

# NERILLIDAE (ANNELIDA: POLYCHAETA) FROM THE WHITE SEA, WITH DESCRIPTION OF A NEW SPECIES OF *MICRONERILLA* JOUIN

Michail V. Saphonov<sup>1</sup> & Alexander B. Tzetlin<sup>2</sup>

<sup>1</sup>White Sea Biological Station and <sup>2</sup>Department of Invertebrate Zoology,  
Moscow State University, 119899 Moscow, Russia

## ABSTRACT

Nerillids are recorded for the first time from the White Sea. Four species were found: *Meganerilla swedmarki* Boaden, 1961, *Nerillidium gradfe* Remane, 1925, *Thalassochaetus palpifoliaceus* Ax, 1954, and *Micronerilla brevis* sp. n. All four species are described and figured. The new species differs from the only other known member of the genus, *M. minuta* (Swedmark, 1959), in having seven rather than eight segments.

## INTRODUCTION

At present the family Nerillidae contains 14 genera and about 30 species. The family is distributed worldwide in coastal and shallow waters (Marcus 1948, Wieser 1957, Jouin 1970, Gelder 1974, Schmidt & Westheide 1977, Riser 1984, Saphonov & Tzetlin 1988, Tzetlin & Larionov 1988, Westheide 1990). Most known members are described from European coastal waters, from the Mediterranean to the Norwegian Sea (see Jouin 1970, Westheide 1990). Nerillidae of the Arctic Basin are rather poorly studied: *Nerilla antennata* O. Schmidt, 1848 was reported from the east coast of the Kola Peninsula by Chlebovich (1961) and *Nerillidium gracile* Remane, 1925, and *Nerilla antennata* from Tromsø in northern Norway by Schmidt (1972).

Since 1987 the interstitial fauna of the White Sea has been investigated continuously. Interstitial habitats (coarse sand, shell gravel) are not widespread in the White Sea. Previous investigations (Beklemishev et al. 1977, Kondratova & Tzetlin 1979) have shown that the deep basin of the White Sea as well as most of the shallow-water areas are occupied by soft sediments (silt, clay). During an ongoing inspection of the southern shore of Kandalaksha Bay, some interstitial habitats were found. Most of this work was done at Velikaja Salma (up to 40 m depth), in close proximity to the White Sea Biological Station (WSBS) of Moscow State University (Fig. 1, 66°33'N, 33°06'E). In addition, the region near Cheremshicha Island (66°18'N, 33°54'E, 10-15 m) was investigated in detail.

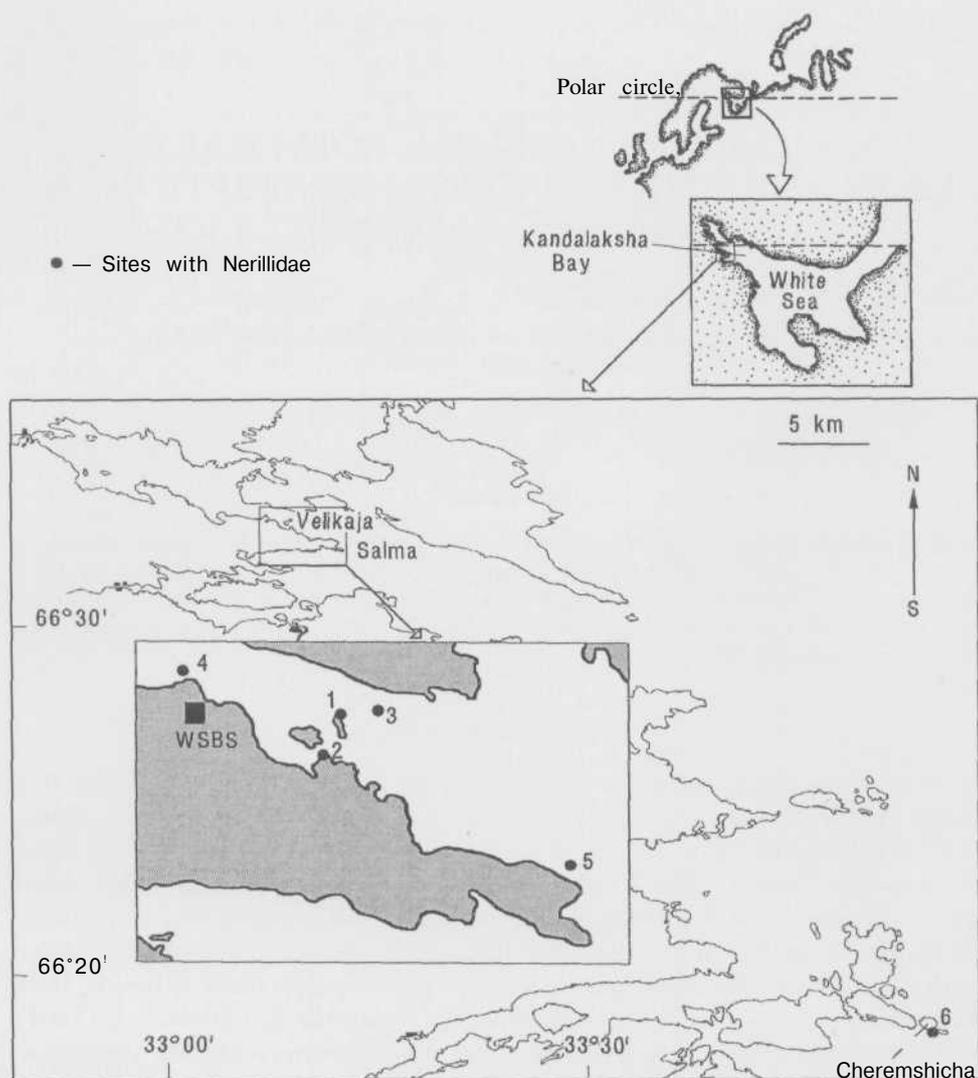


Fig. 1. Map of White Sea and vicinity of White Sea Biological Station. Numerals refer to sampling sites where nerillids were found.

Qualitative samples of substrate were taken from different biotopes, from the intertidal zone to a depth of 40 m.

Nerillids were found at the two intertidal and four sublittoral sites. Both intertidal sites are located on the shores of narrow bays with tidal currents up to 1.5 m/sec (A. Pantulin, pers. com.). Sublittoral interstitial biotopes with nerillids also are situated in the zone with strong tidal currents (approximately 0.7-1.5 m/sec, A. Pantulin, pers. com.), as a rule on a slope (10-25 m).

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## MATERIALS AND METHODS

All material was collected at the White Sea Biological Station of Moscow State University in 1989-1994. Samples were taken in the period 20 June to 10 September. (Table 1, Fig. 1).

About 60 samples of sediment with nerillids were collected from sublittoral depths by SCUBA diving. The top layer of 5-10 cm of sand or shell sediment or 2-5 cm of silt was collected by digging with a small trowel and placing the sediment in plastic bags. The average sample volume was about 3 liters. Animals were extracted by gentle agitation of the substrate in sea water and subsequent decantation through a 70 µm mesh nylon monofilament net, both with and without prior relaxation with MgCl<sub>2</sub>. The use of MgCl<sub>2</sub> increased the number of specimens retrieved, but also increased damage. Animals from the intertidal zone were collected by means of two methods: 1) 10 samples from the lower littoral collected and processed as above; 2) 16 samples were collected by means

Table 1. Localities where nerillids were found

Localities, dates	Coordinates	Depth m	Type of sediment	Species
1. Velikaja Salma (21), July -August	66°33'N, 33°08'E	tidal zone	Coarse sandy and gravel sediments	<i>Meganerilla swedmarki</i> <i>Thalassochaetus</i> <i>palpifoliaceus</i>
2. Velikaja Salma (5), July-August	66°33'N, 33°08'E	tidal zone	Coarse sandy and gravel sediments	<i>M. swedmarki</i> <i>T. palpifoliaceus</i>
3. Velikaja Salma (35), June-September	66°33'N, 33°08'E	16-20	Coarse shelly sediments	<i>Micronerilla brevis</i> , <i>Nerillidium gracile</i>
4. Velikaja Salma (15), June-September	66°33'N, 33°06'E	12-18	Coarse shelly sediments	<i>Micronerilla brevis</i> , <i>N. gracile</i>
5. Velikaja Salma (3), July -August	66°32'N, 33°11'E	23-26	Silt-clay	<i>Meganerilla swedmarki</i>
6. Cheremshiha Island (4), July -August	66°18'N, 33°54'E	10-12	Gravel sediments	<i>N. gracile</i>

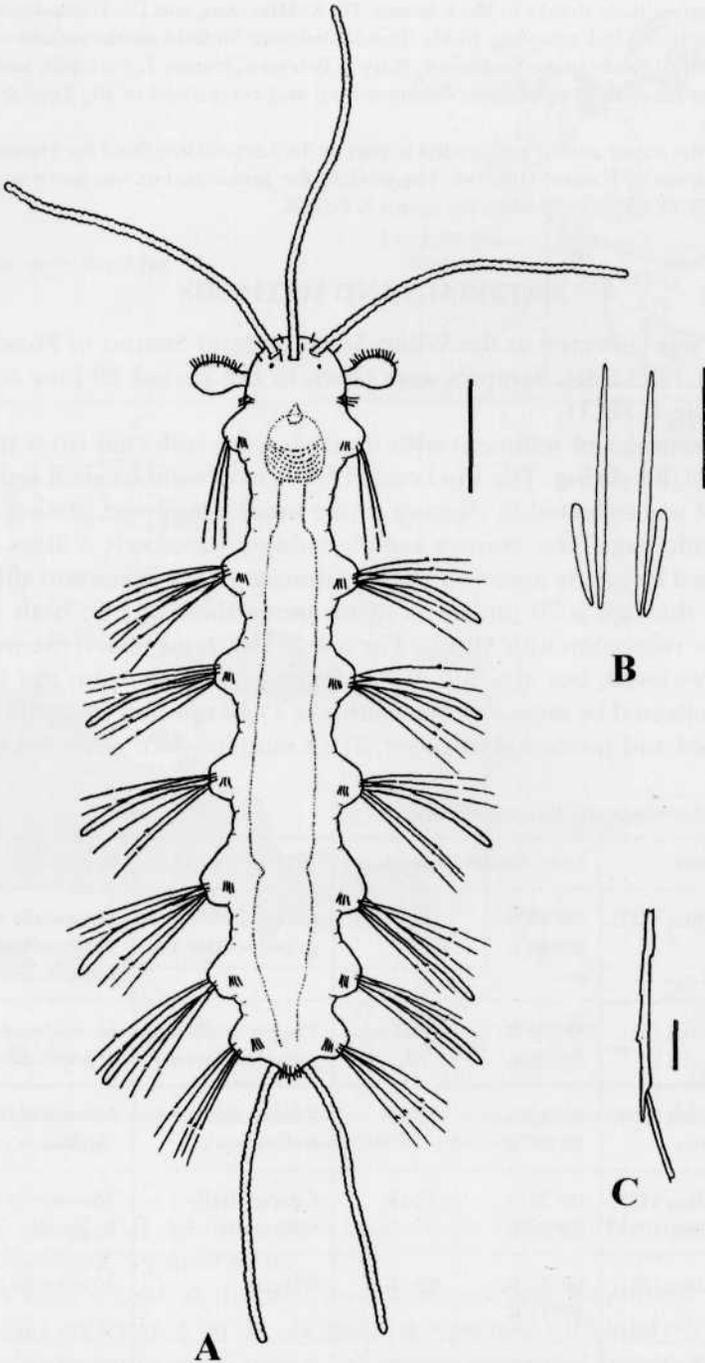


Fig. 2. *Micronerilla l/revis* sp. n. — A, dorsal view of entire specimen. — B, buccal pieces. — C, joint of compound chaeta. Scale bars: A, 100  $\mu$ m; B and C, 10  $\mu$ m.

of filtration of water that seeps from the sides of a pit (Fleeger et al. 1988): pits of 20-30 cm depth were dug at the lower level, with the collected groundwater removed and filtered through the same net as above (70  $\mu\text{m}$ ). The percentage of animals with intact appendages was higher when this method was used than with other methods.

Live individuals were examined and photographed in a compound microscope. Drawings and measurements were made from photographs.

For fixation, animals were kept for one day in Petri dishes with filtered sea water, subsequently fixed for one hour in 2.5% glutaraldehyde buffered with 0.2 M Na-cacodylate buffer (pH = 7.2-7.4) with addition of 0.115 g sucrose in 1 ml of solution, and postfixed with 1% osmium tetroxide in the same buffer. For SEM observations, specimens were dehydrated in an ethanol series and with acetone, critical-point dried, coated with gold, and examined in a Hitachi S-405.

The sediment in which *Micronerilla brevis* sp. n. was found (site 3) is especially rich in interstitial forms, and therefore was examined more thoroughly than other sites; a total of 35 samples were taken here. Thus we are able to provide information on associated fauna for *Micronerilla brevis*. All these species, with the exception of Heliozoa and *Glycera capitata*, are newly reported from the White Sea.

## RESULTS

### Genus *Micronerilla* Jouin, 1970

Emended generic diagnosis of *Micronerilla* Jouin, 1970: Nerillidae with three antennae and two palps; seven or eight chaetigerous segments, parapodial cirri on segments 2-6 or 2-7 only; jointed chaetae throughout.

#### *Micronerilla brevis* sp. n.

(Figs 2,3)

*Diagnosis.* - *Micronerilla* with 7 chaetigerous segments.

*Material.* - More than 50 specimens were collected, measured and fixed from 35 samples from site 3 (type locality, see Fig. 1). Another 3 incomplete specimens were taken from site 4. The type material (holotype: N 970, 66°33'N, 33°08'E, and one paratype: N 971, same locality as holotype) is deposited in the collections of the Zoological Museum of Moscow State University. Other specimens are in the collections of the Department of Invertebrate Zoology, Biological Faculty of Moscow State University.

*Etymology.* - The species name "*brevis*" (from Latin "*brevis*" - shortened) refers to the smaller number of segments (7 rather than 8) as compared to *Micronerilla minuta* (Swedmark, 1959), formerly the only known species in the genus.

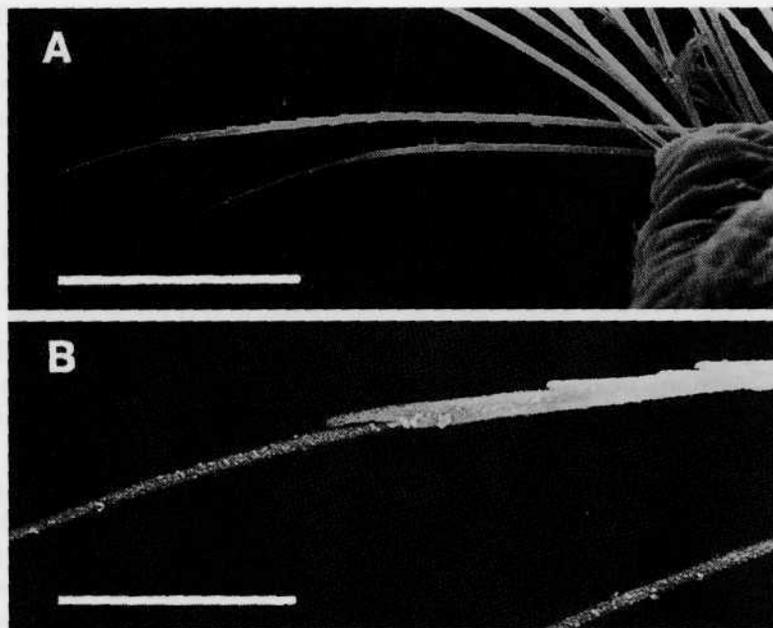


Fig. 3. *Micronehlla brevis* sp. n., SEM micrographs of chaetae of chaetigerous segment 5. A, dorsal bundle of chaetae. - B, distal part of notochaeta. - Scale bars: A, 50  $\mu\text{m}$ ; B, 15  $\mu\text{m}$ .

*Description.* — Body transparent, of typical nerillid appearance, consisting of prostomium, seven chaetigerous segments and pygidium (Fig. 2,A). Length 550-670  $\mu\text{m}$  (without anterior and posterior appendages), width up to 100  $\mu\text{m}$  (without parapodia). Prostomium with three threadlike (filiform) antennae, all three characteristically wrinkled (lateral antennae 260-320  $\mu\text{m}$  long; median antenna 270-330  $\mu\text{m}$  long). Two club-shaped palps arising dorsolaterally (length 40-60  $\mu\text{m}$ ). Each palp with longitudinal row of cilia on frontal surface. Two colourless eyes behind base of each lateral antenna. Pair of nuchal organs situated laterally on prostomium, forming two dorsoventral ciliated grooves. Frontal and dorsal surfaces of prostomium with individually occurring cilia. First segment (peristomium) and last segment without parapodial cirri, parapodia of segments 2-6 with elongate, cylindrical cirri (length 100-140  $\mu\text{m}$ ).

All chaetae compound, gradually increasing in length from segment 1 (120-140  $\mu\text{m}$ ) to 7 (170-190  $\mu\text{m}$ ). Shafts serrated, 95-160  $\mu\text{m}$  long, correlated to length of chaeta; blades smooth, 25-30  $\mu\text{m}$  long, independent of length of chaeta. Peristomium with single bundle of 9-12 chaetae on each side. Parapodia of following segments with dorsal and ventral bundles of 10-16 chaetae each (Fig. 2,B, 3J-B).

Pygidium with two threadlike (filiform) anal cirri (length up to 300  $\mu\text{m}$ ),

wrinkled characteristically, as antennae. Ventral ciliary tract continuous from ciliary oral field to end of pygidium. Short transverse row of cilia situated above each **parapodium**. Tonguelike organ of ventral buccal bulb with two pairs of buccal pieces (length 18-22  $\mu\text{m}$  and 8-15  $\mu\text{rn}$ ).

*Remarks.* - *Micronerilla Irrevis* is distinguished from *M. minuta*, the only other known species of *Micronerilla*, in having 7 rather than 8 chaetigerous segments.

*Habitat.* - Subtidal, 16-20 m depth, coarse shelly sediments.

*Distribution.* - Karelian shore of the White Sea, Kandalaksha Bay, Velikaja Salma Strait, site 3 (type locality) and 4 on the map (Fig. 1).

*Biological remarks.* — Mature males and females were found during the entire period of sampling (20 June to 10 September).

*Associated fauna.* — Heliozoa: *Acanthocystis saphonovi* Mikrjukov, 1994; *Actinophrys marina* (Mikrjukov, 1994). - Ciliata: many species. - Coelenterata: *Halammohydra* sp. - Turbellaria: many species. - Gastrotricha: *Macrodasy* spp., *Urodasy* sp. - Nematoda: many species, in particular Draconematidae spp., Epsilonematidae spp. - Polychaeta: *Nerillidium gracile*, *Protodrillus* sp., *Exogone* sp., *Sphaerosyllis* sp., *Glycera capitata*. - Solenogastres: *Meiomenia* sp. - Gastropoda: *Hedilopsis spiculifera*. - Holothuroidea: *Myriotrochus* sp. - Ostracoda: few species. - Copepoda: many unidentified harpacticoid species. - Halacarida: one unidentified species.

Genus *Meganerilla* Boaden, 1961

*Meganerilla swedmarki* Boaden, 1961

(Fig. 4A)

*Meganerilla swedmarki* Boaden, 1961; Westheide, 1990.

*Material.* - More than 60 specimens were collected (sites 1 and 2) and fixed with glutaraldehyde, 20 of these were measured alive; 4 specimens were found at site 5.

*Description.* — Body opaque, without pigmentation. Length **1.7-1.9** mm; width 230-290  $\mu\text{m}$  (without parapodia). Prostomium with pair of large cylindrical palps (up to 500  $\mu\text{m}$  long) arising laterally. No antennae. One pair of pigmented eyes. One pair of nuchal organs situated behind palps and forming dorsoventral ciliated grooves. Nine chaetigerous segments. Peristomium with single bundle of 2-4 chaetae on each side, usually posteriorly directed. Chaetae of other segments arranged in dorsal and ventral bundles of 6-8 chaetae per bundle. All chaetae simple capillaries without serrations. Cirri present in all segments, differing in size and shape: posterior ones conspicuously larger than anterior ones. Mature males and, especially, mature females with cirri of posterior three segments oval, enlarged and inflated, with small apical knob. Pygidium with

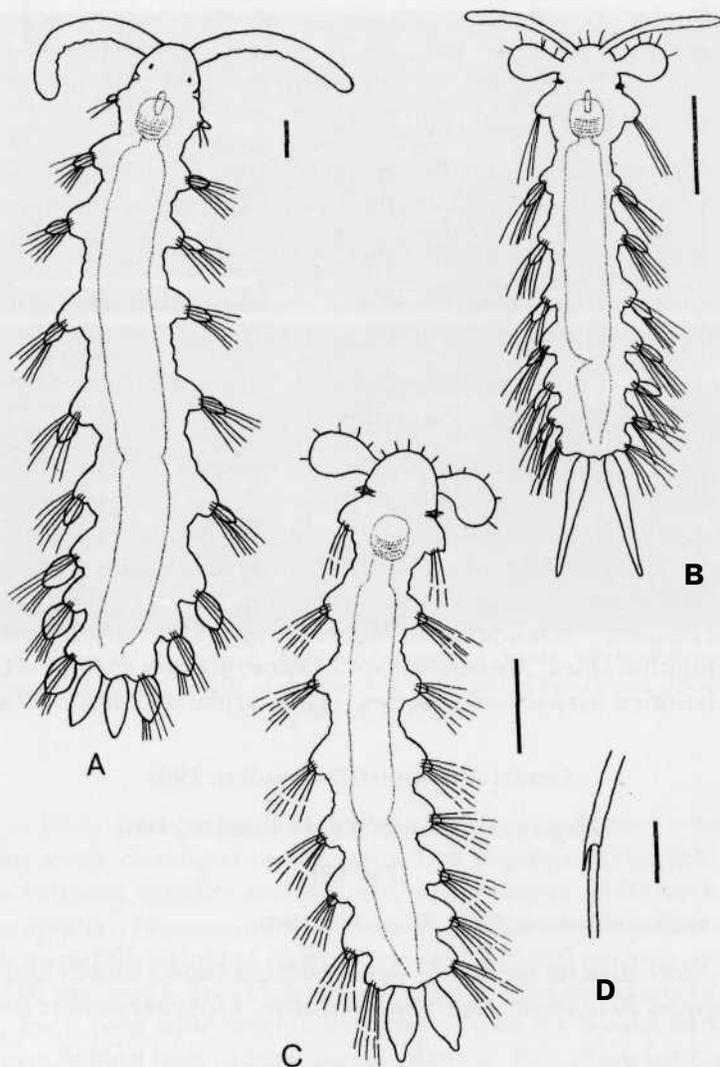


Fig. 4. Nerillids from the White Sea; all in dorsal view. A. *MeganeriUa swedmarki*, female from site 2 (see the map, fig 1). - B. *Nerillidium gracile* from site 4 (see the map, fig 1). - C, D. *Thalassochaetus palpifoliaceus* from site 2 (see the map, fig 1). - D, joint of a compound chaeta. Scale bars: A-C, 100  $\mu\text{m}$ ; D, 10  $\mu\text{m}$ .

pair of spindle-shaped anal cirri, distally tapered (length up to 180  $\mu\text{m}$ ). No buccal pieces found.

*Habitat.* — Intertidal coarse sand or gravel sediments at mid-tidal level (site 1 and 2), soft sediment from 23 to 26 m depth (site 5). *MeganeriUa swedmarki* from site

5 was found in the 3 samples with silt covered with a 5-10 mm layer of large detritus particles.

*Distribution.* - White Sea, Kandalaksha Bay. Outside the White Sea: North Sea off SE Scotland, Skagerrak off W Sweden, 0-22 m depth.

*Biological remarks.* — Mature specimens of both sexes were found during the entire period of sampling.

*Nerillidium gracile* Remane, 1925

(Fig. 4B)

*Nerillidium gracile* Remane 1925, 1932; Levi 1953; Swedmark 1959; **Boaden** 1966; Jouin 1967; Jouin in Cabioch et al. 1968; Schmidt 1972; Westheide 1990.

*Material.* — 12 specimens from site 3, 8 specimens from site 4, 4 specimens from site 6, all measured and fixed.

*Description.* - Body transparent, length 400-500  $\mu\text{m}$  (without anterior and posterior appendages), width 70-90  $\mu\text{m}$ . Prostomium with two elongate antennae (length 100-120  $\mu\text{m}$ ); two club-shaped palps (length 65-75  $\mu\text{m}$ ). Two dorsolateral nuchal organs behind palps. Eight chaetigerous segments. Body gradually increasing in width from chaetigers 1 to 6 and decreasing from chaetigers 6 to 8. Parapodia of segments 2-7 with oval cirri (up to 30  $\mu\text{m}$  long). Peristomium and segment 8 without appendages. Chaetae simple, arranged in single bundles on chaetiger 1 and in two bundles on the others. Anal cirri paired, slightly swollen at base, distally tapered, 120-160  $\mu\text{m}$  long. Four buccal pieces about 20-25  $\mu\text{m}$  long.

*Habitat.* - Subtidal sand, gravel or shelly sediments, 10-20 m depth.

*Distribution.* - White Sea, Kandalaksha Bay. Outside the White Sea: North Sea, English Channel, Irish Sea and N Norway, subtidal areas.

*Biological remarks.* - Mature specimens with eggs were found during the entire period of sampling (June-September).

*Thalassochaetus palpifoliaceus* Ax, 1954

(Fig. 4C)

*Material.* - 12 specimens from sites 1 and 2, measured alive and fixed in glutaraldehyde.

*Description.* - Body transparent, length 500-650  $\mu\text{m}$  (without appendages), width 70-85  $\mu\text{m}$  (without parapodia). Prostomium with two club-shaped palps (length 65-75  $\mu\text{m}$ ), without antenna. Two dorsolateral nuchal organs behind palps.

Eight chaetigerous segments. Parapodia of segments 2-7 with rudimentary cirri. Peristomium and segment 8 without any appendages. Parapodia biramous, each with two bundles of 1-4 jointed chaetae. Pygidium with pair of spindle-shaped thick anal cirri (width 20-30  $\mu\text{m}$ , length 45-55  $\mu\text{m}$ ). No buccal pieces found.

*Habitat.* - In White Sea: intertidal coarse sand or gravel sediments at mid-tidal level. Outside White Sea: sublittoral coarse sand or gravel sediments (Ax 1954).

*Distribution.* - White Sea, Kandalaksha Bay. Outside White Sea: Kiel Bay (Baltic Sea).

*Biological remarks.* — Mature specimens (with eggs or sperm) occurred during the entire period of sampling (July - August). It is still uncertain whether *Thalassochaetus palpifoliaceus* is gonochoristic or hermaphroditic. (Ax 1954).

#### DISCUSSION

The first representative of the genus *Micronerilla* Jouin was described by Swedmark (1959) as *Mesonerilla minuta*, a species with eight chaetigerous segments. Up to then, the genus *Mesonerilla* Remane, 1949 contained only 9-segmented nerillids. As the number of chaetigers is considered a stable character in other nerillid genera, Swedmark widened the diagnosis of *Mesonerilla* to include *M. minuta*. Jouin (1970) re-evaluated the species and placed it in the newly created genus *Micronerilla* Jouin, 1970, at the same time renaming it *Micronerilla cirrata*. The genus *Micronerilla* differs from *Mesonerilla* in the lower number of chaetigerous segments and in the absence of peristomial cirri.

Westheide (1990) pointed out that the specific name given by Swedmark has priority over that of Jouin; the correct name of the species is therefore *Micronerilla minuta* (Swedmark, 1959).

*Micronerilla brevis* sp. n. has the same kind of prostomial, trunk and pygidial appendages as *M. minuta*, and both species also have the same type of compound chaetae. We therefore place the new 7-segmented species in the genus *Micronerilla* in spite of the difference from the type species in the number of segments.

The discovery of *Micronerilla brevis* sp. n. makes it possible to postulate a morphological series: *Mesonerilla*  $\rightarrow$  *Micronerilla minuta*  $\rightarrow$  *Micronerilla brevis*, consisting of animals united by the same (combination of) major taxonomic characters (appendages, chaetae) and differentiated by the number of trunk segments: 9  $\rightarrow$  8  $\rightarrow$  7, respectively. We perceive this series as a sequence from 9 segments to 7 segments. Further it is correlated with differences in the appendages: we suppose that the presence of parapodial cirri on each chaetigerous segment including the peristomium is plesiomorphic for Nerillidae and that absence of these structures on some segments is a derived feature. In the present

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