

Laonice species (Polychaeta, Spionidae) from the Whittard Canyon (NE Atlantic) with descriptions of two new species

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Four species of *Laonice* (Annelida: Spionidae) were collected from the lower bathyal depths (3300–3700 m) in the Whittard Canyon, NE Atlantic. Two are herewith described as new species: *Laonice whittardensis* sp. nov. and *Laonice natae* sp. nov. The other two are *Laonice blakei* Sikorski & Jirkov, 1988 and *Laonice magnacristata* Maciolek, 2000. *Laonice whittardensis* has genital pouches appearing from chaetiger 3, prostomium free of peristomium and bidentate hooks. *Laonice natae* belongs to the subgenus *Appelloefia* nov. with prostomium distinct from the peristomium, more than two vertical rows of capillaries in several anterior chaetigers, genital pouches present on a limited number of segments or totally absent. However, the absence of pronounced anterior widening of the body together with anterior branchiae, which are remarkably (nearly twice) longer than the notopodial postchaetal lobes, the narrow lanceolate notopodial postchaetal lobes, the pronounced pointedness of all postchaetal lobes (both notopodial and neuropodial) in the anterior half of body at least, and absence of genital pouches and the size of the body all distinguish *L. natae* from other species belonging to this subgenus. An identification key to all nine known deep-water (>400 m depth) *Laonice* species in North Atlantic is given and four previously recognized sub-generic groups are formally named: *Laonice*, *Sarsiana* subgen. nov., *Appelloefia* subgen. nov., *Norgensia* subgen. nov.

Keywords: *Laonice whittardensis*, *Laonice natae*, taxonomy, deep-sea fauna, NE Atlantic, *Laonice*, *Sarsiana*, *Appelloefia*, *Norgensia*,

Zoobank identifier: LSID urn:lsid:zoobank.org:act:98CFBF90-746E-4564-841F-BD457F097816 for *Laonice whittardensis*

Zoobank identifier: LSID urn:lsid:zoobank.org:act:D94F8F97-AE73-450C-A61E-454BA78895BD for *Laonice natae*

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INTRODUCTION

The genus *Laonice* was designated by Malmgren (1867) for the species *Nerine cirrata* Sars, 1851 and in 2003 A. Sikorski produced the generic revision concerning the Arctic and North Atlantic – the type locality of *L. cirrata* (type species). Sikorski & Pavlova (2016) recognized 34 valid species and four morphologically distinct groups within the genus. The authors are convinced that the groups qualify for subgeneric status. Therefore, to simplify the presentation of observations in the future, we decided to give names for these subgenera. Thus we offer *Laonice* for ‘*L. cirrata*’-group, *Sarsiana* for ‘*L. sarsi*’-group, *Appelloefia* for ‘*L. appelloefi*’-group and *Norgensia* for ‘*L. norgensis*’-group.

Only one deep-water species (>400–500 m) *Laonice appelloefi*, Söderström, 1920 was described before *Laonice blakei* Sikorski & Jirkov, 1988. However, since the year 2000, six deep-water species have been described: *Laonice magnacristata* Maciolek, 2000; *Laonice shamrockensis* Sikorski, 2003; *Laonice asaccata* Sigvaldadóttir & Desbruyères, 2003; *Laonice junoyi* Aguirrezabalaga & Ceberio, 2005; *Laonice maciolekae* Aguirrezabalaga & Ceberio, 2005 and *Laonice pectinata*

Greaves *et al.*, 2011. Three of these species have the type locality of the Bay of Biscay, NE Atlantic: *L. shamrockensis*, *L. junoyi* and *L. maciolekae*. Meißner *et al.* (2014) synonymized the last species (*L. maciolekae*) with *L. appelloefi*. Deep-water benthic investigations are frequently carried out in the Bay of Biscay and adjacent areas and as a result new deep-sea species are reported from this region. In this paper we report four species of *Laonice* found in the Whittard Canyon, a large dendritic submarine canyon, situated along the Celtic Margin, north-west of the Bay of Biscay: two new species, *Laonice whittardensis* sp. nov. and *Laonice natae* sp. nov., and two previously described species, *L. blakei* and *L. magnacristata*.

MATERIALS AND METHODS

The specimens were collected during the RRS ‘James Cook’ cruise 036 (19–28 July 2009) to the Whittard Canyon, NE Atlantic (Masson, 2009). Three sites in the Whittard Canyon, and one site on the continental slope to the west of the canyon were sampled for macrofauna using a Megacorer (Gage & Bett, 2005). All sites were located at ~3500 m depth. Details on sample collection and processing are given in Gunton *et al.* (2015). In brief, once on deck, the Megacore sediment samples were sliced into five sediment layers (0–1, 1–3, 3–5, 5–10 and 10–15 cm) and then carefully sieved over 300 and 500 µm sieves. The sieved material (i.e. 300–500

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and 500 µm residues) from each layer was placed in 5-litre tubs and fixed with 10% borax-buffered formalin.

In the laboratory, the top three sediment layers (0–1, 1–3, 3–5 cm) were resieved on a 300 µm mesh sieve, rinsed with fresh water and sorted in 70% ethanol. A Leica MZ9.5 stereomicroscope and a DM5000 compound microscope were used to identify polychaete specimens to genus level at the Natural History Museum, London. Individuals belonging to the genus *Laonice* were sent to Norway, where further species-level identification and description of new species was performed. Examination of the material, including the drawings, was performed using binocular microscopes (Leica M80) and transmitted light microscopes (Leica DM2000).

Specimens collected from the Whittard Canyon on JC036 were deposited in the Natural History Museum, London, and given voucher numbers with the prefix – NHMUK ANEA. Deep-sea *Laonice* specimens from other localities were also examined. The examined material is deposited in the following localities: Zoological Museum of the Copenhagen University, Denmark (ZMUC); Zoological Museum, Moscow State University, Russia (ZMUM). Material collected under the MAREANO program by the Institute of Marine Research (IMR, Bergen, Norway) – now deposited in the Zoological Museum of the University of Bergen (UBZM); the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia (ZISP); the P.P. Shirshov Institute of Oceanology, Moscow, Russia (SIO) and Akvaplan-niva AS, Tromsø, Norway (AKV).

RESULTS

SYSTEMATICS

Family SPIONIDAE Grube, 1850

Genus *Laonice* Malmgren, 1867 emended.

DIAGNOSIS

Prostomium anteriorly rounded or with slight incurvation, T-shaped or sometimes skittle-shaped, often fused with peristomium by anterolateral corners. Adults with 0–3 pairs of eyespots. Occipital tentacle present (absent in *Laonice brevicristata* Pillai, 1961, *Laonice dayianum* Sikorski, 1997 and *Laonice shamrockensis* Sikorski, 2003). Caruncle often well pronounced and long, is followed by nuchal organ on dorsal surface along several anterior chaetigers. Palps without sheath at base. Nuchal (dorsal sense) organs appear as 4 ciliary stripes or sometimes as a clear pair of ciliary loops along several anterior chaetigers. Peristomium not fused to chaetiger 1. Hooded hooks with primary hood only, absent in notopodia (except *Laonice sarsi* Söderström, 1920 and *Laonice rossica* Sikorski, 2003). Neuropodial inferior fascicles with sabre chaetae (sometimes whip-like) starting in the anterior part of the body. Branchiae start from chaetiger 2 and present on a number of anterior segments. Usually branchiae are not fused to the notopodial postchaetal lamellae, however they are sometimes fused basally. Genital pouches present on varying number of segments and appear as folds between the neuropodia of neighbouring segments (sometimes including most anterior ones). Anus terminal, surrounded by 2 small ventral papilliform cirri usually closely arranged to each other and several pairs of comparatively long dorsal cirri.

REMARKS

Sikorski & Pavlova (2016) recognized four morphologically distinct groups within *Laonice*. We now believe these groups qualify for subgeneric status and formally name them here.

Laonice Malmgren, 1867

(Type species: *Laonice cirrata* Malmgren, 1867)

'*L. cirrata*' – group (Sikorski & Pavlova, 2016: 361).

Can easily be distinguished by a prostomium clearly fused with peristomium by anterior margin; capillaries in anterior part of body arranged in two vertical rows and all numerical characters quite variable.

Nine or ten species belong to this subgenus: *L. cirrata*; *L. brevicornis* (Kinberg, 1866); *L. bahusiensis* Söderström, 1920; *L. brevicristata*; *L. branchiata* Nonato et al., 1986; *L. shamrockensis* Sikorski, 2003; *L. asaccata*, *L. antipoda* Sikorski, 2011, *L. cricketae* Sikorski & Pavlova, 2016 and maybe *L. pinnulata* Radashevsky & Lana, 2009 (see Sikorski & Pavlova, 2016).

Sarsiana subgen. nov.

(Type species: *Laonice sarsi* Söderström, 1920)

'*L. sarsi*' – group (Sikorski & Pavlova, 2016: 361).

Representatives of this group are characterized by: anterolateral corners of the prostomium fused to peristomium generally only by an inconspicuous (in dorsal view) membrane (membrane connecting the prostomium could be hidden in the groove between the two); nuchal organ generally quite short (~10 anterior chaetigers long) and not so variable; other numerical characters highly variable and by notopodial hooded hooks which may present in the very posterior chaetigers.

Seven species belong to this subgenus: *L. japonica* (Moore, 1907); *L. sarsi* Hartman, 1953; *L. antarcticae*; *L. dayianum*; *L. sinica* Sikorski & Wu, 1998; *L. rossica*; and *L. olgae* Sikorski & Pavlova, 2016.

ETYMOLOGY: name derived from the specific name of the type species

Appelloefia subgen. nov.

(Type species: *Laonice appelloefi* Söderström, 1920)

'*L. appelloefi*' – group (Sikorski & Pavlova, 2016: 361).

This group is characterized by the following features: prostomium looks totally free from peristomium, capillaries arranged in more than two vertical rows in several anterior chaetigers, genital pouches generally present on very limited number of segments (or completely absent), hooks have more than two teeth in side view, and there is often a widening of the body on several anterior segments.

There are eight species (including one species described here) in this subgenus: *L. appelloefi*; *L. postcirrata* Hartmann-Schröder, 1965; *L. weddellia* Hartman, 1978; *L. blakei*, *L. nuchala* Blake, 1996; *L. pectinata* Greaves et al., 2011; *L. galathea* Sikorski & Pavlova, 2016; and *L. natae* sp. nov.

ETYMOLOGY: name derived from the specific name of the type species

Norgensia subgen. nov.

(Type species: *Laonice norgensis* Sikorski, 2003)

'*L. norgensis*'-group (Sikorski & Pavlova, 2016: 361).

In this subgenus the prostomium and peristomium are completely un-fused; branchiae are present along nearly all segments; often capillaries are arranged in more than two vertical rows in anterior chaetigers, and often transversal dorsal membranous crests present in the 'post nuchal organ' area.

It consists today of only three species: *L. norgensis*; *L. vieitezi* Lopez, 2011; and *L. lemniscata* Greaves *et al.*, 2011.

ETYMOLOGY: name derived from the specific name of the type species

Laonice whittardensis sp. nov.
Figure 1A–H, Map 1 (empty circle).

TYPE MATERIAL

Whittard Canyon. 2 specimens.

Holotype: anterior fragment 0.38 mm width consisting of 22 chaetigers. Station JCO36-016, Smp. 446, 47°56.787'N 10°46.853'W; 3511 m; 24 June 2009 (NHMUK ANEA 2016.141).

Paratype: anterior fragment 0.28 mm width, consisting of 21 chaetigers. Station JCO36-003, Smp. 286, 48°09.174'N 10°33.7'W; 3661 m; 21 June 2009 (NHMUK ANEA 2016.140).

DESCRIPTION

Prostomium bell-shaped with broadest part in the posterior half (Figure 1A) and rounded anteriorly; clearly distinct from the peristomium and standing far ahead of it

(Figure 1A). Occipital tentacle erect, large, and positioned in the most posterior part of prostomium (Figure 1A, B). Eyespots absent.

Nuchal organs extending to chaetiger 8 (Figure 1A). Caruncle following nuchal organ is not detected.

Branchiae present from chaetiger 2–17 (holotype) or to 16 (paratype); remarkably longer than notopodial postchaetal lamellae until chaetiger 12. Genital pouches starting from chaetiger 3 (anterior segments are densely aggregated and, due to the small size of the animal the initial appearance of the genital pouches is difficult to observe).

Notopodial postchaetal lobes having upwardly rounded tips in the branchial area (Figure 1E–G) and roughly rounded in shape in the postbranchial region (Figure 1H). Neuropodial postchaetal lobes roughly rounded in shape (Figure 1E–H). Transversal dorsal membranes in postbranchial region not observed.

Neuropodial hooded hooks appearing from chaetiger 15 (paratype) and chaetiger 16 (holotype); six hooks per neuropodium in the paratype and seven in the holotype; bidentate bearing unpaired apical teeth (Figure 1C–D). Sabre chaetae appear from chaetiger 6 (paratype) or chaetiger 9 (holotype), one per fascicle.

Pygidium unknown.

Worms unpigmented.

STAINING IN METHYLENE GREEN

No specific staining.

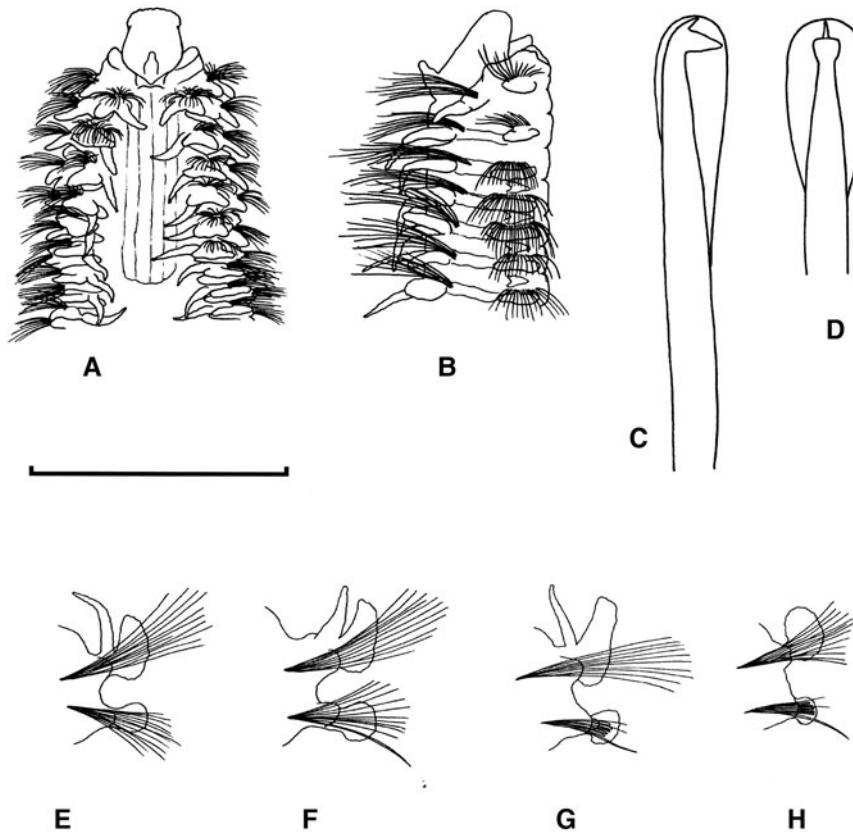
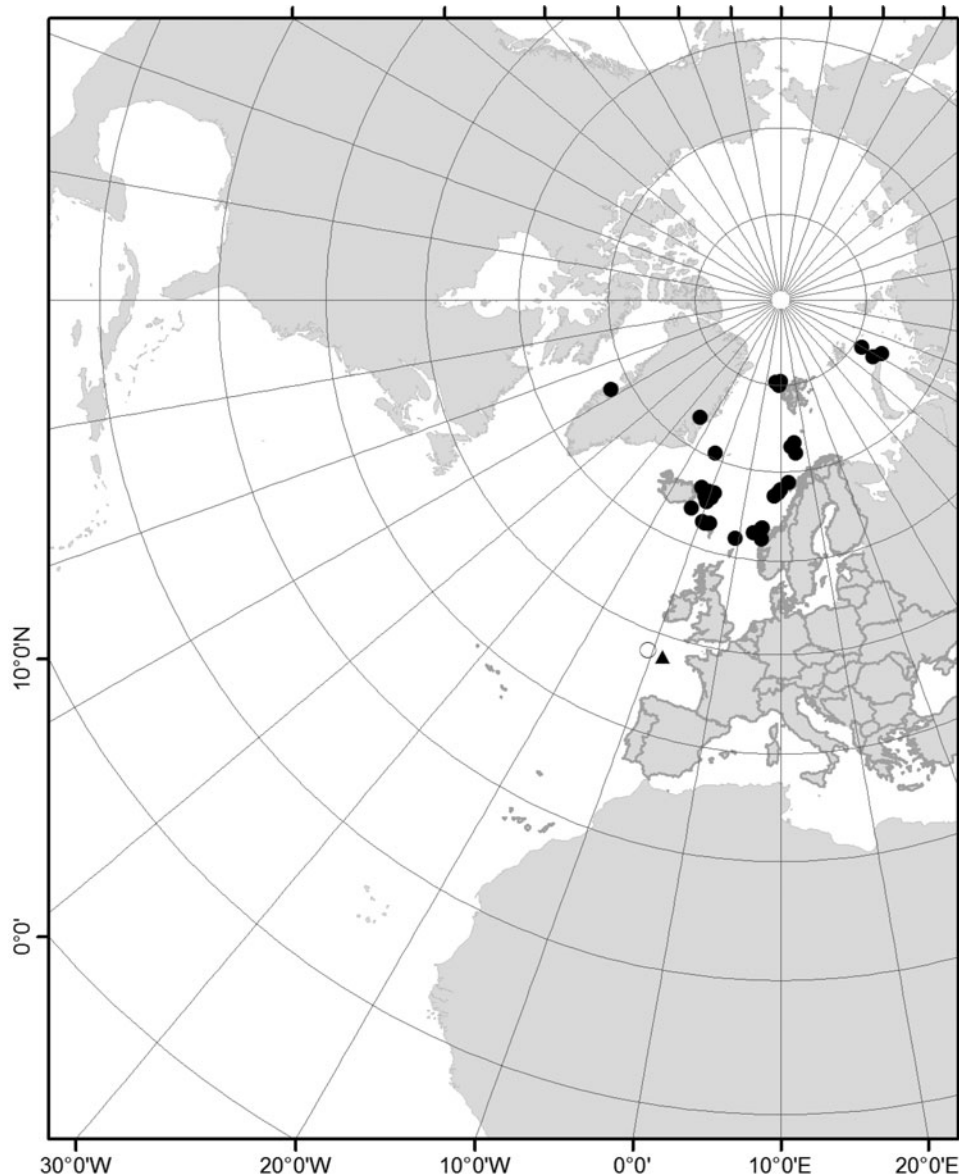


Fig. 1. *Laonice whittardensis* sp. nov. (A) Anterior end (10 chaetigers), dorsal view. (B) Anterior end (7 chaetigers), side view. (C) Hooded hook, chaetiger 20, side view. (D) Hooded hook, chaetiger 20, face view. (E) Parapodia chaetiger 5. (F) Parapodia chaetiger 12. (G) Parapodia chaetiger 16. (H) Parapodia chaetiger 20. Material: A, B Holotype; C–H Paratype. Scale: A–B, E–H 0.5 mm; C, D 0.05 mm.



Map 1. Distribution of *Laonice cirrata* (filled black circle), *Laonice whittardensis* (empty circle) and *Laonice shamrockensis* (triangles).

ETYMOLOGY

This species is named after the Whittard Canyon, the type locality of this species.

DISTRIBUTION

Whittard Canyon, 3511–3661 m.

REMARKS

In both specimens of *L. whittardensis* genital pouches appear on chaetiger 3 as in *L. cirrata*, *L. brevicornis*, *L. antarcticae*, *L. blakei*, *L. shamrockensis*, *L. bassensis* Blake & Kudenov, 1978, *L. pinnulata* Radashevsky & Lana, 2009 and *L. pectinata* Greaves *et al.*, 2011. However, *L. cirrata*, *L. brevicornis*, *L. shamrockensis*, *L. bassensis* and *L. pinnulata* clearly differ from *L. whittardensis* in their prostomia, which are fused anteriorly with the peristomium. In *L. antarcticae* fusion of the prostomium is less obvious and happens only in anterolateral corners (Sikorski, 2011 – Figure 1D), but this species can be distinguished from *L. whittardensis* because it bears paired apical teeth in the

hooded hooks, which are more numerous in each parapodium. In this species the first neuropodial hooded hook, the last branchiate chaetiger and the first sabre chaeta occur on a more rear position than in *L. whittardensis*. Finally, both *L. blakei* and *L. pectinata* are similar to *L. whittardensis* in not having fused prostomia and peristomia, but they differ in having multidentate hooded hooks. Subgeneric affiliation of this species is unclear today.

Laonice (Appelloefia) natae sp. nov.

Figure 2A–F, Map 2 (empty circle).

TYPE MATERIAL

Whittard Canyon. 2 specimens.

Holotype: anterior fragment with 26 chaetigers, 0.6 mm width. Station JC036-095/096, Smp. 154, 48°15.776'N 10°09.576'W; 3429 m; 21.07.09 (NHMUK ANEA 2016.123).

Paratype: anterior fragment 27 chaetigers, 0.5 mm width. Station JC036-065, Smp. 27, 48°17.035'N 10°18.892'W; 3373 m; 13.07.09 (NHMUK ANEA 2016.122).

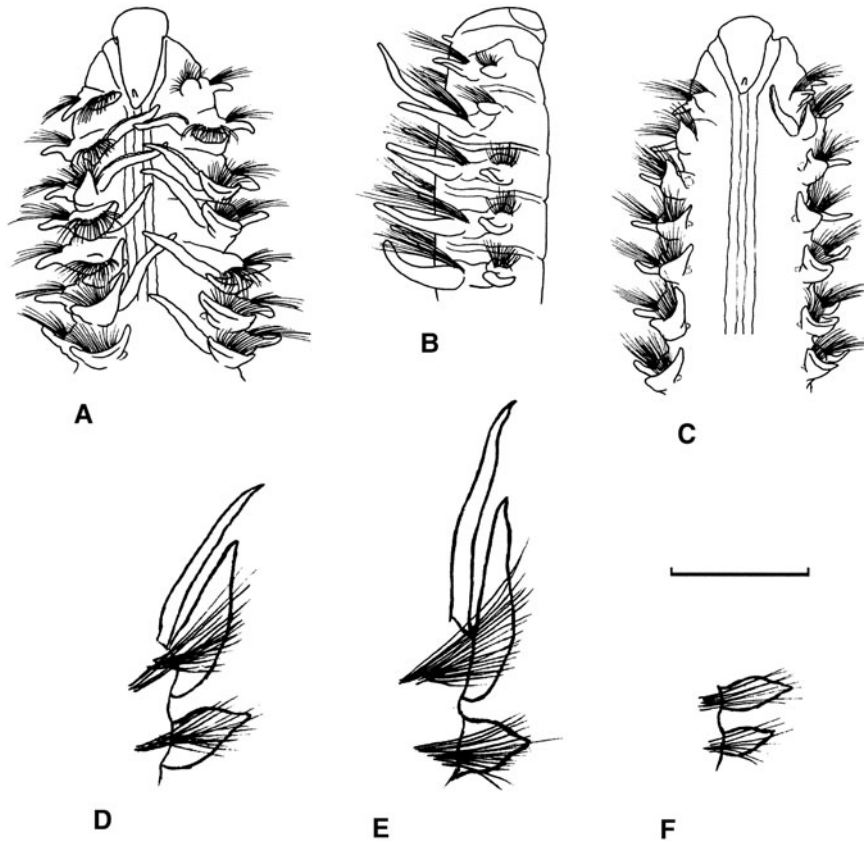


Fig. 2. *Laonice natae* sp. nov. (A) Anterior end dorsal view. (B) Anterior end lateral view. (C) Anterior end dorsal view. (D) Parapodia chaetiger 3. (E) Parapodia chaetiger 6. (F) Parapodia chaetiger 24. Material: A, D–F Holotype; B, C Paratype. Scale: A–C 0.5 mm; D–F 0.3 mm.

DESCRIPTION

Prostomium triangular with small conical occipital papilla in the posterior angle; eyes absent. Prostomium and peristomium are not fused by the anterior margin. The nuchal organ resembling a pair of parallel stripes along the dorsal side of 6 anterior chaetigers; the nuchal organ appears not to be followed by a caruncle. Branchiae present from chaetiger 2; complete branchiae present on 6 anterior segments of the holotype; first pair of branchiae remarkably longer than corresponding notopodial postchaetal lobes; branchiae on chaetigers 3 and 6 nearly twice as long as the notopodial postchaetal lobes (Figure 2D, E). Scars of branchial attachment visible up to chaetiger 12 in holotype and chaetiger 14 in paratype (paratype had no intact branchiae – the branchia depicted in Figure 2C was lost). Notopodial postchaetal lobes narrowly lanceolate and erect, large until chaetiger 14 (maximum size on chaetigers 4–7) becoming shorter posteriorly but keeping the shape with upward directed, clearly acute tips (Figure 2F). Neuropodial postchaetal lobes with clearly acute tips all along both fragments, lobes large on 14–15 anterior chaetigers diminishing in size posteriorly (Figure 2D–F). Capillaries arranged in three vertical rows from chaetiger 3 to chaetiger 14–15. Neither hooded hooks nor genital pouches were detected on the examined fragments. Hooded hooks should be detected after 26 or 27 chaetigers as well as genital pouches (if any exist). Sabre chaetae appearing from chaetiger 6–7. Body the same width along both fragments. Pygidium unknown.

STAINING IN METHYLENE GREEN

No specific staining.

ETYMOLOGY

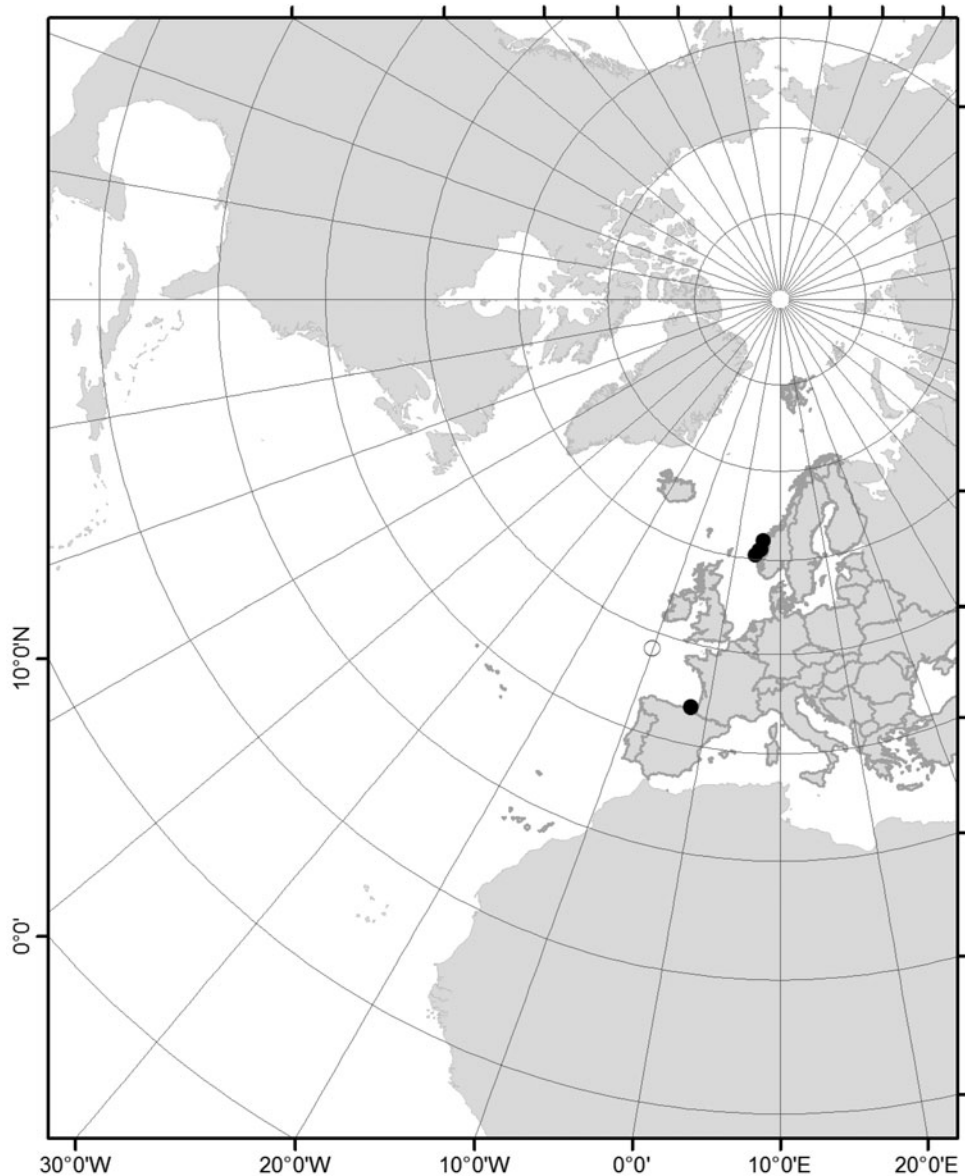
The species is named after Natalia ('Nata'), the eldest daughter of the author – A. Sikorski.

DISTRIBUTION

Whittard Canyon, 3373–3429 m.

REMARKS

Appelloefia subgen. nov. (see '*Laonice appelloefi*' group in Sikorski & Pavlova, 2016: 361), is characterized by having prostomium and peristomium clearly separated, by bearing more than two vertical rows of capillaries in several anterior chaetigers, by presenting genital pouches on limited number of segments or by lacking them and by showing a distinct widening of the body on several anterior segments in most species. *Laonice natae* sp. nov. can be assigned to this subgenus because its prostomium is not fused anteriorly with the peristomium, its capillaries are arranged in three vertical rows in anterior parapodia and it lacks genital pouches. Within the subgenus, *L. natae* most closely resembles *L. galathea* Sikorski & Pavlova, 2016 due to the absence of the pronounced anterior widening of the body. However, it differs in the shape of the anterior branchiae, which are remarkably (nearly twice) longer than the notopodial postchaetal lobes, in the narrow lanceolate notopodial postchaetal lobes, in the pronounced pointedness of postchaetal lobes (both notopodial and neuropodial) in the anterior half of body at least, in the absence of genital pouches and in much smaller size of the body. The four last characters listed also



Map 2. Distribution of *Laonice appelloefi* (filled black circle) and *Laonice natae* (empty circle).

distinguish it from all other known species belonging to *Appelloefia* subgen. nov.

Laonice (Appelloefia) blakei Sikorski & Jirkov 1988

Figure 3A–I, Map 4

Laonice blakei Sikorski & Jirkov, 1988 in Sikorski et al., 1988: 830–831, figure 1; Detinova, 1997: 121; Sikorski, 2003: 325–326, figure 1E–J.

TYPE MATERIAL

Holotype: RV 'Tunets', Station 105.16, 72°50'N 14°00'E, 960 m, silt, stones, −0.96°C, 34.91‰, 30.06.1978, coll. I.A. Jirkov (ZMUM Pl 746).

Paratypes: RV 'Tunets', Station 105.16, 72°50'N 14°00'E, 960 m, silt, stones, −0.96°C, 34.91‰, 30.06.1978, coll. I.A. Jirkov (ZMUM Pl 839, 1), (ZMUC-POL-945, 1), (SMNH 4669, 1); RV 'Alaid', Station 30.5, 72°50'N 10°30'E, 2130–2140 m, −0.9°C, 24.06.1978, coll. I.A. Jirkov (ZMUM Pl 939, 6); RV 'Sevastopol', Station 5.1054, 65°43.3'N 4°10'E, 1300 m, clayey silt, −0.9°C, 10.07.1957, coll. L.A. Rittich

(ZMUM Pl 940, 1); RV 'Sevastopol', Station 8.1351, 69°39.6'N 15°10.7'E, 2198 m, silt, Foraminifera, 23.03.1958, coll. L.A. Rittich (ZMUM Pl 941, 1); RV 'Sevastopol', Station 8.1360, 66°57.1'N 4°30'E, 1305 m, clayey silt, Foraminifera, −0.84°C, 34.90‰, 26.03.1958, coll. L.A. Rittich (ZMUM Pl 942, 1); RV 'Sevastopol', Station 10.1705, 67°19.9'N 2°07'E, 1385 m, clayey silt, −0.91°C, 34.88‰, 27.09.1958, coll. L.A. Rittich (ZMUM Pl 943, 1); RV 'Sevastopol', Station 10.1742, 64°34'N 2°50.8'E, 2510 m, clayey silt, −0.94°C, 34.94‰, 08.10.1958, coll. L.A. Rittich (ZMUM Pl 944, 5); RV 'Sevastopol', Station 10.1760, 63°21.4'N 4°35.1'W, 2500 m, −0.94°C, 34.92‰, 14.10.1958, coll. L.A. Rittich (ZMUM Pl 945, 4).

NON TYPE MATERIAL

RV 'Tunets', Station 105.6, 68°00'N 10°00'E, 930–1010 m, −0.96°C, 34.91‰, silty sand, stones, 15.06.1978 (ZMUM Pl 946, 1); RV 'Johan Ruud', Station 1203, 69°30.4'N 14°29'E, 2450 m, 23.08.1982 (TM no number, 14; ZMUM Pl 947, 1); RV 'Johan Ruud', Station 1221, 69°56.5'N

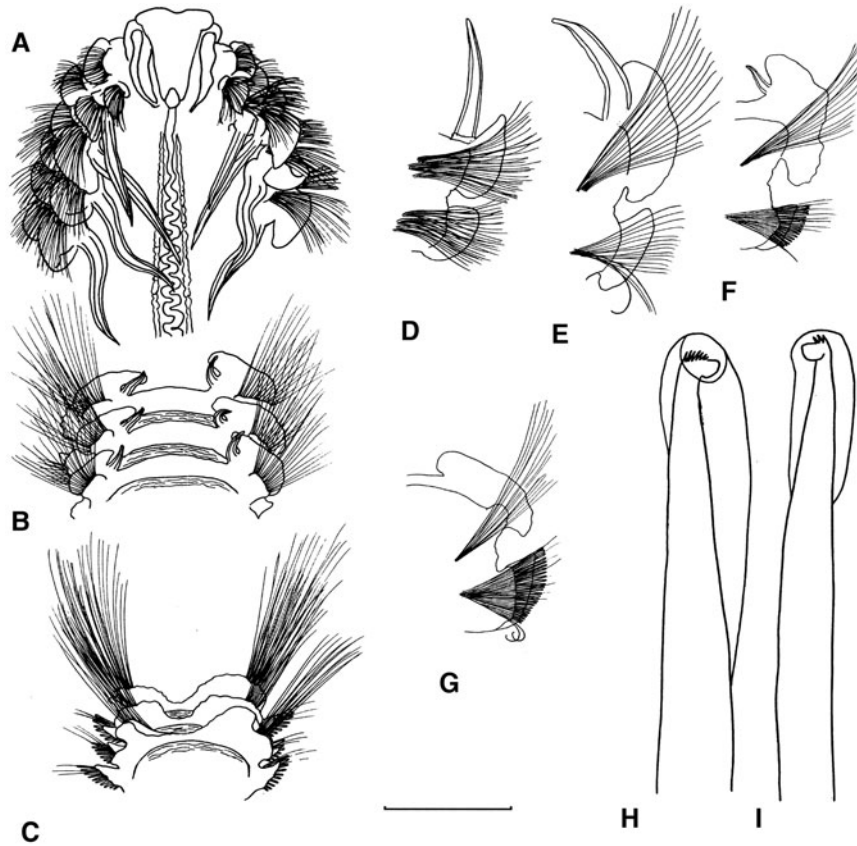


Fig. 3. *Laonice blakei* Sikorski & Jirkov, 1988. (A) Anterior end (5 chaetigers), dorsal view. (B) Fragment from chaetiger 21 to 23. (C) Fragment from chaetiger 59 to 59. (D) Parapodia, chaetigers 2. (E) Parapodia, chaetigers 21 (after Sikorski, 2003). (F) Parapodia, chaetigers 26. (G) Parapodia, chaetigers 41. (H, I) Hooded hook of chaetigers 41. Material: A, D, F–G, H–I. JCO36-094; B–C. JCO36-065; E. ZMUM Pl 947. Scale: A–D, F, G 1 mm; E 0.5 mm; H, I 0.05 mm.

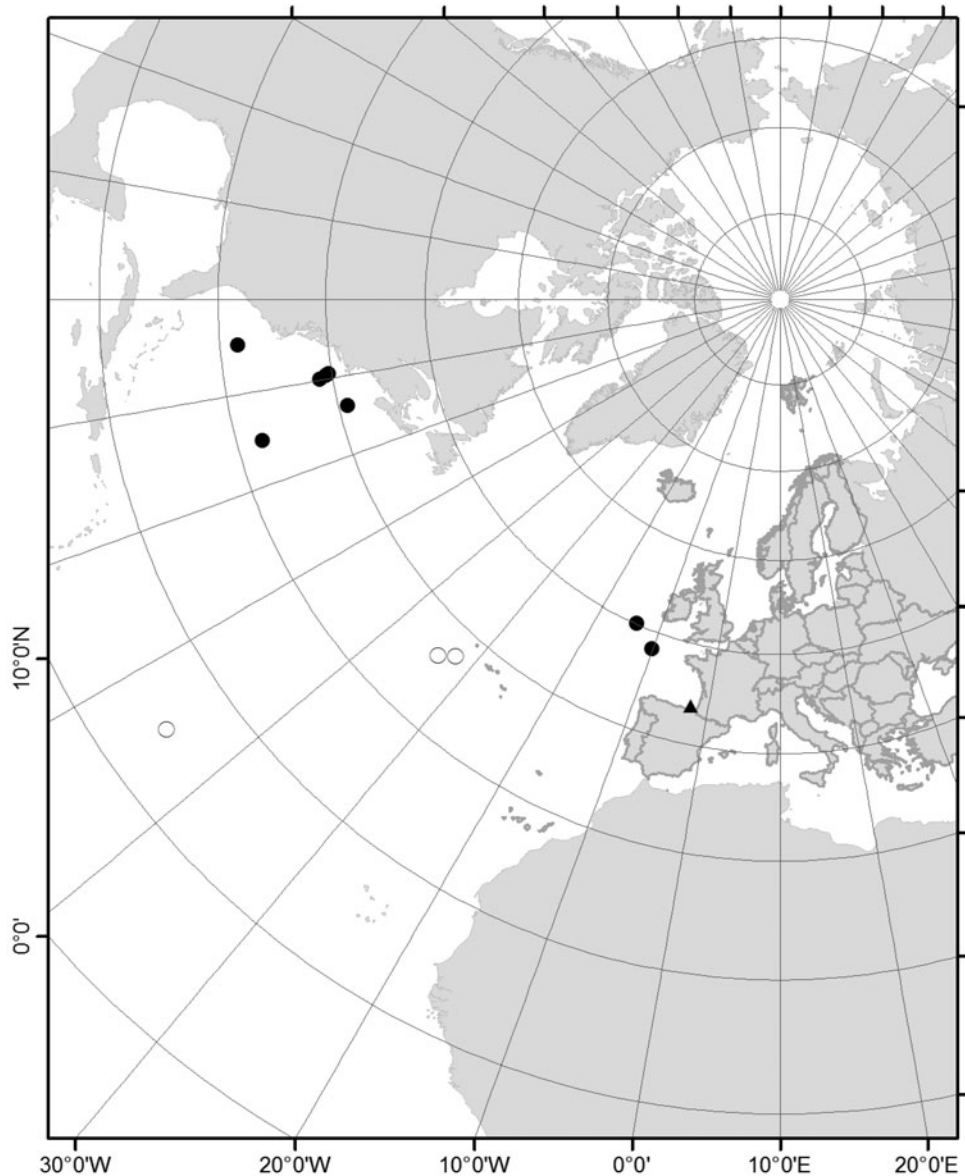
16°00'E, 2100 m, 27.08.1982 (TM no number, 3). MAREANO program, RV 'G.O. Sars' (UBZM, 13 samples, 13 specimens): Station 2008104.209, Smp. 18, 69°28.8'N 16°15.1'E, 1590 m, Van Veen grab, 05.06.2008; Station 2008114.301, Smp. 349, 68°25.6'N 11°21.3'E, 1937 m, Van Veen grab, 15.10.2008; Station 2009105.391, Smp. 371, 72°10'N 15°24'E, 729 m, Van Veen grab, 12.04.2009; Station 2009105.405, Smp. 382, 72°05.1'N 15°12.74'E, 900 m, Van Veen grab, 15.04.2009; Station 2009105.405, Smp. 383, 72°05.1'N 15°12.7'E, 901 m, Van Veen grab, 15.04.2009; Station 2009111.488, Smps 153 and 154, 69°25.73'N 15°07.15'E, 2167 m, Van Veen grab, 09 and 10.10.2009; Station 2010112.642, Smp. 377, 68°08.9'N 09°08.3'E, 2354 m, Van Veen grab, 25.09.2010; Station 2010112.642, Smp. 447, 68°09.23'N 09°09.1'E, 2339 m, Van Veen grab, 25.09.2010; Station 2010112.653, Smp. 450 and 451, 67°22.66'N 08°13.95'E, 1802 m, Van Veen grab, 02.10.2010; Station 2010112.671, Smp. 457, 67°32.21'N 09°31.73'E, 1802 m, Van Veen grab, 02.10.2010; Station 2012106.879, Smp. 73, 67°20.15'N 08°21.04'E, 1582 m, Van Veen grab, 06.05.2012. Ormen Lange Field, Station OL-04, 63°30.7'N 05°22.7'E, 869 m, box corer, 15.06.2009 (1, AKV). The site of the sunken atomic submarine 'Komsomolets' in Bear Island (73°43'41"N 13°16'E, 1677 m), 5 trawl and 3 grab samples, 1989–1994 (~20, SIO).

Whittard Canyon: Station JCO36-065, Smp. 131, 48°17.035'N 10°18.892'W; 3373 m; 13.07.09 (NHMUK ANEA 2016.115); Station JCO36-065, Smp. 148, 48°17.035'N

10°18.892'W; 3373 m; 13.07.09 (NHMUK ANEA 2016.116); Station JCO36-094, Smp. 121, 48°15.779'N 10°09.574'W; 3429 m; 21.07.09 (NHMUK ANEA 2016.117, 1).

DESCRIPTION

All worms are incomplete. Longest specimen with 60 chaetigers; up to 1.7 mm wide. Prostomium bell-shaped; with anterior margin broadly rounded, truncated or slightly incurved, not fused with the peristomium at anterior angles (Figure 3A). Occipital tentacle large. Caruncle well developed, extending together with nuchal organ to chaetigers 10–14. No eyespots. Palps absent in all specimens examined. Branchiae starting on chaetiger 2 and visible up to chaetiger 21–26; first pair ~ twice as long as the corresponding notopodial post-chaetal lamellae; branchiae on chaetiger 3 ~ 1.5 times longer than the notopodial post-chaetal lamellae (due to the lengthening of lamellae); remaining anterior branchiae long (length equal to the body width), posteriorly length diminishing gradually; last five pairs of branchiae fused basally to notopodial lamellae (Figure 3E–F), very last one hardly visible, shorter than notopodial lamellae (Figure 3F). Notopodial post-chaetal lamellae broad; without acute tips, tapering on several segments after appearance of sabre chaetae. Dorsal transverse membranes connecting notopodial postchaetal lamellae on the last branchial segments and post-branchial segments (Figure 3B–C, F, G). Upper parts of notopodial postchaetal lamellae erect and with rounded tips from chaetiger 3 to 12–14 (Figure 3A); folding downwards in posterior chaetigers (Figure 3E–G).



Map 3. Distribution of *Laonice magnacrystata* (filled black circle), *Laonice asaccata* (empty circle) and *Laonice junoyi* (triangles).

Notopodial postchaetal lamellae extending over the dorsal surface on the postbranchial region forming transdorsal membranes (Figure 3C). Neuropodial postchaetal lamellae broadly rounded anteriorly (Figure 3D), narrow with an upper finger-like appendage (Figure 3E) after chaetigers 12–16 and nearly triangular on the last branchial and in postbranchial segments (Figure 3F, G). Genital pouches from chaetiger 3 on each segment to chaetigers 7–17. These are present irregularly or absent afterwards.

Noto- and neuropodial capillaries arranged in more than two (up to four) vertical rows per fascicle from chaetiger 1–3 to 9–16; fascicles not very dense. Appearance of sabre chaetae from chaetiger 10–13; numbering two per fascicle at first, increasing to 4–5 sabre chaetae per fascicle within the following three segments; only one sabre chaeta per fascicle on chaetigers bearing neuropodial hooks; sabre chaetae long with thin tips, two to three times thicker than the hooks at their base. Neuropodial hooks from chaetiger 15–23, with 9–22 hooks per fascicle; hooks with four to six teeth in side view; apical teeth usually paired. Notopodial hooks not

found. Long, thin capillary chaetae in the upper part of the notopodium occurring with the appearance of neuropodial hooks (Figure 3C). Pygidium unknown. Worms unpigmented.

STAINING IN METHYLENE GREEN

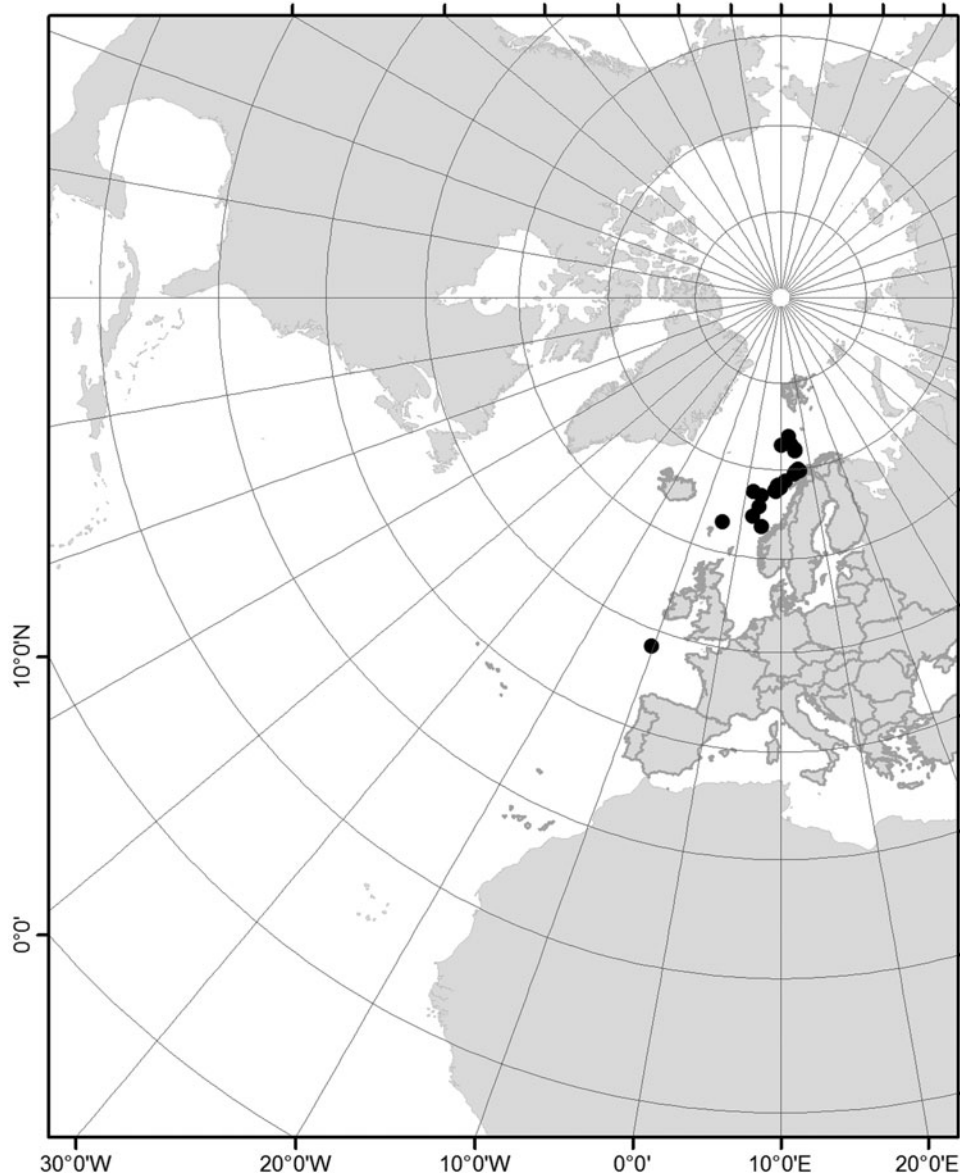
No specific staining in methylene green, only microscopic glands in branchiae stained more intensively. Staining occurs most persistently on the outer margins of the notopodial post-chaetal lamellae and branchiae from chaetiger 10 to 22.

DISTRIBUTION (Map 4)

NE Atlantic, Norwegian and Greenland Seas; 930–3429 m; soft and mixed bottom; from -0.96 to -0.84°C (Sikorski *et al.*, 1988; Detinova, 1997; Sikorski, 2003).

REMARKS

Sikorski (2003) stated, 'notopodial postsetal lamellae very tall even in posterior part of body (Sikorski, 2003; Fig. 1I)'. This



Map. 4. Distribution of *Laonice blakei*.

statement was incorrect since notopodial lamellae were just detached from the dorsal surface of body. The posterior notopodial postchaetal lobes are depicted correctly in Figure 3B, C and F, G.

Laonice magnacristata Maciolek, 2000
Figure 4A–H, Map 3 (filled black circle).

Laonice magnacristata Maciolek, 2000: 536–538, figure 3.

13 type specimens (not examined): 32°16.5'N 64°42.5'W, 1000 m, 13.04.1960; 38°47'N 70°08'W, 2900 m, 21.05.1961; 39°42'N 70°39'W, 2000 m, 21.05.1961; 39°27.5'N 70°33'W, 2478 m, 03.10.1961; 50°08.3'N 13°53.7'W, 3338–3356 m, 21.08.1972; 40°57.21'N 66°13.85'W, 2100 m; 31°35.23'N 75°10.62'W, 3008 m.

NON TYPE MATERIAL

Whittard Canyon. Four specimens: Station JCo36-093, Smp. 31, 48°15.886'N 10°09.560'W; 3424 m; 21.07.09 (NHMUK ANEA 2016.120); Station JCo36-003, Smp. 288,

48°09.174'N 10°33.7'W; 3661 m; 21.06.09 (NHMUK ANEA 2016.118); Station JCo36-020, Smp. 330, Station JCo36-020; 47°56.780'N 10°46.852'W; 3514 m; 25.06.09 (NHMUK ANEA 2016.119); Station JCo36-066/68, Smp. 340, 48°16.828'N 10°18.715'W; 3381 m; 13.07.09 (NHMUK ANEA 2016.121).

DESCRIPTION (based on the original description completely matching up to the additional characters of the material from Whittard Canyon)

Four anterior fragments (22, 22, 18 and 12 chaetigers). Width 0.18–0.38 mm. Prostomium triangular with the anterior margin truncated, without eyespots. Occipital tentacle rudimentary. Caruncle could not be detected (Figure 4A, C). Prostomium and peristomium are not fused anteriorly. Nuchal organ looking like a pair of ciliary loops extending to the middle of chaetiger 2.

Branchiae from chaetiger 3 to 5–8 (not detected on chaetiger 2); as long as or shorter than postchaetal notopodial lobes; slightly basally fused with notopodial postchaetal

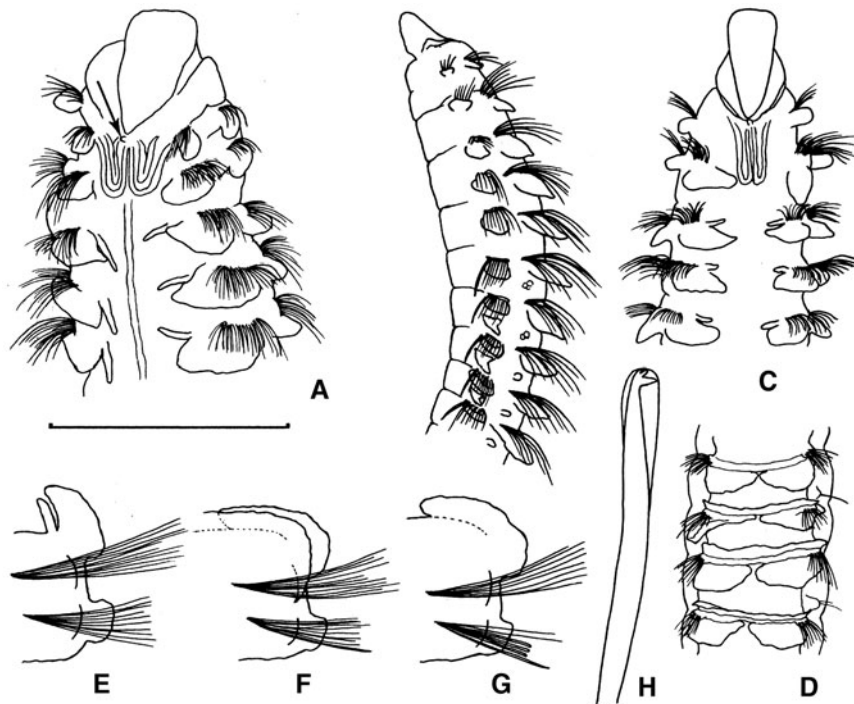


Fig. 4. *Laonice magnacristata* Maciolek, 2000 (A) Anterior end (5 chaetigers), dorsal view. (B) Anterior end (10 chaetigers), side view. (C) Anterior end (5 chaetigers), dorsal view. (D) Fragment from chaetiger 13 to 16, with transversal dorsal membranes in front of notopodia. (E) Parapodia chaetiger 5. (F) Parapodia chaetiger 16. (G) Parapodia chaetiger 21. (H) Hooded hook, chaetiger 18, side view. Material: A, E–G. NHMUK ANEA 2015.119; B–D, H. NHMUK ANEA 2015.121. Scale: A, C–G 0.5 mm; B 0.7 mm; H 0.1 mm.

lobes. Genital pouches appearing from chaetiger 7–8; present on all subsequent segments of the examined specimens. Anterior notopodial postchaetal lobes with rounded lateral margins and triangular, tapering upper parts (Figure 4E). Notopodial postchaetal lobes changing after chaetiger 11, with bases of the lobes extending to the dorsal surface of the body, but without connecting the two lobes of the same segment (Figure 4D, F, G). High transversal dorsal membranes (as high as the notopodial postchaetal lobes) present in front of notopodia; appearing from chaetiger 14–16 (Figure 4D) or from chaetiger 15–17 (NHMUK ANEA 2016.121).

Anterior capillaries arranged in two vertical rows. Neuropodial hooded hooks from chaetiger 17–19, numbering up to 6 hooks per fascicle; hooks tridentate in side view, with two small teeth above the main tooth (Figure 4H). Sabre chaetae from chaetiger 6–8 numbering 1–2 per fascicle. Pygidium unknown.

STAINING IN METHYLENE GREEN

No specific staining in methylene green.

DISTRIBUTION (Map. 3)

Deep-sea, north-transatlantic.

REMARKS

Subgeneric affiliation is unclear (Sikorski & Pavlova, 2016: 361, 367). The investigated material was identified as *L. magnacristata* due to correspondence with the original description in every small detail. However, our observations differ from the original description in that Maciolek (2000) reported branchiae starting from chaetiger 2, whereas we recorded branchiae starting from chaetiger 3. Form and position of

the transversal dorsal crests also differ from the original description: notopodial postchaetal lobes in the middle region of body are not connected by entire transdorsal membranes in our specimens (although such structures were recorded for *L. magnacristata* in the original description), whereas, instead of membranes connecting notopodial postchaetal lobes, there are transdorsal membranes in front of the notopodia on the three mid-body segments (only) after chaetiger 14 or 15.

CONCLUSIONS AND DISCUSSION

Nine out of ten deep-sea *Laonice* species known thus far were described from the northern Atlantic. Recently, Meißner *et al.* (2014) synonymized *L. maciolekae* Aguirrezabalaga & Ceberio, 2005 with *L. appelloefi*. The coordinates and depth (deeper than 400 m) for samples where five other deep-sea North Atlantic *Laonice* species have been found are given in Appendix 1.

In total, seven deep-water *Laonice* species are known from a comparatively small geographic area, the Bay of Biscay. Three of them were described from this deep-water area (*L. appelloefi*, *L. shamrockensis*, *L. junoyi*) in previous works and two species are newly described here (*L. whittardensis* sp. nov. and *L. natae* sp. nov.). In addition, two other species are new records for the area: *L. blakei*, known until now only from more northerly regions, and *L. magnacristata*, previously supposed to be a western Atlantic species. These species make up a large proportion of the 10 known deep-water *Laonice* species.

This fact correlates with the increased sampling effort in this area of the ocean compared with other areas. However,

it also highlights the differences in sampling methods for deep-sea and shelf zones. The history of benthic studies from the shelf zone is much longer than that of the deep-sea benthos and a much higher number of samples have been collected from the shelf zone (including many regular monitoring programmes) compared with the deep sea. The Megacorer sampling device used in this study enabled the collection of a number of relatively undisturbed sediment samples from lower-bathyal depths. Increased use of this gear may result in a significant increase in the species list of the genus *Laonice* due to the number of new species from deep-water materials.

IDENTIFICATION KEY FOR THE DEEP-SEA NORTH ATLANTIC SPECIES OF THE GENUS *LAONICE* (INCLUDING *L. CIRRATA* WHICH HAS ALSO BEEN RECORDED DEEPER ~400 M):

1. prostomium obviously fused anteriorly (in dorsal view) with peristomium 2
 - no anterior obvious fusion (in dorsal view) of prostomium and peristomium..... 4
2. less than 5 pairs of branchiae..... *L. shamrockensis*
 - more than 10 pairs of branchiae..... 3
3. no genital pouches; nuchal organ extending to chaetiger 4..... *L. asaccata*
 - genital pouches present; nuchal organ much longer (extending only to chaetiger 4 occasionally in juveniles less than 0.3 mm wide) *L. cirrata*
4. genital pouches appear between chaetigers 3 and 4 5
 - genital pouches appear on a more posterior segment 6
5. hooded hooks bidentate; no transversal dorsal membranes in postbranchial region *L. whittardensis*
 - hooded hooks multidentate; high and prominent transversal dorsal membranes in postbranchial region *L. blakei*
6. nuchal organ to end of chaetiger 2 *L. magnacristata*
 - nuchal organ longer than two anterior chaetigers 7
7. nuchal organ extends to chaetiger 8 or longer..... *L. appelloefi*
 - nuchal organ extends to chaetiger 7 or shorter 8
8. genital pouches appear on chaetiger 8–9; branchiae easily lost..... *L. junoyi*
 - no genital pouches; branchiae do not tend to be lost *L. natae*

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APPENDIX 1

Laonice (Laonice) cirrata (M. Sars, 1851)

Map 1 (filled black circle).

NON TYPE DEEP-SEA MATERIAL

West Iceland. RV 'Sevastopol', coll. L.A. Rittich: Cr. 5, Station 1078, 63°55'N, 13°03'W, 650 m, 3.38°C, 34.99‰, silty sand, pebbles and broken shells, 15.07.1957 (1, ZMUM PI-1734).

Davis Strait. RV 'Godthaab': Station 9 A, 37 miles from the mouth, 67°47'N 52°15'W, 535–500 m, ooze, coll. V. Nordmann, 06.07.1911 (3, ZMUC-POL-775).

Norwegian Sea. RV 'Ingolf', Station 102, 66°23'N 10°26'W, 1412 m, 10.07.1896 (1, ZMUC-POL-770); Station 103, 66°23'N 8°52'W, 1090 m, 10.07.1896 (1, ZMUC-POL-771); RV 'N. Maslov', Cr.5, coll. V.F. Bryazgin: Station 188, 73°20'N 15°25'E, 500 m, 2.7°C, 35.1‰, clayey silt, stones, 20.08.1969 (1, ZMUM PI-1656); RV 'Tunetz', Cr.105, coll. I.A. Jirkov: Station 6, 68°00'N 10°00'E, 970 m, -0.96°C, 34.91‰, silty sand, stones, 15.06.1978 (1, ZMUM PI-1753); Station 16, 72°50'N 14°00'E, 960 m, -0.96°C, 34.91‰, silt, stones, 30.06.1978 (1, ZMUM PI-1754); RV 'Alaid', Cr. 30, Station 3, 68°00'N 10°00'E, 958 m, -0.79°C, 34.92‰, sandy silt, coll. I.A. Jirkov, 13.06.1980 (1, ZMUM PI-1620); RV 'Sevastopol', coll. L.A. Rittich: Cr. 5: Station 1069, 65°48'N 9°08'W, 780 m, -0.59°C, 34.9‰, clayey silt, 12.07.1957 (1, ZMUM PI-1731); Station 1071, 65°49'N 11°10'W, 940 m, -0.65°C, 34.88‰, sandy silt, 13.07.1957 (2, ZMUM PI-1732); Station 1086, 62°56'N 9°19'W, 495 m, 0.39°C, 34.85‰, silt, pebbles, 16.07.1957 (4, ZMUM PI-1738); Station 1115, 62°59'N 3°26'E, 875 m, -1.04°C, 34.92‰, sandy silt, 20.07.1957 (1, ZMUM PI-1739); Cr. 8: Station 1413, 62°05'N 0°40'W, 608 m, 1.36°C, 34.92‰, sandy silt, pebbles, 06.04.1958 (1, ZMUM PI-1743); Cr. 10: Station 1766, 65°13'N 10°00'W, 730 m, -0.69°C, 34.92‰, sandy silt, 15.10.1958 (3, ZMUM PI-1745); Cr. 15: Station 2530, 65°45'N 11°00'W, 960 m, -0.74°C, 34.90‰, 22.11.1959 (5, ZMUM PI-1748); Station 2545, 62°51'N 8°40'W, 465 m, 8.56°C, 35.28‰, 28.11.1959 (1, ZMUM PI-1749); Station 2549, 63°00'N 7°30'W, 710 m, -0.2°C, 34.90‰, silt, pebbles, 04.12.1959 (1, ZMUM PI-1750); Station 2562, 63°00'N 3°30'E, 870 m, -0.74°C, 34.92‰, silt, 08.12.1959 (3, ZMUM PI-1751); RV 'G.O. Sars', Station 248, Smp. 14, 68°47.45'N 12°32.74'E, Beamtrawl, 1314 m, 19.06.2008 (1, MAREANO); Station 1349, Smps. 381, 392, 63°35.44'N 05°34.4'E, small and large Van Veen grab, 768 m, -0.62°C, 34.92‰, 19–20.06.2014 (2, MAREANO); Station 1350, Smps. 397, 400, 412, 63°37.93'N 05°30'E, small and large Van Veen grab, 963 m, -0.763°C, 34.92‰, 20–21.06.2014 (3, MAREANO); Station 942, Smp. 602, 62°24.3'N 05°34.2'E, large Van Veen grab, 826 m, -0.77°C, 34.91‰,

26.06.2013 (1, MAREANO); Station 818, Smp. 11, 67°35.9'N 09°19.7'E, Beamtrawl, 920 m, -0.81°C, 34.91‰, 05.05.2012 (9, MAREANO); Station 882, Smp. 15, 67°16.8'N 08°07.3'E, Beamtrawl, 920 m, -0.84°C, 34.91‰, 08.05.2012 (13, MAREANO).

Greenland Sea. RV 'Ingolf', Between Eleonores Bay and Ymers Isl., 460 m, tough, grey clay mixed with a little red clay, 05.08.1932 (1, ZMUC-POL-787); RV 'Sevastopol': Cr. 5, Station 1237, 70°40'N 12°53'W, 1200 m, -0.9°C, silt, 10.08.1957 (1, ZMUM Pl-1741); Cr.8, Station 1383, 66°30'N 12°40'W, 920 m, -0.9°C, 34.88‰, sandy silt, stones, 31.03.1958 (1, ZMUM Pl-1742); RV 'Sadko', Station 11, 80°01.5'N 9°17'E, 500 m, 0.95°C, 34.94‰, silt, pebbles, Foraminifera, 01.08.1935 (1, ZISP-56/25629); Station 12, 80°21.5'N 7°03'E, 660 m, 0.55°C, 34.92‰, silt, 02.08.1935 (2, ZISP-62/25635); Station 13, 80°30.6'N 9°59'E, 680 m, 0.22°C, 34.85‰, silt, gravel, 03.08.1935 (1, ZISP-57/25630); RV 'G.O. Sars', Station 404, Smp. 11, 67°35.9'N 09°19.7'E, large Van Veen grab, 621 m, 15.04.2009 (2, MAREANO); Ormen Lange Field, Stations 1-19, 63°30'N 05°22'E, ~900 m, box corer, 15.06.2009 (150, AKV).

Barents Sea. RV 'Håkon Mosby': Station 4, Smpls. 380, 381, 72°04.7'N 15°48.34'E, large Van Veen grab, 435 m, 05.06.2006 (1, MAREANO).

Kara Sea. RV 'Sadko': Station 26, 77°15.2'N 68°28'E, 500 m, 0.82°C, 34.85‰, silt, pebbles, 25.08.1935 (10, ZISP-60/25633); Station 83, 79°01'N 69°56'E, 509 m, -0.11°C, 34.99‰, silt, 12.08.1948 (1, ZISP-98/7195); Station 99, 76°37'N 72°04'E, 178 m, -1.41°C, 34.83‰, silt, 03.09.1948 (1, ZISP-98/7195).

Laonice (Appelloefia) appelloefi Söderström, 1920.
Map 2 (filled black circle).

TYPE MATERIAL

Holotype: Hjeltefjord, 60°32'N 4°34.5'E, coll. A. Appellöf, Station 30. Right half dissected into 27 separate parapodia kept in four slides [UUZM 347a (1-8), 347b (9-16), 347c (17-24), 347d (25-27)]. Left half fixed in ethanol (UBZM 18649).

NON TYPE MATERIAL

Sognefjord S. For Raudberg lukt., 03.05.1966, 1248-1228 m, 61°03'N 5°24'E, Stn S1, coll. T. Brattegard, det. K. Fauchald

(1 specimen, UBZM 53367); Sognefjord SW. For Raudberg lukt., 03.05.1966, 1224 m, 61°03'36"N 5°22'36"E, coll. T. Brattegard, det. K. Fauchald (7, UBZM 53368); Sognefjord SW. For Vadheimsfjord, 04.05.1966, 1272 m, 61°08'15"N 5°45'30"E, Stn S3 (6.1), coll. T. Brattegard, det. K. Fauchald (3, UBZM 53369). Rønstad (project 7441), Station 2, 62°07.865'N 06°02.207'E, 378 m, 2014 (AKV).

Seven type specimens of *Laonice maciolekae* following Meißner *et al.* (2014): Atlantic Ocean, Bay of Biscay, Capbreton Canyon. ~43°44'N 2°18'W, ~1000 m, July 1988 (Aguirrezabalaga & Ceberio, 2005).

Laonice (Laonice) asacca Sigvaldadóttir & Desbruyeres, 2003
Map 3 (empty circle)

TYPE MATERIAL (NOT EXAMINED)

17 type specimens (Sigvaldadóttir & Desbruyeres, 2003): Mid-Atlantic Ridge, 37°17'18"N 32°16'29"W, 1690 m ('Tour Eiffel' site on the Lucky Strike vent field).

NON TYPE MATERIAL (NOT EXAMINED)

Additional material comes from the Logatchev vent field ('Irina' site 14°45'06"N 44°58'41"W, 3047 m) and from Rainbow vent field ('Atos' site 36°13.76'N 33°54.11'W, 2275 m).

Laonice junoyi Aguirrezabalaga & Ceberio, 2005
Map 3 (triangles)

TYPE MATERIAL (NOT EXAMINED)

Two specimens: Capbreton Canyon (Bay of Biscay), 43°43.25'N 2°18.75'W, 984-1029 m, 08.07.1988 (Aguirrezabalaga & Ceberio, 2005).

Subgeneric affiliation is unclear.

Laonice (Laonice) shamrockensis Sikorski, 2003
Map 1 (triangles).

TYPE MATERIAL

Holotype: Shamrock Canyon, RV 'Shackleton', Station 1885/3, 47°47.7'N 8°11.5'W, 1700 m, 20.04.1977 (ZMUC-POL-646).