

New arctic species of *Scolelepis* (Polychaeta, Spionidae)

Andrew V. SIKORSKI

Zoological Museum of the Moscow Lomonosov State University
Herzen Street 6, K-9, Moscow 103009, Russia.

ABSTRACT

Three new species of *Scolelepis* were present in the Russian collections from the Arctic Ocean and the border areas *S. matsugae*, *S. burkovskii* and *S. korsuni*. All these are from the Barents Sea. *S. korsuni* is known also from the northern part of the North Sea, and *S. matsugae* from the Kara Sea and Franz-Josef Land. There are no other species of *Scolelepis* in the Russian arctic zoological collections. The diagnostic characters for *S. korsuni* are: presence of superior flag-like process in middle dorsal lamellae, absence of setae in first notopodiae, shape of hooks and their number; for *S. matsugae*: shape of prostomium, shape of hooks, setiger of hooks starting and pattern of branchiae decreasing. *S. burkovskii* separated by complex of characters. Five species with *S. squamatus* (O.F. Müller, 1806) and *S. foliosus* (Audouin & Milne Edwards, 1833) are now known from the Arctic Ocean and the border areas.

RÉSUMÉ

Nouvelles espèces arctiques du genre *Scolelepis* (Polychètes, Spionidae)

Trois nouvelles espèces de *Scolelepis* ont été trouvées dans les collections russes de l'océan Arctique et des mers polaires : *S. matsugae*, *S. burkovskii* et *S. korsuni*. Ces trois espèces proviennent de la mer de Barents. *S. korsuni* est aussi présente dans la partie nord de la mer du Nord, et *S. matsugae* dans la mer de Kara et près de la Terre François-Joseph. Les caractères distinctifs de *S. korsuni* sont les suivants : la présence d'expansion en forme de drapeau au milieu de la lamelle dorsale, l'absence de soies dans les premiers notopodes, la forme et le nombre des crochets ; ceux de *S. matsugae* sont : la forme du prostomium et des crochets, le niveau d'apparition du premier sétigère avec des crochets et la forme de la branchie. *S. burkovskii* a été séparée des autres espèces par plusieurs caractères. Cinq espèces, y compris *S. squamatus* (O.F. Müller, 1806) et *S. foliosus* (Audouin & Milne Edwards, 1833), sont maintenant connues dans l'océan Arctique.

INTRODUCTION

Only two species of *Scolelepis* de Blainville, 1828, *S. squamatus* (O.F. Müller, 1806) and *S. foliosus* (Audouin & Milne Edwards, 1833), are known from the Arctic Ocean and the border areas. The former has been recorded off Iceland (WESENBERG-LUND, 1951) and from the Norwegian Sea (HARTMANN-SCHRÖDER, 1971);

the latter species is known from the Norwegian coast to Finmark (SARS, 1851, 1873). An examination of all Russian collections from the area (about 2,500 samples) revealed an additional three new species from the Barents Sea (with the Franz-Josef Land) and the Kara Sea.

MATERIAL

Specimens described in this paper are deposited in Zoological Museum, Moscow Lomonosov State University (ZMUM), Zoological Institution of St. Petersburg (ZIN), Zoological Museum, University of Copenhagen (ZMUC), Muséum National d'Histoire Naturelle of Paris (MNHN) and the reference collection of Akvaplan-niva (AKV), consulting firm, Tromsø, Norway.

SYSTEMATICS

Scoelepis de Blainville, 1828

DIAGNOSIS. — Prostomium anteriorly pointed or bluntly rounded, extending posteriorly as a narrow caruncle. Occipital crest generally well developed, sometimes forming occipital tentacle; 0-2 pairs of eyes. Peristomium generally not fused with setiger 1, lateral wings variously developed. Neuropodial hooded hooks present, notopodial hooded hooks present or absent; secondary hoods sometimes present. Sabre setae absent. Flattened branchiae from setiger 2 on anterior half of body, sometimes continuing to posterior end. Anterior branchiae completely or mostly fused with dorsal lamellae. Dorsal nuchal organ (according to SÖDERSTRÖM, 1920) restricted to small areas on either side of posterior caruncle. Anus terminal or dorsal. Pygidium with ventral cushion (incised or entire), oval or multilobed membrane. Dark pigmentation resistant to alcohol, occurs primarily on the prostomium and pygidium.

I agree with the point supported by BLAKE & KUDENOV (1978) and MACIOLEK (1987) that many exceptions occur with the set of characters making the separation of the genera *Scoelepis* de Blainville, 1828 and *Nerinides* Mesnil, 1896 unfeasible at this time.

Separation of subgenus *Parascoelepis* proposed by MACIOLEK (1987) seems interesting, but I am not sure if it is possible in *Scoelepis*-genus to use the shape of hooded hooks for separating taxa above species. We can see gradations in the genus between the falciger-like type of hooks with 0-3 short apical teeth for subgenus *Scoelepis* and sharp-fanged, multidentate hooks for subgenus *Parascoelepis*. Moreover, there are many species in the genus showing both individual and size variation of the shape of hooded hooks. I think that more useful character might be the presence of a sheath at the base of the palps, but I do not have complete information for all species. I do not separate these two subgenera herein.

Scoelepis korsuni sp.nov.

? *Nerinides tridentata* — HANNERZ, 1956: 9-11, Fig.1(a-c). — KIRKEGAARD, 1969: 79, Fig. 42.

MATERIAL EXAMINED. — North Sea. coll. AKV for Elf Aquitaine: stn 4-1 (LILLE FRIGG II), 59°57'42"N, 2°23'44"E, 108 m, 11.V.1992: holotype (ZMUC). Forty samples (LILLE FRIGG II), from 59°56' to 60°01'30"N, from 2°20' to 2°25'45"E, 95-111 m, 7-11.V.1992: 78 paratypes (ZMUM PI 1/883-6/888, 8/890-13/895, 15/897-24/906, 25/910-45/930; ZIN 1/48517, 2/48518 - two specimens; five specimens in AKV; one specimen in MNHN). Ten samples (NØ FRIGG), from 59°57'40" to 60°01'30"N, from 2°12' to 2°23'30"E, 95-110 m, 13-14 and 17-18.V.1992: 10 paratypes (ZMUM PI 47/932-51/936; five specimens in AKV). five samples (HEIMDAL), from 59°34' to 59°36"N, from 2°11'40" to 2°14'15"E, 114-116 m, 15-17.V.1992: five paratypes (ZMUM PI 7/889, 14/896, 46/931; two specimens in AKV). Barents Sea. R/V "Tunets": stn 105.20, 73°01'N, 22°00'E, 440-450 m, silt, 1.16°C, 4.VII.1978: one paratype (ZMUM PI 52/824).

DESCRIPTION. — Holotype complete, 1.2 mm wide and 13.2 mm long, 46 setigers, without palps. Fig. 1a-h.

The smallest specimen (ZMUM PI 899), 0.6 mm wide and 6.6 mm long for 34 setigers. The longest complete specimens (ZMUM PI 882, 886, 901), 1-1.2 mm wide and 11-13 mm long for 40-46 setigers. The longest incomplete specimen (ZMUM PI 900), 1.6 mm wide and 21 mm long for 51 setigers. The largest

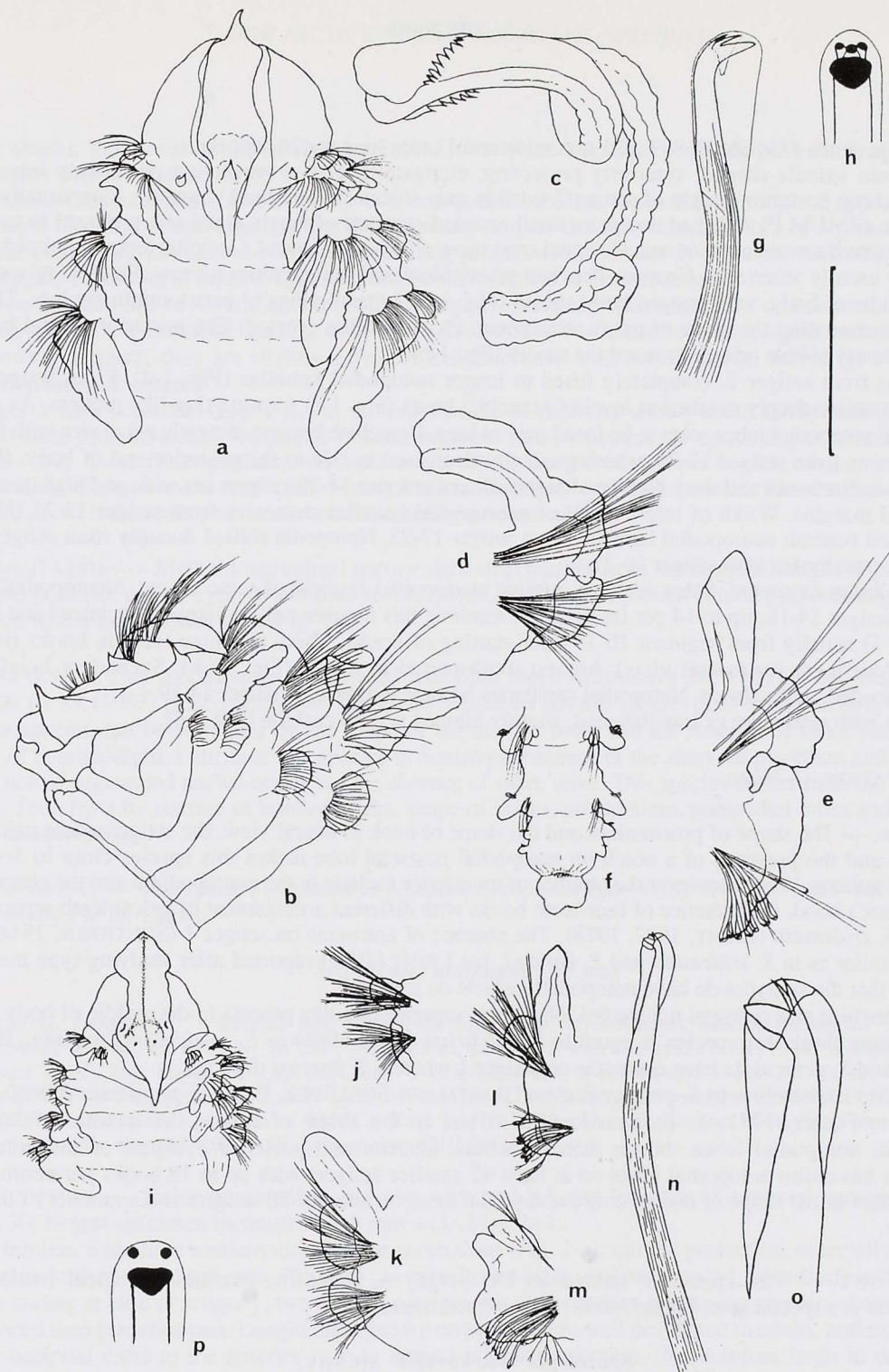


FIG. 1. — *Scolelepis korsuni* sp. nov.: a, anterior end through first 4 setigers, in dorsal view (palps missing). - b, same anterior end, in lateral view. - c, palp. - d, parapodium of setiger 8. - e, parapodium of setiger 19. - f, pygidium. - g, a hooded hook of parapodium 21 (in lateral view). - h, distal end of same seta (in frontal view - scheme). — *Scolelepis burkovskii* sp. nov.: i, anterior end through first 4 setigers, in dorsal view (palps missing). - j, first parapodium. - k, seventh parapodium. - l, parapodium 17. - m, a posterior, or second last, parapodium. - n, a hooded hook from parapodium 18, in frontal-lateral view. - o, distal end of same seta. - p, distal end of same seta (in frontal view - scheme). Scale: a-b, 1 mm; c, f, 1.4 mm; d, 0.6 mm; e, 0.4 mm; g, 0.06 mm; i, 0.56 mm; j-m, 0.28 mm; n, 0.044 mm; o, 0.017 mm.

incomplete specimen (ZMUM PI 889), 2.1 mm wide and 11 mm long for 26 setigers.

Prostomium spindle-shaped, anteriorly projecting, elongate (Fig. 1-a) narrowing posteriorly into pointed caruncle reaching posterior margin of setiger 2 (visible only if stained with methyl green). Eyes usually absent; one specimen (ZMUM PI 932) had two pairs small rounded eyespots of nearly equal size arranged in transverse line slightly curved toward anterior end. Occipital crest more or less pronounced. Occipital tentacle pointed, erected and oriented usually anteriorly. Grooves between prostomium and peristomium narrow. Palps long sometimes reaching middle of body, with cogged basal sheath (Fig. 1-c). Lateral wings of peristomium are low. There are small folds surrounding the place of palp's attachment. Pharynx often eversed. The posterior ventral border of setiger 1 is clearly visible oriented toward the mouth (Fig. 1-b).

Branchiae from setiger 2, completely fused to longer notopodial lamellae (Fig. 1-d). From setiger 14-19 notopodial lamellae deeply notched at level of branchial bases (Fig. 1-e) forming flag-like process. As a result, branchiae and notopodial lobes seem to be fused only at base. Branchiae became of nearly equal size with postsetal notopodial lobes from setiger 17-28, which gradually decreased in size to the posterior end of body. Posterior notopodial lamellae small and oval. Neuropodial lamellae of anterior 14-20 setigers are wide and high, rectangular with rounded margins. Width of inferior half of neuropodial lamellae decreases from setiger 15-21 (Fig. 1-e). Hooks situated beneath neuropodial lamellae from setiger 17-23. Notopodia shifted dorsally from setiger 16-28. Segments become longer after setiger 16-21.

Setiger 1 lacks notosetae. Sabre setae or inferior neuropodial fascicle of setae absent. Neuropodial hooded hooks from setiger 14-18; up to 14 per fascicle, but reaching this number only in largest specimens and in a few segments (1-3) usually from segment 10-15 after starting of hooks. There are three teeth in hooks (in lateral view), and four teeth (in frontal view); highest tooth paired as a rule (Fig. 1g-h). Secondary hood absent. Notopodial hooded hooks absent. Notopodial capillaries become longer after setiger 14-19.

Pygidium with oval more or less flattened, slightly bilobed ventral cushion (Fig. 1-f).

PIGMENTATION. — None.

REMARKS. — The shape of prostomium and the shape of hook in lateral view, the setiger where neuropodial hooks begin and the presence of a notch on notopodial postsetal lobe makes this species close to *Scolelepis tridentata* (Southern, 1914). However the absence of an inferior fascicle in the neuropodium and the characteristic outline of hook's hood, the presence of four-teeth hooks with different arrangement of apical teeth separated this taxon from *S. tridentata* (LIGHT, 1977, 1978). The absence of notosetae on setiger 1 (SOUTHERN, 1914) would have been similar as in *S. tridentata* and *S. korsuni*, but LIGHT (1978) reported after studying type material of *S. tridentata* that the syntypes do have notopodial fascicle on setiger 1.

Fused branchiae and postsetal notopodial lobes form superior flag-like process in the middle of body so some researchers may think this species is equal to *S. gilchristi* (DAY, 1961) or *S. geniculata* Imajima, 1992, but *S. gilchristi* and *S. geniculata* have notosetae on setiger 1 whereas *S. korsuni* does not.

This species is also close to *S. quinquedentata* (HARTMANN-SCHRÖDER, 1965), *S. papillosus* (OKUDA, 1937) and *S. texana* Foster, 1971. *S. quinquedentata* differs in the shape of hooks, the number of hooks per neuropodium, notopodial lobes shorter than branchiae, anterior and posterior eyespots of different shape. *S. papillosus* has entire notopodial lobes on at least 42 anterior setigers with up to 18 hooks per neuropodium. *S. texana* differs in the shape of hooks, entire notopodial lobes on anterior 30 setigers and a number of hooks per neuropodium.

ETYMOLOGY. — This species is named for Dr. Sergey A. KORSUN, Marine Biological Institution of Murmansk. He is a specialist on Foraminifera and my good friend.

Scolelepis burkovskii sp.nov.

MATERIAL EXAMINED. — Barents Sea. R/V "Pomor": stn 17.5b, 69°08'N, 50°22'E, 19 m, sand, 4.30°C, 16.VII.1985, grab 1: holotype (ZMUM PI 821) and three paratypes (ZMUM PI 822); grab 2: two paratypes (ZMUM PL 823 and ZMUC).

DESCRIPTION. — Maximum length - 8-9 mm; maximum width - 0,6 mm. The single complete specimen had 50 setigers. Figs 1 i-p.

Prostomium anteriorly pointed with an approximately right angle (Fig. 1-i). Caruncle narrow and pointed, extending posteriorly to the middle of setiger 2. Two pairs of eyespots. Occipital crest not pronounced. Occipital

tentacle absent. Palps without basal sheath (present in only the holotype) reaching posteriorly to setiger 6-7. Peristomium without lateral wings.

Branchiae flattened, partly fused basally with notopodial lamellae. Branchiae of setiger 2 approximately 1.5 times longer than notopodial lamellae. On the following setigers the ratio increases to 2 or 3 times (Figs 1 k-l). Branchiae continuing throughout body, but becoming progressively smaller in posterior third of body with the upper margins becoming of equal length with notopodial lamellae in the last setigers.

Notopodial lamellae of several anterior setigers slightly elongated becoming more or less semicircular in the following setigers. Neuropodial lamellae of setiger 1 small and low lamellae becoming higher and semicircular in the following setigers; they are slightly asymmetrical anteriorly with a wide dorsal half (Fig. 1-j). Notch on neuropodial lamellae absent.

Setiger 1 with notosetae (Fig. 1-j). An inferior fascicle of capillary setae present in the neuropodium in all setigers (sabre setae absent). Notopodial fascicle becomes narrow posteriorly consisting of a small number of capillaries (Fig. 1-m). Neuropodial hooks from setiger 17-19, numbering 6-8 per fascicle; hooks tridentate with pair of widely arranged apical teeth surmounting main tooth (Figs 1 o-p). Notopodial hooks absent.

Pygidium with the scalloped membrane surrounding terminal anus.

PIGMENTATION. — Medial longitudinal narrow dark strip present from the anterior margin of prostomium to behind the posterior pair of eyes. In addition, several small spots may be present behind eyes forming 2 dark fields connected with a longitudinal strip (Fig. 1-i).

REMARKS. — This species may be confused with *Spio theeli* (SÖDERSTRÖM, 1920) in habiting in the same area. MACIOLEK (1987) placed *Microspio theeli* into *Scolecopsis* but this species does belong to *Spio*-genus group. The new species can be separated by the shape of the hooded hook and the absence of sabre setae in inferior fascicle of neuropodium. I attribute this species to *Scolecopsis* because of the shape of pygidium and prostomium, the absence of segmented nuchal organ and the absence of sabre setae. This species differs from the other species of genus *Scolecopsis* by starting of hooded hooks, shape of hooks, prostomium, parapodial lobes and composition of setae in neuropodia.

ETYMOLOGY. — The species is named in honour of Professor Igor V. BURKOVSKI who was my principal advisor of my Ph. D. Thesis.

Scolecopsis matsugae sp.nov.

MATERIAL EXAMINED. — Barents Sea. Drozdovka Inlet. Exp. of Murmansk Marine Biological Institution, coll. A.V.SIKORSKI: stn P1, 68°18'20"N, 38°25'E, grab, 7.5 m, sandy silt with detritus, 17.VIII.1984: holotype (ZMUM Pl 818). Franz Josef Land. Hayes Isl. Exp. ZIN, coll. V.G.AVERINTSEV & A.F.PUSHKIN: stns 22, 40, 43, 44, 54, 73, 83; 80°35'N, 57°50'E, 3-7 m, silt and in *Alaria esculenta* on stones, X-XII.1981: 10 paratypes (ZMUM Pl 819 and Pl 820; ZIN 2/47388-8/47394; one specimen in ZMUC). Kara Sea. R/V "Zarja", coll. Russian Polar Exp.: stn 12d, 74°28'N, 83°33'E, 52 m, thin clay, 19.VIII.1900: one paratype (ZIN 1/47387).

DESCRIPTION. — Holotype complete, 1.7 mm wide and 9.5 mm long for 48 setigers; maximal number of setigers 50; largest specimen incomplete, 2.8 mm wide. Figs 2a-k.

Prostomium with three semicircular anterior projections (Fig. 2-a); middle projection, especially in juveniles, less prominent than the lateral ones (Fig. 2-c); occipital crest high, well pronounced, posteriorly ending abruptly; caruncle ending at base of setiger 1; two pairs of eyes present, with anterior pair larger, crescent-shaped and further apart spaced than posterior pair. Longitudinal groove on prostomium well developed in adults, and extend from the base of occipital crest to the anterior margin around middle projection. Peristomium large in comparison to prostomium, high, laterally inflated. Pharynx often more or less eversed, resulting in anterior margin of prostomium being abruptly turned dorsally. Peristomium distinct from setiger 1, lateral wings lacking; palps thick, long, without basal sheath extending posteriorly to setiger 14.

Setiger 1 without notosetae but with notopodial lamellae. Branchiae flattened, fused entirely to wide Setiger 1 without notosetae but with notopodial lamellae. Branchiae flattened, fused entirely to wide notopodial lamellae. Branchiae of setiger 2 are well developed, long and only 1.5 times shorter than longest one on setiger 14 or 15; fused branchiae and notopodial lamellae abruptly diminished on setiger 22-29, becoming low, semicircular and not changing in shape and size posteriorly.

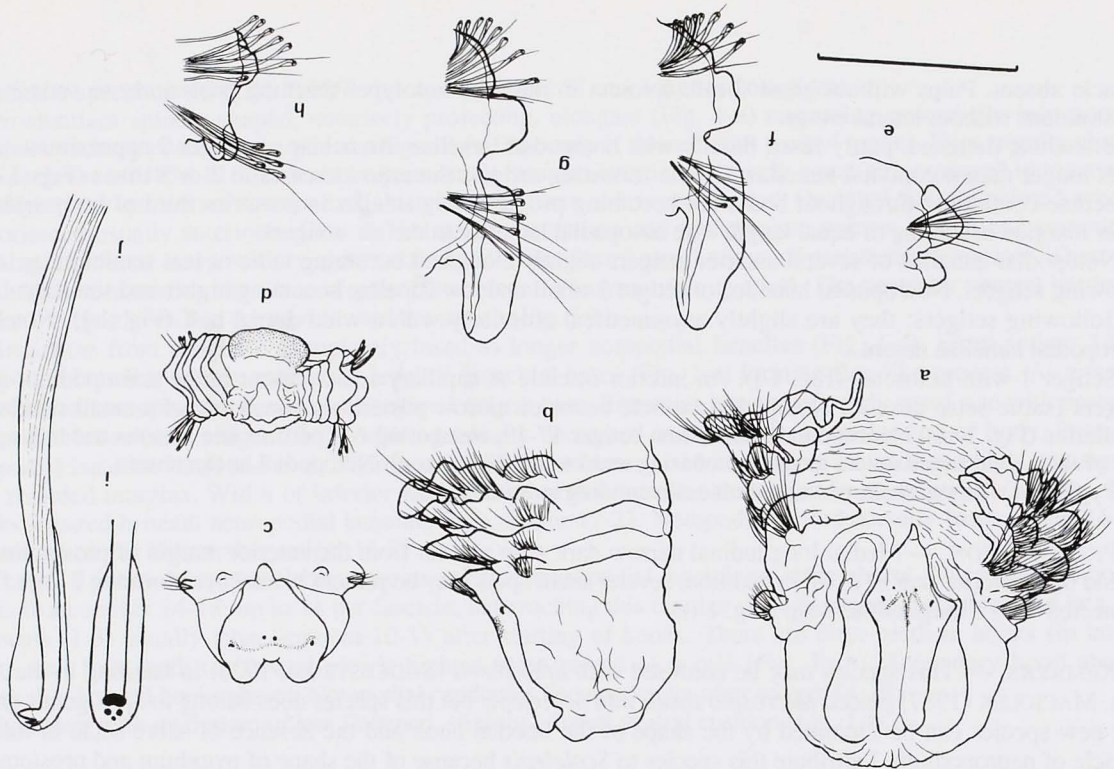


FIG. 2. — *Scolelepis matsugae* sp. nov.: a, anterior end through first four setigers, in dorsal view (palps missing). b, same anterior end, in lateral view. c, anterior end of juvenile specimen, in dorsal view. d, pygidium. e, first parapodium. f, parapodium 23. g, parapodium 25. h, parapodium 36. i, distal end of a hooded hook (in frontal view scheme). - j, a hooded hook from parapodium 25, in lateral view. Scale: a and b, 1 mm; c, 0.3 mm; d, 0.8 mm; e-h, 0.5 mm; j, 0.035 mm.

Neuropodial postsetal lamellae of anterior setigers irregularly rounded, with notch starting from setiger 16-18; ventral parts of neuropodial postsetal lamellae on following segments reduced, resembling narrow membrane and absent on posterior setigers. Almost all neuropodial fascicles of anterior half of body shorter than the upper part of neuropodial postsetal lamellae. Superior notopodial capillares of anterior setigers longest. Sabre setae or inferior fascicle of neuropodium absent. Neuropodial hooks present from setiger 11-22, numbering up to 9 per fascicle. Only young specimens (≤ 0.5 mm width) have hooks from setiger 11-13. Shedding of hooks connected with age confirmed by presence of one hook in neuropodium 14 of holotype; the next neuropodium with hooks in the holotype was in setiger 17. Notopodial hooded hooks begin at setigers 13-26, numbering up to 5 per fascicle. Hooks are tridentate in side view, but in frontal view main tooth clearly surmounted by pair of apical teeth and a single, unpaired (Figs 2 i-j).

Anus terminal, sometimes slightly displaced to dorsum (Fig. 2h). Pygidium with ventral transverse cushion.

PIGMENTATION. — A slight dark stripe present along posterior part of longitudinal groove on prostomium with two dispersing stripes in front of eyes (Fig. 2-a). One juvenile specimen with transverse dark stripes behind anterior pair of eyes (Fig. 2-c). Proximal part of eversed pharynx usually with dark ring. One specimen with pigment on tip of notopodial postsetal lamellae on setiger 3. Anal cushion pigmented. Palps with diffused pigment.

REMARKS. — This species resembles *Scolelepis oligobranchus* (CHLEBOVITSCH, 1959). However, *S. matsugae* differs from *S. oligobranchus* in its smaller size, fused branchiae and notopodial postsetal lamellae reduced more anteriorly, absence of an inferior fascicle of neuropodium, shape of pygidium and shape of hooks. Hooks of *S. oligobranchus* are bifid in side view but their apical tooth paired; it had not been mentioned in original description but it is clearly visible in the holotype.

ETYMOLOGY. — The species is named for my mother Nina Pavlovna SIKORSKA. Her maiden name was MATSUGA.

There are now five valid species of genus *Scolelepis* known from the Arctic Ocean.

Key to species of *Scolelepis* from the Arctic Ocean

- | | | |
|---|---|----------------------|
| 1 | Prostomium pointed anteriorly | 2 |
| | Prostomium rounded or trifold anteriorly | 4 |
| 2 | Anterior branchiae completely fused to dorsal lamellae;
setiger 1 without notosetae | <i>S. korsuni</i> |
| | Anterior branchiae free distally; setiger 1 with notosetae..... | 3 |
| 3 | Neuropodial hooks from setiger 17-19; ventral lamellae without notch;
notopodial hooded hooks absent | <i>S. burkovskii</i> |
| | Neuropodial hooks from setiger 26-42; ventral lamellae with
a notch after setiger 18-20; notopodial hooks from setiger 60-75 | <i>S. squamatus</i> |
| 4 | Neuropodial hooks from setiger 11-22; branchiae become
very short abruptly on setiger 22-29 | <i>S. matsugae</i> |
| | Neuropodial hooks from setiger 50-67; branchiae diminish gradually
becoming very short near end of body | <i>S. foliosus</i> |

ACKNOWLEDGEMENTS

I would like to thank Drs. I.A. JIRKOV, M.A. SAFRONOVA, A.B. TZETLIN for reviewing the manuscript ; M.V. KOLESNIKOV, A.K. KARAMYSHEV, Drs. V.G. AVERINTSEV, A.F. PUSHKIN, N.A. ANISIMOVA, the consulting firm Akvaplan-niva and Elf Aquitaine Norge AS for helping in collectioning the specimens. I am especially grateful to the referees of the manuscript for their critical review and to Dr. M.E. PETERSEN for valuable advise.

REFERENCES

- BLAKE, J.A. & KUDENOV, J.D., 1978. — The Spionidae (Polychaeta) from southeastern Australia and adjacent areas with a revision of the genera. *Mem. Nat. Mus. Victoria*, **39** : 171-280.
- BLAINVILLE, H. de, 1828. — *Dictionnaire des Sciences naturelles*. **57** : 368-501.
- CHLEBOVITSCH, V.V., 1959. — Species of polychaete worms from the Kuril Islands, which are new or recorded for the first time on the USSR (Leningrad). *Zool. Zh.*, **38** : 167-181 (in Russian).
- DAY, J.H., 1961. — The polychaete fauna of South Africa. Part 6. Sedentary species dredged off Cape coasts with a few new records from the shore. *J. Linn. Soc. Zool.*, **44** : 463-560.
- FOSTER, N.M., 1971. — Spionidae (Polychaeta) of the Gulf of Mexico and the Caribbean Sea. *Stud. Fauna Curaçao*, **36** : 1-183.
- HANNERZ, L., 1956. — Larval development of the polychaete families Spionidae Sars, Disomidae Mesnil, and Poecilochaetidae n. fam. in the Gullmar Fjord (Sweden). *Zool. Bidr. Uppsala*, **31** : 1-204.
- HARTMANN-SCHRÖDER, G., 1965. — Die Polychaeten des Sublitorals. In : G. HARTMANN-SCHRÖDER & G. HARTMANN (eds.), Zur Kenntnis des Eulittorals der chilenischen Küste unter besonderer Berücksichtigung der Polychaeten und Ostracoden. *Mitt. hamb. zool. Mus. Inst.*, Suppl. **62** : 59-305.
- HARTMANN-SCHRÖDER, G., 1971. — Annelida, Borstenwürmer, Polychaeta. *Die Tierwelt Deutschlands*, **58** : 1-594.
- IMAJIMA, M., 1992. — Spionidae (Annelida, Polychaeta) from Japan VIII. The genus *Scolelepis*. *Bull. Natn. Sci. Mus. Tokyo*, Ser.A, **18** : 1-34.
- KIRKEGAARD, J.B., 1969. — A quantitative investigation of the central North Sea. *Spolia*, **29** : 8-285.

- LIGHT, W.J., 1977. — Spionidae (Polychaeta; Annelida) from San Francisco Bay, California: a revised list with nomenclatural changes, new records, and comments on related species from the northeastern Pacific Ocean. *Proc. Biol. Soc. Wash.*, **90** : 66-88.
- LIGHT, W.J., 1978. — *Spionidae (Polychaeta; Annelida)*. Invertebrates of the San Francisco Bay Estuary System, Pacific Grove, California, 211 pp.
- MACIOLEK, N.J., 1987. — New species and records of *Scolecopsis* (Polychaeta: Spionidae) from the east coast of North America, with a review of the subgenera. *Bull. Biol. Soc. Wash.*, **7** : 16-40.
- MESNIL, F., 1896. — Études de morphologie externe chez les Annélides. Les Spionidiens des côtes de la Manche. *Bull. Sci. France Belg.*, sér.4., **29** : 110-287.
- OKUDA, S., 1937. — Spioniform polychaetes from Japan. *J. Fac. Sci. Hokkaido Univ.*, Ser. 6, Zool **5** : 217-254.
- SARS, M., 1851. — Beretning om en i Sommeren 1849 foretagen zoologisk Reise i Lofoten og Finmarken. *Nyt Mag. Naturv. Oslo*, **6** : 121-211.
- SARS, M., 1873. — Bidrag til Kundskaben om Norges Annelider. *Vidensk. Selsk. Christiania, Forh.* : 1-51.
- SÖDERSTRÖM, A., 1920. — *Studien über die Polychäten-familie Spionidae*. Dissertation, Uppsala, 286 pp.
- SOUTHERN, R., 1914. — Archiannelida and Polychaeta. *Roy. Irish Acad. Dublin.*, **31** : 1-160.
- WESENBERG-LUND, E., 1951. — Polychaeta. *Zoology Iceland*, **2** : 1-182.