



## Diversity and taxonomy of Ampharetidae (Polychaeta) from Icelandic waters

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**Abstract:** Based on material collected during the BIOICE project off Iceland, the taxonomy and distribution of seventeen species (11 genera) of polychaetous annelids belonging to the family Ampharetidae (Annelida; Polychaeta) is reviewed. Eleven of these species were previously reported in the area or nearby areas: *Amage auricula*, *Anobothrus gracilis*, *Glyphanostomum pallescens*, *Grubianella klugei*, *Lysippe fragilis*, *L. labiata*, *L. sexcirrata*, *L. vanelli*, *Samythella elongata*, *Sosane bathyalis* and *S. wireni*. Five species, *Amage benhami*, *Melinnampharete eoa*, *Noanelia hartmanae*, *Ymerana pteropoda* and *Zatsepinia rittichae*, either never or only once reported after original description, are redescribed or discussed. A potentially new species, *Amage* sp., is described but not named because only one specimen is present. Several body characters of high taxonomic relevance in Ampharetidae are reviewed using SEM. The distribution of each species off Iceland is provided.

**Key words:** Icelandic waters, Polychaeta, Ampharetidae, diversity, distribution, BIOICE.

### Introduction

The BIOICE (Benthic Invertebrates of Icelandic Waters) expeditions were part of an international collaborative program started in 1992 and designated to conduct a thorough survey of the marine benthic fauna living in the 200-mile economic zone of Iceland. The BIOICE sampling area covers a depth range from 20 to 3500 m on both sides of the Greenland-Iceland-Faeroe Ridge (GIF Ridge), which is generally less than 500 m deep and marks the boundary between the relatively warm North Atlantic Ocean and the much colder Arctic Ocean (Hansen and

Østerhus, 2000). Several water masses associated with the Ridge occur around Iceland, which limit the distribution of the species (Brix and Svavarsson 2010; Meißner *et al.* 2014).

Several works have dealt with polychaetes (Annelida, Polychaeta) collected within the BIOICE programme, such as those by Petersen (2000) on Fauveliopsidae, Kirkegaard (2001) on Glyceridae and Goniadidae, Sanfilippo (2001) on Serpulidae, Sigvaldadóttir (2002) on Spionidae, Chambers and Woodham (2003) on Cirratulidae, Parapar (2003, 2006) on Oweniidae, Parapar *et al.* (2011a) on Trichobranchidae, Parapar *et al.* (2011b) on Opheliidae, Moreira and Parapar (2012) on Sphaerodoridae, and Parapar *et al.* (2014) on Longosomatidae.

The Ampharetidae Malmgren, 1866 is among the most speciose families among the Polychaeta. Its diversity at the genus level is huge, and many genera are monospecific. This fact, along with insufficient diagnoses for many taxa, makes necessary a worldwide revision of the systematics of the group. As a first step to achieve this goal, several papers have been published recently in which many new species are described and some systematics issues are discussed (*e.g.*, Hilbig 2000; Jirkov 2008, 2011; Reuscher *et al.* 2009; Salazar-Vallejo and Hutchings 2012; Imajima *et al.* 2012, 2013; Schüller and Jirkov 2013).

To gather further insight into the diversity and distribution of some ampharetid genera in Icelandic waters, a number of samples collected during the different BIOICE cruises were studied. Two previous studies on this family were already done dealing respectively with the genus *Amphicteis* Grube, 1850 (Parapar *et al.* 2011c) and *Ampharete* Malmgren, 1866 (Parapar *et al.* 2012). Here, we report seventeen additional species belonging to eleven genera and provide comments about their taxonomy, distribution and ecology in Iceland.

## Material and methods

This study is based on material collected in the framework of the BIOICE project. A total of 3277 ampharetid specimens were collected in 284 samples (Fig. 1A).

Specimens were fixed in 10% formalin buffered with borax, and preserved in 70% ethanol. Animals were picked from samples by the staff of the Sandgerdi Marine Centre (SMC), and then identified to species level by the authors. Most of the material examined was deposited in the collections of the Icelandic Museum of Natural History (IMNH, Reykjavik); several specimens were also deposited in the Museo Nacional de Ciencias Naturales (MNCN, Madrid). Stations and abiotic data of BIOICE samples are available at the following link: [http://utgafa.ni.is/greinar/BIOICE\\_station\\_list\\_91-04\\_Paper\\_A2.pdf](http://utgafa.ni.is/greinar/BIOICE_station_list_91-04_Paper_A2.pdf). Specimens used for examination with SEM were prepared by critical point drying, covered with gold in a BAL-TEC SCD 004 evaporator, and examined and photographed under a JEOL JSM-6400 scanning

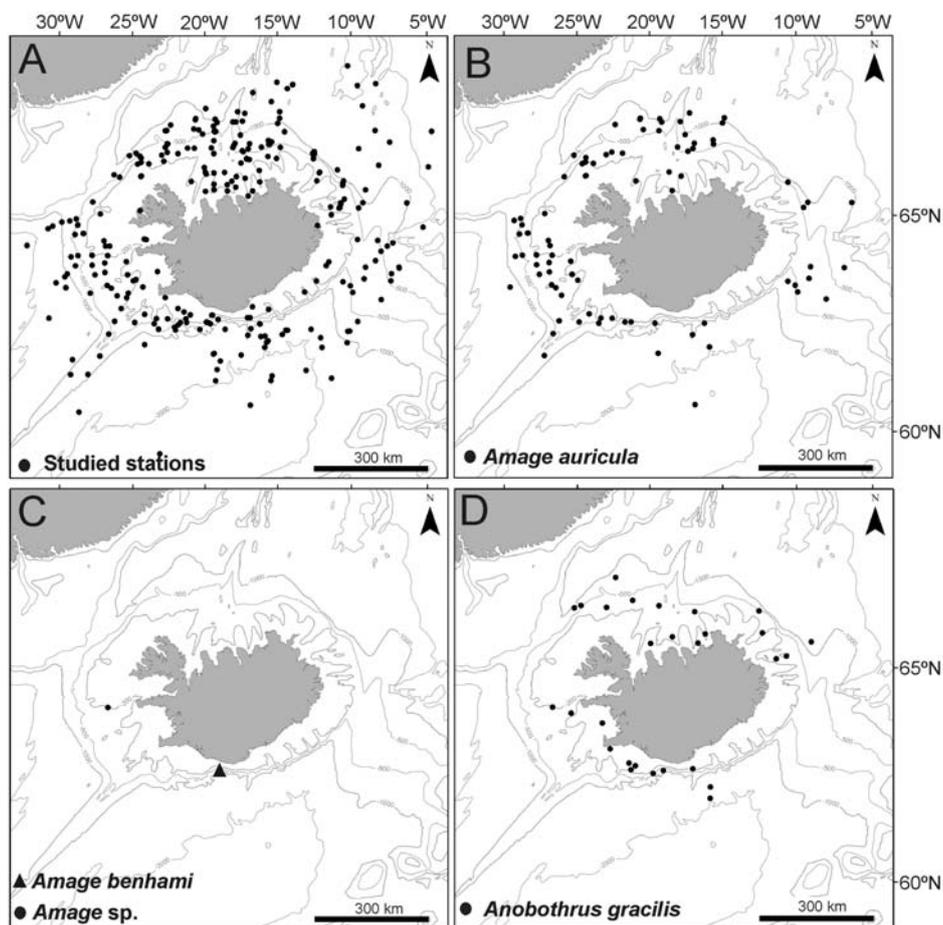


Fig. 1. Maps of Iceland showing all BIOICE sampling stations (A) and those with specimens of *Amage auricula* (B), *Amage benhami* and *Amage* sp. (C) and *Anobothrus gracilis* (D).

electron microscope at the SAI (University of A Coruña-UDC, Spain). Nomenclature for genera, species and synonyms follows Jirkov (2001).

**Abbreviations.** — AU = abdominal unciniger, S = segment, TC = thoracic chaetiger, TS = thoracic segment, TU = thoracic unciniger.

## Results

The study of the samples collected during the BIOICE project yielded seventeen species belonging to eleven genera: *Amage* Malmgren, 1866, *Anobothrus* Levinsen, 1884, *Glyphanostomum* Levinsen, 1884, *Grubianella* McIntosh, 1885, *Lysippe* Malmgren, 1866, *Melinnampharete* Anenkova, 1937, *Noanelia* Desbruyères and

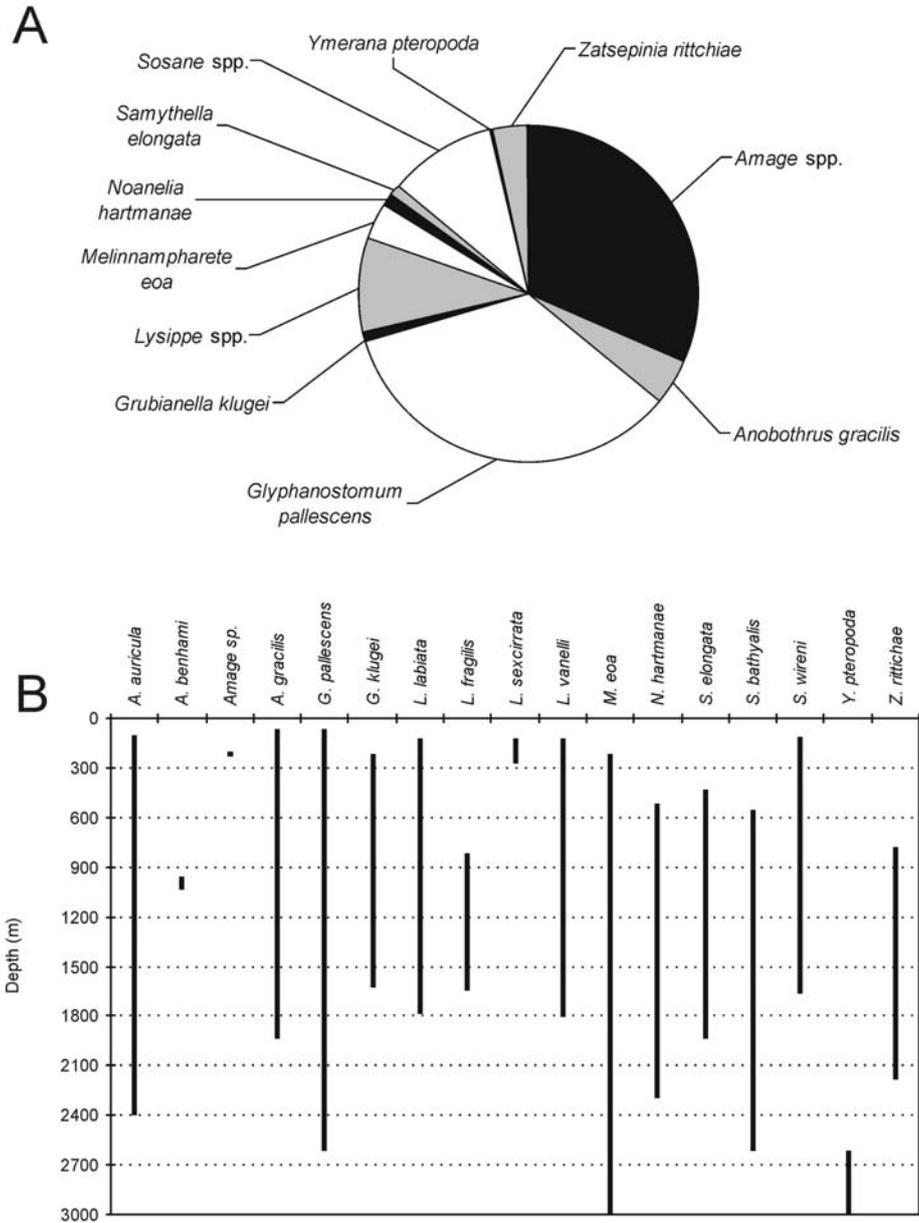


Fig. 2. Diversity and abundance (%) of the ampharetid species studied (A) and depth distribution ranges (B).

Laubier, 1977, *Samythella* Verrill, 1873, *Sosane* Malmgren, 1866, *Ymerana* Holthe, 1986 and *Zatsepinia* Jirkov, 1986.

In terms of diversity, only three genera were represented by more than one species: *Lysippe* with four species, *Amage* (3) and *Sosane* (2) (Fig. 2A). *Amage*

*auricula* and *Glyphanostomum pallescens* comprised 64.6% of total abundance. Other two species i.e. *Lysippe vanelli* and *Sosane wireni*, comprised 10% of total abundance each. The remaining species showed percentages of less than 5%; among them *Anobothrus gracilis*, *Melinnampharete eoa* and *Zatsepinia rittichae* the only species with values higher than 2%.

Most of the species (10) show wide ranges of distribution in depth, being present from subtidal to deep waters (<100 to 2500 m) (Fig. 2B). *Amage* sp. and *Lysippe sexcirrata* seem to be restricted to shallow shelf waters (<100 to 300 m), while *Amage benhami*, *Lysippe fragilis*, *Sosane bathyalis* and *Zatsepinia rittichae* were found at slope depths (600–2,000 m). Only one species, *Ymerana pteropoda*, appears to be restricted to deep slope waters (>2500 m).

Data of abundance and distribution around Iceland of each of those species are presented and discussed below. Descriptions and taxonomic remarks for selected species are also provided.

#### Family Ampharetidae Malmgren, 1866

##### Genus *Amage* Malmgren, 1866

Type species: *Ampharete auricula* Malmgren, 1866.

**Remarks.** — Reuscher *et al.* (2009) propose an emended diagnosis of the genus, taking into account its variability in terms of the number of branchiae (3 or 4 pairs) and thoracic uncinigers (10–14) and, following Hilbig (2000), consider nuchal organs as the traditionally named “glandular ridges”. Recently, Schüller and Jirkov (2013) propose the last emended diagnosis to accommodate the presence of minute chaetae in the second thoracic segment characteristic of a new species described by them.

##### *Amage auricula* Malmgren, 1866

*Amage auricula*: Holthe 1986a: 75, map 30, fig. 31; Holthe 1986b: 232; Hartmann-Schröder 1996: 490; Jirkov 2001: 459.

**Material examined.** — 1016 specimens (31.00% of the total) were collected in 93 samples.

**Occurrence in the studied area.** — Depth range: 108–2400 m; temperature range: -0.61 to 7.61°C. The species is ubiquitous in Icelandic waters (Fig. 1B).

**Geographic distribution.** — Iceland (Wesenberg-Lund 1951), East and West coasts of Norwegian Sea, Svalbard, Skagerrak, Kattegat and Arctic Ocean (Holthe 1986a, c; Jirkov 2001). Holthe (1986a) also gathered reports of this species in northeast and northwest Atlantic Ocean, Mediterranean Sea, Canadian Arctic, Japan and East India. Nevertheless, several of these reports may probably correspond to other species. Icelandic specimens, as those reported in North Atlantic waters, have eight abdominal uncinigers (AU), while other authors reported worms with 14 AU from North Carolina (Hartman 1945), 9 AU from Irish continental slope (Amoureux 1982; perhaps *A. scotica*?) and 12 AU from Japan

(Imajima 1997). Probably, the distribution range of this species is restricted to the North Atlantic and deep waters of the North Polar Basin.

**Reported bathymetric and temperature ranges.** — From 43 to 1230 m depth; -1.64 to 9.48°C (Jirkov 2001).

*Amage benhami* Reuscher, Fiege *et* Wehe, 2009.

*Amage benhami*: Reuscher, Fiege and Wehe 2009: 21, fig. 1.

**Material examined.** — Two specimens (0.06% of the total) were collected in BIOICE samples 2434 and 2435.

**Description of BIOICE specimens.** — Length of specimens 12 mm (excluding anal cirri); width (excl. parapodia) 2.0 mm. Anterior part of body broad, tapering gradually towards posterior end. Prostomium with two conspicuous anterolateral horns. No eye-spots. A pair of nuchal organs visible as oval fields framed by posterior U-shaped lobe. Buccal tentacles withdrawn. Four pairs of branchiae; left and right group of branchiae widely separated. First two branchiae of each group in transverse row on segment III (thoracic chaetiger 1: TC1). Third and fourth pair of branchiae on TC2 in diagonal row with outer branchiae of transverse row. All branchiae present in both specimens. First branchial segment protruding medially between branchiae. TC2 divided dorsally into anterior and posterior part, each bearing one pair of branchiae. 15 TC from SIII and 12 thoracic uncinigers (TU). Thoracic notopodia with conspicuous digitiform process ventral to chaetal fascicle. Anterior thoracic uncinigerous tori long, gradually shortening towards posterior end with first thoracic tori about twice as long as posteriormost. Abdomen about 2/3 of thorax length; 15 AU with conspicuous rudimentary notopodia with bluntly digitiform tips. Abdominal neuropodia with minute dorsal papilla. Left and right abdominal neuropodia of each segment connected by a transverse ventral ridge. Pygidium with one pair of lateral anal cirri, as long as last five abdominal segments.

**Occurrence in the studied area.** — Depth range: 960–1036 m; temperature: 5.48°C. The species is present in the warmer waters of the southern coast of Iceland (Fig. 1C).

**Geographic distribution.** — North-East Pacific (off Oregon, USA) and Antarctica (Ross Sea; Reuscher *et al.* 2009); this is the second report of the species after original description.

**Reported bathymetric and temperature ranges.** — From 293 to 625 m depth (Reuscher *et al.* 2009). No temperature data available.

**Remarks.** — Our specimens agree well with the description and drawings done by Reuscher *et al.* (2009). The presence of 15 TC, 12 TU and 15 AU, and two long pygidial cirri, separates this species from *A. auricula*, by far the most abundant species of this genus in North Atlantic waters (see above). Icelandic specimens share with type specimens of *A. benhami* even the presence of conspicuous

digitiform processes in the ventral part of chaetal fascicles of thoracic notopodia, and the gradual shortening of length of thoracic uncinigerous tori from anterior to posterior thorax. However, the vast geographical distance between Icelandic and Pacific-Antarctic specimens suggests that cryptic species may be hidden within this taxon. The only relevant difference of Icelandic specimens corresponds to the presence of transverse ventral ridges connecting left and right abdominal neuropodia of each segment. Other minor issues are related to the smaller size observed in the digitiform process located in the thoracic notopodia and the apparent absence of a ventral part free from body wall in the abdominal neuropodial tori. Either way, although these differences might support the proposal of a new species, more specimens are needed for further examination, including SEM (*e.g.* shape and appearance of uncini), to solve the true identity of Icelandic specimens.

*Amage* sp.  
(Fig. 3)

**Material examined.** — One specimen (0.03% of the total) was collected in BIOICE sample 2868.

**Description of BIOICE specimen.** — Length 5.0 mm; width (excl. parapodia) 0.7 mm. Anterior part of body broad, abruptly tapering near posterior end (Fig. 3A,C). Prostomium with two antero-lateral horns (Fig. 3D). No eye-spots. A pair of nuchal organs visible as oval fields framed by posterior U-shaped lobe. Buccal tentacles withdrawn. All four pairs of branchiae present; left and right group well separated but not widely (Fig. 3B). Each group placed diagonally in TC1 and TC2 (Fig. 3B). First branchial segment not protruding medially between branchiae. 14 TC from SIII. First two thoracic notopodia and notochaetae very small; from TC3 well developed and provided with long chaetae. 11 TU. Anterior thoracic tori long, gradually shortening towards posterior end with first thoracic torus about three times as long as posteriormost. Anterior body region (from peristomium to TC3) clearly differentiated in ventral part; rest of thorax (TC4 to TC14) thinner and without ventral glandular area (Fig. 3C, D). Abdomen short, encompassing about one sixth of total body length (Fig. 3A, C), provided with 9 AU with conspicuous rudimentary notopodia with bluntly digitiform tips. Pygidium with apparently no lateral anal cirri.

**Occurrence in the studied area.** — Depth range: 212–216 m; temperature: 6.35°C. The species was found in the warmer waters of western coast of Iceland (Fig. 1C).

**Remarks.** — Five species belonging to the genus *Amage* are hitherto reported in waters near Iceland: *Amage auricula* Malmgren, 1866, *A. gallasii* Marion, 1875, *A. adspersa* (Grube, 1863), *A. scotica* Clark, 1952 and *A. benhami* Reuscher, Fiege *et* Wehe, 2009 (reported in this paper). *Amage* sp. differs from the description provided by Fauvel (1927) of *A. gallasii* by the presence in the latter of three

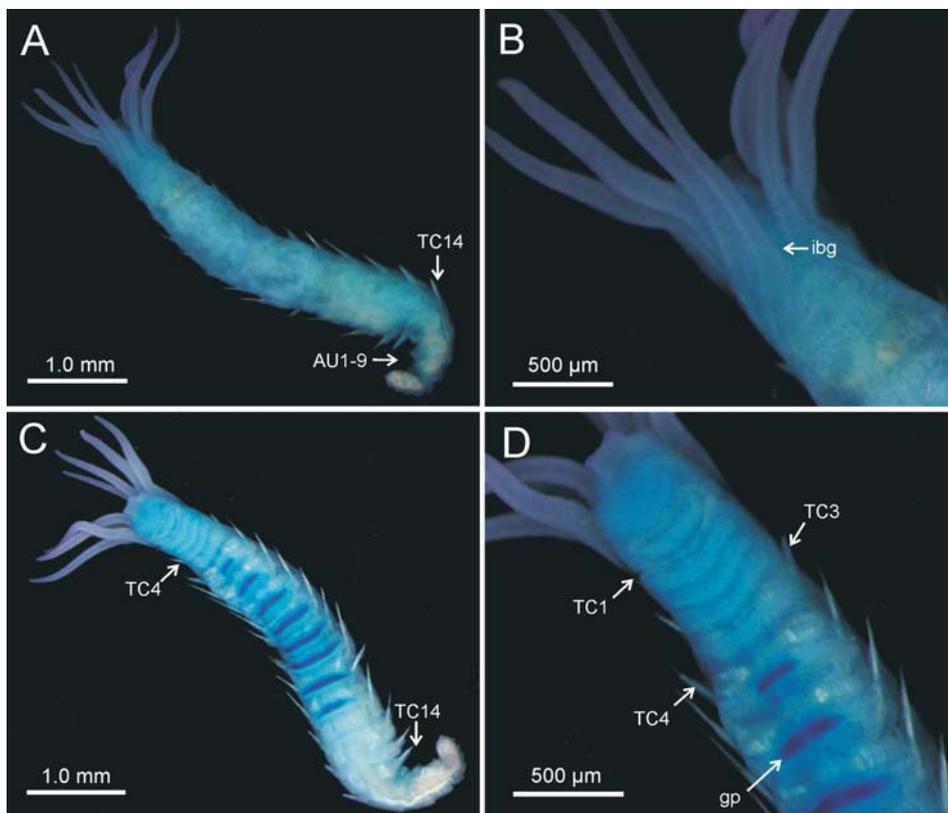


Fig. 3. *Amage* sp. stained with Methyl Green. **A.** Complete body, dorsal view. **B.** Anterior end, dorsal view. **C.** Complete body, ventral view. **D.** Anterior end, ventral view. Abbreviations: AU = abdominal unciniger, gp = glandular pad, ibg = interbranchial gap, TC = thoracic chaetiger.

pairs of branchiae instead of four, as it happens in the other species. *A. gallasii* was described from the littoral of Marseille (French Mediterranean) and later reported by Clark (1952, 1960) in the Clyde Sea. The number of thoracic chaetigers in *Amage* sp. (14) differs from those of *A. adspersa* (17) and *A. benhami* (15). The number of TU in *Amage* sp. (9) is also different from that of *A. auricula* (8). The species more similar to *Amage* sp., taking into account all meristic characters, is *A. scotica*; Icelandic specimens clearly differ, however, in the length and disposition of the branchiae. Thus, branchiae in *A. scotica* are short, slightly outpacing the prostomium, and the distance between the two groups of branchiae is very large, corresponding almost to the entire width of the prostomium (see Clark 1952, fig. 4a), while in *Amage* sp. branchiae are much longer, projecting anteriorly well beyond the prostomium, and the gap between both branchial groups is conversely much smaller and shorter than the prostomial width. We suspect therefore that this specimen belongs to a new species of *Amage* but is pending of formal description until more material is available.

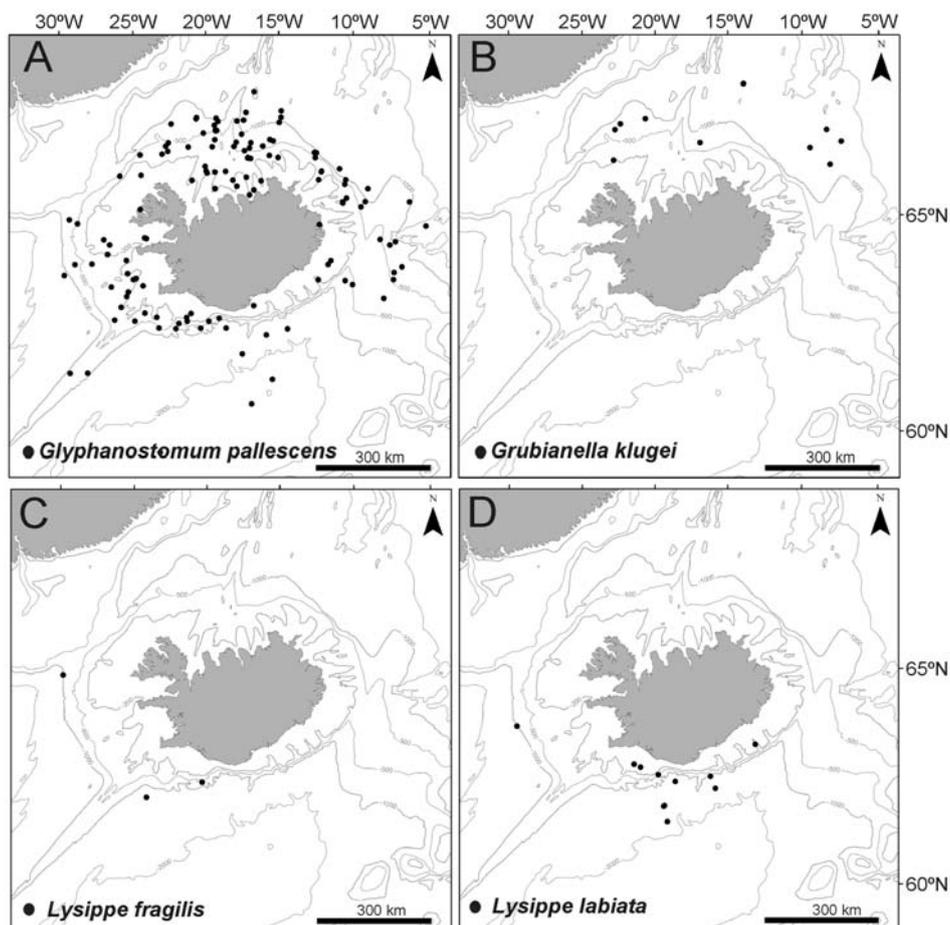


Fig. 4. Maps of Iceland showing BIOCE sampling stations with specimens of *Glyphanostomum pallescens* (A), *Grubianella klugei* (B), *Lysippe fragilis* (C) and *Lysippe labiata* (D).

#### Genus *Anobothrus* Levinsen, 1884

Type species: *Ampharete gracilis* Malmgren, 1866.

**Remarks.** — Reuscher *et al.* (2009) and Imajima *et al.* (2013) modified the diagnosis of the genus presented by Jirkov (2008) in order to accommodate special characteristics of several species described in both papers. Reuscher *et al.* (2009) also include a special reference to the possibility of absence of paleae because *A. apaleatus* Reuscher, Fiege *et* Wehe, 2009 has none. They argue that the character “presence of paleae” is inappropriate at the generic diagnostic level, but useful for discriminating species in *Anobothrus*. Actually, Jirkov (2008) follows that opinion and in his diagnosis of the genus the presence of paleae is not mentioned as he has not considered this character as of diagnostic relevance at the genus level, not only in *Amage* but also in other genera, such as *Ampharete* (Jirkov 1994).

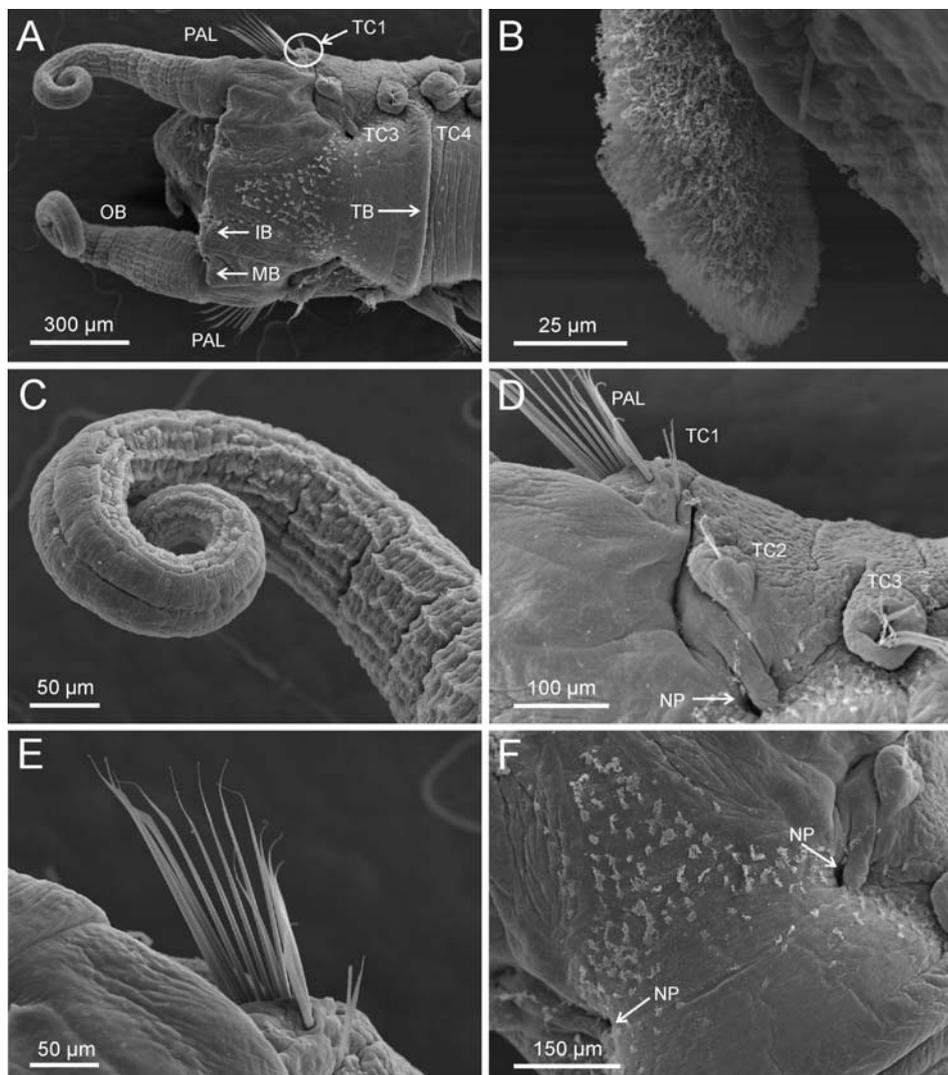


Fig. 5. *Melinnampharete eoa* Annenkova, 1937, BIOICE sample 2707. **A.** Anterior end, dorsal view. **B.** Buccal tentacle. **C.** Distal end of outer branchia. **D.** Right TC1 to TC3. **E.** Right paleae. **F.** Nephridial pores on postbranchial area. Abbreviations: IB = inner branchia, MB = median branchia, OB = outer branchia, NP = nephridial pore, PAL = paleae, TB = thoracic brim, TC = thoracic chaetiger.

Imajima *et al.* (2013) propose a further emendation by taking into account that S II and S III are fused and their chaetae can be reduced. Recently, Schüller and Jirkov (2013) proposed a new diagnosis for the genus combining the ones proposed by Jirkov (2008) and Reuscher *et al.* (2009). Reuscher *et al.* (2009) also present a synoptic table of characters of all species of *Anobothrus* hitherto described and Schüller and Jirkov (2013) provide an identification key.

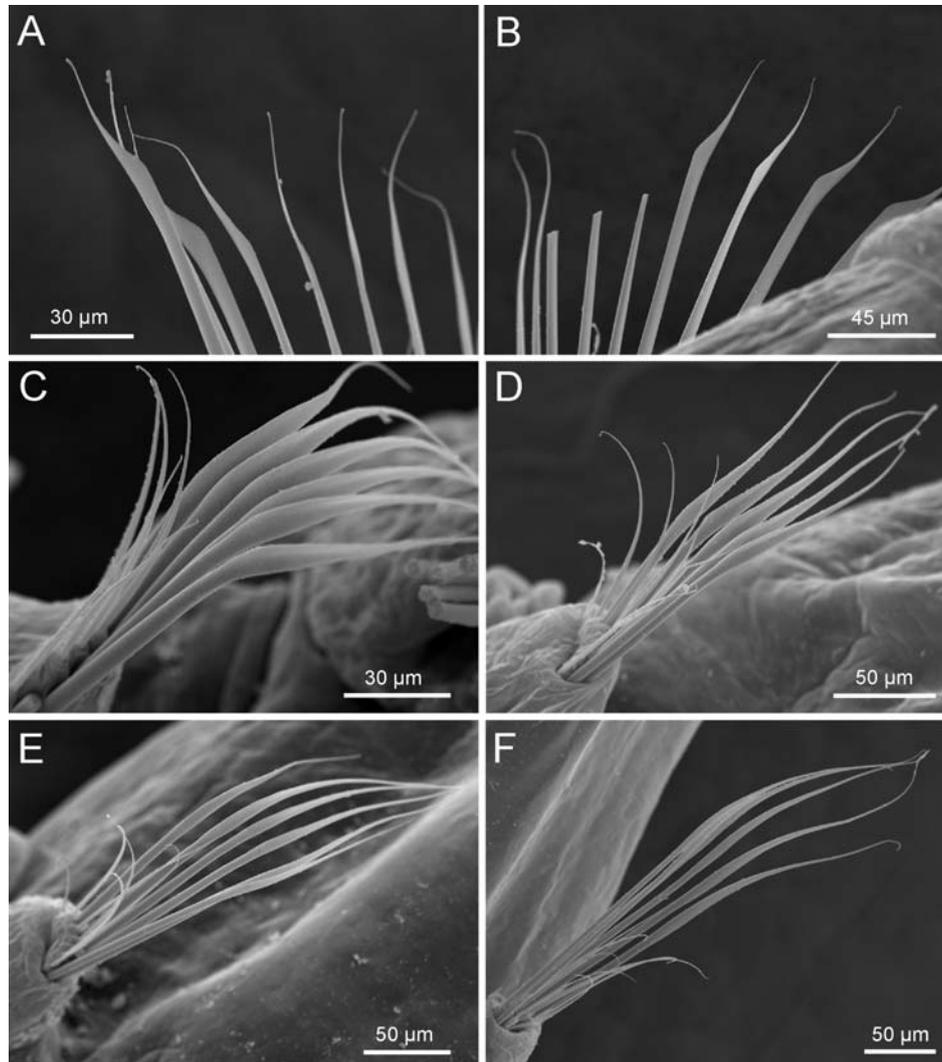


Fig. 6. *Melinnampharete eoa* Annenkova, 1937, BIOICE sample 2707. **A.** Detail of tips of right paleae. **B.** Detail of tips of left paleae. **C.** Notochaetae of TC7. **D.** Notochaetae of TC8. **E.** Notochaetae of TC11. **F.** Notochaetae of TC14.

*Anobothrus gracilis* (Malmgren, 1866)

*Ampharete gracilis*: Malmgren 1866: 365, pl. 26, fig. 75; Hartmann-Schröder 1996: 497, fig. 242.

*Anobothrus gracilis*: Holthe 1986a: 50, map 17, fig. 18; Hilbig 2000: 192, fig. 8.9; Jirkov 2001: 474 (text-fig.); Jirkov 2008: 122, figs 7–8.

**Material examined.** — 147 specimens (4.48% of the total) were collected in 28 samples.

**Occurrence in the studied area.** — Depth range: 66–1940 m; temperature range: -0.79 to 8.01°C. The species is ubiquitous in Icelandic waters (Fig. 1D).

**Geographic distribution.** — Iceland (Saemundsson 1918; Wesenberg-Lund 1951). Widely distributed in East and West coasts of Norwegian Sea, Iceland, Barents Sea, North Sea, Kattegat, Swedish West coast, Øresund and North-East Pacific, North-West Pacific and Arctic waters (Jirkov 2001, 2008).

**Reported bathymetric and temperature ranges.** — From 9 to 1960 m depth; -1.63 to 9.22°C (Jirkov 2001).

Genus *Glyphanostomum* Levinsen, 1884

Type species: *Samytha pallescens* Théel, 1879.

**Remarks.** — Reuscher *et al.* (2009) described a new species of this genus and provide a key to all hitherto described species.

*Glyphanostomum pallescens* (Théel, 1879)

*Samytha pallescens*: Théel 1879: 61–62, pl. 4, figs 60–62.

*Glyphanostomum pallescens*: Holthe 1986a: 71, map 28, fig. 29; Holthe 1986b: 232; Hilbig 2000: 204, fig. 8.15; Jirkov 2001: 478.

**Material examined.** — 1102 specimens (33.62% of the total) were collected in 135 samples.

**Occurrence in the studied area.** — Depth range: 62–2613 m; temperature range: -0.86 to 7.60°C. The species is ubiquitous in Icelandic waters (Fig. 4A).

**Geographic distribution.** — Widely distributed in East and West coasts of Norwegian Sea, Iceland, Svalbard, Barents Sea and Arctic waters (Holthe 1986a, c; Jirkov 2001).

**Reported bathymetric and temperature ranges.** — From 9 to 1385 m depth; -1.8 to 8.56°C (Jirkov 2001).

Genus *Grubianella* McIntosh, 1885

Type species: *Grubianella antarctica* McIntosh, 1885.

*Grubianella klugei* (Pergament *et* Khlebovitch in Khlebovitch, 1964)

*Amagopsis klugei*: Pergament and Khlebovitch in Khlebovitch 1964: 176, fig. 1; Holthe 1986a: 77, map 31, fig. 32; Holthe 1986b: 228.

*Grubianella klugei*: Jirkov 2001: 479.

**Material examined.** — 23 specimens (0.73% of the total) were collected in 10 samples.

**Occurrence in the studied area.** — Depth range: 213–1628 m; temperature range: -0.82 to 5.41°C. The species is present in Northern Icelandic waters (Fig. 4B).

**Geographic distribution.** — Present in East and West Norwegian Sea, Iceland, Spitsbergen and Arctic waters (Holthe 1986a, c; Jirkov 2001).

**Reported bathymetric and temperature ranges.** — From 445 to 3540 m depth; -0.96 to 3.38°C (Jirkov 2001).

Genus *Lysippe* Malmgren, 1866

Type species: *Lysippe labiata* Malmgren, 1866.

*Lysippe fragilis* (Wollebæk, 1912)

*Amphicteis fragilis*: Wollebæk 1912: 57–58, text-fig. 8, pl. 9, figs 1–7.

*Lysippides fragilis*: Hessle 1917: 111; Eliason 1955: 10; Holthe 1986a: 55, map 19, fig. 20; Hartmann-Schröder 1996: 500.

*Lysippe fragilis*: Jirkov 2001: 482.

**Material examined.** — Three specimens (0.09% of the total) were collected in three samples.

**Occurrence in the studied area.** — Depth range: 814–1650 m; temperature range: 3.61 to 5.82°C. The species is present in the South and West coast of Iceland (Fig. 4C).

**Geographic distribution.** — Southern Norway, north of Jutland and Swedish coast (Eliason 1955; Holthe 1986a).

**Reported bathymetric and temperature ranges.** — From 20 to 180 m depth (Holthe 1986a). No temperature data available.

*Lysippe labiata* Malmgren, 1866

*Lysippe labiata*: Malmgren 1866: 367, pl. 26, fig. 78; Fournier and Pocklington 1984: 265; Holthe 1986a: 52, map 18, fig. 19; Hartmann-Schröder 1996: 500; Hilbig 2000: 206, fig. 8.16; Jirkov 2001: 480.

**Material examined.** — 37 specimens (1.13% of the total) were collected in 10 samples.

**Occurrence in the studied area.** — Depth range: 124–1784 m; temperature range: 2.70 to 7.67°C. The species is present along the southern coast of Iceland (Fig. 4D).

**Geographic distribution.** — Iceland (Wesenberg-Lund 1951), widely distributed in Arctic Ocean, East Greenland, Svalbard, Barents Sea and North coast of Norway (Jirkov 2001).

**Reported bathymetric and temperature ranges.** From 14 to 395 m depth; -1.63 to 3.4°C (Jirkov 2001).

*Lysippe sexcirrata* (M. Sars, 1856)

*Sabellides sexcirrata*: M. Sars 1856: 24.

*Samytha sexcirrata*: Holthe 1986a: 68, map 26, fig. 27; Holthe 1986b: 232; Hartmann-Schröder 1996: 502; Böggemann 1997: 179, fig. 130.

*Lysippe sexcirrata*: Jirkov 2001: 481.

**Material examined.** — Eight specimens (0.24% of the total) were collected in four stations.

**Occurrence in the studied area.** — Depth range: 125–277 m; temperature range: 6.51 to 7.20°C. The species is present in the South coast of Iceland (Fig. 8A).

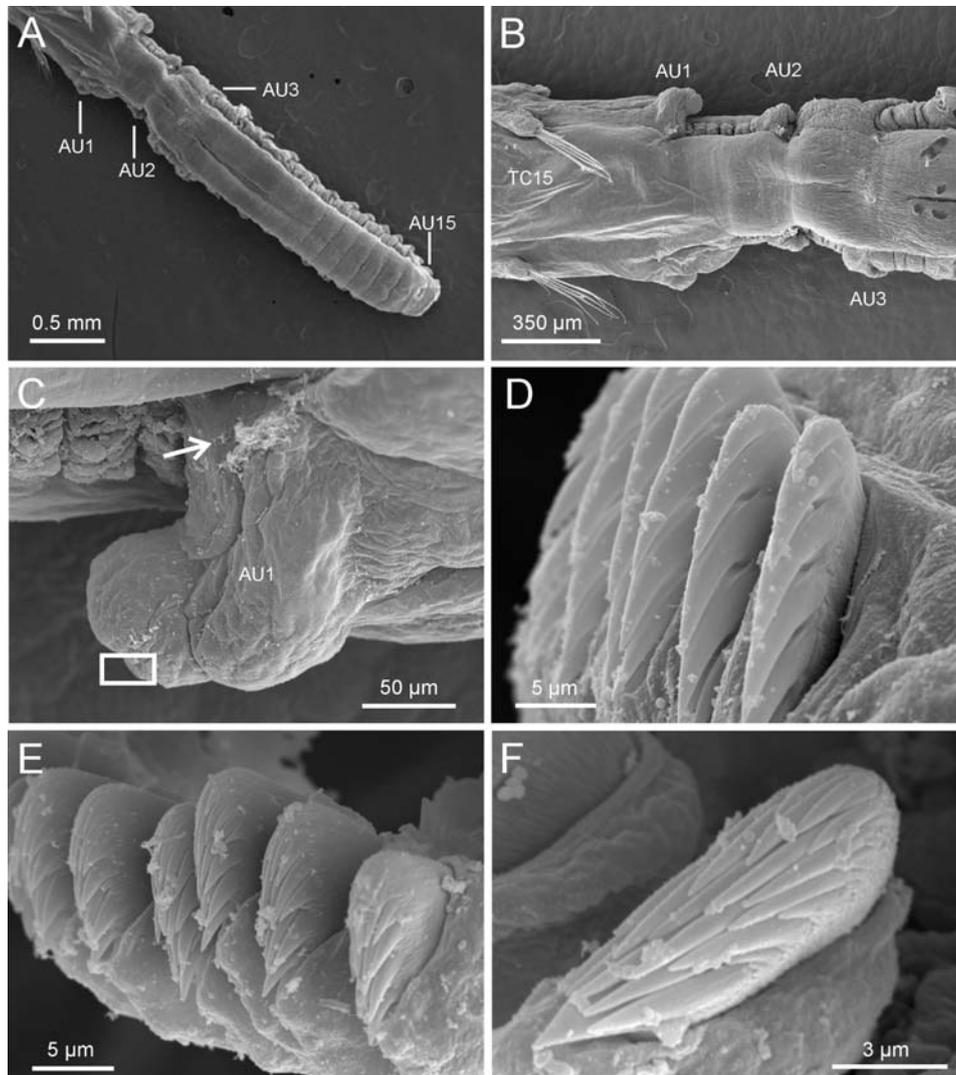


Fig. 7. *Melinnampharete eoa* Annenkova, 1937, BIOICE sample 2707. **A.** Abdomen, dorsal view. **B.** First abdominal chaetigers, dorsal view. **C.** AU1, dorsal view (arrow showing dorsal tuft of cilia; white square marking position of uncini). **D.** Uncinus of thoracic type of AU1, antero-lateral view. **E.** Abdominal uncini, frontal-lateral view. **F.** Abdominal uncini, upper view. Abbreviations: AU = abdominal unciniger, TC = thoracic chaetiger.

**Geographic distribution.** — Svalbard, Norway, Shetland, North Sea, Iceland, Skagerrak, Kattegat, Swedish West coast and South-West Barents Sea (Holthe 1986a, c; Jirkov 2001).

**Bathymetric and temperature ranges.** — Form 104 to 460 m depth; 1.4 to 8.17°C (Jirkov 2001).

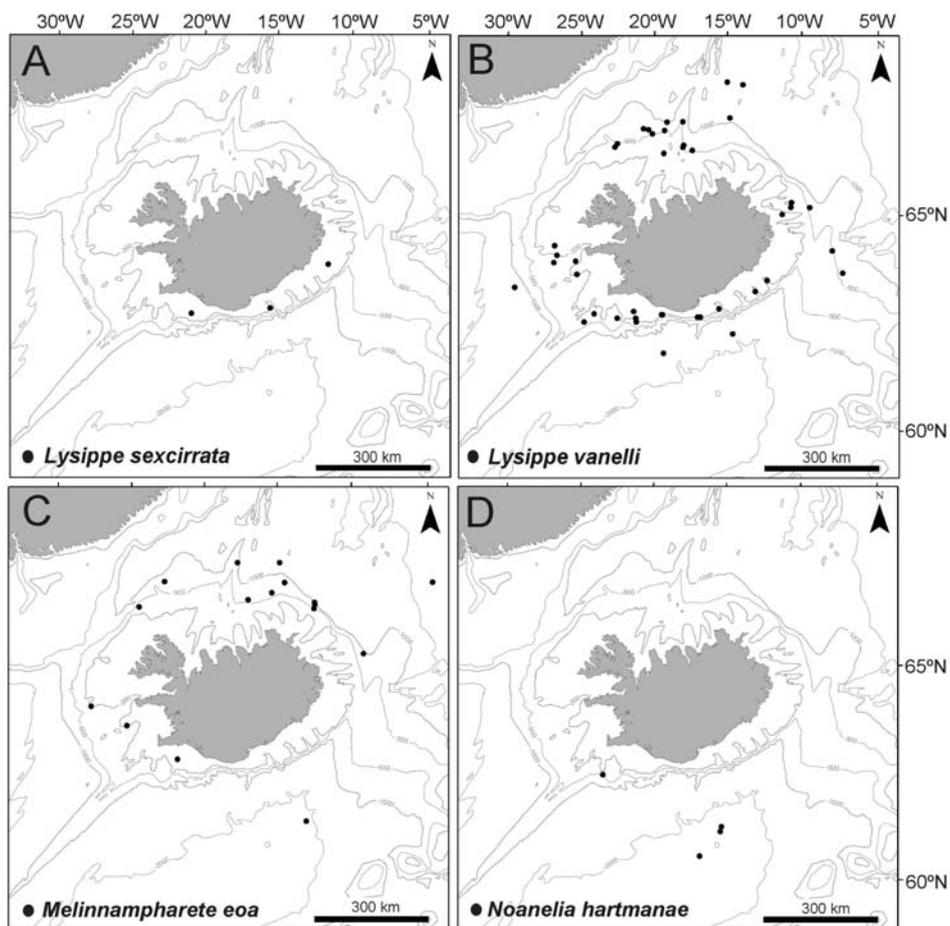


Fig. 8. Maps of Iceland showing BIOCE sampling stations with specimens of *Lysippe sexcirrata* (A), *Lysippe vanelli* (B), *Melinnampharete eoa* (C) and *Noanelia hartmanae* (D).

*Lysippe vanelli* Fauvel, 1936

*Lysippe vanelli*: Fauvel 1936: 96, fig. 13a–e.

*Eclysippe vanelli*: Eliason 1955: 10, fig. 3; Holthe 1986a: 64, map 24, fig. 25; Holthe 1986b: 228; Hartmann-Schröder 1996: 498.

*Pterolysippe vanelli*: Jirkov 2001: 484.

**Material examined.** — 297 specimens (9.06% of the total) were collected in 43 samples.

**Occurrence in the studied area.** — Depth range: 126–1810 m; temperature range: -0.80 to 7.92°C. The species is ubiquitous in Icelandic waters (Fig. 8B).

**Geographic distribution.** — Norwegian and Swedish coasts, Barents Sea, north coast of Jutland, Skagerrak and East Iceland (Eliason 1955; Holthe 1986a, c; Jirkov 2001).

**Reported bathymetric and temperature ranges:** From 70 to 1065 m depth; -0.84 to 9.48°C (Jirkov 2001).

Genus *Melinnampharete* Annenkova, 1937

Type specie: *Melinnampharete eoa* Annenkova, 1937.

**Remarks.** — The genera *Eusamythella* and *Neosamytha* were recently synonymized with *Melinnampharete* by Jirkov (2011), also including the genus *Eusamytha* as described by Hartman (1967); the latter name was preoccupied in the Ampharetidae by *Eusamytha* McIntosh, 1885. Therefore, the genus comprises nowadays six species: *M. eoa* from West Pacific Ocean, *M. gracilis* (Hartman, 1967; as *Neosamytha*) and *M. sexdentata* (Hartman, 1967; as *Eusamytha*) from Antarctica, *M. gracilis* (Hartman, 1969; non Hartman 1967) from East Pacific Ocean, *M. septemdentata* Levenstein, 1978 and *M. multidentata* (Wu, Wu *et* Qian, 1987; as *Eusamythella*) both from Southern Ocean. After the aforementioned proposal of synonymies by Jirkov (2011), *M. gracilis* (Hartman, 1969) would have become a junior secondary homonym of *M. gracilis* (Hartman, 1967) and therefore a new name should be proposed for the former. However, to assess accurately these issues, a thorough study of all the above mentioned genera would be needed and that is beyond the scope of this work.

*Melinnampharete eoa* Annenkova, 1937

(Figs 5–7)

*Melinnampharete eoa*: Annenkova 1937: 187, fig. 11.

**Material examined.** — 123 specimens (3.75% of the total) were collected in 15 samples.

**Description of BIOICE specimens.** — Body length 10 mm; width (excl. parapodia) 1 mm. Body broad anteriorly (Fig. 5A) and gradually tapering towards the end of thorax, abdomen of constant width (Fig. 7A). Prostomium trilobed, eye-spots not seen. Buccal tentacles with tips densely covered with ciliae (Fig. 5B). Three pairs of smooth cirriform branchiae on thoracic segment II (TSII). A short gap between groups of branchiae (Fig. 5A, C). Three pairs of branchiae arranged in a transverse line; outer branchiae horn-like as the consequence of shrinking in dorsal half (Fig. 5A). A pair of nephridial pores located behind innermost branchiae and dorsal to TC2 (Fig. 5D, F). 15 TC being last 12 uncinigers. Paleae *ca.* 9–11, of similar length and width as longer notopodial chaetae (Fig. 5E, 6A–B), abruptly tapering near the distal end with sickle-shaped distal end. First three notopodia reduced, especially TC1 (Fig. 5A, D) which is very small and located behind paleae, hardly visible without SEM. A broad dorsal rim located dorsally between TC3 and TC4 (Fig. 5A). TC9 and TC10 elevated, both without morphological modifications, resembling remaining notopodia, and without dorsal glandular ridge connecting them. Notopodia without cirri. Abdomen short, encompassing about one third of body length. 15 AU (Fig. 7A). First two AU (AU1 and AU2) with uncinigers of thoracic type (Fig. 7B–C). Body constricted

between AU2 and AU3 (Fig. 7B). Neuropodia from AU3 onwards as elongated pinnules with dorsal tuft of ciliae (Fig. 7C). Pygidium with terminal anus with apparently no cirri or papillae. Capillary chaetae unilimbate, broad at distal end in first thoracic notopodia (Fig. 6C) and progressively narrower toward last thoracic chaetigers (Fig. 6C–F). Chaetae of uncinigers with elevated notopodia without modifications. Thoracic uncini with one vertical row of four teeth above rostrum (Fig. 7D). Abdominal uncini with 3–4 horizontal rows of 4–5 teeth of similar size each (Fig. 7E–F).

**Occurrence in the studied area.** — Depth range: 213–3003 m; temperature range:  $-0.72$  to  $6.99^{\circ}\text{C}$ . The species is present along the entire coast of Iceland but mostly in deeper waters of northern coast (Fig. 8C).

**Geographic distribution.** — North Japan Sea (Annenkova 1937). This is the first report of the species after the original description.

**Reported bathymetric and temperature ranges.** — From 78 to 1600 m depth (Annenkova 1937). No temperature data available.

#### Genus *Noanelia* Desbruyères *et* Laubier, 1977

Type species: *Noanelia hartmanae* Desbruyères *et* Laubier, 1977.

Jirkov (2011) emends the diagnosis of this genus and points out that its position in the clade Terebellomorpha remains unresolved because, unlike other ampharetids, the buccal tentacles are outside of the mouth, which is diagnostic for the Terebellidae. Furthermore, the two known species of *Noanelia* have ventral glandular shields, which have never been previously reported in Ampharetidae, but can be present in the subfamilies Terebellinae and Polycirrinae within the Terebellidae. However, Terebellinae with ventral shields always have double rows of uncini in some segments, while *Noanelia* has only a single one, and Polycirrinae lack branchiae, while *Noanelia* bears well developed ones. Therefore, *Noanelia* does not belong to Terebellidae despite the aforementioned similarities.

Schüller and Jirkov (2013) propose an emended diagnosis to accommodate the characteristics of the new species they described, i.e. *N. orensanzi* Schüller and Jirkov, 2013, excluding the dental formula and the large differences in size of the four pairs of branchiae displayed in *N. hartmanae* but not seen in the new species.

#### *Noanelia hartmanae* Desbruyères *et* Laubier, 1977

(Figs 9–10)

*Noanelia hartmanae*: Desbruyères and Laubier 1977: 280, fig. 1; Detinova 1985: 128; Kongsrud *et al.* 2013: 542.

**Material examined.** — 37 specimens (1.13% of the total) were collected in four samples.

**Occurrence in the studied area.** — Depth range: 520–2298 m; temperature range:  $2.37$  to  $6.74^{\circ}\text{C}$ . The species is present along the southern coast of Iceland (Fig. 8D).

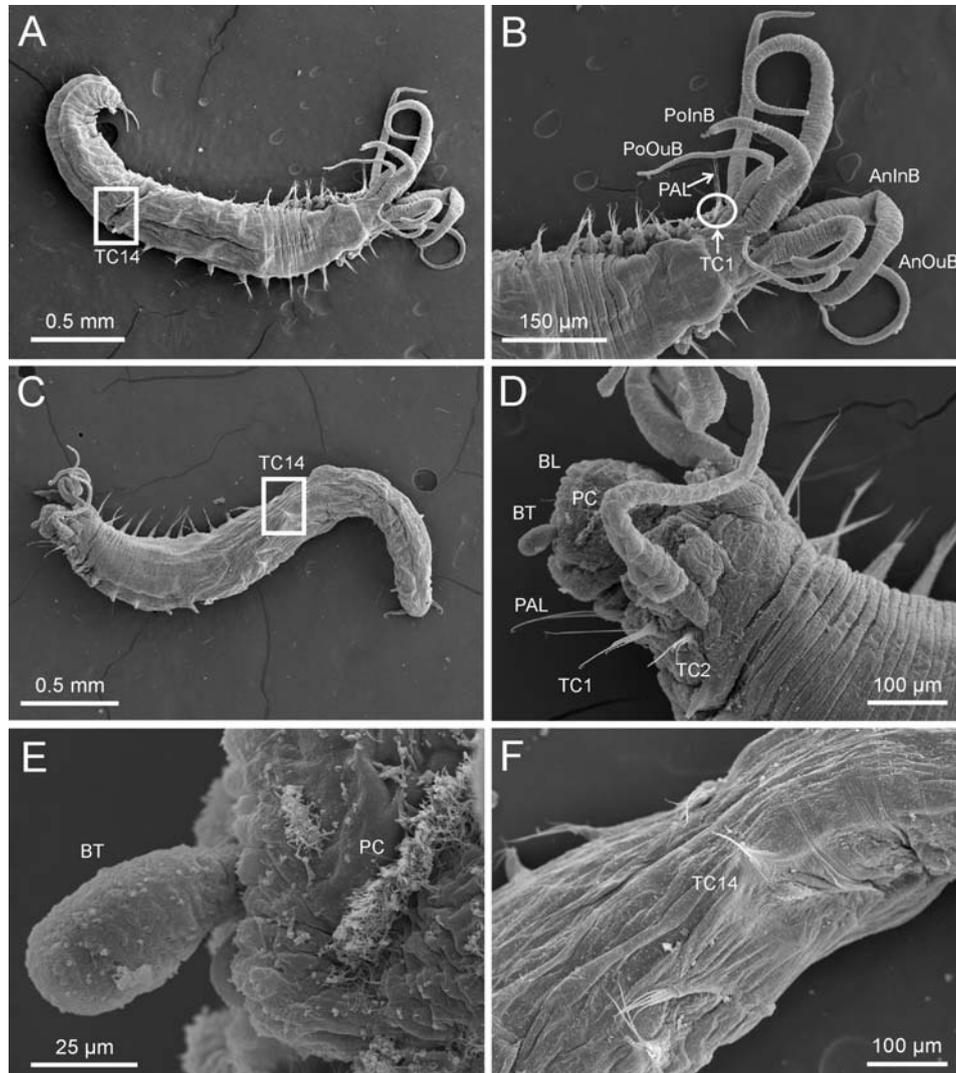


Fig. 9. *Noanelia hartmanae* Desbruyères *et* Laubier, 1977, BIOICE sample 2401. **A.** Complete specimen, dorsal view. **B.** Detail of anterior end. **C.** Complete specimen, dorsal view. **D.** Detail of anterior end. **E.** Detail of a buccal tentacle and prostomial ciliature. **F.** Detail of elevated notopodia at TC14 (inset of figure C). Abbreviations: AnInB = anterior inner branchia, AnOuB = anterior outer branchia, BL = buccal lobes, BT = buccal tentacle, PAL = paleae, PC = prostomial ciliature, PoInB = posterior inner branchia, PoOuB = posterior outer branchia, TC = thoracic chaetiger.

**Geographic distribution.** — Species originally described by Desbruyères and Laubier (1977) from the Bay of Biscay, later found on the Reykjanes Ridge by Detinova (1985) and recently south of the Charlie-Gibbs Fracture Zone (Kongsrud *et al.* 2013; Fig. 11). Our record confirms the boreal distribution of the species.

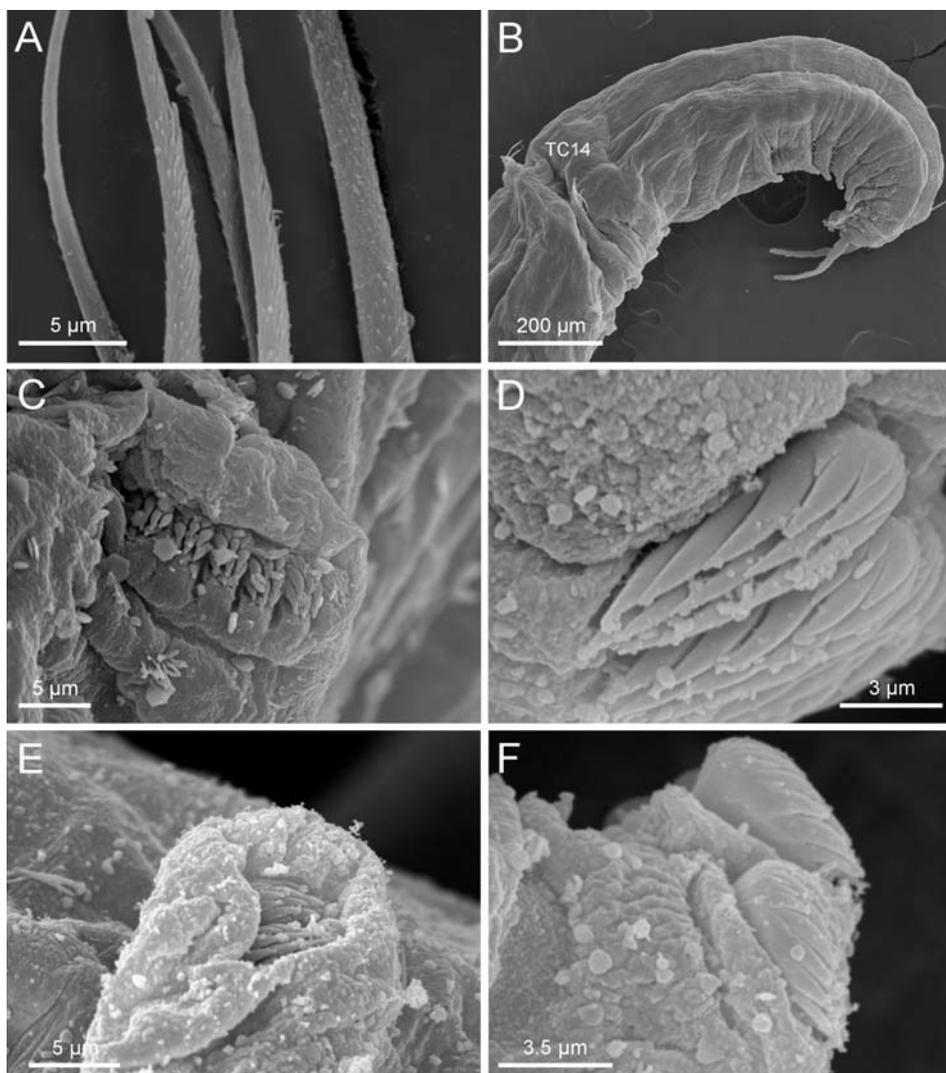


Fig. 10. *Noanelia hartmanae* Desbruyères *et* Laubier, 1977, BIOICE sample 2860. **A.** Detail of notochaetal surface. **B.** Abdomen, latero-dorsal view. **C.** Thoracic unciniger. **D.** Thoracic uncini, upper view. **E.** Abdominal unciniger. **F.** Abdominal uncini, lateral view. Abbreviation: TC = thoracic chaetiger.

**Reported bathymetric and temperature ranges.** — From 1550 to 4251 m depth (Kongsrud *et al.* 2013). No temperature data available.

**Remarks.** — The species is well characterised by the different length of the four pairs of branchiae, the anterior two pairs being longer than the posterior ones, and the two pairs of inner branchiae are much thicker than the outer ones (Fig. 9A–B). Also, the prostomium shows short club shaped buccal tentacles (Fig. 9D–E) and TC14 is elevated (Figs 9A, C, F; 10B). Thoracic notochaetae

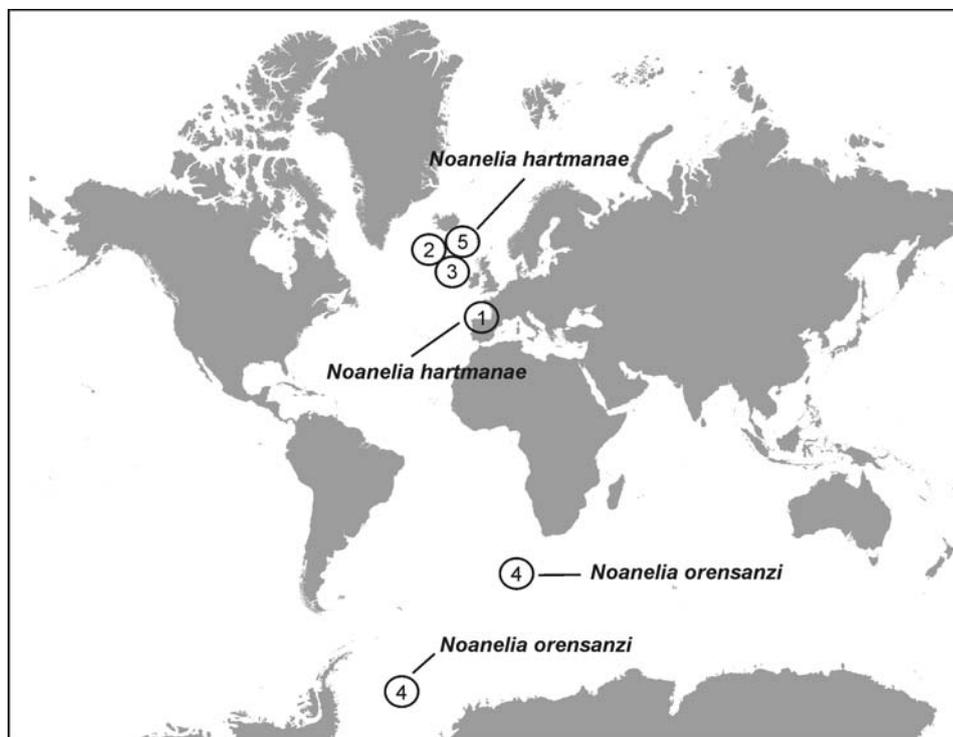


Fig. 11. Worldwide reports of species of *Noanelia* in ascending order by date. For each species, the original designation is indicated. (1) Desbruyères and Laubier (1977), (2) Detinova (1985), (3) Köngsrud *et al.* (2013), (4) Schüller and Jirkov (2013), (5) this paper.

shows hirsute surface (Fig. 10A). Both thoracic and abdominal uncinigers were studied under the SEM showing that the thoracic ones have three vertical rows of teeth over the rostrum (Fig. 10C–D). The abdominal ones are difficult to see because most of them were inside the torus; they have about 5–6 rows of horizontal teeth above the rostrum (Fig. 10E–F).

Schüller and Jirkov (2013) describe a second species of the genus, *N. orensanzi*, in Southern Atlantic Ocean (Fig. 11), which differs from *N. hartmanae* in the branchial length, the different position of the nephridial papillae and in that the last two thoracic chaetigers are shifted dorsally instead of the last one only.

#### Genus *Samythella* Verrill, 1873

Type species: *Samythella elongata* Verrill, 1873.

#### *Samythella elongata* Verrill, 1873

*Samythella elongata*: Verrill 1873: 98–99; Hartman and Fauchald 1971: 163–164; Amoureux 1982: 202; Jirkov 1986a: 330, figs 1–3; Jirkov 2001: 484.

*Samythella neglecta*: Wollebæk 1912: 62–64, pl. 12; Holthe 1986a: 69, map 27, fig. 28; Wesenberg-Lund 1950a: 48; Wesenberg-Lund 1950b: 113–114; Holthe 1986b: 232.

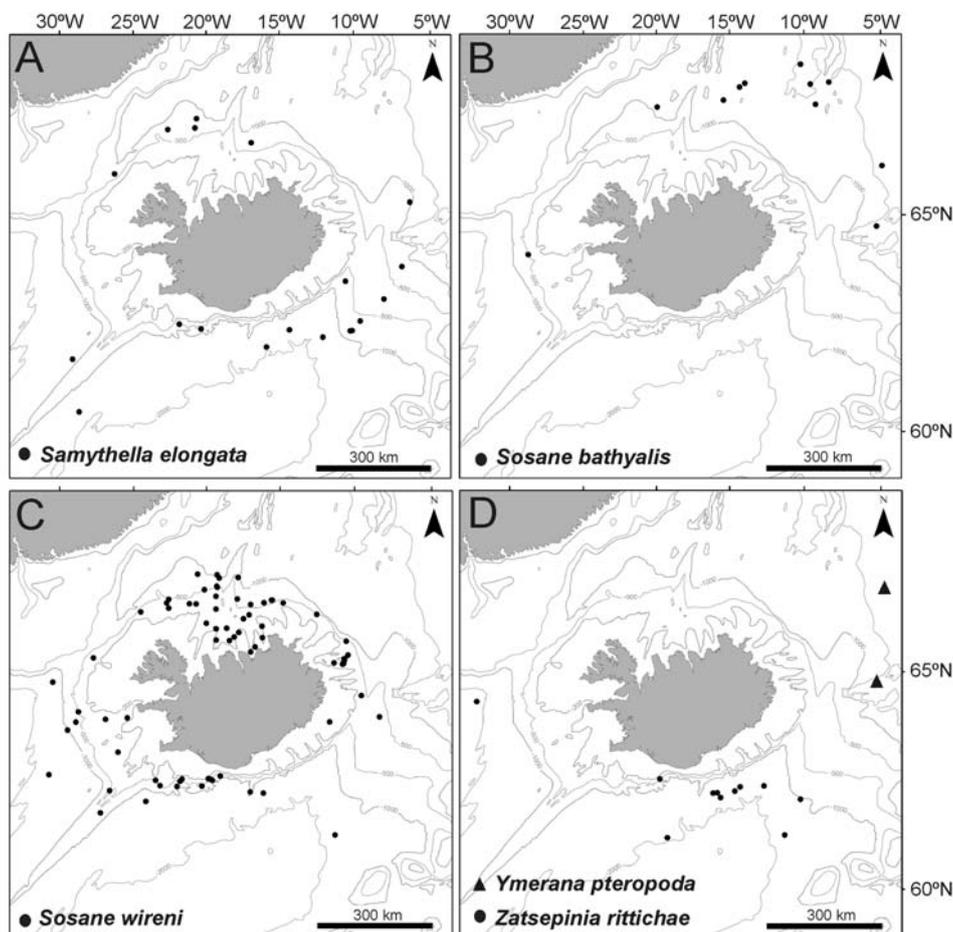


Fig. 12. Maps of Iceland showing BIOCE sampling stations with specimens of *Samythella elongata* (A), *Sosane bathyalis* (B), *Sosane wireni* (C) and *Ymerana pteropoda* and *Zatsepinia rittichae* (D).

*Samythella bathycola*: Uschakov 1950: 220, fig. 106.

*Samythella interrupta*: Fauchald 1972: 313, pl. 66, figs a–b.

*Samythella pala*: Fauchald 1972: 315–316, pl. 66, figs c–f.

*Sabellides fulva*: Ehlers 1874: 64–66 (see Holthe 1986b).

**Material examined.** — Thirty three specimens (1.01% of the total) were collected in 18 samples.

**Occurrence in the studied area.** — Depth range: 429–1940 m; temperature range: -0.63 to 6.09°C. The species is ubiquitous in Icelandic waters (Fig. 12A).

**Geographic distribution.** — Norwegian coast, Svalbard and Norwegian Sea (Holthe 1986a, c; Jirkov 1986a), Arctic Ocean and North West Pacific Ocean (Jirkov 1986a, 2001).

**Reported bathymetric and temperature ranges.** — From 125 to 5460 m depth; -1.17 to 9.62°C (Jirkov 1986a, 2001).

Genus *Sosane* Malmgren, 1866

Type species: *Sosane sulcata* Malmgren, 1866.

**Remarks.** — Imajima *et al.* (2013) propose an emended diagnosis of the genus to accommodate two species described in their paper which have the second-to-last and fourth-to-last thoracic uncinigers with elevated and modified notopodia, respectively. In addition, they include for the first time the disposition of the branchiae in the anterior body end and the number of intermediate segments.

*Sosane bathyalis* (Holthe, 1986)

*Mugga bathyalis*: Holthe 1986c: 228, fig. 1; Jirkov 2001: 486.

?*Mugga wahrbergi*: Eliason 1955: 8, fig. 2; Holthe 1986a: 60, map 22, fig. 23; Hartmann-Schröder 1996: 501; Hilbig 2000: 210, fig. 8.18.

?*Sosane wahrbergi*: Jirkov 2001: 487.

**Material examined.** — 70 specimens (2.13% of the total) were collected in 11 samples.

**Occurrence in the studied area.** — Depth range: 554–2613 m; temperature range: -0.84 to 6.35°C. The species is present in the northern half of the studied area (Fig. 12B).

**Geographic distribution.** — Norwegian coast (Holthe 1986a, c).

**Reported bathymetric and temperature ranges.** — 900 to 2630 m depth (Jirkov 2001). No temperature data available.

**Discussion.** — Holthe (1986c) describes *S. bathyalis* (as *Mugga*) from deep waters off Southern Norway separating it from *Sosane wahrbergi* (Eliason, 1955) by its smaller abdomen and the very different depth distribution. Thus, *S. wahrbergi* is a shelf water species (20–181 m) while *S. bathyalis* was described from specimens caught at 2630 m depth. Hilbig (2000) discusses morphological similarities among *M. bathyalis* and *M. wahrbergi* in detail but although she does not explicitly mention their synonymy, she refers to genus *Mugga* as being monotypic. On the contrary, Jirkov (2001) keeps both species separate. We believe that the ecological differences may justify keeping them separate; however, specimens from both species have not been directly compared and therefore we may not confirm their possible synonymy.

*Sosane wireni* (Hessle, 1917)

(Fig. 13)

*Sosanopsis wireni*: Hessle 1917: 112, text-fig. 17, pl. I, fig. 6; Banse 1979: 1550; Holthe 1986a: 66, map 25, fig. 26; Holthe 1986b: 228; Hartmann-Schröder 1996: 503; Imajima *et al.* 2013: 156, figs 12, 17c.

*Sosane wireni*: Jirkov 2001: 488.

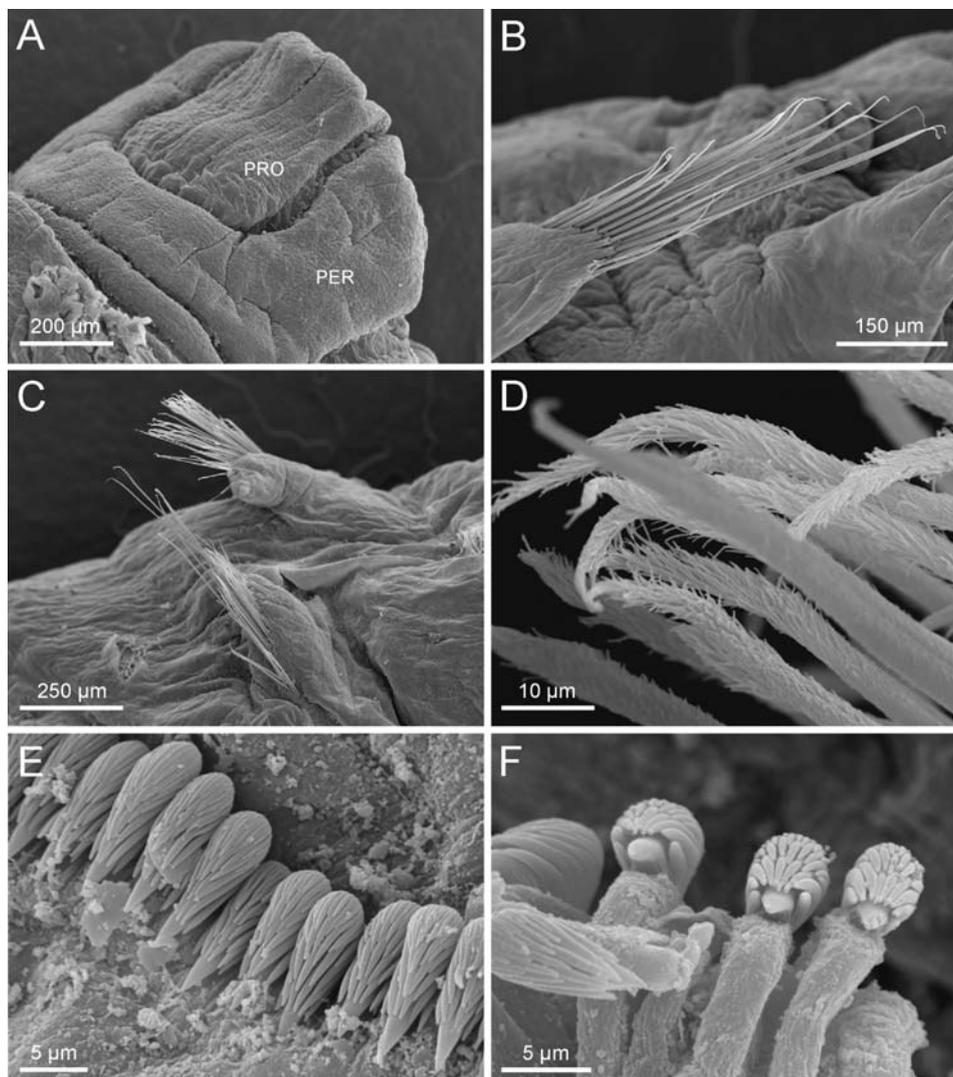


Fig. 13. *Sosane wireni* (Hessle, 1917), BIOICE sample 2627. **A.** Anterior end, dorso-lateral view. **B.** Detail of notochaetae of TC11. **C.** Elevated notopodia of TC13. **D.** Detail of distal end of TC13 notochaetae. **E.** Thoracic uncini, upper view. **F.** Abdominal uncini, frontal view. Abbreviations: PER = peristomium, PRO = prostomium.

**Material examined.** — 263 specimens (8.02% of the total) were collected in 73 samples.

**Occurrence in the studied area.** — Depth range: 110–1662 m; temperature range:  $-0.61$  to  $7.61^{\circ}\text{C}$ . The species is ubiquitous in the Icelandic waters (Fig. 12C).

**Geographic distribution.** — North Sea, Norwegian Sea, Barents Sea, Laptev Sea (Holthe 1986a, c; Hartmann-Schröder 1996), New England (Hilbig 1994),

California (Hilbig 2000), Japan (Imajima *et al.* 2013). This is the first record of the species in Icelandic waters.

**Bathymetric and temperature ranges.** — From 111 to 445 m depth; -0.04 to 2.56°C (Jirkov 2001).

**Discussion.** — Imajima *et al.* (2013) consider *Sosane wireni* Caullery, 1944 as a potential homonym of *S. wireni* (Hessle, 1917), likely belonging to the genus *Lysippe* and probably a different species. Some body characters were studied here under the SEM and appear to show significant differences between North Atlantic and North Pacific specimens. For instance, the overall appearance of the prostomium of North Atlantic specimens (Fig. 13A) is clearly different to that illustrated by Imajima *et al.* (2013, fig. 12A–B). Furthermore, special thoracic notochaetae of TC13 and uncini also show conspicuous differences; thoracic capillary chaetae do not seem bilimbate (Fig. 13B) and the plumose tips of special notochaetae located at TC13 elevated notopodia (Fig. 13C–D) clearly differ from those illustrated by Imajima *et al.* (2013, fig. 12F) for Japanese specimens. Lastly, shape, length and disposition of uncinal teeth seem to differ between Icelandic and Pacific specimens (*cf.* Imajima *et al.* 2013, fig. 12G *versus* Fig. 13E–F, this paper).

#### Genus *Ymerana* Holthe, 1986

Type species: *Ymerana pteropoda* Holthe, 1986.

#### *Ymerana pteropoda* Holthe, 1986

*Ymerana pteropoda*: Holthe 1986c: 231, fig. 2; Jirkov 2001: 488.

**Material examined.** — Ten specimens (0.30% of the total) were collected in 2 BIOICE samples (3204 and 3214).

**Description of BIOICE specimens.** — Body around 3 mm in length and 0.3 mm in width. General body appearance agrees completely with original description by Holthe (1986c). Prostomium broad. Tentacles withdrawn in buccal cavity. No eyes. All branchiae lost; three pairs of branchial scars barely distinguishable forming a close group widely separated. Thorax with 13 pairs of TC, TC1 and TC2 being shorter than following; TC3 to TC11 long and provided with long and slender notochaetae. Segment XV achaetous and transformed into dorsolateral fans with pointed wings located laterally. Neuropodia present from CH4 (SVII) and probably through body, in thorax as low tori and in abdomen as pinnulae. At least 8 abdominal segments, anterior ones longer than following ones. No rudimental notopodia in abdomen, no parapodial cirri. Pygidium unknown.

**Occurrence in the studied area.** — Depth range: 2611–3003 m; temperature range: -0.83 to -0.90°C. The species is present along eastern Iceland (Fig. 12D).

**Geographic distribution.** — Arctic waters north to Svalbard (Holthe 1986c). This is the first report of the species after original description.

**Reported bathymetric and temperature ranges.** — Depth 3270 m (Holthe 1986b). No temperature data available.

Genus *Zatsepinia* Jirkov, 1986

Type species: *Zatsepinia rittichae* Jirkov, 1986.

**Remarks.** — Schüller and Jirkov (2013) and Imajima *et al.* (2013) simultaneously propose an emended diagnosis of the genus to accommodate the characteristics of the new species described by them.

*Zatsepinia rittichae* Jirkov, 1986

*Zatsepinia rittichae*: Jirkov 1986b: 289, figs a–e; Jirkov 2001: 489; Jirkov 2008: 120; Imajima *et al.* 2013: 162, figs 15, 17f.

**Material examined.** — 105 specimens (3.20% of the total) were collected in 11 samples.

**Occurrence in the studied area.** — Depth range: 778–2185 m; temperature range: 2.40 to 5.50°C. The species is ubiquitous in Icelandic waters (Fig. 12D).

**Geographic distribution.** — Since its original description from the Barents Sea and Norwegian Sea by Jirkov (1986b), the species had not been recorded until Imajima *et al.* (2013) report on its presence along the coast of Japan. This record, along with our finding in southern coast of Iceland, confirm the boreo-arctic distribution of the species.

**Reported bathymetric and temperature ranges.** — 175–356 m depth; 3.62 to 8.84°C in boreo-arctic Atlantic waters (Jirkov 2001). Imajima *et al.* (2013) extended the bathymetric distribution from 100 to 2055 m depth.

**Remarks.** — Schüller and Jirkov (2013) and Imajima *et al.* (2013) describe two new species of this until then monospecific genus: *Z. antarctica* Schüller *et* Jirkov, 2013 from deep waters (3138 to 4418 m depth) of Weddell Sea and *Z. jirkovi* Imajima, Reuscher *et* Fiege, 2013 from shelf (46–1000 m depth) waters of Japan.

## Summary

Seventeen species belonging to eleven genera were identified. Most of the species which had been reported in Icelandic and nearby waters by previous studies (*e.g.*, Fauvel 1913, 1946; Ditlevsen 1917; Saemundsson 1918; Spärck 1937; Einarsson 1941; Wesenberg-Lund 1951; Gardarsson 1973; Holthe 1986a; Jirkov 2001; Kongsrud *et al.* 2013) were also found in this study: *Amage auricula*, *Anobothrus gracilis*, *Lysippe labiata*, *Glyphanostomum pallescens* and *Grubianella klugei*. *Amage adpersa* (Grube, 1863) was reported by Spärck (1937) in North-Western Icelandic fjords but it was not found in the BIOICE samples. Six other species were described or previously reported from nearby areas (*e.g.*, North Sea, Norwegian Sea, Skagerrak and Kattegat) namely: *Lysippe fragilis*, *Lysippe sexcirrata*, *Lysippe vanelli*, *Samythella elongata*, *Sosane bathyalis* and *Sosane wireni*. Five species were scarcely (or never) reported after original description, namely *Amage benhami*, *Melinnampharete eoa*, *Noanelia hartmanae*, *Ymerana*

*pteropoda* and *Zatsepinia rittichae*. They are discussed based on BIOICE material. A potential new species of *Amage* is also described but not named due to the single specimen available.

Among the species described or reported in nearby waters (*e.g.*, Norwegian Sea, North Sea, Baltic Sea, Arctic Ocean) only five species were not hitherto found in the BIOICE samples: *Alkmaria romijni* Horst, 1919, *Amythasides macroglossus* Eliason, 1955, *Anobothrus laubieri* (Desbruyères, 1978), *Sosane sulcata* Malmgren, 1866 and *S. wahrbergi* (Eliason, 1955). Among them, *A. romijni* is a typical brackish-water species, found from the eulittoral to shallow subtidal, described and reported in the Baltic Sea and Baltic Canal and the coast of the Netherlands and Denmark (Holthe 1986a). *A. macroglossus* is a rare species, reported only from South-West Sweden, Skagerrak and Norwegian Southern-Eastern coast (Hartmann-Schröder 1996; Holthe 1986a; Jirkov 2001). *A. laubieri* is an Arctic deep-water species, widely distributed and very common in the deep Norwegian Sea (Jirkov 2001). *S. wahrbergi* is a shallow water species described in Swedish South-Western coast (Eliason 1955) and later reported in nearby areas (Holthe 1986a; Jirkov 2001). This species is morphologically very similar to *S. bathyalis* and common in deep, cold northern waters. The main difference between both species is related to the length of the abdomen and the number of abdominal uncinigers, and the shape of the uncini (Holthe 1986c). *S. sulcata* is a shelf species described from Southern Norwegian and Swedish coasts and later reported from several localities on the coast of France and Great Britain (Holthe 1986a) and even from the Gulf of Mexico (Uebelacker 1984) and Japan (Hayashi and Hanaoka 1997; Imajima *et al.* 2013).

In total, 29 species of ampharetids have been reported up to date in Icelandic waters from BIOICE material, including the two new species recently described by Parapar *et al.* (2011c, 2012) and the new records reported in this paper. Further work is, however, needed to assess the true identity of some taxa with wide distribution range across the Arctic and other oceans, and therefore the actual diversity of this family in Iceland.

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