscow: Moscow State University, 1989.
3. Zhirkov, I.A., *Polychaetes of the Arctic Ocean*, Moscow: Yanus-K, 2001.
4. Bilyard, G.R. and Carey, A.G., Jr., Zoogeography of Western Beaufort Sea, Alaska, USA Polychaeta Annelida, *Sarsia*, 1980, vol. 65, pp. 19–26.
5. Bremec, C.S. and Elias, R., Species of *Terebellides* from South Atlantic Water off Argentina and Brazil (Polychaeta: Trichobranchidae), *Ophelia*, 1999, vol. 51, no. 3, pp. 177–186.
6. Chamberlin, R.V., The Annelida Polychaeta, *Mem. Mus. Comp. Zool.*, Harvard, 1919, vol. 43, pp. 1–493.
7. Garraffoni, A.R.S. and Lana, P.C., Species of *Terebellides* (Polychaeta, Terebellidae, Trichobranchinae) from the Brazilian Coast, *Iheringia, Sér. Zool.*, 2003, vol. 93, no. 4, pp. 355–363.
8. Grube, Ed., Annulaten, *Middendorffs Reise in den aussersten Norden und Osten Sibiriens während der Jahre 1843–1844, 1851*, 1878, vol. 2 (Zool.), no. 1, pp. 1–24.
9. Hansen, G.A., Annelida, Den norske Nordhavexpedition 1876–1878, *Zoologie*, Oslo, 1882, vol. 25, no. 3, pp. 225–234.
10. Hartman, O. and Fauchald, K., Deep-Water Benthic Polychaetous Annelids off New England to Bermuda and other North Atlantic Areas, Part 2, *Allan Hancock Monogr. Mar. Biol.*, 1971, vol. 6, pp. 1–27.
11. Hartmann-Schröder, G., Zur Kenntnis des Sublitoral der chilenischen Küste unter besonderer Berücksichtigung der Polychaeten und Ostracoden (Mit Bemerkungen über den Einfluß sauerstoffärmer Strömungen auf die Besiedlung von marinen Sedimenten), *Mitt. Hamburg. Zool. Mus. Inst. Ergänzungsband*, 1965, vol. 62, pp. 1–384.
12. Hartmann-Schröder, G., Zur Polychaetenfauna der polynesischen Inseln Huahiné (Gesellschaftsinseln) und Rangiroa (Tuamotu-Inseln), *Mitt. Hamburg. Zool. Mus. Inst.*, 1992, Bd. 89, S. 49–84.
13. Hessle, C., Zur Kenntnis der terebellomorphen Polychaeten, *Zool. Bidr. Uppsala*, 1917, Bd. 5, S. 39–58.
14. Holthe, T., Evolution, Systematics and Distribution of the Polychaeta Terebellomorpha, with a Catalogue of the Taxa and a Bibliography, *Gunneria (Trondheim)*, 1986, vol. 55, pp. 1–236.
15. Hutchings, P.A. and Peart, R., A Revision of the Australian Trichobranchidae, *Invertebr. Taxon.*, 2000, vol. 14, pp. 225–272.
16. Imajima, M. and Williams, S.J., Trichobranchidae (Polychaeta) Chiefly from the Sagami and Sugura Bays, Collected by R/V *Tansei-Maru* (Cruises KT-65~76), *Bull. Nat. Sci. Mus. Tokyo, Ser. A*, 1985, vol. 11, no. 1, pp. 7–18.
17. Kinberg, J.C.H., Annual nova. Öfvers. K. Vetensk. Akad. Förh. Stockholm, 1867, vol. 23, no. 9, pp. 337–357.
18. McIntosh, W.C., Report on the Annelida Polychaeta Collected by H.M.S. *Challenger* during the Years 1873–76, Report on the Scientific Results of Voyage of H.M.S. *Challenger* during the Years 1873–76 under the Command of Captain George S. Nares, R.N., F.R.S. and the Late Captain Frank Tourle Thomson, R.N., *Zoology*, 1885, vol. 12, pp. 1–554.
19. Moore, J.P., Polychaeta from the Coastal Slope of Japan and from Kamchatka and Bering Sea, *Proc. Acad. Nat. Sci. Phil.*, 1903, vol. 55, pp. 401–490.
20. Sars, M., *Beskrivelser og iagttagelser over nogle maerkelige eller nye i havet ved den bergenske kyst levende dyr af polypernes, acalephernes, radiaternes, annelidernes, og molluskernes classer, med en kort oversigt over de hidtil af forfatternen sammesteds funde arter og deres forekommen*, Bergen, 1835, vol. 12, pp. 1–81.
21. Solis-Weiss, V., Fauchald, K., and Blankensteyn, A., Trichobranchidae (Polychaeta) from Shallow Warm Water Areas in the Western Atlantic Ocean, *Proc. Biol. Soc. Wash.*, 1991, vol. 104, no. 1, pp. 147–158.
22. Williams, S.J., The Status of *Terebellides stroemi* (Polychaeta; Trichobranchidae) as a Cosmopolitan Species, Based on a World-Wide Morphological Survey, Including Description of New Species, Proc. First Int. Polychaete Conf. Sydney, *The Linnean Society of New South Wales*, 1984, pp. 118–142.