

Laonice (Polychaeta, Spionidae) in the Arctic and the North Atlantic

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SARSIA



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Laonice Malmgren, 1867 species from the Arctic and the North Atlantic are revised. Existing types of five species recorded from the area are described. All available material has been used and cited. New approaches to the use of widely varying and size-related numeric characters are put into practice. Eight species of the genus *Laonice* were found: *L. appelloefi*, *L. bahusiensis*, *L. blakei*, *L. cirrata*, *L. dayanum*, *L. norgensis* sp. nov., *L. sarsi* and *L. shamrockensis* sp. nov. Descriptive and nomenclatural confusions among existing species are analysed and, where necessary, such species are redescribed on the basis of an appropriate range of common characters. Lectotypes of *L. bahusiensis* and *L. sarsi* are designated. *Spionides foliata*, *S. sacculata* and *L. pugettensis* are synonymized with *L. cirrata*. A key for all species recorded from the area is provided.

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INTRODUCTION

This article is the result of more than 15 years of work (Sikorski & Sennikov 1985; Sikorski & al. 1988; Sikorski 1997, 1999) on the taxonomy of the genus *Laonice*. It is a regional (the Arctic and the North Atlantic) revision of the genus. The genus *Laonice* was designated by Malmgren (1867) for the species *Nerine cirrata* Sars, 1851. The genus contained only this species until Söderström (1920) described three new species: *L. appelloefi*, *L. sarsi* and *L. bahusiensis*, from Swedish and Norwegian waters. These descriptions were based chiefly on numeric characters, such as the length of the nuchal organ, the number of pairs of branchiae, the ordinal numbers of the setigers where neuropodial hooded hooks, sabre setae and genital pouches first occur. After a short time, Söderström's species were synonymized with *L. cirrata* (Fauvel 1927). He could not differentiate between his material from Roscoff (France) and the material from Spitsbergen. However, Eliason (1962) and Fauchald (1972) disagreed with this. Eliason recognized *L. sarsi* as a distinct species, as did Fauchald with *L. appelloefi*, but neither author examined variation in the numeric characters. Due to wide variations in numeric characters, Foster (1971) combined all species of the genus into *L. cirrata*. However, such problems did not inhibit other authors from describing new species, although such descriptions were sometimes based on a single widely variable numeric character (Banse & Hobson 1968), which is considered a dubious practice. All

authors compared widely variable numeric characters by the intervals of variation in pairs of species (normally they overlap). Such a procedure, however, weakens the significance of the numeric characters. Due to the shortage of clearly distinguishable morphological characters, an attempt to use numeric characters more effectively looks sensible. Hitherto there has been no attempt to increase the significance of numeric characters by examining size-related variation and by comparing each character by the intervals of variation within separate size groups or by using arithmetical differences between quantities of the characters as taxonomic characters. Within the present study area, only three papers (Sikorski & al. 1988; Orrhage & Sundberg 1991; Sikorski 1999) have reviewed the taxonomic situation within the genus following the detailed and formative work of Söderström (1920). Sikorski & al. (1988) compared *L. cirrata* and *L. sarsi* and moved *L. annenkovae* into the genus *Marenzelleria*, but these authors still synonymized *L. bahusiensis* with *L. cirrata*. Orrhage & Sundberg (1991) compared *L. sarsi* and *L. bahusiensis*. All known specimens of *L. appelloefi* were examined in Sikorski (1999). Hitherto, definitive published taxonomic descriptions, allowing adequate specific identification of the material collected in recent years, have not been available. One of the problems in previous studies was the geographically limited range of material available. Researchers were not able to see and compare material on several species simultaneously. The main goal of the present work is to prepare suitable and full descriptions that reflect the





Type species: *Nerine cirrata* M. Sars, 1851 (by monotypy).

Laonice appelloefi Söderström, 1920

Figs 1A–D, 2A

Laonice appelloefi Söderström, 1920:225–227, figs 131, 132.

Laonice appelloefi – Fauchald 1972:98–99, fig. 3B; Sikorski 1999:1465–1467, figs a–d.

Type locality

Hjeltefjord, 60°32'N 4°34.5'E.

Material examined

HOLOTYPE (cut into two halves in sagittal plane): Hjeltefjord, 60°32'N 4°34.5'E, coll. A. Appellöf, Stn 30. Right half dissected into 27 separate parapodia kept in four slides [UUM 347a (1–8), 347b (9–16), 347c (17–24), 347d (25–27)]. Left half fixed in ethanol (UBZM 18649). Additional material (Fauchald 1972): Sognefjord S. For Raudberg loka., 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 loka., 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).

Description

HOLOTYPE: anterior fragment with 27 setigers, 1.2 mm wide. HH = 19, QHH = 10, NO = 13; Br = 24; SS = 13; GP = 7 (genital pouches absent after setiger 13). All material examined: up to 2.2 mm wide at setigers 7–12.

Prostomium almost triangular (Fig. 1A). Anterior margin of prostomium truncated or slightly rounded, sometimes slightly incurved, not fused with peristomium at anterior angles. Two pairs of deeply imbedded eyespots, trapeziformly arranged with posterior pair more closely spaced (sometimes only anterior pair visible). Occipital tentacle well developed. Caruncle with nuchal organ extending posteriorly to setigers 8–14. Palps lost in examined material. Anterior 12–15 setigers twice as wide as subsequent segments.

Branchiae as long as notopodial post-setal lamellae at setiger 2; increasing to a maximum length of twice that of the notopodial lamellae over the subsequent three to four segments. Branchiae continuing posteriorly to setigers 23–24 (data for three specimens).

Notopodial post-setal lamellae of anterior seven to eight setigers narrowed dorsally into pointed tips (Fig. 1A). Becoming rounded in subsequent branchial segments, with the pointed tips on the upper lateral margin of lamellae (Fig. 1B, C). Poor condition of material does not allow a description of notopodial lamellae in post-branchial region. Pre-setal lamellae most prominent from setiger 2 to 15; but may present posteriorly up to setiger 30.

Neuropodial post-setal lamellae of seven anterior setigers with pointed tips dorsally; subsequent segments with pointed tips on lateral margins of lamellae. Neuropodial lamellae rounded at the beginning of post-branchial region (Fig. 1B, C). Dorsal transverse membranes connecting bases of notopodial post-setal lamellae inconspicuous. Very low and medially incomplete crests in one specimen at most posterior branchial and on several subsequent segments.

Genital pouches first appearing on setigers 5–7 (normally, on different segments in right and left sides of same worm). Individuals with one to 10 pairs of pouches, continuing to setigers 7–15.

Noto- and neuropodial capillaries arranged in more than two vertical rows per fascicle (up to four to five) varying from setiger 1 to 4; in two rows from setiger 9 to 18. Neuropodial hooded hooks first appearing from setiger 18 to 23, up to seven to 10 per fascicle; hooks tridentate, main fang surmounted by pair of large apical teeth; clearly visible in nearly every slide (Fig. 1D). Sabre setae from setiger 11 to 13, four to six per fascicle at first appearance, reduced to only two after five to six segments. Notopodial hooks not found. Pygidium unknown.

Worms without pigment.

Methylene green

Anterior part of prostomium and lateral lobes of peristomium are the most intensively stained by methylene green.

Distribution (Fig. 2A)

Two W Norwegian fjords at the border between the North Sea and the Norwegian Sea: Hjeltefjord and Sognefjord.

Remarks

This species is very close to *L. nuchala* Blake, 1996 by the presence of genital pouches on several segments (not to the end of body), by having a comparatively short nuchal organ only slightly varying in length and by having the anterior capillaries arranged in more than

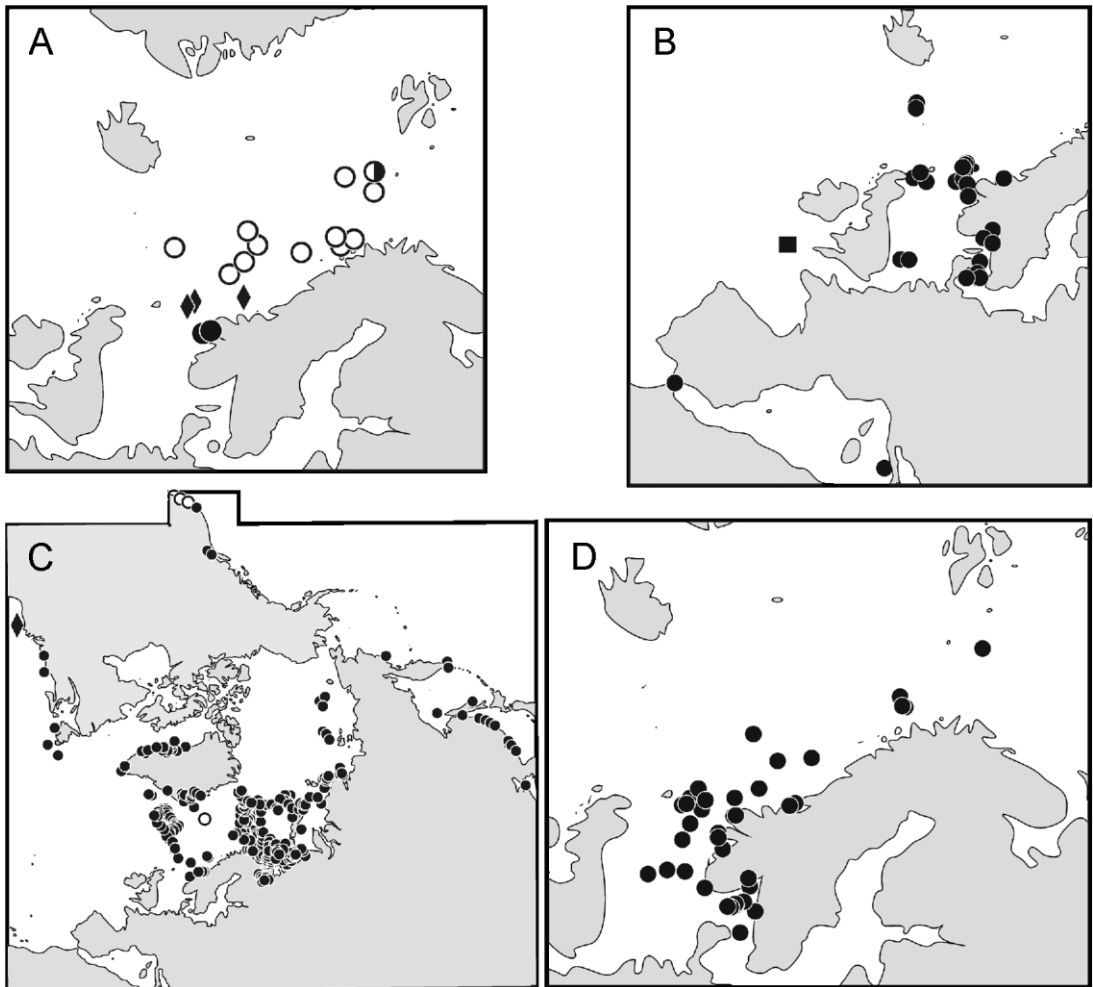


Fig. 2. Maps of samples examined. A. *Laonice appelloefi* Söderström, 1920 (filled circles), *L. blakei* Sikorski & al., 1988 (hollow circles; half-filled circle – literature data), *L. norgensis* sp. nov. (rhombuses). B. *Laonice bahusiensis* Söderström, 1920 (filled circles), *L. shamrockensis* sp. nov. (square). C. *Laonice cirrata* (filled circles – material examined; hollow circles – literature data), *L. dayianum* Sikorski, 1997 (rhombus). D. *Laonice sarsi* Söderström, 1920.

two rows. However, the neuropodial hooks of *L. nuchala* have a completely different shape. *Laonice appelloefi* is also similar to *L. sarsi* in having a limited number of genital pouches and a short nuchal organ. On the other hand, *L. sarsi* has only two rows of anterior capillaries and many more genital pouches. *Laonice blakei*, *L. norgensis* sp. nov. and *L. weddellia* Hartman, 1978 also have anterior capillaries arranged in more than two rows, but they have a longer nuchal organ. Moreover, *L. appelloefi* has a very characteristic anterior widening of the body.

Laonice bahusiensis Söderström, 1920

Figs 2B, 3A–I, 4A, B, 5A, B, 6F

Laonice bahusiensis Söderström, 1920:4–7, 81–83, 93, 98, 99, 110, 114, 128, 134, 195, 223, figs 78–82.

Scolecoplepis cirrata. – ? Möbius 1874:260; ? McIntosh 1915:164 (see Söderström 1920:223).

Spio cirratus – Levinsen 1893:334 (part).

Laonice sarsi Söderström, 1920:223–225, figs 129, 130 (part – see material examined: two specimens in syntypes of *L. sarsi*, UBZM 18645).

Laonice bahusiensis – Orrhage & Sundberg 1991:173–

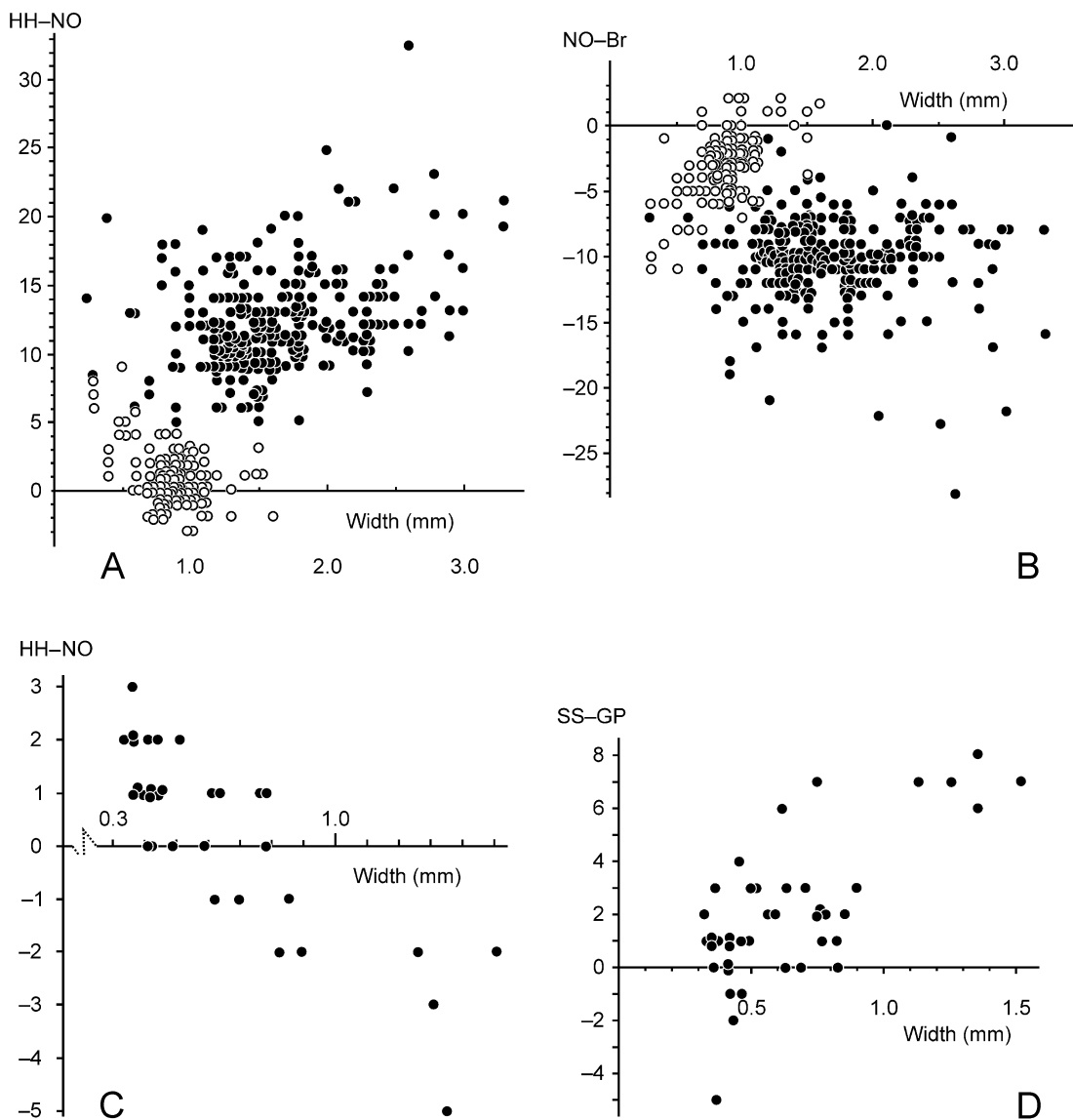


Fig. 4. A. The relationship between HH-NO and width for both *Laonice cirrata* (Sars, 1851) (filled circles) and *L. bahusiensis* Söderström, 1920 (hollow circles). B. The relationship between NO-Br and width for *L. cirrata* (filled circles) and *L. bahusiensis* (hollow circles). C. *Laonice norgensis* sp. nov. The relationship between HH-NO and width. D. *Laonice norgensis* sp. nov. The relationship between SS-GP and width.

morphologically, but differs from *L. cirrata* in the following characters:

1. The presence of complete dorsal transverse membranes joining bases of notopodial post-setal lamellae in the very last branchiate and several following segments.
2. HH-NO: 5–23 in *L. cirrata* and –3 to 9 in *L. bahusiensis* (Fig. 4A).
3. NO-Br: –23 to 0 in *L. cirrata* and –11 to 2 in *L. bahusiensis* (Fig. 4B).
4. Methylene green staining pattern: *L. bahusiensis* has more intensive staining in the tips of notopodial post-setal lamellae from setiger 4–5 to 7–12 in every case;

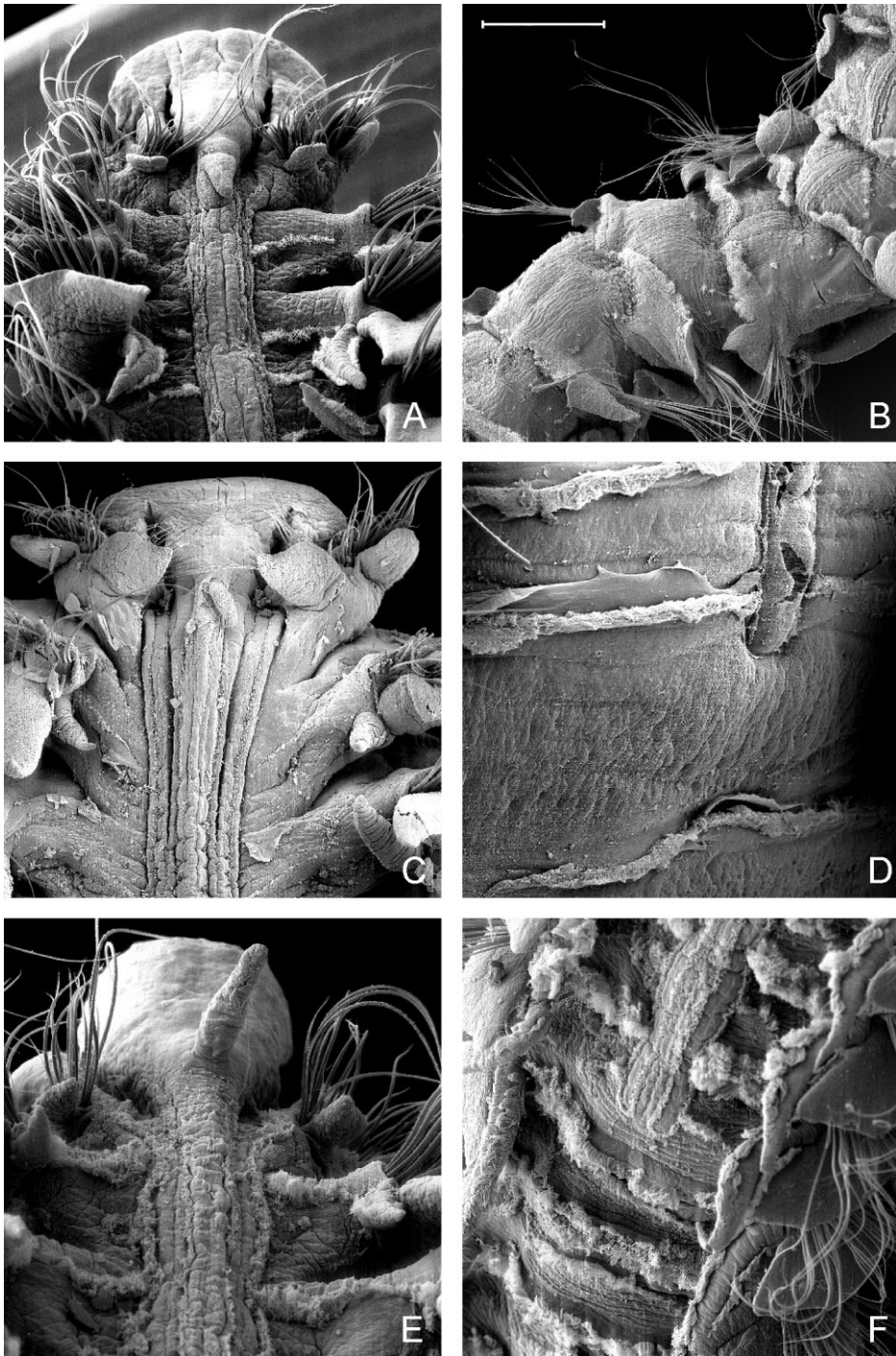


Fig. 5. Scanning electron micrographs. *Laonice bahusiensis* Söderström, 1920. A. Anterior end, dorsal view. B. End of dorsal sense organ; *L. cirrata* (Sars, 1851). C. Anterior end, dorsal view. D. End of dorsal sense organ; *L. norgensis* sp. nov. E. Anterior end, dorsal view. F. End of dorsal sense organ. Material: A, B. S Norwegian Sea. C, D. ZMUM PI 1131. E, F. S Norwegian Sea. Scales (mm): A, D, F = 0.3; B = 0.4; C = 0.6; E = 0.15.



pouches appearing on setigers 18 and 28. Nine to 10 anterior notopodial post-setal lamellae lancet-like; asymmetrically leaf-shaped, with rounded upper margin and with small peak shifting to upper lateral margin on next 10–16 setigers; symmetrically leaf-shaped from setiger 21 to 27 (Fig. 1L). No dorsal transverse membranes connecting bases of notopodial post-setal lamellae. Neuropodial post-setal lamellae of anterior 27–31 setigers with rounded margins, upper part slightly narrowed with pointed tip; axe-shaped posteriorly (Fig. 1L). Neuropodial hooded hooks from setiger 31 and 37, up to five per fascicle, bidentate in side view (Fig. 1M). Sabre setae from setiger 26, one to two per fascicle. Pygidium unknown.

Worms unpigmented

Remarks

Morphologically, *L. dayanium* is closest to *L. sarsi*. The main differences are: rudimentary occipital tentacle, large apical tooth in hooded hook (cf. *L. sarsi* – Figs 6D, 8H), length of nuchal organ extending to setigers 12–14 and appearance of sabre setae from setiger 26 for 0.5–0.8 mm width of specimens. *Laonice brevicristata* Pillai, 1961, another species without an occipital tentacle, has a shorter nuchal organ (to setigers 7–8) and appearance of sabre setae from setiger 13 to 14.

Laonice norgensis Sikorski sp. nov.

Figs 2A, 4C, D, 5E, F, 9A–F, 10A–G

Material examined

Forty-four specimens from 30 samples collected by Akvaplan-niva AS in May 1998 and June 1999 with a Van-Veen grab (0.1 m²) plus one sample (ZMUM PI 963).

Type material

HOLOTYPE. Oseberg-C Field, Stn 19, grab 3, 60°36.19'N 2°45.64'E, 110 m, fine sand, 05.05.1998 (ZMUM PI 1818). **PARATYPES:** Oseberg-FS Field, Stn 12, grab 3, 60°28.46'N 2°52.02'E, 106 m, fine sand, 05.05.1998 (1 specimen, ZMUM PI 1819); Oseberg-C Field, Stn Ref. 1, grab 9, 60°41.33'N 2°41.91'E, 120 m, fine sand, 06.05.1998 (1, ZMUM PI 1820); Brage Field, Stn Ref. 1, grab 10, 60°39.55'N 2°54.59'E, 140 m, fine sand, 06.05.1998 (1, ZMUM PI 1821); Veslefrikk Field, Stn 8, grab 2, 60°46.94'N 2°52.79'E, 172 m, fine sand, 16.05.1998 (1, ZMUM PI 1822); Nordøstflanken Field, Stn 1, grab 2, 61°20'N 1°57.63'E, 150 m, fine sand, 17.05.1998 (1, ZMUM PI 1823); grab 3 (1, ZMUM PI 1824); Nordøstflanken Field, Stn 2, grab 2, 61°21'N

1°56.85'E, 152 m, fine sand, 17.05.1998 (3, ZMUM PI 1825); grab 3 (3, ZMUM PI 1826); grab 4 (6, ZMUM PI 1827); grab 5 (4, ZMUM PI 1828); Nordøstflanken Field, Stn 3, grab 2, 61°21.52'N 1°56.45'E, 157 m, medium sand, 17.05.1998 (3, ZMUM PI 1829); grab 3 (1, ZMUM PI 1830); grab 4 (1, ZMUM PI 1831); Nordøstflanken Field, Stn 5, grab 5, 61°21.88'N 1°56.15'E, 157 m, fine sand, 17.05.1998 (1, ZMUM PI 1832); Nordøstflanken Field, Stn 6, grab 2, 61°22.15'N 1°56.53'E, 170 m, medium sand, 17.05.1998 (1, ZMUM PI 1833); Nordøstflanken Field, Stn 9, grab 5, 61°21.66'N 1°55.20'E, 153 m, fine sand, 18.05.1998 (1, ZMUM PI 1834); Nordøstflanken Field, Stn 10, grab 3, 61°22.23'N 1°55.72'E, 161 m, fine sand, 18.05.1998 (1, ZMUM PI 1835); grab 5 (1, ZMUM PI 1836); Nordøstflanken Field, Stn 11, grab 3, 61°22.44'N 1°55.39'E, 161 m, fine sand, 18.05.1998 (1, ZMUM PI 1837); Nordøstflanken Field, Stn Ref. 12, grab 10, 61°24.19'N 1°52.75'E, 161 m, fine sand, 18.05.1998 (1, ZMUM PI 1838); Huldra Field, Stn 12, grab 3, 60°51'51.81"N 02°40'51.72"E, 123 m, sandy bottom, 04.06.1999 (1, ZMUM PI 2134); Statfjord Field, Stn Ref. 8, grab 6, 61°28'51.68"N 01°51'01.28"E, 266 m, sandy bottom, 08.06.1999 (1, ZMUM PI 2135); Sygna Field, Stn 2, grab 3, 61°27'51.86"N 01°59'55.18"E, 298 m, silty sand, 09.06.1999 (1, ZMUM PI 2137); Statfjord C Field, Stn 7, grab 4, 61°17'31.08"N 01°53'46.40"E, 144 m, sandy bottom, 14.06.1999 (1, ZMUM PI 2140); Gullfaks Field, Stn Ref. 1, grab 3, 61°07'08.31"N 02°07'27.12"E, 135 m, sandy bottom, 17.06.1999 (1, ZMUM PI 2138); Gullfaks A Field, Stn 6, grab 2, 61°10'51.18"N, 02°12'08.96"E, 135 m, sandy bottom, 19.06.1999 (1, ZMUM PI 2139); Gullfaks C Field, Stn 10, grab 2, 61°13'04.20"N 02°15'58.27"E, 215 m, sandy bottom, 19.06.1999 (1, ZMUM PI 2141).

Additional material

RV *Sevastopol*, 10.1747, 63°21'N 6°19'E, 210 m, sand, 7.7 °C, 35.08 psu, 10.10.1958 (1, ZMUM PI 963); Brage Field, Stn 11, grab 4, 60°30.69'N 3°04.99'E, 140 m, fine sand, 07.05.1998 (1 – middle fragment, ZMUM PI 1841).

Etymology

The name derives from the Norwegian name of Norway, Norge.

Description (see also Table 3)

Up to 1.5 mm wide, 103 mm long and 142 setigers. The HOLOTYPE is 1.3 mm wide, 60 mm long and with 125 setigers. Prostomium longer than wide, bell-shaped,

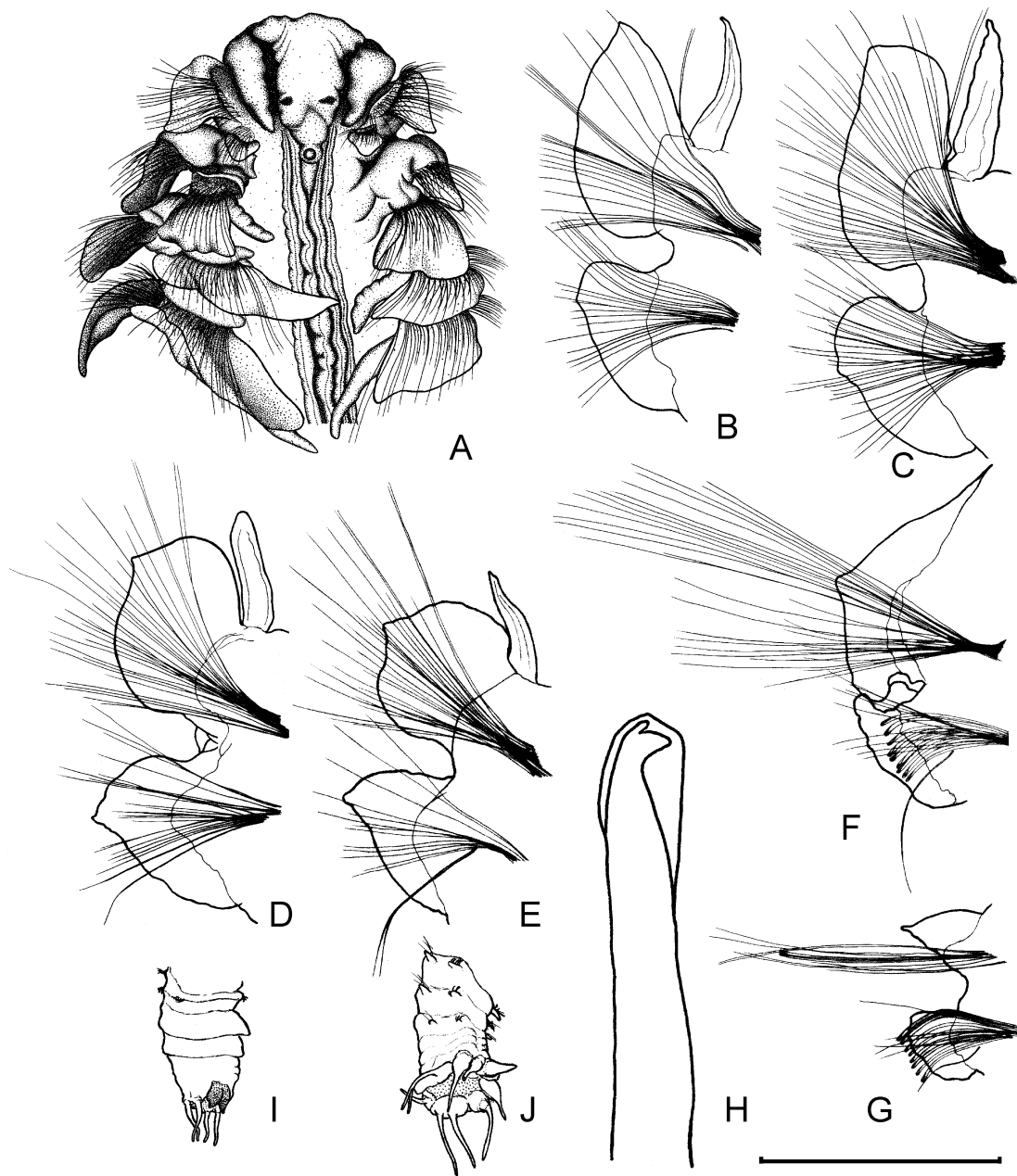


Fig. 8. *Laonice sarsi* Söderström, 1920. A. Anterior end, dorsal view. B–G. Right parapodia, setigers 5, 12, 23, 29, 62 and 111. H. Neuropodial hooded hook, setiger 36. I. Pygidium with paired ventral cirri. J. Pygidium with unpaired ventral cirrus. Material: A. ZMUM PI 957. B–G. ZMUM PI 2136. H. ZMUM PI 961. I. ZMUM PI 2143. J. ZMUM PI 2142. Scales (mm): A = 2.0; B–G = 0.8; H = 0.027; I = 0.44; J = 0.58.

broadly rounded on anterior margin (Fig. 9C) or truncated, with small apical incision in some specimens (Fig. 9A). Prostomium not fused with peristomium; narrowing gradually from anterior margin to middle

and then abruptly narrowing posteriorly into caruncle (Fig. 9A, C). One or two pairs of brown or reddish eyes. Posterior pair small (Fig. 9A) or rather large (Fig. 9C). Anterior pair small and may be located in front of

Table 3. *Laonice norgensis* sp. nov. Measurements of the main numeric taxonomic characters in type material.

Coll. numb.								Coll. numb.							
ZMUM Pl	Setigers	Width (mm)	HH	NO	Br	SS	GP	ZMUM Pl	Setigers	Width (mm)	HH	NO	Br	SS	GP
1818 ^{holotype}	125	1.32	25	28	96	16	8	1828		0.85	23	24		13	11
1819	96	0.62	22	23	64	14	8	1828		0.56	17			11	9
1820		0.51	19	17	32	11	8	1829		0.82	23			11	10
1821	104	0.74	24		79	15	8	1829		0.69	21			13	13
1822		1.12				15	8	1829		0.55	16			11	
1823		0.37	18	16		11	10	1830		0.59	18	18		11	9
1824	105	0.70	21	22	87	14	11	1831	105	0.82	21	23	94	13	13
1825		0.34	17	15	11	10	10	1832		0.37	20	19	42	12	17
1825	107	0.90	21	23	90	12	9	1833		0.44	17	16		11	10
1825		0.49	17	17		11	8	1834		0.41	17	15	30	10	10
1826		0.37	17			11	11	1835	71	0.41	17	16	51	10	9
1826		0.32	16		36	11	9	1836		0.44	17	15	37	10	11
1826		0.41	17	16		10	11	1837	111	0.78	22	22	82	12	11
1827	70	0.41	17	16	38	10	10	1838		0.42	17	17		10	13
1827		0.41	17	17		10	9	2134	126	1.37	26	31	94	15	15
1827		0.37	17	16		11	10	2135	75	0.45	20	19	41	12	8
1827		0.37	18	16		11	10	2137	95	0.62	22	21	62	14	11
1827		0.62	19	18		12	12	2138	117	1.26	28	30	102	17	10
1827		0.49	18	17		10	9	2139	101	0.77	20	19	86	12	10
1828		0.77	22			14	12	2140	68	0.36	19	16	33	12	9
1828		0.78	22	21		12	10	2141	142	1.51	31	33	115	18	11

HH – Setiger with first neuropodial hooded hooks; NO – Last setiger with nuchal organ; Br – Last setiger with branchiae; SS – Setiger with first occurrence of sabre setae; GP – Setiger with first occurrence of genital pouches.

posterior one (Fig. 9C) or may be moved on to lateral surface of middle part of prostomium, often deeply imbedded within cuticle and not visible in dorsal view. Finger-like erect occipital tentacle as long as setiger 1 located at posterior end of prostomium behind eyespots (Figs 5E, 9A, C). Caruncle long, following nuchal organ up to setigers 15–33 (Figs 5E, F, 9A, B). All palps lost. Most anterior complete intersegmental border visible between setigers 2 and 3 in ventral view. Peristomial lateral wings not rising above prostomium, their length half that of prostomium. Length of nuchal organ correlating with body size. Nuchal organ extending posteriorly to setiger 15 in smallest specimens (0.35–0.45 mm wide); to the border between setigers 28 and 29 in holotype.

Branchiae of setiger 2 lower than the notopodial post-setal lamellae, becoming as high as the lamellae from setiger 3 to 5, then increasing in size and thickness on subsequent setigers (Fig. 9A). Branchiae continuing posteriorly to setigers 30–115 (to setigers 15–36 counting from pygidium). This character is size dependent (Table 3).

The shape of post-setal lamellae is illustrated in Fig. 10A–G. The shape of neuropodial post-setal lamellae is nearly the same throughout body. Their size gradually decreasing towards the end of branchial region and then increasing slightly (Fig. 10F). Notopodial post-setal lamellae retain the same shape from setiger 1 to 7–11

(Fig. 10A); with peaks at tips of notopodial post-setal lamellae from setiger 8 to 12 (Fig. 10B), peaks shifting downwards on to lateral margin of lamellae quickly on subsequent segments (Fig. 10C). Part of notopodial lamellum above peak narrower than rest of lamellum (Fig. 10C–E), more pronounced in segments more posterior to the nuchal organ (Fig. 10D, E). Upper part of notopodial lamellum gradually reduced posteriorly. Notopodial lamellae leaf-shaped at end of branchial region (Figs 3G, 10F). Every setiger with two dorsal transverse membranes: one membrane connecting bases of notopodial lamellae, another following the anterior border of the setiger (Figs 5F, 9B). Normally these membranes visible up to posterior-most setigers. Membranes from bases of notopodial lamellae may be clearly visible (Fig. 9A) from setiger 7, interrupted only by nuchal organ.

Genital pouches appearing from setiger 8 to 17, present regularly on every setiger through two to 65 segments; not found on every setiger afterwards. Genital pouches usually disappearing on setigers 9–21 counting from pygidium, but sometimes within three to eight setigers after appearing regularly.

Noto- and neuropodial capillaries arranged in more than two vertical rows per fascicle (usually in three rows) varying from setiger 1 to 4; in two rows from setiger 8 to 17; sometimes in four rows for several segments (from setigers 4–7 to 9–14) in larger speci-

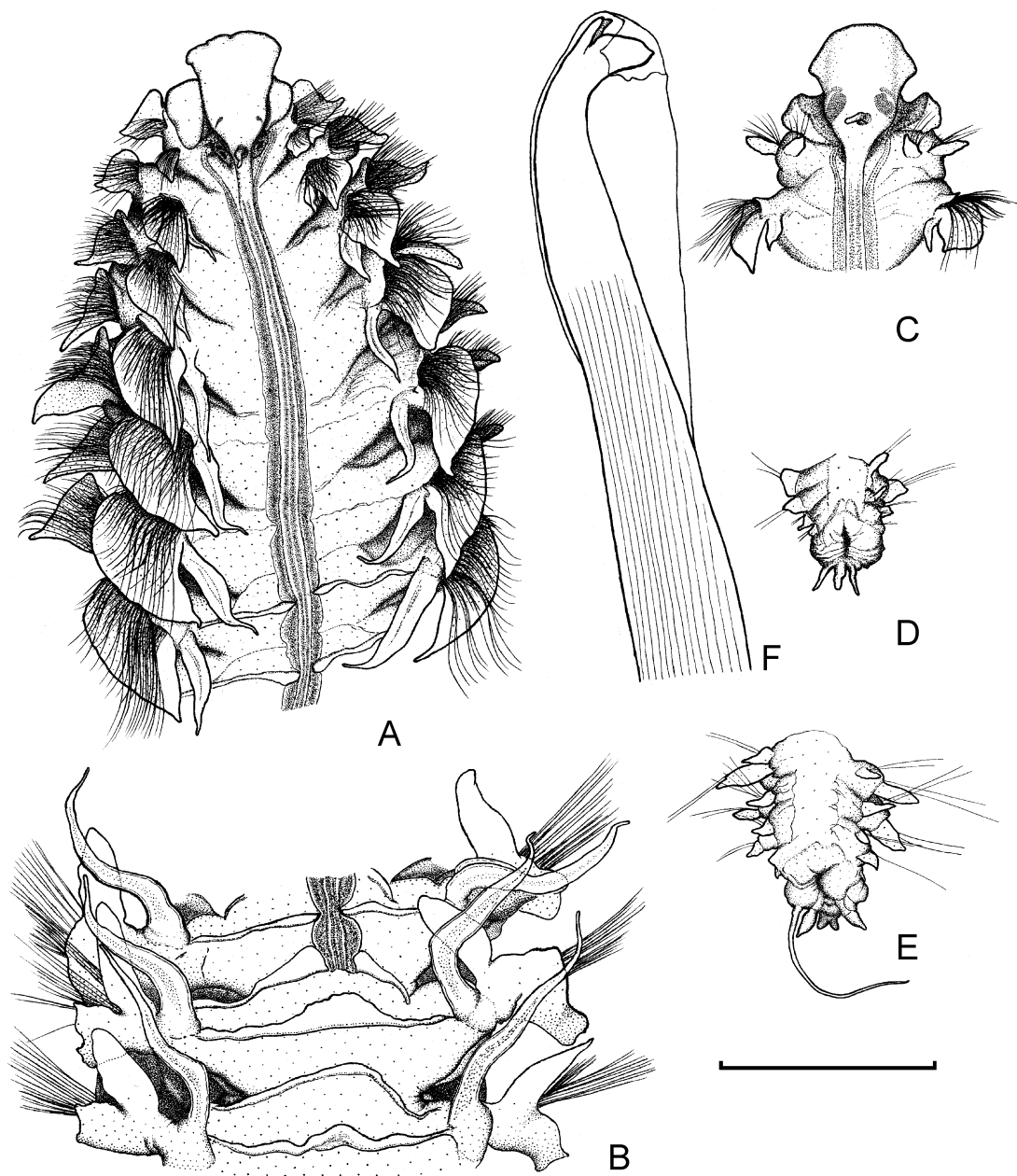


Fig. 9. *Laonice norgensis* sp. nov. A. Anterior end, dorsal view. B. Setigers 28, 29 and 30, dorsal view. C. Anterior end of a smaller specimen, dorsal view. D. Pygidium with mid-ventral cirrus, dorsal view. E. Pygidium with furcated mid-ventral cirrus, dorsal view. F. Hooded hook of setiger 38, side view. Material: A, B. Holotype ZMUM PI 1818. C. ZMUM PI 1837. D. ZMUM PI 1821. E. ZMUM PI 1822. F. ZMUM PI 1831. Scale (mm): A, B = 1.1; C–E = 0.64; F = 0.02.

mens. Sabre setae first appearing between setigers 10 and 18; from setiger 10 only in smallest specimens (0.42–0.50 mm wide); up to four per fascicle, decreasing to one in posterior part of body (Fig. 10F, G).

Hooded hooks appearing from setiger 16 to 31; from setiger 16 to 20 only in small specimens (0.3–0.6 mm wide). Starting from four to 12 hooded hooks per fascicle it reaches six to 17 hooded hooks per fascicle (a

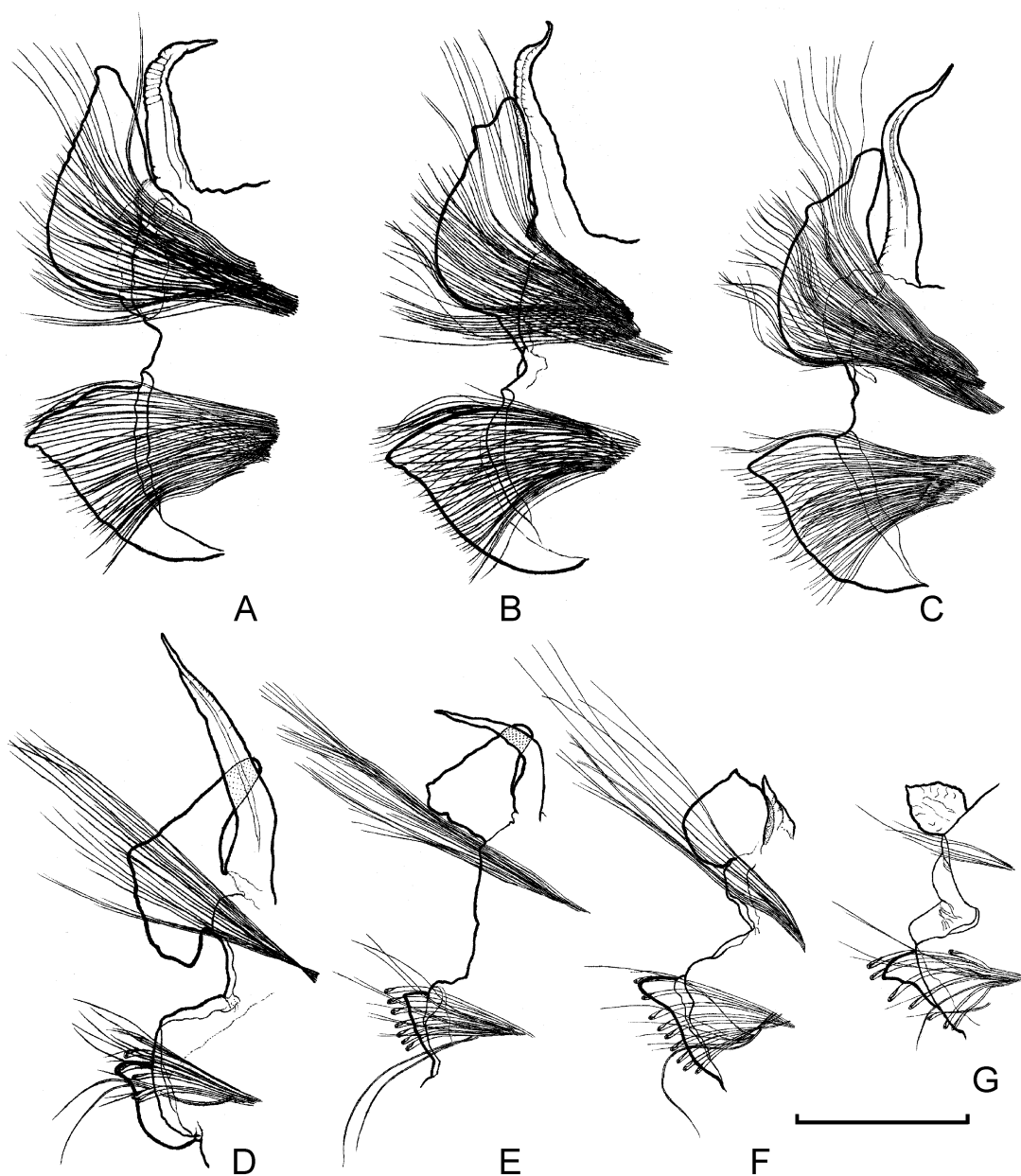


Fig. 10 *Laonice norgensis* sp. nov. Right parapodia. A. Setiger 9. B. Setiger 11. C. Setiger 12. D. Setiger 25. E. Setiger 44. F. Setiger 64. G. Setiger 86. Material: A–G. ZMUM PI 1819. Scale (mm): 0.5.

maximum number) in central neuropodia. Hooded hook bidentate in side view; but main fang surmounted by paired apical teeth (best seen using phase contrast).

Pygidium bearing a pair of short and thick ventral cirri placed rather far apart; characteristic for all species of *Laonice* (Fig. 9D, E). Pygidium also with up to six pairs of thread-like long dorsal cirri; they may all be

absent or lost (Fig. 9D) or partially present (Fig. 9E). Cirriform ventral-most medial appendage positioned between ventral cirri. Tip of appendage may be forked (Fig. 9E) or entire, resembling single ventromedial cirrus (Fig. 9D). Holotype with ventromedial cirrus and one of the dorsal cirri only.

Body of worms normally unpigmented but ventro-



medial appendage of the pygidium sometimes darkly pigmented.

Methylene green

Anterior part of prostomium (approximately two thirds of length), base of occipital tentacle, post-setal lamellae, anteroventral surface of body (approximately length of nuchal organ) visibly stained stronger than adjacent parts of body.

Distribution (Fig. 2A)

Northern North Sea and Norwegian Shelf north to 63°30'N; 106–298 m, sandy bottom and sometimes mixed bottom.

Differential diagnosis

Laonice norgensis most resembles *L. appelloefi*, *L. weddellia* Blake 1983, *L. blakei* and *L. nuchala* Blake, 1996, given the arrangement of capillary setae in more than two rows in the anterior parapodia. The new species differs from *L. appelloefi* mainly by the absence of visible widening of the 12–15 anterior setigers (Sikorski 1999), a longer nuchal organ (to setigers 15–28 instead of setigers 8–14 in *L. appelloefi*), genital pouches starting from setiger 8 to 17 (from setiger 5 to 7 in *L. appelloefi*) and by the absence of complete dorsal transverse membranes in *L. appelloefi*. I have not examined any entire specimen of *L. appelloefi*, such that the pygidia of these species cannot be compared. Differences from *L. weddellia*, which also has a mid-ventral cirrus, are as follows: two to three pairs of eyes in *L. weddellia* (one to two in *L. norgensis*); the shape of hooded hooks (in *L. weddellia* the second apical tooth is not located side by side as in *L. norgensis* “in tandem with the first” – *sensu* Blake 1983); the shape of the anterior-most notopodial post-setal lamellae (see Blake 1983: figs 5A, 9B) – the notopodial post-setal lamellae of *L. weddellia* has inferior extensions. Moreover, the branchiae in *L. weddellia* (maximum number of setigers = 130) continue posteriorly for 20–50 setigers (Hartman 1978; Blake 1983) as in *L. norgensis* – for 30–115 setigers (maximum number of setigers = 142). There is a discrepancy in Blake’s description: the left parapodium of setiger 100 depicted on (Blake 1983) fig. 9C has a branchium and does not have a neuropodial post-setal lamellum. This runs counter to the text description. There is no information about dorsal transverse membranes in *L. weddellia*. *Laonice norgensis* differs from *L. blakei* in that the latter taxon has genital pouches only from setiger 3 and a completely different shape of hooded hooks and notopodial post-setal

lamellae. The main differences between *L. norgensis* and *L. nuchala* are that *L. nuchala* has a much shorter nuchal organ (to setiger 13) and differently shaped hooded hooks.

Remarks

Ranges of values of numeric characters: HH: 16–31; NO: 15–33; Br: 30–115; SS: 10–18; GP: 8–17; HH–NO: –5 to 3; HH–SS: 5–13; HH–GP: 3–20; NO–SS: 4–16; NO–GP: 2–20; Br–HH: 13–84; Br–NO: 15–82; Br–SS: 20–97; Br–GP: 20–104; SS–GP: –5 to 8. It is clear from Table 3, showing the results of measurements of the main numeric characters, that only GP does not correlate with size and only the correlation between HH–NO and size is negative (Fig. 4C). The correlation between HH–SS, HH–GP, NO–SS, NO–GP, Br–HH, Br–NO, Br–SS, Br–GP and size seems to be not so interesting as a special taxonomic character. All of these values are differences between comparatively widely varying characters strongly correlated with size and another less variable character sometimes with little relationship to size (GP). Figure 4D illustrates the correlation of SS–GP with width that might be more useful as a taxonomic character.

Laonice sarsi Söderström, 1920

Figs 2B, 6A–E, 8A–J

Laonice sarsi Söderström, 1920:223–225, figs 129, 130 (part).

Laonice sarsi – Eliason 1962:263; Sikorski & al. 1988:833–835, fig. 2e–f; Orrhage & Sundberg 1991:173–178.

Type locality

W Sweden, Gullmaren, N Flatholmsrännan.

Material examined

One hundred and fourteen samples, 379 specimens.

Type material

LECTOTYPE: Gullmaren, N. Flatholmsrännan, coll. A. Wirén (UUM 154h); PARALECTOTYPES: Trondhjemsfjord, Röberg, 70 m, silt, stones, rocks, coll. I. Arwidsson (1 specimen, SMNH 4639); Trondhjemsfjord, Röberg, 180–150 m, 15.06.1901, coll. I. Arwidsson (1, SMNH 4640); Trondhjemsfjord, Röberg, 195–140 m, coll. I. Arwidsson (1, SMNH 4641); Trondhjemsfjord, Röberg, 70–35 m, silt, stones, 08.06.1901, coll. I. Arwidsson (3, SMNH 4642); Trondhjemsfjord, Röberg, 140–90 m, 10.06.1901 (1, SMNH 4643);



Table 4. *Laonice sarsi*. Values of strongly size-related characters for distinct intervals of width. Numbers of specimens in parentheses.

	Width (mm)						
	<0.4	0.5–0.6	0.7–0.8	0.9–1.0	1.1–1.2	1.3–1.4	>1.5
HH	16–22 (10)	24–33 (10)	27–31 (10)	23–36 (22)	32–39 (21)	31–36 (10)	30–39 (5)
QHH	4 (6)	6–8 (5)	6–8 (8)	6–12 (18)	6–12 (16)	7–12 (7)	9–13 (4)
NO	2–6 (11)	6–10 (9)	8–11 (11)	7–13 (26)	8–13 (32)	8–13 (11)	8–10 (5)
Br	0*–16 (10)	18–28 (10)	26–28 (8)	21–32 (19)	28–32 (22)	30–33 (9)	30–32 (5)
SS	10–14 (11)	16–21 (9)	17–21 (10)	18–26 (24)	20–26 (30)	20–26 (10)	22–25 (5)
GP	4–9 (10)	8–29 (9)	15–23 (8)	21–32 (22)	23–31 (27)	24–33 (9)	26–31 (5)

*Branchiae absent.

HH – Setiger with first neuropodial hooded hooks; NO – Last setiger with nuchal organ; Br – Last setiger with branchiae; SS – Setiger with first occurrence of sabre setae; GP – Setiger with first occurrence of genital pouches; QHH – Number of hooded hooks per neuropodium.

wide) consisting of 17 setigers and another fragment (from setiger 18 to 26). Prostomium longer than wide, with anterior margin broadly rounded. Prostomium fused with peristomium at anterior margin (Fig. 11A). Two pairs of eyes. Posterior pair larger and appear as transversally oriented stripes. Anterior pair small rounded dots. Occipital tentacle absent (may be lost). Caruncle following nuchal organ extending to setiger 5. Palps lost.

The only remaining branchium on setiger 3 *Ca* 2–2.5 times shorter than notopodial post-setal lamellum. Traces of branchiae clearly visible on setigers 2 and 4, but nothing clearly visible posteriorly. Post-setal lamellae of setiger 1 with pointed tips oriented upwards; notopodial lamellae lancet-shaped. Notopodial post-setal lamellae on setigers 2 and 3 standing out by size and being stretched towards one another (their tips nearly meet at mid-dorsum). Notopodial post-setal lamellae having rounded margins with small peak visible dorsally up to setiger 12; peak shifting on lateral margin of lamellum further back. Neuropodial post-setal lamellae with acute upper lateral margins up to setiger 20; rounded further back; with superior appendage after appearance of hooks. Lower parts of notopodial post-setal lamellae overlapping with upper parts of neuropodial post-setal lamellae (Fig. 11B, C). No membranous crests across dorsum. Body cylindrical in section backwards from setiger 12. Insertion of posterior parapodia gradually moving ventrally.

Genital pouches appearing after setiger 3, visible on all setigers. In every genital pouch membrane attaching to neuropodia at notably lower level anteriorly than posteriorly.

Sabre setae from setiger 12; two per fascicle. Neuropodial hooded hooks from setiger 23; up to seven per fascicle. Hooded hook bidentate in side view; but main fang surmounted by paired apical teeth (best seen using phase contrast; Fig. 11D).

Pygidium unknown.

Worms unpigmented.

Methylene green

Usually a distinct staining pattern on the tips of notopodial post-setal lamellae from setiger 4 up to 8 (tips of notopodial post-setal lamellae on setigers 2, 3 and 9 less stained). The rest of the body has a more or less diffused staining pattern.

Differential diagnosis

It is clear that the specimen belongs to a new, undescribed species. It has a short nuchal organ, and only a few short branchiae. Moreover, the occipital tentacle appears to be absent altogether and not merely lost. The specimen also has particularly well-developed notopodial post-setal lamellae on setigers 3 and 4. All listed characters are also typical for *Prionospio*, although *Prionospio* does not have such a long nuchal organ. This specimen has hooded hooks of a similar shape to those of most *Laonice*. Its prostomium fused with the peristomium at the anterior margin similar to prostomia of *L. cirrata*, *L. bahusiensis*, *L. quadridentata* Blake & Kudenov, 1978, *L. bassensis* Blake & Kudenov, 1978 and *L. brevicornis* (Kinberg, 1866). *Laonice cirrata*, *L. bahusiensis* and *L. quadridentata* have an occipital tentacle, a much longer nuchal organ, more branchiae, a different size of anterior branchiae, a different shape of post-setal lamellae and the hooded hooks. *Laonice brevicornis* has more branchiae and HH–Br = 2 (HH–Br = 17 in *L. shamrockensis*). It most resembles *L. bassensis* by the short nuchal organ and the appearance of genital pouches so close to the prostomium. But *L. bassensis* has branchiae after setiger 5 (from the original description it is not clear how many branchiae it has), an occipital tentacle, a



longer nuchal organ, a different shape of post-setal lamellae, no eyes and only one apical tooth above the main fang in hooks.

Remarks

It was decided to describe a new species based on a single specimen, as today there is little probability of obtaining supplementary material on this group from the Shamrock Canyon.

CONCLUSIONS

Eight species of the genus *Laonice* were found in the material examined from the Arctic and North Atlantic, these being *L. appelloefi*, *L. bahusiensis*, *L. blakei*, *L. cirrata*, *L. dayianum*, *L. norgensis*, *L. sarsi* and *L. shamrockensis*.

Laonice norgensis and *L. shamrockensis* are new to science.

Lectotypes of *L. bahusiensis* and *L. sarsi* are designated. *Spionides foliata*, *S. sacculata* and *L. pugettensis* are synonymized with *L. cirrata*.

For size-related characters, it seems useful to show the values of size-dependent characters for distinct width intervals of specimens. This gives more information for comparing species (see the comparison of *L. dayianum* and *L. sarsi* above) and makes the use of that character more reliable. However, a large amount of material representing different size classes is required. We only possess such information for four species (see "Remarks" for *L. bahusiensis*, *L. cirrata*, *L. sarsi* and *L. norgensis*). I have given all the measurements (the amount of material was not great) and conclusions for *L. norgensis* as this seems to be the most useful way. Values of size-dependent characters for distinct intervals of width for *L. sarsi* are given in Table 2. Similar information for *L. bahusiensis* and *L. cirrata* is available in Sikorski (2002).

Arithmetic differences between some pairs of numeric characters may often be used as independent taxonomic characters.

KEY TO THE NORTH ATLANTIC AND ARCTIC SPECIES OF *LAONICE*

- 1 Prostomium fused with peristomium at anterior margin, clearly visible in dorsal view **6**
- Prostomium not fused with peristomium at anterior margin or it is not visible in dorsal view **2**
- 2 Genital pouches always start between setigers 3 and 4 ***Laonice blakei***
- Genital pouches start after setiger 4. **3**

- 3 Large complete dorsal transverse membranes connecting bases of notopodial post-setal lamellae exist in post-branchial region ***Laonice norgensis* sp. nov.**
- No complete dorsal transverse membranes connecting bases of notopodial post-setal lamellae **4**
- 4 Occipital tentacle rudimentary. . ***Laonice dayianum***
- Occipital tentacle well developed **5**
- 5 Body widened anteriorly on 12–15 setigers; capillary setae arranged in three to four rows on several of most anterior 15–17 setigers ***Laonice appelloefi***
- Body not widened anteriorly; capillary setae arranged in two rows on anterior setigers ***Laonice sarsi***
- 6 Branchiae on setiger 3 twice as short as notopodial post-setal lamellae or even shorter. ***Laonice shamrockensis* sp. nov.**
- Branchiae on setiger 3 longer (more or less similar to notopodial post-setal lamellae in length) **7**
- 7 Complete dorsal transverse membranes connecting bases of notopodial post-setal lamellae in last branchiate and several following segments. Hooded hook with two apical teeth in lateral view ***Laonice bahusiensis***
- No complete dorsal transverse membranes connecting bases of notopodial post-setal lamellae in very last branchiate and several following segments. Hooded hook with one apical tooth in lateral view ***Laonice cirrata***

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