

# Polychaetes of the genus *Ampharete* (Polychaeta: Ampharetidae) collected in Icelandic waters during the BIOICE project

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## Abstract

Based on material collected during the BIOICE project off Iceland, the taxonomy and distribution of eight species of polychaetous annelids belonging to the genus *Ampharete* (Polychaeta: Ampharetidae) are reviewed. Five of these species were previously reported in the area: *Ampharete acutifrons*, *Ampharete borealis*, *Ampharete finmarchica*, *Ampharete octocirrata* and *Ampharete petersenae*; two are new to Icelandic waters: *Ampharete baltica* and *Ampharete lindstroemi*; and one is new to science: *Ampharete villenai* sp. nov. *A. petersenae* was found for the first time after the original description and is redescribed. *A. villenai* sp. nov. is primarily characterized by the size, shape and disposition of the paleae, a special kind of chaetae located on the first body chaetiger. Several body characters of high taxonomic relevance in Ampharetidae are reviewed under the SEM. The distribution of each species off the coast of Iceland and a key to all species recorded in European Boreo-Arctic waters is provided.

## Keywords

Polychaeta; Ampharetidae; *Ampharete*; Iceland; New species; BIOICE project

## Introduction

The genus *Ampharete* Malmgren, 1866, with about 30 described species (Jirkov 1994) is the most speciose genus in the family Ampharetidae Malmgren, 1866. This number would exceed 40 species if *Asabellides* and *Sabellides* are considered synonymous. It is composed of surface deposit-feeding polychaetes that live on soft bottoms from the intertidal down to abyssal depths (Salazar-Vallejo 1996). Since its creation by Malmgren (1866), the genus has been well characterized, not undergoing significant changes in its diagnosis after the classical reviews by Hesse (1917), Day (1964) and Holthe (1986a). Thus, the main diagnostic characters used to be included are the presence of papillose buccal tentacles, four pairs of branchiae, presence of paleae (a special kind of forward-pointing chaetae, located on the third body segment), 14 thoracic chaetigers with notosetae (15 when considering paleae) and 12 with neurosetae and 12–26 abdominal segments (Reuscher et al. 2009). Nevertheless, Jirkov (1994, 2001, 2009) questions the taxonomic validity of the presence/absence of paleae. He showed that within some Ampharetinae genera traditionally considered as provided with paleae, the form and number of this kind of chaetae can vary significantly, suggesting that their presence/absence should not be used for generic definition. Thus, in *Ampharete*, a variation from huge well-developed paleae (*A. longipaleolata* Ushakov, 1950) to completely absent (*A. sibirica* (Wiren, 1883) and *A. petersenae* Jirkov, 1997) is noted. Also, a species devoid of paleae was also recently described within the genus *Anobothrus* Levinsen, 1884, i.e. *Anobothrus apaleatus* Reuscher, Fiege & Wehe, 2009. Moreover, Jirkov (1994, 2009) reported that the facultative absence of paleae in some specimens (ca. 5%) of a population of *Ampharete saphronovae* Jirkov 1994, a species described with paleal chaetae of almost the same size as the thoracic notochoetae, concluding that even for species diagnosis this character should be used with care. According to this, we consider the genus *Asabellides* Annenkova, 1929 as a junior synonym of *Ampharete* because both genera were only distinguished by the absence of paleae in the former. Furthermore, we also follow Jirkov (2001, 2009) in considering the presence of 13 thoracic chaetigers (genus *Sabellides* Milne-Edwards, 1838 in Malmgren 1866) instead of 14, as character states that do not justify the discrimination of genera. Consequently, the genus *Ampharetetesensu* Jirkov (1994, 1997, 2001, 2009) would include ampharetids with or without paleae, with four pairs of smooth branchiae, papillose buccal tentacles, 13–14 thoracic chaetigers (excluding paleae) provided with notochoetae and 11–12 thoracic uncinigers.

Since Holthe (1986a) reported 7 species of *Ampharete* in North Atlantic waters, only Jirkov (2001), within a larger study on Arctic Polychaeta, reviewed the presence of this genus in northern European waters. The scattered information on this genus in Icelandic waters was first compiled by Wesenberg-Lund (1951), who mentions *Ampharete acutifrons* (Grube, 1860), *Ampharete goesi* Malmgren, 1866 (as *A. goësi*), *Ampharete borealis* (Sars, 1856) (as *Sabellides*) and *Ampharete octocirrata* (Sars, 1835) (as *Sabella*). Later, Gardarsson (1973) reports the presence of *Ampharete finmarchica* (Sars, 1866) and recently Jirkov (1997) described a new species, *Ampharete petersenae* Jirkov, 1997, from the east coast.

The BIOICE (Benthic Invertebrates of Icelandic Waters) expeditions were part of an international collaborative programme that started in 1992 to conduct a thorough survey of the marine benthic fauna living in the 200 mile exclusive economic zone (EEZ) of Iceland. Eight species belonging to the genus *Ampharete sensu* Jirkov (1994) were identified from material collected in those expeditions. Five species have previously been reported in Icelandic waters, namely *Ampharete acutifrons*, *Ampharete borealis*, *Ampharete finmarchica*, *Ampharete octocirrata* and *Ampharete petersenae*; the latter is reported for the first time after the original description and is redescribed. *Ampharete baltica* Eliason, 1955 and *Ampharete lindstroemi* Malmgren in Hesse, 1917 ar

e new for the studied area. *Ampharete villenai* sp. nov. is new to science and described herein. *Ampharete goesi* Malmgren, 1866, a mostly Arctic species (type locality Spitsbergen) but also reported from the Okhotsk Sea and Japan Sea (NW Pacific), was the only previously reported species that was not found in this study. Furthermore, two other species known from North Atlantic and the Arctic, respectively, were not present in the BIOICE samples, i.e. *Ampharete falcata* Eliason, 1955 (low-boreal species; type locality Swedish west coast) and *Ampharete vega* (Wirén, 1883) (shallow-water Arctic euryhaline species, type locality Bering Sea).

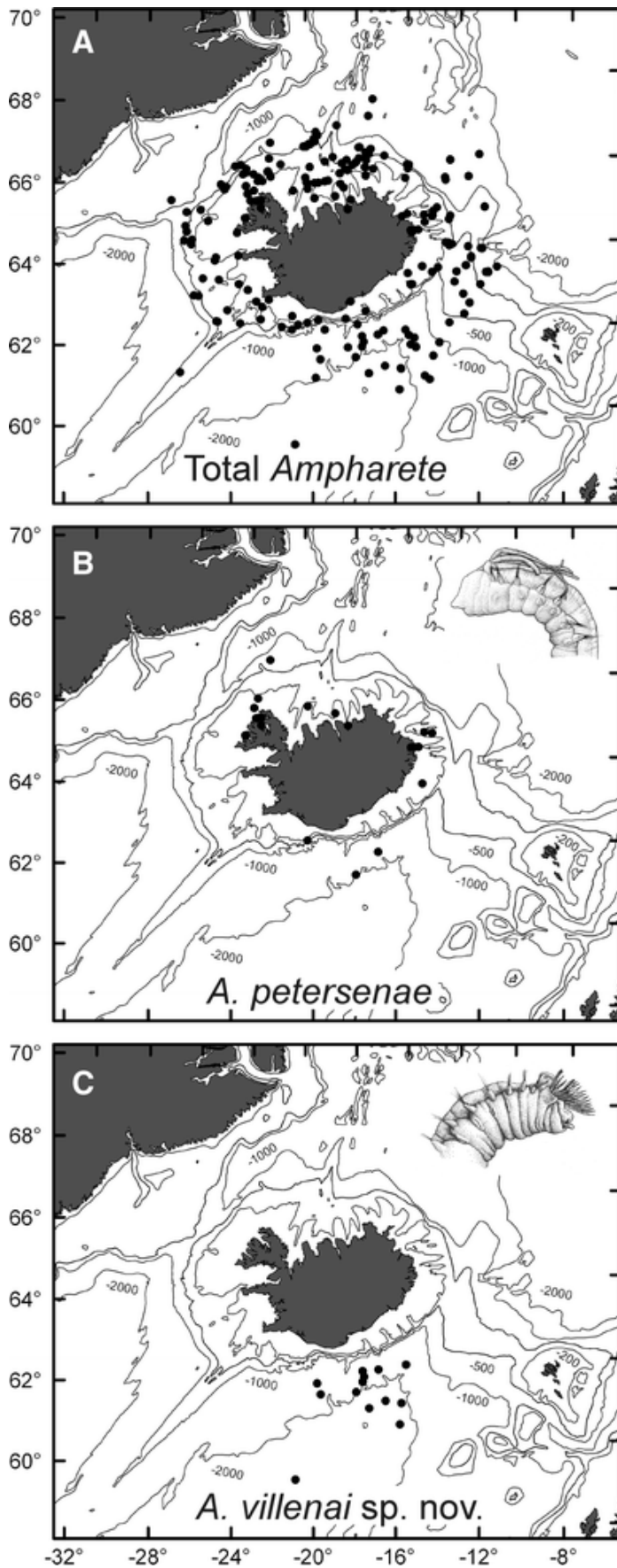
The use of the scanning electronic microscope (SEM) has been proved a useful tool in the study of external structures of polychaetes in general and those of the clade Terebellomorpha in particular (Hutchings and Peart 2000; Jouin-Toulmond and Hourdez 2006; Parapar and Moreira 2008a, b). In this work, the SEM has been used to elucidate some anatomical characteristics, which are difficult to observe under the compound microscope, such as the presence and distribution of body ciliature and the shape of paleae, notochaetae and uncini.

The BIOICE sampling area covers a depth range from 20 to 3,500 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 Nordic seas of the Arctic Ocean. Other papers dealing with BIOICE polychaetes were those of 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. (2011c) on Opheliidae, Parapar et al. (2011b) on the Ampharetidae genus *Amphicteis* and Parapar et al. (2011a) on the genus *Terebellides*.

## Materials and methods

This study is based on material collected in the framework of the BIOICE project. A total of 1371 specimens of the genus *Ampharete* were collected from 224 bottom samples (Fig. 1a) along the continental shelf and slope of Iceland. Several bottom samplers (modified Rothlisberg–Pearcy epibenthic sledge, detritus sledge, triangle dredge, Agassiz trawl and Shipek grab) were used during the BIOICE cruises on different research vessels (*Bjarni Sæmundsson*, *Hákon Mosby* and *Magnus Heinason*). Sampling coordinates and abiotic features of the BIOICE samples are available in the home page of the Icelandic Institute of Natural History ([http://www.utgafa.ni.is/greinar/BIOICE\\_station\\_list\\_91-04\\_Paper\\_A2.pdf](http://www.utgafa.ni.is/greinar/BIOICE_station_list_91-04_Paper_A2.pdf)) and also from the authors (GVH) upon request.

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, including the type series of the new species, was deposited in the collections of the Icelandic Museum of Natural History (IMNH, Reykjavik); some paratypes and a few specimens of other species were deposited in the Museo Nacional de Ciencias Naturales (MNCN, Madrid). 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 electron microscope at the SAI (University of A Coruña-UDC, Spain).



**Fig. 1** Maps of Iceland showing BIOICE sampling stations with specimens of **a** all *Ampharete* species, **b** *Ampharete petersenae*, **c** *Ampharete villenai* sp. nov

## Results

The study of the samples collected during the BIOICE project yielded eight species of the genus *Ampharete sensu* Jirkov (2001). Remarks on taxonomy and distribution of those species around Iceland are presented and discussed.

Family AMPHARETIDAE Malmgren, 1866

Genus *Ampharete* Malmgren, 1866

*Asabellides* Annenkova, 1929

*Sabellides* Milne Edwards *in* Malmgren, 1866

*Type species: Ampharete acutifrons* (Grube, 1860) as *Amphicteis*

*Diagnosis:* Prostomium without ridges. Buccal tentacles papillose. Four pairs of branchiae. Two nephridial papillae behind branchiae. Segments III-VI without neuropodia and neurochaetae. Notochaetae of segment III usually enlarged to form paleae, but sometimes absent. Notochaetae of segment IV absent; notochaetae of segments V and VI present. Eleven or twelve uncinigerous thoracic segments. Two anterior abdominal neuropodia of thoracic type.

As already pointed by Day (1964), from the earlier reviews of the family Ampharetidae (e.g. Nilsson 1912; Hessle 1917), a confusion exists about the numbering of the segments anterior to the paleal segment. Most recent authors (Chardy and Desbruyères 1979; Holthe 1986a, b; Jirkov 2001, 2009), following the classic works of Malmgren (1866), Fauvel (1897, 1927), Caullery (1944) and Day (1964, 1967), recognize two segments and the location of the paleal chaetae in the third (III) segment. Nevertheless, Reuscher et al. (2009), following Cazaux (1982), retrieve the opinion of Annenkova (1930), Eliason (1955) and Uschakov (1965), arguing that this is based on misinterpretation of the peristomium as first segment, and therefore, the second (II) segment should be considered as the paleal segment. We agree with Day's (1967) opinion in considering the actual number of paleal segment as of high taxonomic value. To avoid future confusion among the descriptions of species and waiting for further contributions that may clarify this issue, here we consider the paleal segment as the third.

*Ampharete acutifrons* (Grube, 1860)

*Amphicteis acutifrons* Grube 1860: 109; Hessle 1917: 96; Annenkova 1929: 491 (in part); Wesenberg-Lund 1951: 102; Pettibone 1954: 316 (in part); Bick and Gosselck 1985: 258; Holthe 1986a: 33; Hartmann-Schröder 1996: 491; Kirkegaard 1996: 294; Jirkov 2001: 460.

*nonAmpharete grubei* Malmgren 1866: 363; Fauvel 1927: 227.

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2044-6 specimens; 2826-1; 2827-1.

*Occurrence:* Eight specimens (0.58% of the total BIOICE *Ampharete* specimens) were collected in fine silt and sandy silt at shallow depths in the north-east and south coast. Depth range: 44–109 m; temperature: 8.80°C (only data from 2826 and 2827 samples available).

*Distribution:* *Ampharete acutifrons* is a widely distributed Arctic-boreal species, originally described from Greenland and commonly reported from North Atlantic waters to Madeira and the

Mediterranean Sea, Sea of Japan and North American Pacific (Holthe 1986a; Jirkov 2001). The southernmost finding of this species corresponds to Kirkegaard (1959) from tropical West Africa. Jirkov (2001) compared Atlantic and Pacific specimens and concluded that this taxon is likely to consist of cryptic species. Because this species was traditionally synonymized with *A. grubei* Malmgren, 1866, it is difficult to ascertain its real geographical distribution. Previous records of this species in Icelandic waters were compiled by Wesenberg-Lund (1951).

*Remarks:* *Ampharete acutifrons* is distinguished from *A. lindstroemi*, the most similar species in Icelandic waters, by the presence of long (*A. acutifrons*) versus short (*A. lindstroemi*) cirri in abdominal neuropodia. Its scanty presence in BIOICE samples is probably due to the few samples taken in shallow-water substrata, which seem to be the characteristic habitat of this species (Wesenberg-Lund 1951).

*Ampharete grubei* Malmgren, 1866 was traditionally considered a junior synonym of *A. acutifrons* (Holthe 1986a, b; Hartmann-Schröder 1996) but it is now regarded as a valid species by Jirkov (2001). *A. grubei* is characterized by more numerous paleae and the absence of long cirri in abdominal neuropodia.

***Ampharete baltica* Eliason, 1955**

*Ampharete grubei baltica* Eliason 1955: 26.

*Ampharete baltica* Holthe 1986a: 34; Hartmann-Schröder 1996: 492; Kirkegaard 1996: 296.

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2180-1 specimen; 2491-1.

*Occurrence:* Two specimens of *Ampharete baltica* (0.15% of the total BIOICE *Ampharete* specimens) were collected in two samples. The species is present in warm shallow waters off the north and north-west coast of Iceland. Depth range: 99–127 m; temperature range: 5.50–5.58°C.

*Distribution:* Originally described from the Baltic Sea between Bornholm and Blekinge, Holthe (1986a) and Hartmann-Schröder (1996) reported it from the coast of Norway and Sweden, Kattegat, Øresund and western Baltic Sea and on the Arctic Jan Mayen Island. Following Holthe (1986a), the few records of this species are possibly due to confusion with juveniles or young specimens of other species. This is the first record of the species in Iceland.

*Remarks:* *Ampharete baltica* was originally described by Eliason (1955) as a subspecies of *A. grubei*, which, in turn, has traditionally been considered synonymous of *A. acutifrons*. *Ampharete baltica* was considered by Jirkov (2001) as a likely member of the *Ampharete lindstroemis* species complex. The study of the type material, located in the Göteborgs Naturhistoriska Museum (ref. number 11049 as *A. grubei baltica*), showed that the shape of the pygidium with many long and cirriform papillae (see Holthe 1986a, fig. 9) seems to be characteristic for this shallow-water taxon. However, more specimens should be analysed to assess more accurately the variability of this character, which has scarcely been used in the species discrimination in the genus *Ampharete*, to help determine the validity of this species.

***Ampharete borealis*** (Sars, 1856)

*Sabellides borealis* Sars 1856: 22; Wesenberg-Lund 1951: 104; Holthe 1986a: 45; Holthe 1986b: 103; Hartmann-Schröder 1996: 501.

*Ampharete borealis* Jirkov 2001: 462.

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2026-1 specimen; 2046-4; 2047-2; 2049-1; 2053-29; 2054-3; 2166-1; 2265-1; 2282-1; 2340-1; 2376-1; 2415-1; 2420-1; 2423-1; 2424-13; 2530-1; 2606-2; 2665-1; 2683-1; 2830-1; 2884-2; 2937-1; 3562-2; 3565-1; 3591-2; 3642-1; 3668-4.

*Occurrence:* 80 specimens of *Ampharete borealis* (5.84% of the total BIOICE *Ampharete* specimens) were collected in 27 samples. The species is present across a wide range of temperatures and depths, being found both in cold northern and warm southern coasts of Iceland. Depth range: 82–1,451 m; temperature range: –0.77 to 7.48°C.

*Distribution:* A widely distributed species in the Arctic Sea (Greenland, Canada, Iceland, Norway, Siberia and Bering Sea), down to Labrador in west Atlantic and Skagerrak in east Atlantic; Canadian Pacific (Holthe 1986a; Hartmann-Schröder 1996). Previous records of this species in Icelandic waters were compiled by Wesenberg-Lund (1951).

***Ampharete finmarchica*** (Sars, 1865) (Figs. 2, 3)

*Amphicteis finmarchica* Sars 1865: 10.

*Ampharete finmarchica* Gardarsson 1973: 86; Holthe 1986a: 38; Holthe 1986b: 86; Jirkov 2001: 465; Hartmann-Schröder 1996: 293.

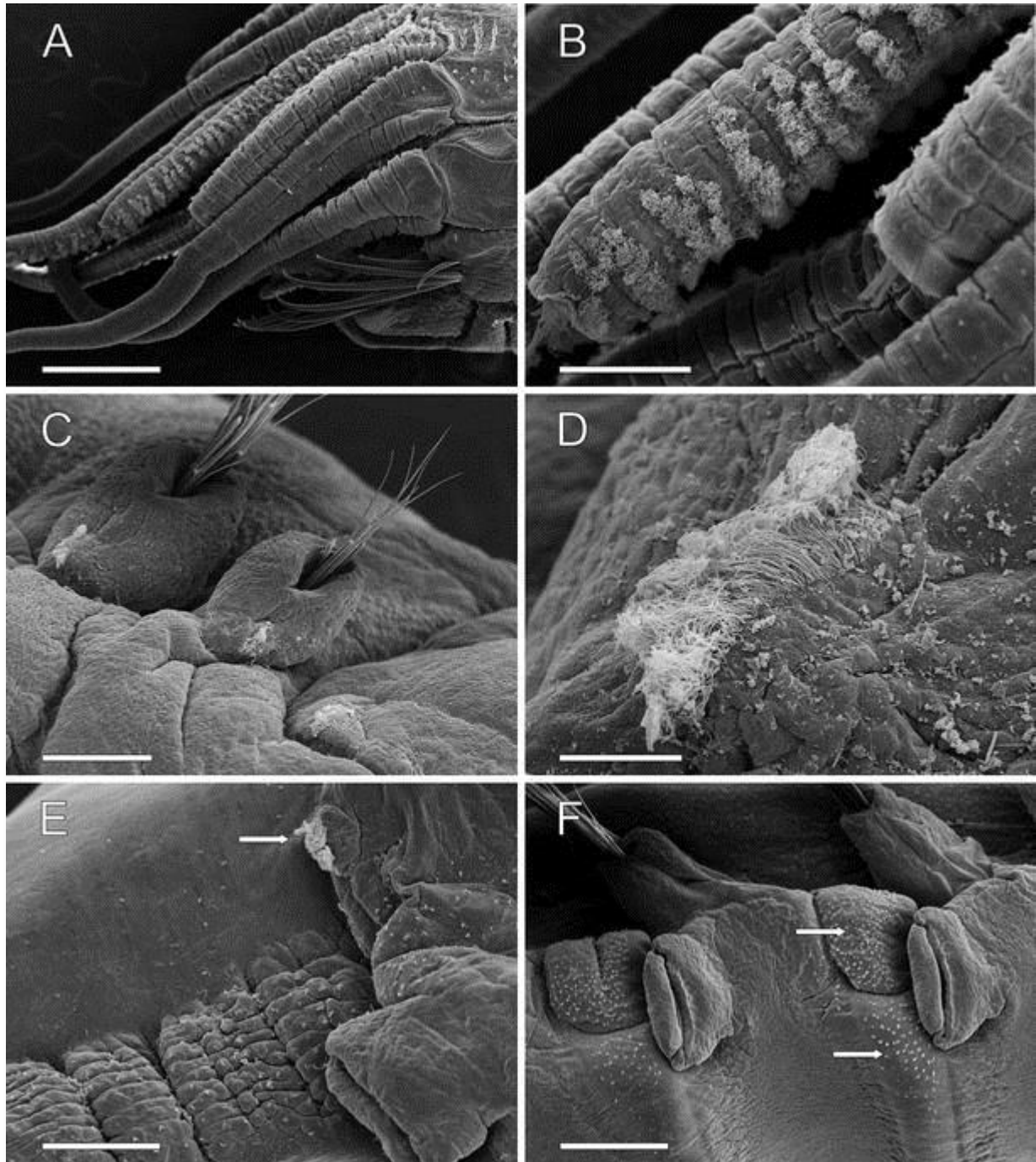
*Ampharete arctica* Malmgren 1866: 364; Augener 1928: 777; Annenkova 1929: 490; *non* Imajima and Hartman 1964: 331.

*nonAmpharete arctica* var. *gagarae* Uschakov 1950: 248; Uschakov 1955: 369.

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2010-6 specimens; 2017-1; 2025-6; 2026-2; 2031-2; 2033-2; 2036-2; 2046-8; 2047-19; 2050-1; 2051-1; 2061-7; 2074-5; 2091-6; 2094-1; 2100-9; 2110-1; 2119-1; 2129-10; 2131-1; 2137-1; 2142-4; 2145-1; 2147-2; 2150-1; 2152-1; 2154-17; 2166-8; 2167-2; 2178-1; 2266-1; 2310-2; 2313-3; 2314-10; 2318-1; 2319-6; 2320-8; 2324-2; 2328-1; 2330-2; 2332-1; 2337-3; 2340-1; 2356-4; 2357-1; 2359-4; 2360-7; 2361-2; 2362-10; 2363-1; 2366-1; 2367-2; 2371-1; 2372-4; 2374-1; 2375-2; 2376-17; 2380-3; 2382-1; 2450-8; 2475-1; 2481-9; 2512-2; 2514-1; 2522-8; 2524-24; 2526-12; 2531-1; 2537-3; 2539-3; 2564-7; 2566-26; 2568-6; 2570-1; 2576-6; 2579-6; 2588-4; 2594-7; 2595-3; 2597-11; 2603-4; 2606-31; 2610-17; 2612-4; 2613-2; 2616-2; 2619-1; 2620-2; 2627-1; 2628-5; 2632-2; 2635-2; 2655-4; 2662-10; 2665-30; 2666-8; 2668-5; 2672-1; 2673-12; 2681-1; 2710-5; 2740-1; 2741-8; 2754-2; 2787-2; 2792-38; 2844-1; 2867-2; 2944-2; 3033-1; 3056-3; 3069-4; 3072-2; 3092-10; 3099-8; 3114-4; 3115-9; 3124-2; 3158-24; 3159-1; 3194-2; 3195-1; 3249-1; 3260-10; 3280-74; 3282-12; 3519-6; 3530-1; 3535-3; 3536-17; 3543-4; 3544-12; 3621-2; 3625-2; 3661-2; 3664-2; 3667-1; 3668-10; 3670-2.

Museo Nacional de Ciencias Naturales: BIOICE sample 2070-5 specimens; 2377-1; 2660-2; 3252-1.

*Occurrence:* 822 specimens of *Ampharete finmarchica* (59.96% of the total BIOICE *Ampharete* specimens) were collected in 141 samples. The species is present from shallow waters to deep slope bottoms around Iceland. It seems to appear in fewer numbers in warm waters at the southern slope. Depth range: 44–2,708 m; temperature range: –0.82 to 7.57°C.



**Fig. 2** *Ampharete finmarchica*: **a** anterior end, latero-dorsal view, **b** detail of branchial ciliature, **c** 1st and 2nd thoracic chaetigers, **d** detail of ciliature of 2nd thoracic notopodium, **e** ciliature of 1st abdominal chaetiger (arrow), **f** 9th and 10th thoracic chaetigers; arrows showing position of ciliated tufts behind neuropodia. Scale bars, **c, e** 300  $\mu$ m; **b** 100  $\mu$ m; **d** 40  $\mu$ m; **f** 500  $\mu$ m



*Distribution:* *Ampharete finmarchica* is a widely distributed Arctic-boreal species commonly reported in the Atlantic and Pacific oceans (Holthe 1986a; Jirkov 2001). This species was previously reported in Icelandic waters by Wesenberg-Lund (1951) and Gardarsson (1973).

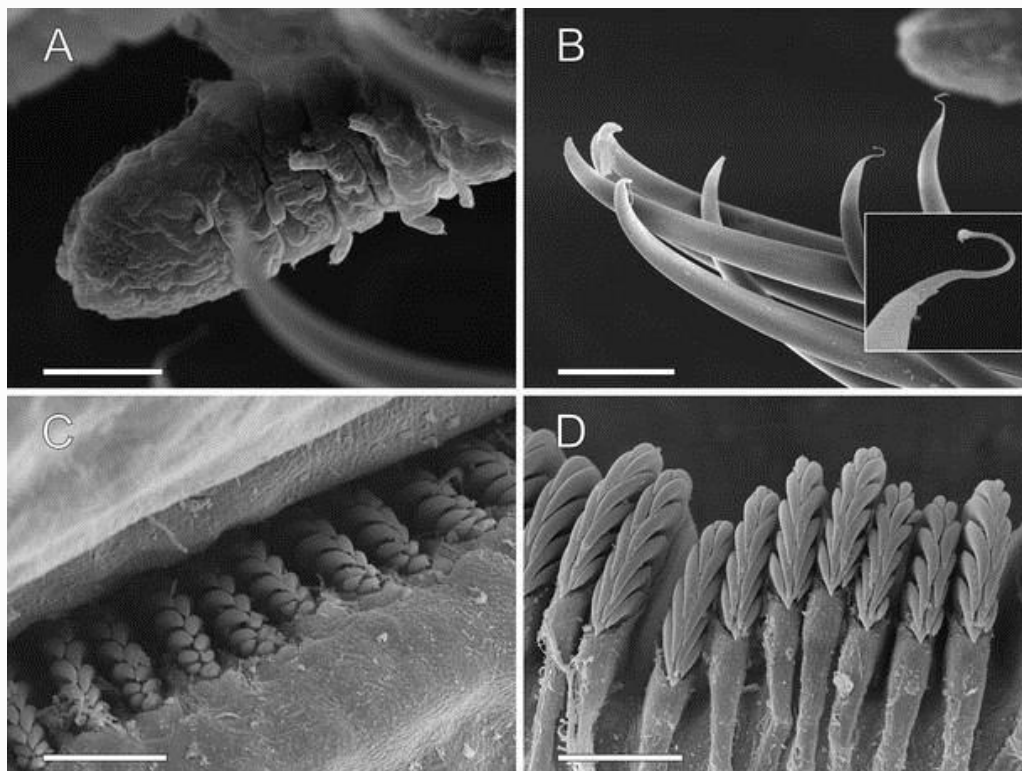
*Remarks:* Examination under the SEM revealed the presence of rich body ciliature. Ciliated bands were observed on the surface of branchiae (Fig. 2a, b) and ciliated tufts dorsally to the thoracic notopodia (Fig. 2c, d). The persistence of this ciliated formation in the dorsal part of abdominal segments after disappearance of notopodial ramus could lead to the erroneous observation of the presence of rudimental notopodia (Fig. 2e). Many ciliated tufts are also located on the whole dorsal body surface and in thoracic areas behind neuropodia (Fig. 2f). The papillae of the oral tentacles are short (Fig. 3a) and the paleal chaetae end abruptly in filiform tips (Fig. 3b), which are often lost. Both thoracic and abdominal uncini are similar and endowed with two vertical rows of 4–6 teeth of similar size located over the rostral tooth (Fig. 3c, d), which agrees with the drawings provided by Gardarsson (1973).

*Ampharetelindstroemi* Malmgren in Hessle 1917 (Fig. 4)

*Ampharete lindstroemi* Malmgren 1867: 214; Hessle 1917: 98; Hartmann-Schröder 1996: 494; Fournier and Pocklington 1984: 264; Holthe 1986a: 41; Holthe 1986b: 87.

*Ampharete gr. lindstroemi* Jirkov 2001: 467.

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2011-5 specimens; 2018-1; 2085-2; 2107-3; 2132-5; 2180-25; 2209-4; 2307-1; 2317-1; 2367-2; 2385-1; 2518-3; 2631-2; 2779-1; 2813-1; 2868-1; 2983-4; 3061-4; 3115-1; 3249-5; 3252-2; 3282-14; 3505-7; 3510-14; 3518-7; 3522-30; 3524-36; 3528-60; 3530-1; 3538-4; 3543-69; 3641-6; 3657-1.



**Fig. 3** *Ampharete finmarchica*: **a** Detail of papillation of buccal tentacle, **b** distal end of paleae, inserted a detail of filiform tip, **c** thoracic uncini, **d** abdominal uncini. Scale bars: **a** 30  $\mu$ m; **b** 45  $\mu$ m; **c**, **d** 15  $\mu$ m

Museo Nacional de Ciencias Naturales: BIOICE sample 2622-2 specimens; 3028-2.

**Occurrence:** Three hundred and twenty-seven specimens of *Ampharete lindstroemi* (23.85% of the total BIOICE *Ampharete* specimens) were collected in 35 samples. This species does not show any ecological preferences when considering depth and temperature, being present from the upper shelf to the deep slope. Depth range: 99–1,940 m; temperature range: –0.82 to 7.59°C.

**Distribution:** Holthe (1986a) reports *A. lindstroemi* from the coast of Norway and west coast of Sweden and list records from the Gulf of St. Lawrence and Nova Scotia, the White Sea and Sea of Japan. This is the first record of the taxon in Icelandic waters.

**Remarks:** Jirkov (2001) suggests that, due to the ill-defined identity of this taxon, *Ampharete lindstroemi* would probably include a complex of several closely related species. We identified all *Ampharete* specimens with long, slender and evenly tapering paleae (Fig. 4a–c), abdominal neuropodia provided with short cirri, and pygidium with two long and a number of short cirri as *A. lindstroemi*. The ciliation observed on the surface of brachiae and the papillae of the oral tentacles (Fig. 4c, d) are very similar to those observed in *A. finmarchica* and *A. petersenae*.

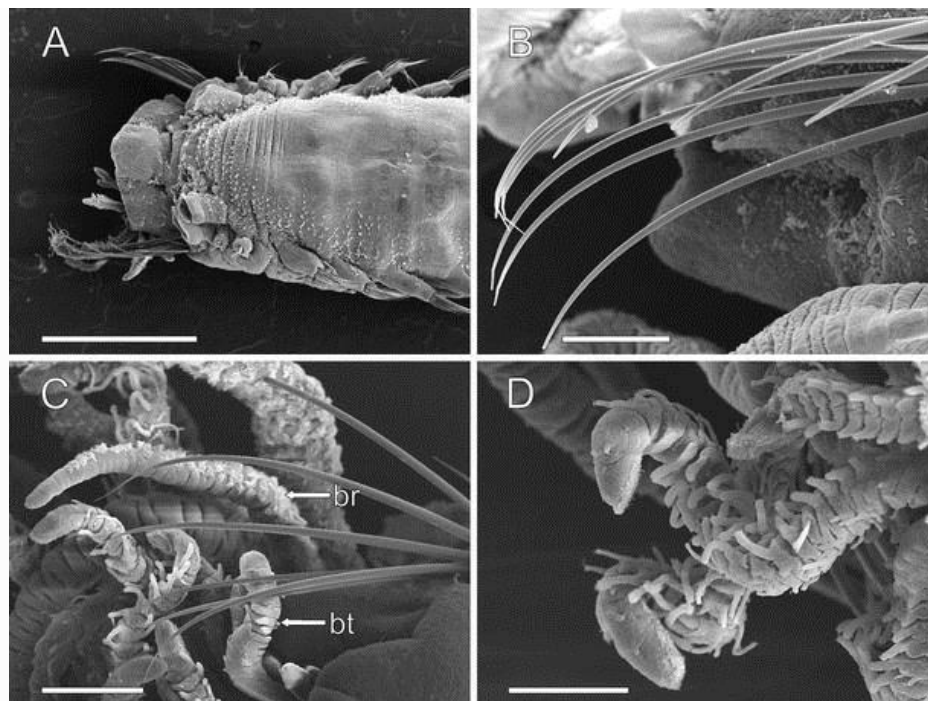
***Ampharete octocirrata* (Sars 1835)**

*Sabella? octocirrata* Sars 1835: 51.

*Sabellides octocirrata* Malmgren 1866: 396; Fauvel 1927: 232. Wesenberg-Lund 1951: 104; Hartmann-Schröder 1996: 501; Holthe 1986a: 46.

*Sabellides octocirrata britannica* McIntosh 1922: 75.

*Ampharete octocirrata* Jirkov 2001: 467.



**Fig. 4** *Ampharete lindstroemi*: **a** anterior end, dorsal view, **b** detail of paleae, **c** paleae and ciliation of branchiae and papillation of buccal tentacle, **d** detail of tip of buccal tentacle. Abbreviations: *br* branchia, *bt* buccal tentacle. *Scale bars* **a** 1 mm; **b, c** 150 µm; **d** 100 µm

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2218-1 specimen; 2237-1; 2308-1; 2434-1; 2527-1; 2813-1; 2881-1; 2886-1; 2892-1; 2897-1; 3052-1; 3550-1; 3558-1; 3668-1.

*Occurrence:* 14 specimens of *Ampharete octocirrata* (1.02% of the total BIOICE *Ampharete* specimens) were collected in 14 samples. The species is restricted to warm waters at the shelf and upper slope of the southern and the north-western coast of Iceland. Depth range: 114–960 m; temperature range: 1.98–7.60°C.

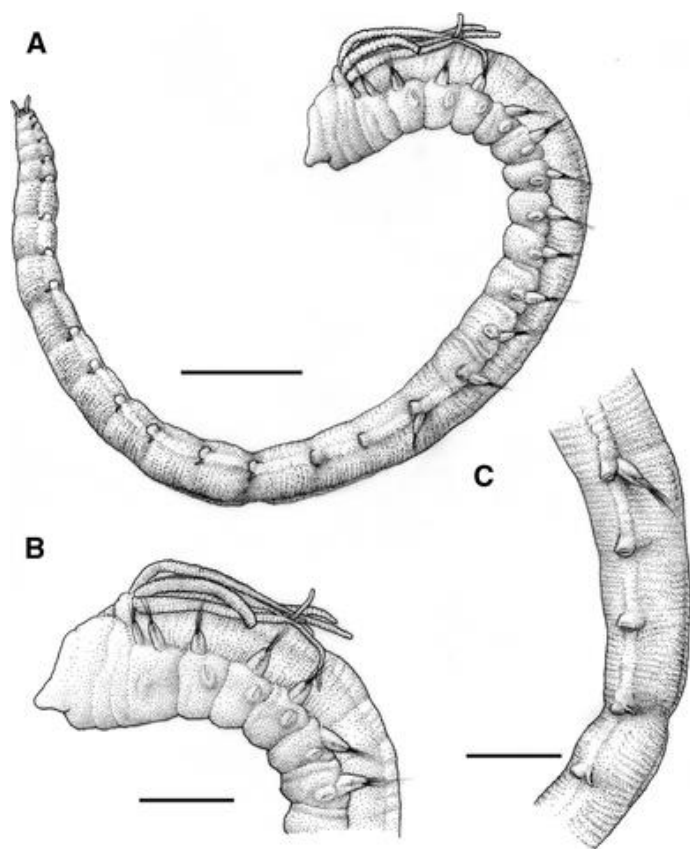
*Distribution:* *Ampharete octocirrata* seems to be widely distributed in the Atlantic Ocean including Canada, the eastern North Atlantic, the east coast of Greenland, the Canary Islands, the Mediterranean Sea and South Africa (Holthe 1986a). It was previously reported in Icelandic waters by Saemundsson (1918) in shallow waters off north-east coast.

***Ampharete petersenae* Jirkov, 1997 (Figs. 1b, 5, 6, 7)**

*Ampharete petersenae* Jirkov 1997: 1418; Jirkov 2001: 468.

*Material examined:* Icelandic Museum of Natural History. BIOICE sample 2000-1 specimen; 2002-1; 2003-6; 2004-1; 2047-1; 2050-1; 2062-24; 2154-1; 2178-1; 2424-1; 2480-1; 2481-1; 2491-12; 2539-1; 2540-1; 2545-3; 2546-1; 2551-1; 2562-1; 2564-1; 2582-1; 3032-1; 3283-1; 3520-1.

*Occurrence:* Sixty-five specimens of *Ampharete petersenae* (4.74% of the total BIOICE *Ampharetes* specimens) were collected in 23 samples. The species is distributed from shallow bottoms to the deep slope and both in cold and warm waters (Fig. 1b). Depth range: 26–1,957 m; temperature range: –0.5 to 7.22°C. Jirkov (1997) reports the species at 135 m depth and 2.67°C.



**Fig. 5** *Ampharete petersenae*: **a** Specimen in lateral view, **b** anterior end in lateral view, **c** thorax-abdomen transition zone with last thoracic chaetiger (14) and first four abdominal chaetigers (15–18) in lateral view. Scale bars **a** 1 mm; **b**, **c** 500 µm

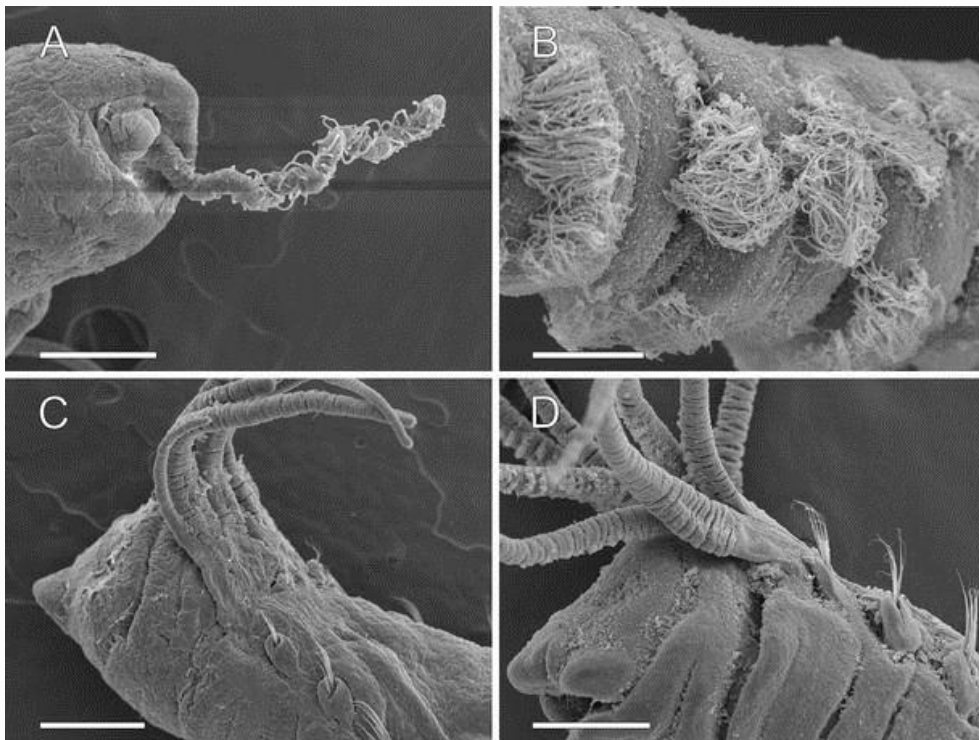
*Distribution:* This is the first record of the species after the original description by Jirkov (1997) from the east coast of Iceland (65°27'N; 12°39'W). Jirkov (2001) also reports this species from a fjord on western Greenland (64°10'N; 51°41'W) (A. Sikorsky, pers. comm.).

*Description:* Body short; longest complete specimen about 11 mm long and 0.5 mm wide. Body tapering towards posterior end (Fig. 5a). No eyespots observed. Long buccal tentacles, with long papillae (Fig. 6a). Four pairs of long branchiae (Fig. 5b), with dense tufts of cilia (Fig. 6b), arranged in two groups very close to each other (Fig. 6c). No paleae. Fourteen thoracic chaetigers; first two chaetigers with slightly less developed notopodia and bristles (Figs. 5b, 6d); posterior twelve thoracic chaetigers also with neuropodia and uncini (Fig. 7a). Sixteen abdominal segments with uncinigerous neuropodia, first two abdominal uncinigerous tori of thoracic-type lacking dorsal cirri (Fig. 5c) and posterior 14 abdominal neuropodia of different shape and with dorsal cirri (Figs. 5c, 7b). Rudimentary notopodia absent. Abdominal uncini similar to thoracic ones, with 2 vertical rows of 3 teeth above rostrum (Fig. 7c). Pygidium with two lateral cirri and about 10 capitate papillae (Figs. 5a, 7d). Colour in alcohol pale yellow.

*Remarks:* *Ampharete petersenae* is characterized by possessing 12 thoracic uncinigers, 16 abdominal uncinigers (14 of them provided with short dorsal cirrus) and no paleae (Jirkov 1997).

*Ampharete villenai* sp. nov. (Figs. 1c, 8, 9, 10)

*Type material:* Icelandic Museum of Natural History: BIOICE sample 2859-2 paratypes (IMNH 26245), 3012-1 (IMNH 26246), 3067-19 (IMNH 26247), 3076-1 (IMNH 26248), 3171-1 (IMNH 26249), 3263-1 (IMNH 26250), 3282-11 (IMNH 26251), 3510 (Holotype, IMNH 26252) and 1 paratype, IMNH 26253), 3519-2 (IMNH 26254), 3524-1 (IMNH 26255), 3524-3 (SEM stub, IMNH 26256), 3528-2 (IMNH 26257).



**Fig. 6** *Ampharete petersenae*: **a** Detail of buccal tentacle, **b** detail of branchial ciliature, **c** anterior end in latero-dorsal view, **d** anterior end in latero-ventral view. *Scale bars*, **d** 200  $\mu$ m; **b** 15  $\mu$ m; **c** 250  $\mu$ m

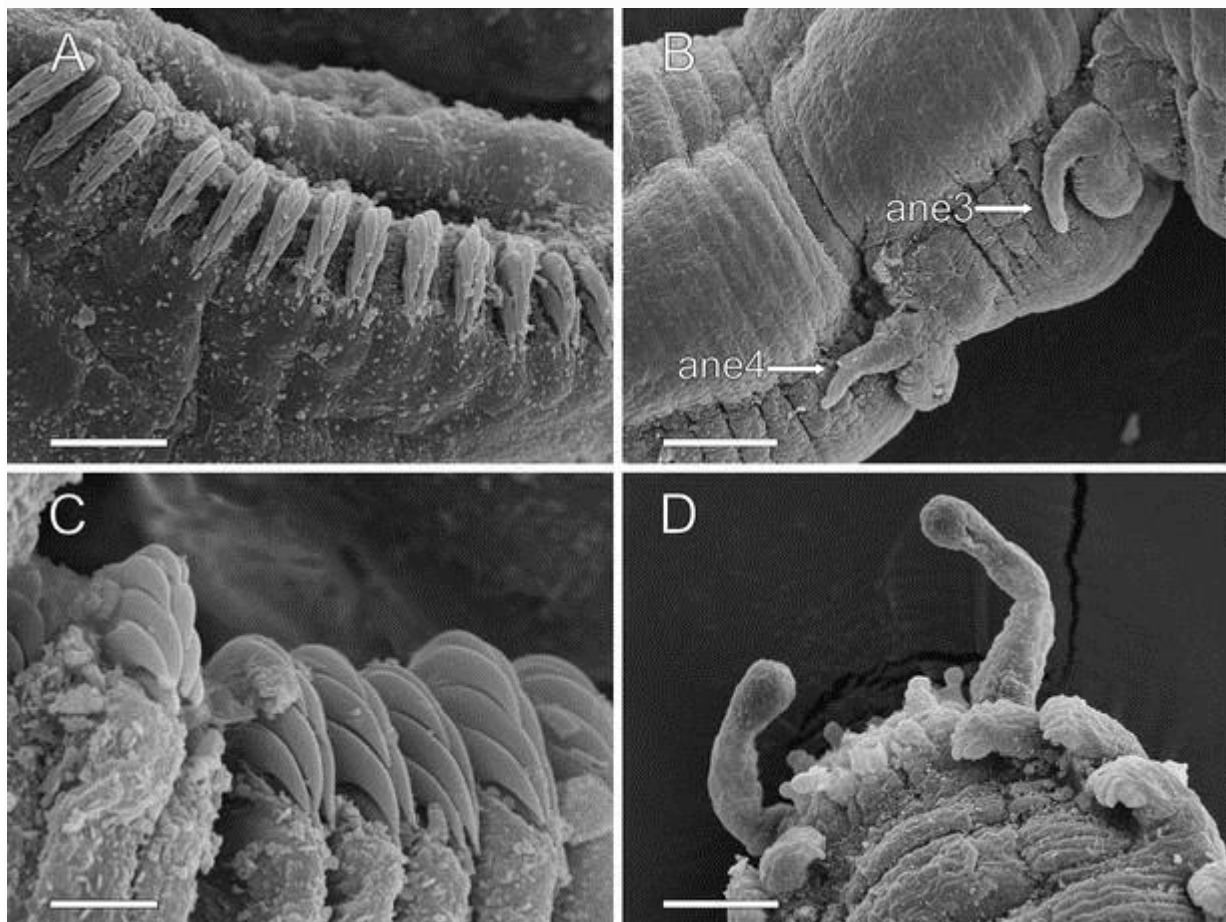
Museo Nacional de Ciencias Naturales: BIOICE sample 3522-4 paratypes (MNCN 16.01/6104).

*Additional material:* Moscow State University: BIOICE sample 3074-3 specimens and 3510-1 (IJ personal collection).

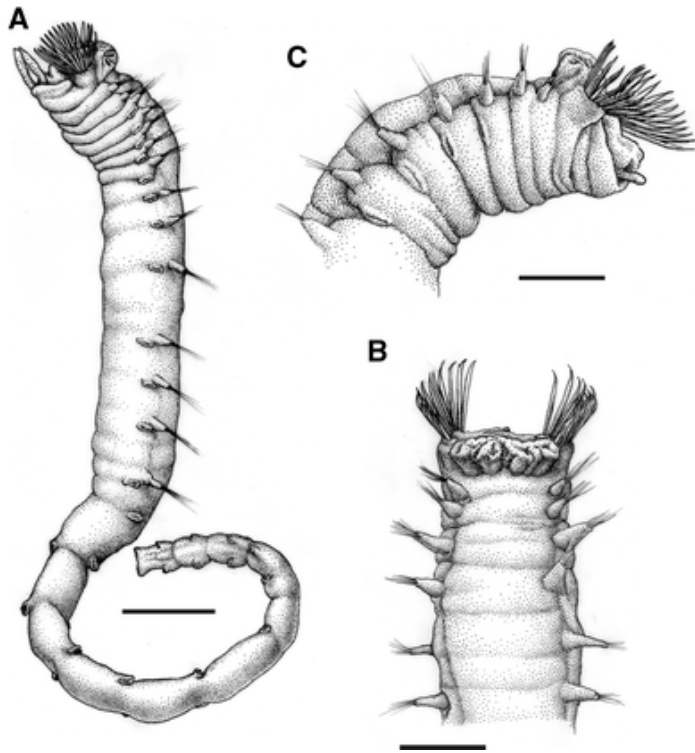
*Type locality:* South Iceland slope (BIOICE station 518; RP sledge; 62°14'41"N; 19°28'62"W; 03/09/2002; 1,605 m depth).

*Occurrence:* Fifty-three specimens of *Ampharete villenai* sp. nov. (3.87% of the total BIOICE *Ampharete* specimens) were collected in 11 samples. The new species is restricted to deep slope bottoms off the south-eastern coast (Fig. 1c). Depth range: 1,605–2,270 m; temperature range: 2.34–3.30°C.

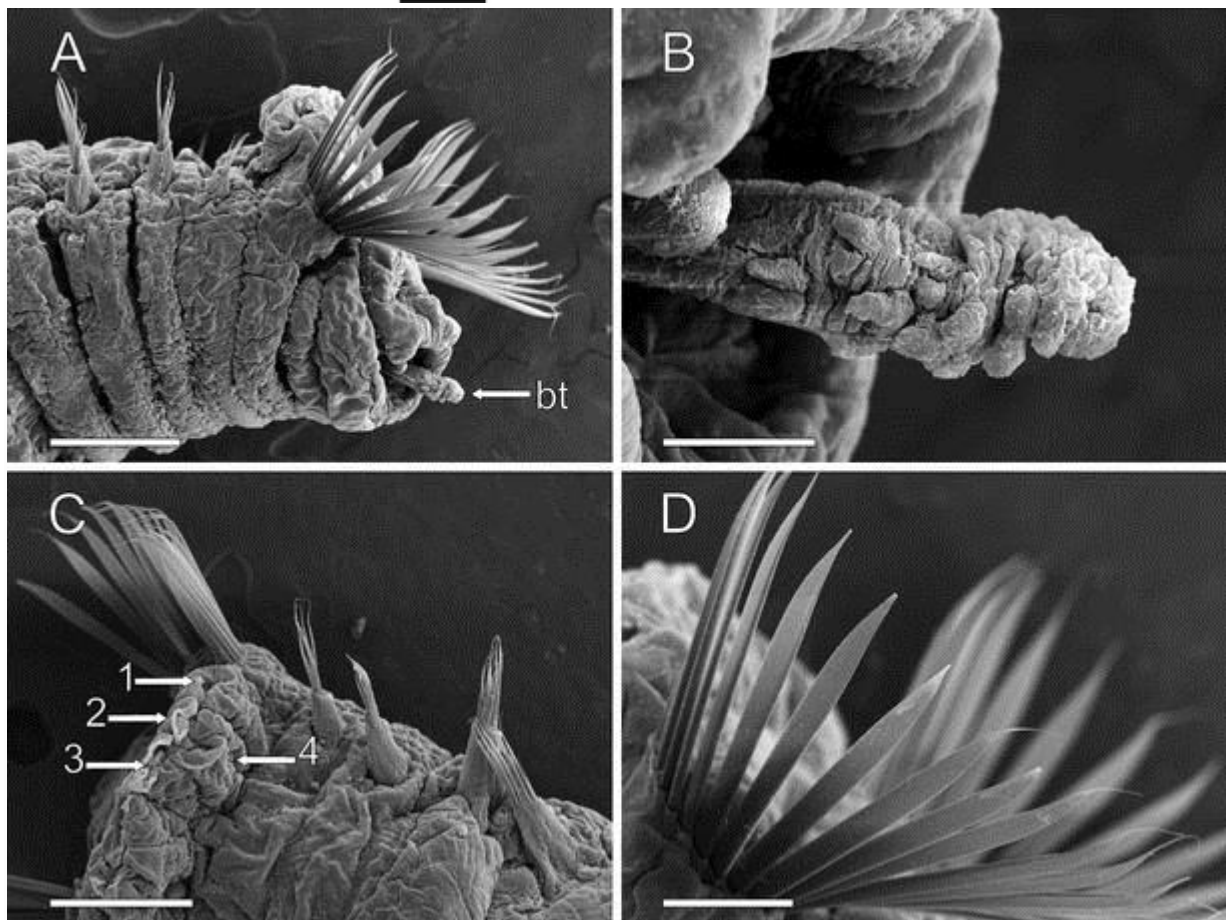
*Description:* Body short; longest complete specimen (holotype) 12 mm long and 1.0 mm wide (Fig. 8a). Thorax thicker than abdomen, of about the same length; abdomen of nearly constant width throughout. No eyespots observed. Buccal tentacles with papillae (Fig. 9a, b). Four pairs of long branchiae arranged in two groups very close to each other (Fig. 8b); first three branchiae of each group in a transverse anterior row and the fourth one in a posterior position (Fig. 9c). Between 13 and 19 short, thick and flat paleae on each side (Figs. 8, 9a, c, d, 10a) (18 in holotype) gradually but quickly tapering to long filiform tips (Figs. 9d, 10a). Fourteen thoracic chaetigers with well-developed notopodia; the posterior twelve also with neuropodia and uncini (Fig. 10b). First two



**Fig. 7** *Ampharete petersenae*: **a** Detail of thoracic neuropod with uncini, **b** third and fourth abdominal chaetigers in latero-dorsal view, **c** detail of abdominal uncini, **d** pygidium in dorsal view. Abbreviations: *ane* abdominal neuropod. *Scale bars* **a** 15  $\mu$ m; **b** 100  $\mu$ m; **c** 5  $\mu$ m; **d** 50  $\mu$ m



**Fig. 8** *Ampharete villenai* sp. nov.: **a** Specimen in latero-ventral view (holotype, IMNH 26252), **b** anterior end in dorsal view (paratype, IMNH 26256), **c** anterior end in latero-ventral view (paratype, IMNH 26256). Scale bars 1 mm; **b**, **c** 600  $\mu$ m



**Fig. 9** *Ampharete villenai* sp. nov.: **a** Anterior end in latero-ventral view, **b** detail of buccal tentacle, **c** anterior end in dorsal view, positions of right branchiae scars numbered, **d** paleae (paratype, IMNH 26256). Abbreviations: *bt* buccal tentacle. Scale bars, **c** 250  $\mu$ m; **b** 45  $\mu$ m; **d** 100  $\mu$ m

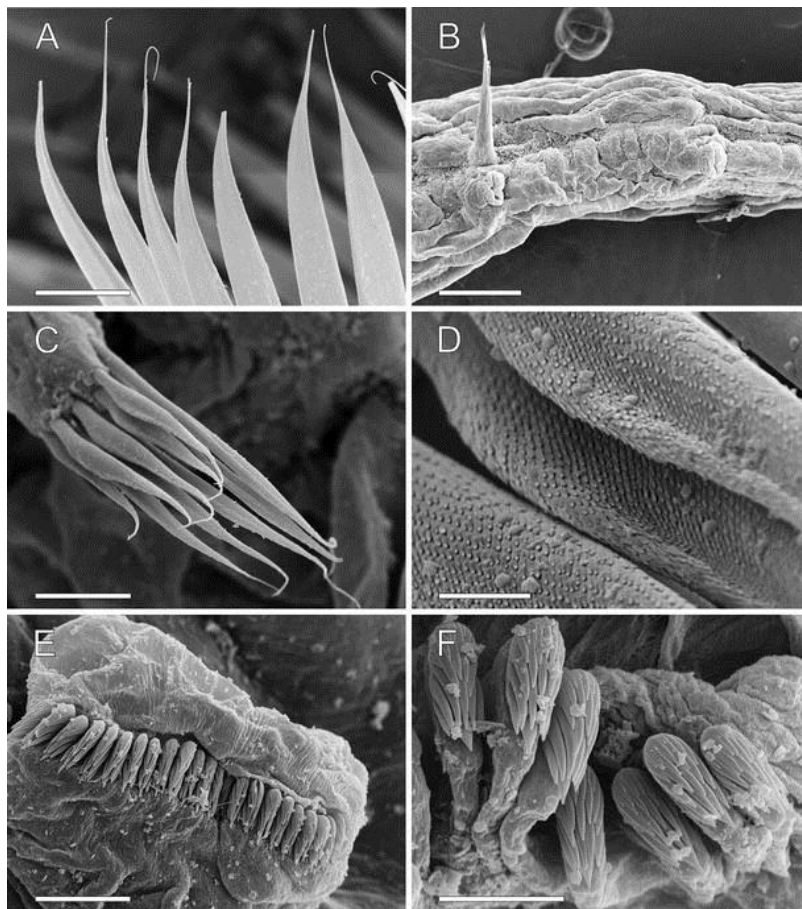
thoracic chaetigers with less developed notopodia (Fig. 9a, c). Notochaetae forming two rows; slightly flattened with a narrow brim, covered with scales and tapering into slender tips (Fig. 10c, d). Thoracic uncini with two vertical rows of 4–6 teeth each above rostrum (Fig. 10e). Twelve abdominal segments, with decreasing length towards the end; first two abdominal segments with neuropodia of thoracic type (Fig. 10b). Abdominal uncini with three horizontal rows of 6–8 teeth each above rostrum (Fig. 10f). Pygidium with a pair of short lateral lobes.

Colour in alcohol pale yellow. No tubes observed. In holotype, oocytes visible in body cavity.

The compression of the holotype's anterior abdomen was idealized to illustrate the shape of the neuropodia.

*Etymology:* The new species is named in honour of the late Dr. Miguel Villena Sánchez-Valero, curator of the Museo Nacional de Ciencias Naturales (Madrid) (Sánchez-Almazán 2008).

*Remarks:* *Ampharete villenai* sp. nov. is distinguished by the number of abdominal segments (12; see keys below) from *A. finmarchica* (13), *A. octocirrata* (15–18), *A. petersenae* (16), *A. goesi* (16–18) and *A. vega* (26). Species that have the same number of abdominal segments include *A. borealis*, *A. falcata*, *A. lindstroemi*, *A. baltica* and *A. acutifrons*. However, *A. borealis* has very short paleae and 11 thoracic uncinigers; *A. falcata* has very short paleae and enlarged rudimental notopodia on the first two abdominal uncinigers, *A. lindstroemi* and *A. baltica* have both slender gradually tapered paleae, and *A. acutifrons* has long dorsal cirri in abdominal neuropodia. Also, *A. villenai* sp. nov. can be distinguished from the aforementioned species by the unique shape of the paleae. The paleae are arranged in a crown-like structure, resembling a leaf rake, which is unique in genus *Ampharete*.



**Fig. 10** *Ampharete villenai* sp. nov.: **a** Distal end of paleae, **b** last thoracic and first abdominal chaetiger, lateral view, **c** thoracic notochaetae from chaetiger 4, **d** scale covering of thoracic notochaetae, **e** thoracic neuropod 12 with uncini, **f** abdominal uncini (paratype, IMNH 26256). Scale bars **a** 50  $\mu\text{m}$ ; **b** 200  $\mu\text{m}$ ; **c** 35  $\mu\text{m}$ ; **d** 5  $\mu\text{m}$ ; **e** 20  $\mu\text{m}$ ; **f** 10  $\mu\text{m}$

## Key to Arctic and Boreo-Atlantic species of the genus *Ampharete*

We propose two complementary keys for the North Atlantic species of the genus *Ampharetes* sensu Jirkov (2001) providing an attempt to synthesize our knowledge about the diversity of the genus in European Arctic and Boreo-Atlantic waters.

### Key 1

This key corresponds to the traditional way of constructing a key for the group (e.g. Day 1967; Holthe 1986a; Hartmann-Schröder 1996), giving special relevance to meristic characters (e.g. number of uncinigers in thorax and abdomen, number of papillae in pygidium) and length of paleae.

1.	11 thoracic uncinigers (TU). Small paleae present	2
	12 TU. Paleae present or absent	3
2.	12 abdominal uncinigers (AU)	<i>A. borealis</i>
	15–18 AU	<i>A. octocirrata</i>
3.	Paleae present	4
	Paleae absent	<i>A. petersenae</i>
4.	12 AU	5
	13 AU	<i>A. finmarchica</i>
	16–18 AU	<i>A. goesi</i>
	24–28 AU	<i>A. vega</i>
5.	Paleae shorter than distance between the two groups of branchiae	<i>A. falcata</i>
	Paleae longer than distance between the two groups of branchiae	6
6.	Paleae stout and gradually but quickly tapering terminally	<i>A. villenai</i> sp. nov.
	Paleae slender and evenly tapered	7
7.	Abdominal neuropodia with long dorsal cirrus	<i>A. acutifrons</i>
	Abdominal neuropodia with short dorsal cirrus	8
8.	Pygidium with two long cirri and a number of small papillae	<i>A. lindstroemi</i>
	Pygidium with two long cirri and a number of long papillae	<i>A. baltica</i>

*Ampharete goesi*, not found among the BIOICE samples, is a Arctic-boreal species (Holthe 1986b; Hartmann-Schröder 1996) reported in Icelandic waters by Saemudsson (1918) (as *A. goësi*) in shallow waters (24–28 m) of Dýrafjörður and Sigufjörður at the northern coast. Holthe (1986a) states that the type material of this species is probably lost but well-preserved syntypes from Svalbard Islands were studied by the senior author in the SMNH (cat. n. 6559–6572).

The type material of two species not found among BIOICE samples and not reported in Icelandic waters was revised: *A. falcata* Eliason, 1955 and *A. vega* (Wirén, 1883). The examination of the type material of *Ampharete falcata* (Göteborgs Naturhistoriska Museum, ref. number 933 (holotype) and 11053–55) showed that this species is well characterized by the wide separation between the two groups of branchiae, the very short paleae and the presence of rudimentary notopodia in the three anteriormost abdominal segments. The type material of *A. vega* was also examined (Swedish Museum of Natural History ref. number NRM 2427 (Holotype) and 2416); this Arctic species (Pettibone 1954; Holthe 1986a; Averincev 1990; Jirkov 2001) is characterized by the high number of abdominal segments (24–28) and particularly by the conspicuous rudimentary notopodia of the first two abdominal uncinigerous segments.



## Key 2

The following alternative key, modified from Jirkov (2001), gives less emphasis to abdominal characters, which often cannot be tested from broken or damaged specimens, giving, however, much more relevance as distinctive characters to features of the anterior region of the body. Among these features, we consider the shape of paleae, number of thoracic uncinigers, shape of the rudimental notopodia of first two anterior abdominal uncinigers and branchial arrangement.

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1. Paleae present, stout and abruptly tapered to very short filiform tips (usually missing)	2
Paleae present, stout and gradually but quickly tapering terminally to comparatively long filiform tips (rarely missing)	<i>A. villenai</i> sp. nov.
Paleae absent or, if present, slender and evenly tapering to long filiform tip	3
2. 13 abdominal uncinigers (AU)	<i>A. finmarchica</i>
16–18 AU	<i>A. goesi</i>
3. Rudimental notopodia of first two abdominal uncinigers enlarged	4
All rudimental notopodia of similar size	5
4. Gap between branchial groups as wide as width of group. 12 AU	<i>A. falcata</i>
Gap between branchial groups narrow or absent. 24–28 AU	<i>A. vega</i>
5. Paleae at least twice longer or wider than the most developed notochaetae	6
Paleae inconspicuous or absent	8
6. Abdominal neuropodia with long cirrus	<i>A. acutifrons</i>
Neuropodial abdominal cirrus (if present) short	7
7. Pygidium with two long cirri and a number of short papillae	<i>A. lindstroemi</i>
Pygidium with two long cirri and a number of long papillae	<i>A. baltica</i>
8. Paleae inconspicuous; 11 thoracic uncinigers (TU)	9
Paleae absent; 12 TU	<i>A. petersenae</i>
9. Three branchiae in each group arranged in a strait transversal line and one behind	<i>A. borealis</i>
All four branchiae arranged in a strait transversal line	<i>A. octocirrata</i>

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