

Two New Species of *Monstrilopsis* Sars (Crustacea: Copepoda: Monstrilloida) from the White Sea and Norway, with Comments on *M. dubia* Scott

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ABSTRACT. A new species of monstrilloid copepod, *Monstrilopsis ferrarii* n. sp., based on four adult female specimens collected in the White Sea, northern Russia, is described and illustrated. The new species is most closely related to *M. dubia* Scott from Scotland and the Mediterranean and *M. dubia* (sensu Sars, 1921) from Norwegian fjords. The latter is considered to represent a distinct species, described herein as *M. dubioides* n. sp. It differs from *M. dubia* in characters related to antennule length compared to body length, but mainly to the shape and relative size of the genital double somite and other urosomal somites. Records of *M. dubia* in Norway and off Lisbon are referable to *M. dubioides* n. sp. On the other hand, *M. ferrarii* n. sp. differs from *M. dubia*, *M. dubioides*, and the other species of the genus by a combination of characters, including 1) two rounded protuberances in the cephalic area, flanking the ocelli; 2) a wide zone of transverse cuticular striations encircling the cephalic area; 3) very long exopodal setae on the fifth legs, with no distal elongation of the exopodal lobe beyond the setal bases; 4) a relatively long genital double somite with the margins of the anterior half produced laterally; and 5) the nearly equal sizes of the anal somite and the preceding somite. It is considered that *M. dubia* and related forms represent a species complex with subtle morphological differences and a wide distribution. This is the first record of a species of *Monstrilopsis* in Russia and the sixth species of this order to be recorded in polar environments.

Key words: marine zooplankton, taxonomy, associated Copepoda, monstrilloid, semiparasitic copepods

RÉSUMÉ. On décrit et illustre une nouvelle espèce de copépode de la famille des monstrillidés, *Monstrilopsis ferrarii* n. sp., établie d'après quatre spécimens femelles adultes prélevés dans la mer Blanche (Russie septentrionale). Cette nouvelle espèce est très proche de *M. dubia* Scott qui vit au large de l'Écosse et en Méditerranée, et de *M. dubia* (sensu Sars, 1921) présente dans les fjords norvégiens. On considère que cette dernière représente une espèce distincte, décrite ici sous le nom de *M. dubioides* n. sp. Elle se différencie de *M. dubia* par certains éléments liés à la longueur de l'antennule par rapport à la longueur corporelle, mais surtout par la forme et la taille relative du double somite génital et d'autres segments de l'urosomite. Les observations de *M. dubia* en Norvège et au large de Lisbonne portent en fait sur *M. dubioides* n. sp. D'un autre côté, *M. ferrarii* n. sp. se différencie de *M. dubia*, *M. dubioides* et des autres espèces appartenant à ce genre par une combinaison de caractéristiques qui comprennent: 1) deux protubérances arrondies dans la zone céphalique, situées de part et d'autre des ocelles; 2) une large zone de stries cuticulaires transversales entourant la partie céphalique; 3) de très longues soies exopoditiques sur la cinquième paire de pattes, sans élévation distale du lobe de l'exopodite au-delà de la partie basilaire des soies; 4) un double somite génital relativement long dont les bords de la moitié antérieure se développent latéralement; et 5) une taille presque similaire du somite anal et du somite qui le précède. On considère que *M. dubia* et les formes apparentées représentent une espèce complexe qui témoigne de différences morphologiques subtiles et d'une large distribution. Il s'agit là de la première observation de *Monstrilopsis* en Russie et de la sixième espèce de cet ordre à être observée dans un environnement polaire.

Mots clés: zooplancton marin, taxinomie, Copépodes apparentés, monstrillidés, copépodes semi-parasites

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INTRODUCTION

Monstrilloid copepods represent one of the ten orders of Copepoda currently recognized (Huys and Boxshall, 1991). They are protelean parasites of benthic macroinvertebrates such as polychaetes and molluscs (Caullery and Mesnil, 1914; Davis, 1984); most postnaupliar and preadult stages are endoparasitic. Adults represent the most conspicuous

stage because they are free-living and are captured by plankton nets in zooplankton surveys of coastal-neritic systems at all latitudes (Suárez-Morales, 2001). This order is currently represented by over 100 nominal species contained in three genera: *Monstrilla* Dana, *Monstrilopsis* Sars, and *Cymbasoma* Thompson (Huys and Boxshall, 1991; Grygier, 1995). A legacy of taxonomical and nomenclatural problems is due to a largely incomplete set

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of basic morphological information about the species (Grygier, 1994a) and to the inaccuracy and shallowness of many species descriptions. With only a few species, *Monstrillopsis* is the smallest genus in the Monstrilloida. It has a wide geographical distribution, including tropical, temperate, and polar zones (Razouls, 1996).

The White Sea is an internal Russian marine system that remained unstudied for many years; however, it is now one of the best-investigated marine areas in Russia. Zooplankton studies in the White Sea started in the 19th century, and these works provided an important set of information on the taxonomy, morphology, and general biology of different zooplankton taxa (Pertsova and Kosobokova, 2000). However, recent efforts have been designed to study dynamic aspects of the biology and distribution of the zooplankton community of this system (i.e., seasonal variations, feeding, physiology, and reproduction) (Pertsova and Kosobokova, 2000). As part of a survey of the marine fauna of the White Sea, zooplankton samples were collected at several sites, one of them being Kandalaksha Bay (Fig. 1). Among these samples, four monstrilloid copepod specimens belonging to an undescribed species were found. The new species is described in full and depicted here following the current upgraded description standards set by Grygier and Ohtsuka (1995) for monstrilloid copepods. During this analysis and comparison, the status of *M. dubia* Scott, 1904 (sensu Sars, 1921) was reappraised.

METHODS

The biological material examined here was obtained as part of an ongoing project to study the copepod fauna of the White Sea. Zooplankton samples were collected on 3 July 1996 from on board a small boat. Collections were made with a standard plankton net (0.150 mm mesh size) that was hauled obliquely in the surface layer (0–10 m) during daytime. Samples were fixed and preserved in a solution of formaline. Several specimens of monstrilloid copepods were recovered from the sample and then transferred to 70% ethanol. The taxonomic analysis included light staining with Methylene Blue and semipermanent mounting in glycerine. Drawings were prepared with the aid of a camera lucida. One specimen was prepared for SEM (Scanning Electron Microscope) following the usual process for routine SEM examination.

SYSTEMATICS

Order Monstrilloida Sars, 1901

Family Monstrillidae Giesbrecht, 1892

Genus *Monstrillopsis* Sars, 1921

Monstrillopsis ferrarii Suárez-Morales and Ivanenko n. sp.

(Figs. 2–6)

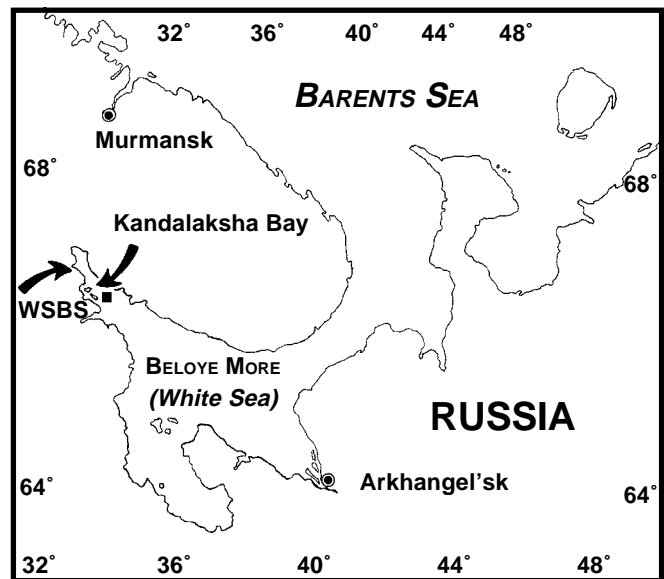


FIG. 1. General location of the White Sea in northern Russia, showing the location of Kandalaksha Bay and of the sampling site (solid square) where specimens of *M. ferrarii* n. sp. were collected. The black square marks the location of the White Sea Biological Station (WSBS).

Material Examined: Holotype: adult female from Kandalaksha Bay (66°34'N, 33°08'E), White Sea, northern Russia, undissected, ethanol-preserved. Date of collection: 3 July 1996. Plankton sample. Vial deposited in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C. (USNM 1019765). Paratype: adult female from Kandalaksha Bay, White Sea, Northern Russia, same date, undissected. Vial deposited in the Collection of Zooplankton at El Colegio de la Frontera Sur (ECOSUR), in Chetumal, Mexico (ECOCH-Z-01330). Plankton sample. Paratype: Adult female, undissected, same locality and date, deposited in the Zoological Museum of Moscow, Russia (ZM MSU). The specimen used for SEM analysis is in the collection of the second author (VNI), in Moscow.

Etymology: The new species is dedicated to Dr. Frank D. Ferrari, zoologist at the NMNH, Smithsonian Institution, for his efforts to understand the biology and development of copepods and for his support to international researchers visiting the NMNH.

Habitat: The White Sea is a marginal sea of the Arctic Ocean connected with the Barents Sea by a shallow strait. The area of the White Sea is almost 89 600 km², the average depth is 60 m, and the maximal depth is 343 m. A general account of the morphology, sediments, and general oceanography of the White Sea is given by Berger and Naumov (2000). The range of tidal fluctuations at the site of collection is very great, reaching up to 4 m. The surface salinity and temperature range between 22 and 24 PSU and 1.2° and 14°C, respectively (Ivanenko and Smurov, 1997).

Description: Adult female: Total body length of the holotype is 2.56 mm, measured from anterior end of cephalothorax to posterior end of anal somite. Paratype

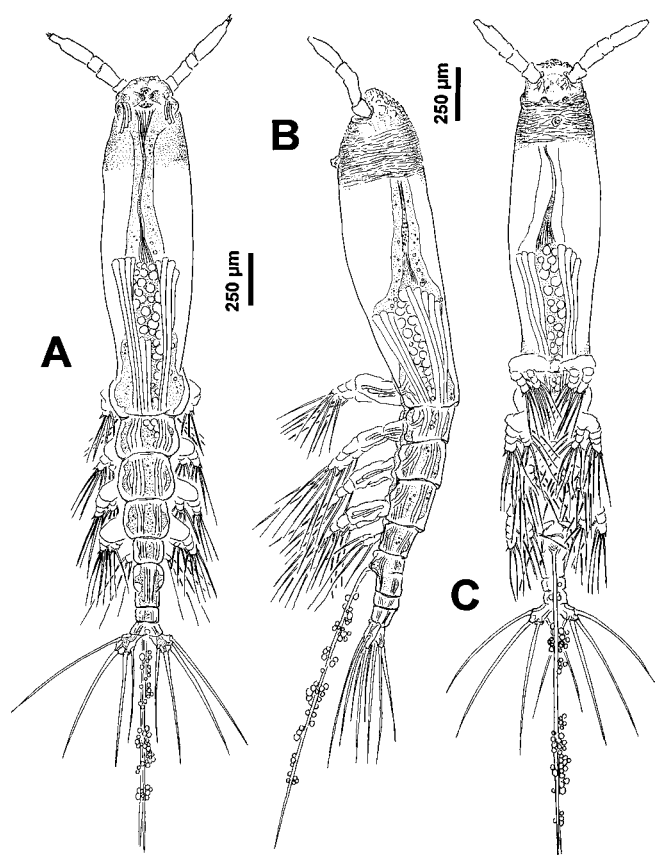


FIG. 2. *Monstrillopsis ferrarii*, new species: adult female holotype from the White Sea, Russia. A) Habitus, dorsal; B) Habitus, lateral; C) Habitus, ventral. (Antennular armature is not shown.)

specimens are 2.54 mm and 1.98 mm long. Cephalothorax is 1.34 mm long in the holotype and 1.18 mm and 1.54 mm in the paratypes, representing up to 61.3% of total body length (Fig. 2A–C). Oral papilla is slightly protuberant (Fig. 3A, C), located less than 21% of way back along ventral surface of cephalothorax (Fig. 2B). Pair of ocelli is present, with pigment cups medially conjoined, well developed, strongly pigmented in central portion, faint on widening outside margins (Fig. 2A). Cephalic segment with irregular cuticular protuberances on “forehead” (Fig. 3B, D) shows the same overall cuticular pattern, but with some variation (Fig. 3A, C); sensilla are not observed on cephalic area. Transverse cuticular wrinkles arranged in a tight parallel pattern form a ring posterior to the ocelli and encircle about 25% of the cephalothorax. A single pair of relatively large, ear-shaped cuticular processes is found on the anterior ventral surface between antennule bases and oral papilla (arrowed in Figs. 3A, 4A); these processes are radially ridged and furrowed. Other ventral cuticular ornamentation includes faint transverse wrinkles covering most of the surface of the cephalothorax, not visible except at high magnification (see Fig. 7A, B).

Antennule length is 0.48 mm in the holotype and 0.40–0.46 mm in paratypes, equal to 15.3% of total body length and 27% of cephalothorax length. As usual in females of

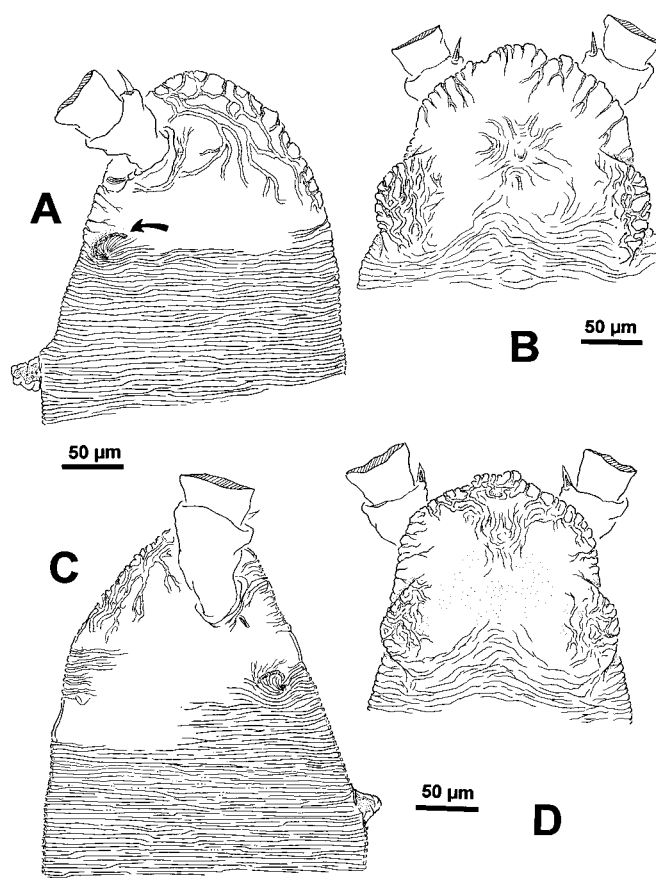


FIG. 3. *Monstrillopsis ferrarii*, new species. Adult female holotype from the White Sea, Russia: A) Cephalic area, lateral view, showing cuticular ornamentation; B) Cephalic area showing dorsal cuticular protuberances and ornamentation. Paratype female: C) Cephalic area, lateral view; D) Cephalic area, dorsal view.

Monstrillopsis, antennules are four-segmented, armed with 0-I; 1-V; 2-I; 10-VIII setae (Arabic numerals) and spines (Roman numerals), plus two aesthetascs (Fig. 4B, C). Some elements were broken off in each specimen; the armature was completed by adding elements present in any specimen. In terms of the pattern described by Grygier and Ohtsuka (1995) for female monstrilloid antennular armature, element 1 is present on the first segment; elements 2d₁, 2d₂, 2v₁, 2v₂, 2v₃, and II d on the second segment, with first four listed spiniform elements particularly long and well-developed (Fig. 4B); the third segment has elements 3, III d, and III v; segment four has normally developed elements 4v₁, 4d_{1,2}, and 4v₂₋₃, as well as setae IV d, IV v, V d, V v, and V m and also element 5. Subterminal elements b₁₋₄ are present, b₁₋₃ being dichotomously branched. Aesthetasc 4aes are well developed on ventral surface (see Fig. 4B), and terminal elements 6aes, 6₁, and 6₂ are present. Elements b₅–b₆ were not observed.

The first pedigerous somite is cephalically incorporated and the three succeeding free pedigerous somites each bear a pair of biramous swimming legs. Pedigerous somites 2–4 together account for 22.7% of total body length (holotype) in dorsal view. Swimming legs 1–4 slightly increase in size

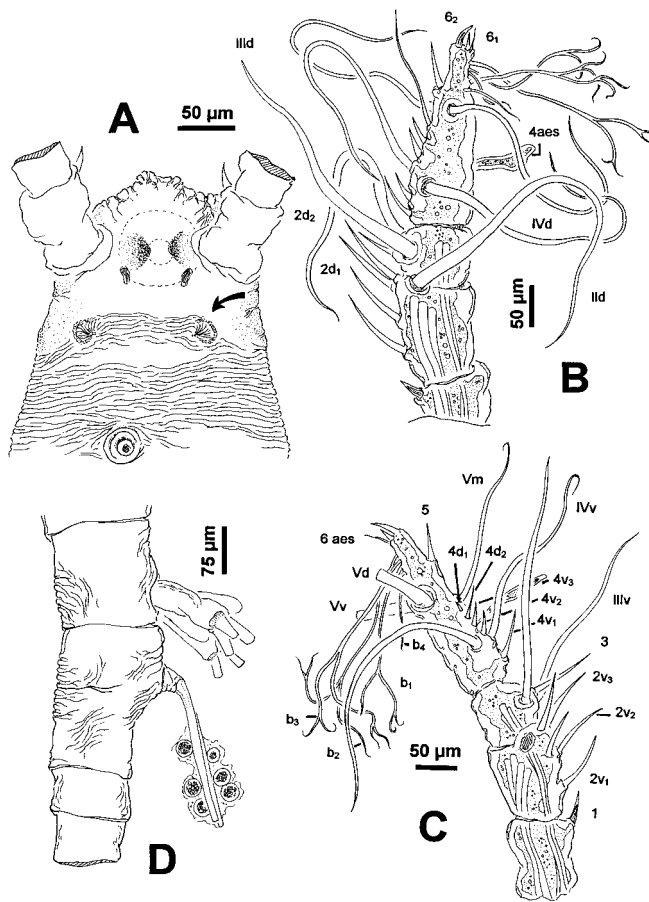


FIG. 4. *Monstrillopsis ferrarii*, new species. Adult females from the White Sea, Russia. A, B, D: paratype; C: holotype. A) Cephalic area, ventral view, showing cuticular ornamentation; B) Right antennule, dorsal view, with some antennular elements identified following the nomenclature of Grygier and Ohtsuka (1995); C) Left antennule, dorsal view, with complementary labels of antennular elements; D) Fifth pedigerous somite, genital double somite, and two free urosomites, lateral view.

posteriorly, but their intercoxal sclerites decrease in size posteriorly. Intercoxal sclerites of legs 1–4 are rectangular, without ornamentation on surface or along distal margin. The basis of these legs articulates with large, rectangular coxa along a diagonal line. The basis has hair-like lateral seta on legs 1–4 (Fig. 5B–E); on leg 3, this seta is about 4.5 times longer and slightly thicker than on the other legs, lightly setulated from the distal half (see Fig. 5D). Endopodites and exopodites of swimming legs 1–4 are triarticulated. Ramus setae are all biserially plumose except the spiniform outer seta (“spine”) on exopodites 1 and 3 and the inner seta of the first exopodal segment, these latter being short and smooth (Fig. 5B, E). Also, the outermost apical exopodal setae (also a “spine”) of swimming legs 1–4 have an inner margin bearing a row of short hair-like setules, with the outer margin lightly spinulose to its tip (Fig. 5C).

Armature formula of swimming legs:

	basis	endopodite	exopodite
leg 1	1–0	0–1;0–1;1,2,2	I–1;0–1;I,2,2
legs 2–4	1–0	0–1;0–1;1,2,2	I–1;0–1;I,1,2,2

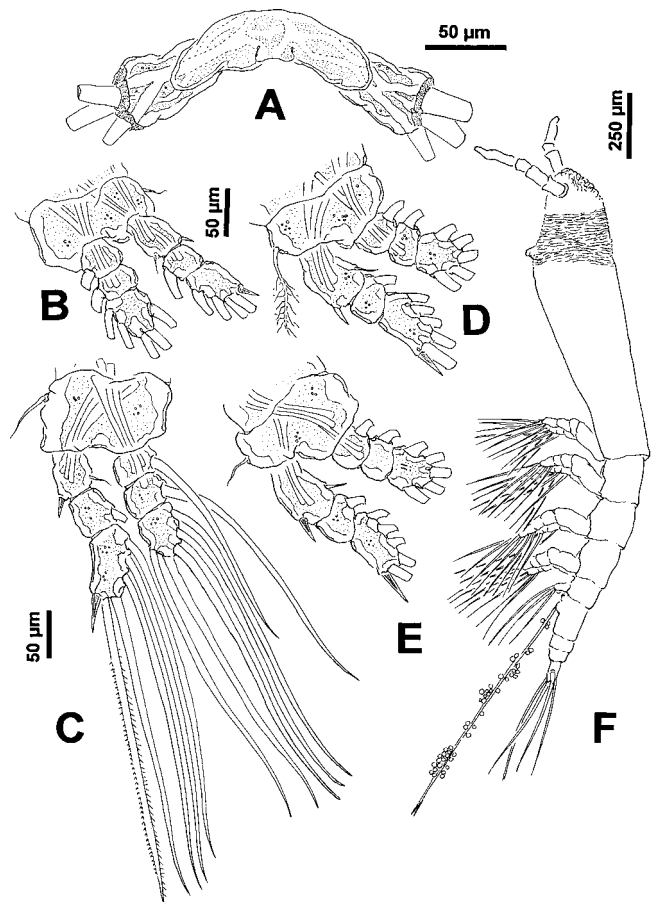


FIG. 5. *Monstrillopsis ferrarii*, new species. Adult females from the White Sea, Russia. A, F: paratype; B–E: holotype. A) Fifth legs, ventral view; B) First swimming leg; C) Second swimming leg; D) Third swimming leg; E) Fourth swimming leg. F) Habitus, lateral view. The setae of swimming legs 1, 3, and 4 and those of the fifth leg are cut short.

Fifth legs are medially conjoined at the base and unsegmented, each consisting of a relatively large outer (exopodal) lobe and an inner (endopodal), digitiform, almost thumb-shaped lobe (Figs. 5A, 6D–F). The endopodal lobe reaches at most the distal margin of the exopodal lobe (Fig. 6D–F). Three exopodal setae are present, all unusually long; the outermost two are longest, reaching the level of the proximal 1/3 of the furcal rami (see Fig. 6A); the third, innermost seta is slightly thinner and about 35% shorter than the outer ones. All three setae are biserially and sparsely setulated.

The urosome consists of four somites: fifth pedigerous bearing fifth legs, genital double somite, free postgenital somite, and free anal somite. The fifth pedigerous somite represents about 5% of total body length, about as long as two postgenital somites together; this somite has cuticular striae near its outer margins (Fig. 6C) and on the dorsal surface (Figs. 4D, 6B). The genital double somite is relatively long (0.22 mm in holotype, 0.22 mm and 0.16 mm in paratypes); the ratio of its length to the lengths of the two succeeding somites is 62:19:19 = 100. Partial

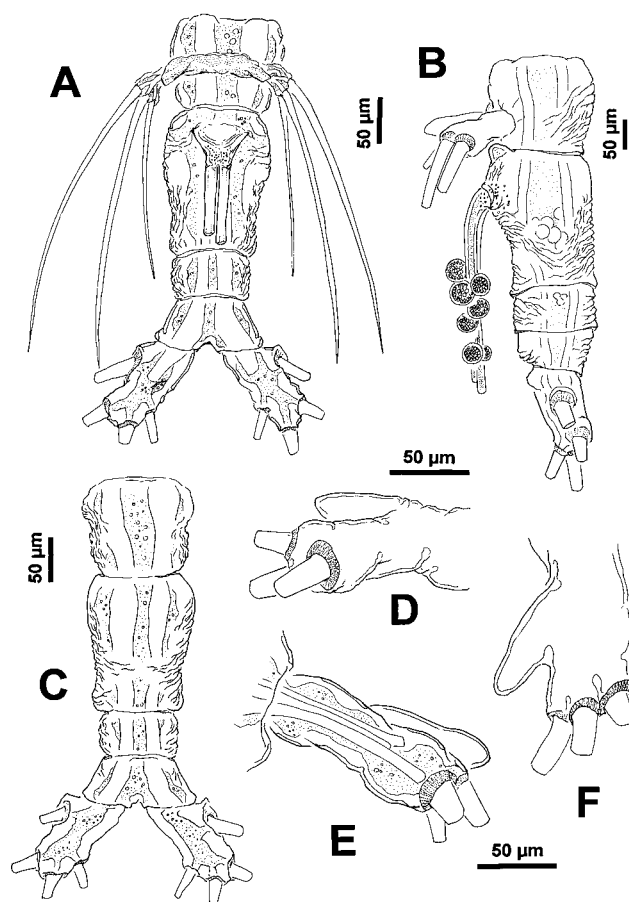


FIG. 6. *Monstrillopsis ferrarii*, new species. Adult females from the White Sea, Russia. A, C, D, F: holotype; B, E: paratype. A) Urosome including fifth pedigerous, genital double, and two free somites, ventral view; B) Same, lateral view; C) Same, dorsal view; D) Fifth leg, lateral view; E) Fifth leg, lateral view; F) Fifth leg, anterior view.

intersegmental division exists on the dorsal surface; the ventral surface has a rounded protuberance on its anterior proximal margin. The anterior half of the genital double somite has outer margins expanded laterally (expansions are rounded), and the posterior half is unexpanded, with small, irregular marginal protuberances and the same kind of cuticular wrinkles on all surfaces as those present on the fifth pedigerous somite (Figs. 4D, 6A–C). The bases of the ovigerous spines are on the proximal half of the ventral side of the double somite. Ovigerous spines are paired, arising separately from a protuberant base visible in lateral view (Fig. 6B), and are relatively long (0.9–1.1 mm), about 60% of total body length and about 85% as long as the cephalothorax; they are broken in one paratype, unbroken in the holotype. Adhering egg clusters along the spines are covered by thin, gelatinous sheath; tips of spines are separated from each other, with slight but distinct subterminal narrowing.

Furcal rami are subrectangular, widely divergent, and approximately 2.3 times longer than wide, each bearing four well-developed setae: two terminal, one outer, and one on the inner margin. The former three setae are longer

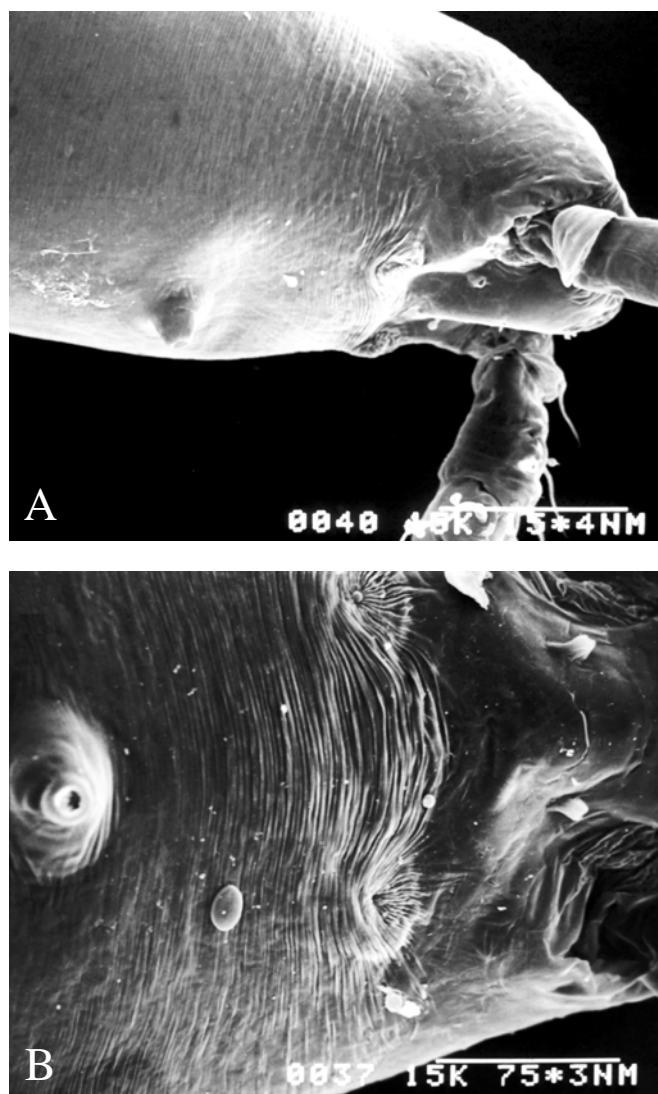


FIG. 7. *Monstrillopsis ferrarii*, new species. Adult female, additional specimen from the White Sea, Russia. SEM. A) Semilateral view of anterior part of cephalothorax, showing posteriorly fading cuticular pattern; B) Detail of anterior-ventral cuticular processes and wrinkles. Scale bars = 100 µm in A, 45 µm in B.

(0.73–0.64 mm) than the innermost seta (0.35–0.42 mm); all furcal setae are nearly the same in breadth (Fig. 2C).

Male: unknown.

Host: unknown.

Remarks: The species described herein is assigned to *Monstrillopsis* owing to its possession of the combination of characters noted by Sars (1921) in his diagnosis of this genus: 1) two free somites posterior to the genital double somite, 2) eyes fully developed, 3) four-segmented antennules in the female, 4) oral papilla occurring near the anteriormost part of the cephalothorax, 5) the bilobed fifth leg of the female, the outer lobe armed with three setae, 6) furcal rami with four setae.

In the most widely used key to the species of the Eastern Atlantic Monstrilloidea (Isaac, 1975), the new species would key down to couplet number 6. This leads to the female of

TABLE 1. Comparison of taxonomic features and morphometry in females of selected species of *Monstrillopsis*, including the two new taxa accounted in this work. A1 = antennule; AN = anal somite; CT = cephalothorax; FP = fifth pediger; GS = genital double somite; LA = last antennular segment; TL = total length; UR = urosome. All ratios are presented in percentage form.

Species	CT/TL	GS/TL	GS/UR	AN/UR	LA/A1	A1/TL	FP/TL	TL (mm)
<i>M. dubia</i>	63.7	4	41.6	30	50	32.5	3.6	3.3
<i>M. dubioides</i> n. sp.	61	4.7	56	28.5	55	22	4.6	3.8
<i>M. ferrarii</i> n. sp.	61.3	8	62	19	42–46	15.3	4.9	1.9–2.5
<i>M. zernowi</i>	57	5.3	46	26.6	70?	32	6	1.5

either *M. dubia*, if the body length is disregarded, or *M. gracilis*, if the position of the mouth is followed. The latter species was mistakenly assigned to *Monstrillopsis* by Isaac (1975); it clearly belongs to the genus in which it was originally described by Gurney (1927) (*Cymbasoma*), as inferred previously by Sekiguchi (1982). The presence of only one somite between the furcal rami and the genital double somite, the occurrence of three furcal setae on each ramus, and the structure of the fifth legs and antennules are characters typical of *Cymbasoma*. In fact, *C. gracilis* probably belongs to a well-defined group of *Cymbasoma* species with a relatively long cephalothorax and the female fifth legs with an inner lobe (see Suárez-Morales, 2002).

Monstrillopsis ferrarii n. sp. differs in several respects from Scott's (1904) *M. dubia*. The latter species has relatively longer antennules (32.5% of total body length) than the new species (less than 18%); both, however, share a relatively long terminal antennular segment. *Monstrillopsis dubia* (sensu Scott, 1904) has a short, robust genital double somite (see Scott, 1904: Pl. XIV, fig. 18), 1.2 times wider than it is long. This somite represents about 4% of the total body length and 41.6% of the urosome length, whereas the corresponding structure in the new species has a different shape and greater relative length. Also, the fifth pedigerous somite is relatively smaller in *M. dubia* (sensu Scott, 1904) than in *M. ferrarii* (see Table 1). The anal somite is longer than the preanal somite in the former species and represents 30% of the urosome length; in the new species, the anal and preanal somites are equally long, and the anal somite represents only 19% of the urosome length (see Table 1). The general structure of the female fifth leg is similar in both species, but *M. ferrarii* lacks the distal process on the outer lobe.

Monstrillopsis dubia (sensu Sars, 1921), on the other hand, is quite close morphologically to *M. ferrarii* n. sp. Both share a relatively long cephalothorax (over 60% of total body length), four furcal setae, a digitiform inner lobe on the female fifth leg, an outer lobe furnished with three long setae, a distal antennular segment representing close to half the length of the antennule, and a relatively long genital double somite. The new species differs from *M. dubia* (sensu Sars, 1921) in several respects. The genital somite is distinctly longer in the new species (8.2% of total body length, 62% of urosome length) than in the latter (4.7% and 56%, respectively). The anal somite is relatively larger in *M. dubia* (sensu Sars) than in *M. ferrarii* (28.5% vs. 19% of urosome length). The structure of the

fifth legs differs: in *M. dubia* (sensu Sars), the distal part of the leg has an elongated process on the outer margin, which gives the impression that the setae are not inserted distally on the appendage (Sars, 1921; Pl. XIV); in contrast, in *M. ferrarii*, this process is absent, and all three setae are inserted either terminally or subterminally (Fig. 6D–F). Some other minor differences are the terminal segment of the antennule, which is relatively longer in *M. dubia* (sensu Sars) than in the new species (50% vs. 42–45% of antennular length), and the body shape. In particular, the cephalothorax is “exceedingly slender and narrow” in the former species, as pointed out by Sars (1921:26, Pl. XIV), whereas it is relatively robust in *M. ferrarii*. Finally, the new species can be readily distinguished by the two ornamented protuberances on the cephalic area and the cuticular striations on different parts of the body. In light of these many differences, the erection of a new species for the specimens from the White Sea seems to be well justified.

The type specimens of *M. dubia* (Scott) collected in Firth of Forth (east of Inchkeith, Scotland) in 1891 and in Loch Fyne, Firth of Clyde, in 1897 (Scott, 1904) were searched for in the collections in which T. Scott could likely have deposited voucher material or type specimens of Copepoda. The fact that most of his work on Monstrilloida was published in Scotland was considered important information to mark the limits of this search. The collections included the Natural History Museum in London and the Royal Museum of Scotland in Edinburgh. Curators of both institutions were contacted and both reported negative results. Therefore, the type specimens of *M. dubia* (Scott) were deemed to be not extant. Also, Sars' specimens of *M. dubia* were requested on loan from the University of Oslo and were examined as explained below.

Monstrillopsis dubioides Suárez-Morales n. sp.
(Figs. 8, 9)

Monstrillopsis dubia Sars 1921:26–27, Pl. XIV.

Material Examined: One adult female from Beian, outside the Trondheimsfjord, Norway. Specimens deposited in the Sars Collection, Zoological Museum, University of Oslo, Norway (F21800). Specimen was ethanol-preserved and badly damaged; body parts had separated in the vial, and most setae were missing. Parts of possibly another specimen were also found in the same vial.

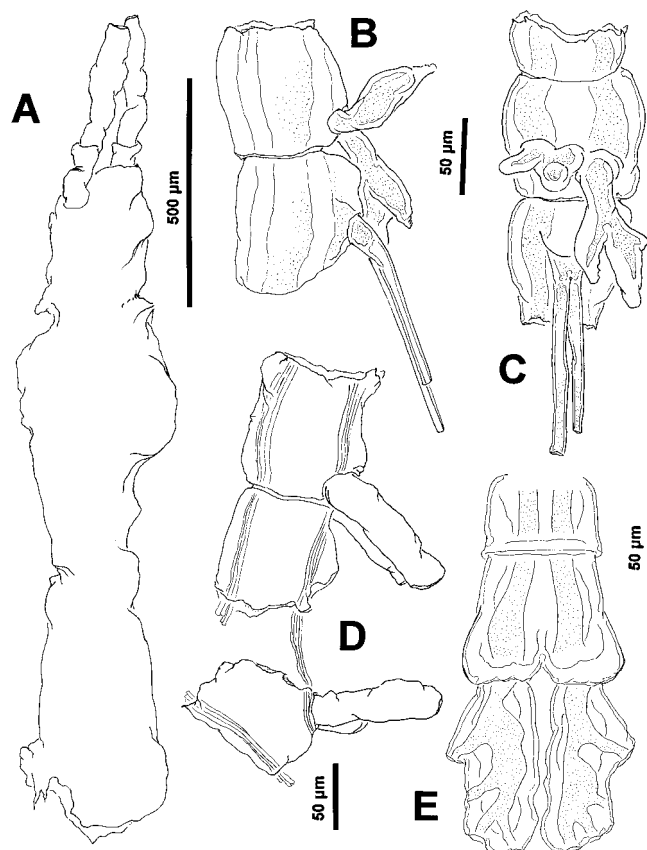


FIG. 8. *Monstrillopsis dubioides* n. sp. (ex *M. dubia* sensu Sars). Adult female specimens from Beian, outside Trondheimsfjord, Norway (F21800). A) Cephalothorax, lateral view; B) Fifth pedigerous, fifth legs, and genital double somite, lateral view; C) Fifth pedigerous and genital double somites, ventral view; D) Second, third, and fourth pedigerous somites, fourth separated; E) Anal and preanal somites, dorsal view.

Diagnosis: Species was as described and depicted by Sars (1921) for the male and female and by Huys and Boxshall (1991: fig. 2.5.11C–E) for the male. Body proportions and other characters of females are shown in Table 1. Females of this species can be distinguished by 1) the distal digitiform process on the outer lobe of the fifth leg; 2) the genital double somite being longer than wide, representing about 55% of length of urosome length; 3) the extremely slender body; and 4) the relatively short antennule, which equals only 22% of the total body length.

Etymology: The new species is named using the root of the species name to which it has been associated for more than 80 years (*dubia*) and adding the suffix *-oides* to denote both the differences and the affinity between the new species and the one it was split from.

Remarks: Several characters present in *Monstrillopsis dubia* (sensu Scott, 1904) differ from those described by Sars (1921) for supposedly the same nominal species. The main differences between these two species reside in the proportions of the body parts, particularly in the urosome; the genital double somite, the fifth pedigerous somite, and the anal somites differ in shape and relative size in the two species, as shown in Table 1. An additional difference is

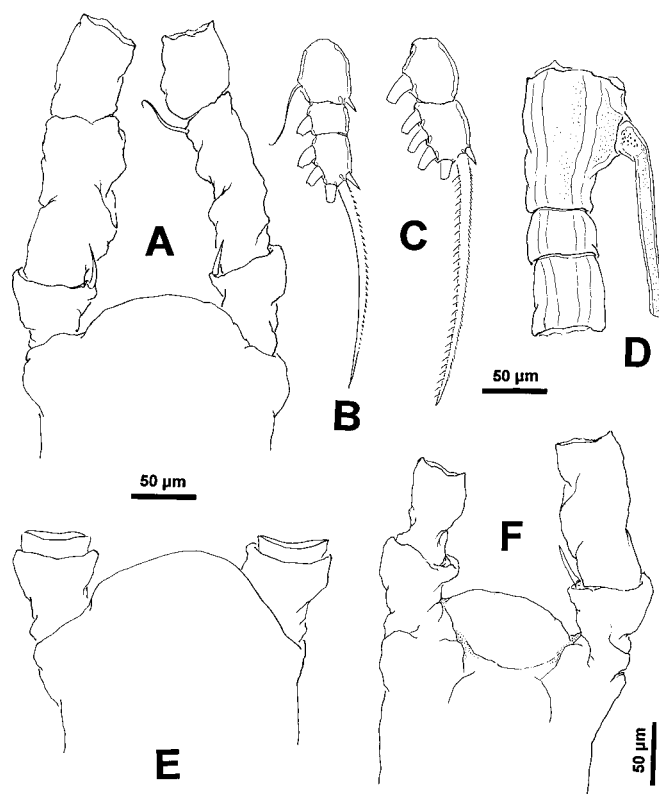


FIG. 9. *Monstrillopsis dubioides* n. sp. (ex *M. dubia* sensu Sars). Adult female specimens from Beian, outside Trondheimsfjord, Norway (F21800). A) Cephalic area with part of the antennules, dorsal; B) Exopod of first legs; C) Two distal segments of exopod of legs 2, 3, or 4; D) Urosome, lateral view, another specimen; E) Cephalic area, dorsal view, second specimen; F) Cephalic area, ventral view, first specimen.

the relative length of the antennules, which are very long in *M. dubia* (sensu Scott, 1904) (32.5% of total body length) and shorter (22%) in *M. dubioides* n. sp. Not much of the antennular armature can be compared between these two species, except perhaps the terminal spines depicted by Scott for *M. dubia* (Scott, 1904: Pl. XIII, fig. 14; Pl. XIV, fig. 16), which are longer than in *M. dubioides* (see Sars, 1921: Pl. XIV), and the stronger element 1 (sensu Grygier and Ohtsuka, 1995) on the first antennular segment of *M. dubia* (sensu Scott, 1904). The specimens upon which Sars (1921) based his identification of *M. dubia* are badly damaged; only separated parts of the body could be examined (see Figs. 8, 9). The label indicates one specimen only, but there are two cephalic portions (Figs. 8A, 9A, E, F) and two genital somites (Figs. 8C, 9D), each with the ovigerous spines attached. Therefore, it is inferred that two specimens were originally put in this vial. Although their condition is poor for taxonomical examination, it is clear that these specimens have the characters of the species as diagnosed herein.

The form described and depicted by Sars (1921), which is now diagnosed as a new species, is clearly different from *M. dubia* Scott, 1904. The species name used by Scott (1904) has nomenclatural priority and remains associated to this species and type locality on the Scotland coasts. The

new species, *Monstrillopsis dubioides* n. sp. seems to be restricted to Norwegian fjords (Sars, 1921; Huys and Boxshall, 1991).

DISCUSSION

The validity of the genus *Monstrillopsis* Sars has been questioned by several authors (Davis, 1949; Davis and Green, 1974) and accepted by others (Huys and Boxshall, 1991; Suárez-Morales and Dias, 2001). Argumentation against it has relied mainly on the mixed characters shown by males of the Arctic species *M. bernardensis* (Willey, 1920) (position of the oral papilla and number of furcal setae as in *Monstrillopsis*, rudimentary fifth leg as in *Monstrilla*), *M. arctica* Davis and Green, 1974 (position of oral papilla and lack of fifth thoracic appendage as in *Monstrillopsis*, number of furcal setae as in *Monstrilla*), and *M. nasuta* Davis and Green, 1974 (position of oral papilla as in *Monstrillopsis*, number of urosomites and furcal setae as in *Monstrilla*). Recently, Huys and Boxshall (1991) strengthened the genus concept by assigning to the males of *Monstrillopsis* a particular antennular type, different from those recognized in *Cymbasoma* and *Monstrilla*. With regard to the females of *Monstrillopsis* species, little evidence contrary to the validity of the genus has been presented.

The male assigned to *M. dubia* by Sars (1921) and now reassigned to *M. dubioides* n. sp. shows, of course, the diagnostic generic characters. However, it is not clear how Sars (1921:27) linked the two sexes of this species. He did mention that "coloured drawings of both, when still alive, were immediately executed." This statement suggests that the presumed male and female specimens were both recovered from the same sample, which is not necessarily a reliable way to link males and females of this group. As is true for many other species of Monstrilloida, the male of *M. ferrarii* n. sp. remains unknown; however, if the male of *M. dubioides* is actually the one depicted by Sars (1921), it could be expected that the male of *M. ferrarii* bears a close morphological resemblance to it. In the White Sea, efforts have been made for several years by one of us (VNI) to determine the hosts of monstrilloid copepods; the male of this species might be discovered in the near future as a result of these investigations, namely by isolation of both sexes after emergence from the same host. The benthic fauna of the White Sea has been surveyed by different authors (Deubel, 2000; Naumov and Fedyakov, 2000) and it includes nearly 50 species of polychaetes, potential hosts for monstrilloid copepods in the area.

European records of *M. dubia* (most under *Monstrilla*) include records from the Mediterranean (Rose, 1933; Isaac, 1975), Scotland and adjacent zones (Scott, 1904; Jorgensen, 1924; Bull, 1929), and the Bristol Channel area, southern England (Isaac, 1974). Jorgensen's (1924) sketch of a female identified as *M. dubia* Scott from Northumberland shows no segmentation in the urosome, thus impeding any effort to identify this specimen. Isaac's (1974) record is

interesting because the female he reported is very small (1.4 mm), less than half the length of *M. dubia* or *M. dubioides*, and it has three furcal setae; we speculate that this specimen may represent a different species.

Another record, from off Lisbon, was published by Vilela (1968); she noted differences between the single female specimen she examined and Scott's (1904) description. This record was referred by Isaac (1975) to *Monstrillopsis gracilis*, but the illustrations confirm that this species is assignable to *M. dubioides* n. sp.: the urosomites have the same proportions and shape shown in Sars' (1921) illustrations, with a particularly large anal somite and a genital double somite longer than it is wide, slightly longer than both succeeding somites together; furthermore, the fifth leg has a distinctive distal elongation on the outer lobe, and the last antennular segment represents 55% of the antennule length. Noting the unusual presence of three furcal setae, Vilela (1968) mentioned the possibility of setae having been broken off the specimen. Even if the specimen originally possessed only three furcal setae, this feature alone would not place it in *Cymbasoma*; the presence of two free somites posterior to the genital somite, the position of the oral papilla, and the eye development would retain it within the current limits of *Monstrillopsis*. Therefore, the Lisbon specimen is tentatively assigned to *M. dubioides* n. sp.

The Mediterranean records of *M. dubia* cannot be verified because the illustrations presented by Rose (1933) and Isaac (1975) were based on Sars' (1921) drawings. There are several records of *M. dubia* in North America, including records in eastern Canada (Fontaine, 1955; Legaré and MacLellan, 1960; Lacroix, 1966; Lacroix and Filteau, 1970, 1971; Davis, 1986) and in Maine, northeastern United States (McAlice and Jaeger, 1982); however, none of these works contain illustrations or comments on the morphology of the specimens. Some of these records might actually pertain to *M. ferrarii* n. sp. or *M. dubioides* n. sp. In sum, the distribution of *M. dubia* Scott appears to be limited to the British Islands, whereas that of *M. dubioides* n. sp. includes one fjord in Norway and, tentatively, the coasts of the Iberian Peninsula. *Monstrillopsis ferrarii* n. sp. would be restricted to the Arctic waters of the White Sea. Records of *M. dubia* in North America require confirmation. Overall, the morphological evidence presented here and the extremely wide geographical ranges of these forms suggest that *M. dubia* and the species related to it probably represent a species complex, with subtle variations. Therefore, this species would be added to a group of monstrilloid species that were considered "cosmopolitan" or widely distributed and have recently been found to be represented by distinct, morphologically close forms (see Grygier, 1994b; Suárez-Morales, 2000).

There are several records of Monstrilloida in areas adjacent to the White Sea, mainly from the Barents Sea: Linko (1907) recorded a *Cymbasoma* (as *Thaumaleus* sp.), Pertsova and Prygunkova (1995) listed *Monstrilla* sp. from the same area, and Kamshilov and Zelikman (1958)

reported the occurrence of *Monstrilla longicornis* Thompson, 1888 and *Monstrillopsis dubia*, also in the Barents Sea. It is possible that the last record corresponds to *M. ferrarii* n. sp. The monstrilloids that Marchenkov (1997) reported from the White Sea are the same that we examined here. Another, older record of *Monstrillopsis* in Ukrainian waters is that of Dolgopolskaya (1948), who described *M. zernowi* from an embayment of the Black Sea. This species displays a mixture of characters typical of *Monstrilla* (five furcal setae) and *Monstrillopsis* (position of oral papilla, well-developed eyes) and also has a bilobed fifth leg with three outer seta on the exopodal lobe and a digitiform inner lobe. Some additional characters of this species are shown in Table 1.

The genus *Monstrillopsis* includes the following nominal taxa (Sars, 1921; Davis, 1949; Isaac, 1975; Suárez-Morales, 1993): *M. dubia* (Scott, 1904) from Scotland; *M. zernowi* Dolgopolskaya, 1948 from the Black Sea; *M. reticulata* Davis, 1949 from Florida; *M. sarsi* Isaac, 1974 from England; *M. angustipes* Isaac, 1975 from the Mediterranean; *M. cigroi* Suárez-Morales, 1992 from the western Caribbean; *M. fosshageni* Suárez-Morales and Dias, 2001 from Brazil; and the two new species, *M. dubioides* Suárez-Morales, n. sp and *M. ferrarii* Suárez-Morales and Ivanenko, n. sp. (*Monstrillopsis gracilis* (Gurney, 1927), transferred to *Monstrillopsis* by Isaac (1974), is not a member of this genus, as previously explained.)

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