

A new Species of *Ophryotrocha* (Polychaeta, Dorvilleidae) associated with Ice Scours in the Canadian Arctic Archipelago

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ABSTRACT

Ophryotrocha spatula sp. n. is described from ice scours off Cornwallis Island in the Canadian Arctic Archipelago. This species resembles *O. scarlatoi* Averincev, 1989 in having the last 5-12 setigers laterally prolonged into a broad, lobulate flange but differs from this species in the structure of the jaw apparatus and setae and in possessing ventral parapodial cirri and a median anal cirrus.

RÉSUMÉ

Une nouvelle espèce d'*Ophryotrocha* (Polychète, Dorvilleidae) associée aux sillons d'icebergs dans l'Archipel arctique canadien

Le polychète *Ophryotrocha spatula* sp. n. en provenance de sillons d'icebergs près de Cornwallis Island dans l'Archipel arctique canadien est décrit. Cette espèce ressemble à *O. scarlatoi* Averincev 1989, par ses bords dorsaux des 5-12 sétigères postérieurs élargis en forme de lobe membraneux, mais elle s'en distingue par les soies, la forme des mâchoires, et la présence de cirres ventraux parapodiaux et un cirre médian anal.

INTRODUCTION

A joint Canadian/United States team has been studying scour formations caused by grounded multi-year ice off the coast of Cornwallis Island, Northwest Territories in the Canadian Arctic Archipelago (Queen Elizabeth Islands). Icescouring is probably the most disruptive and widespread physical disturbance to marine bottom communities in polar waters. In the Arctic, pressure ridges of ice scour the sea floor to depths of 60 m and larger icebergs ground as deep as 750 m (LEWIS & BLASCO, 1990). The team has been investigating the

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benthic population and community responses to ice scour, documenting the successional stages of biotic recovery in order to determine whether widespread patterns of zonation and larger spatial and temporal community mosaics are correlated to the disturbance.

An undescribed dorvilleid of the genus *Ophryotrocha* was among the most abundant polychaete species and showed a strong positive association with the disturbed sediments of the ice scours and berms. Mature specimens of this species have the dorsal surface of the last 5-9 segments laterally prolonged into a lobulated spoon-shaped flange. The species resembles *Ophryotrocha scalatoi* Averincev, 1989 from Franz-Joseph Land and Norway (OUG, pers. comm.) but differs in details of jaw dentition and the presence of ventral parapodial cirri, most noticeable in the posterior segments.

METHODS

Samples were collected by Hunter S. LENIHAN and Kathleen E. CONLAN using diver-operated hand cores pressed into the sediment. Six cores were collected from locations inside and outside each scour and from the scour berm itself for a total of 18 samples from each of four scours. The 72 samples yielded a total of 551 specimens of the new species.

Samples were screened through a 0.5 mm mesh, fixed in 4 % formaldehyde solution and later transferred to 70 % ethanol. Final sorting was done in the laboratory under a dissection microscope. Specimens were examined under dissection and phase-contrast compound microscopes. Drawings were done with a drawing tube. Ocular micrometers in both compound and dissecting microscopes were used for measurements. Body width measurements do not include parapodia.

DESCRIPTION OF COLLECTION SITES

Ice Scour 1 : Cape Martyr, Cornwallis Island, 74°41' N, 95°06' W, depth 15 m; outside scour (one specimen), scour berm (18 specimens), inside scour (27 specimens) sampled 31 July 1991. Outside of scour had gravel/cobble substrate over silt, little *Laminaria* cover, exposed to frequent strong currents. Scour was perpendicular to shoreline, 3-4 m wide, 1.5-2 m deep into sediment, more than 40 m long, estimated age less than one year, probably produced during spring breakup of ice. Sediment inside scour loose and very soft, 4-5 cm oxic layer covering grey anoxic zone. Scour berm with 7-8 mm oxic layer covering sediment. Epifauna outside scour comprised very abundant echinoderms (ophiuroids, echinoids, asteroids, holothuroids), bivalves (*Mya truncata* L., *Serripes groenlandicus* (Bruguère), *Astarte borealis* (Schumacher)) and soft corals (*Gersemia* sp.).

Ice Scour 2: Assistance Bay, Cornwallis Island, 74°39' N, 94°18' W, depth 7 m; outside (31 specimens), scour berm (157 specimens) and inside (94 specimens) sampled 2 August 1991. Scour parallel to shore line in semi-protected bay, well flushed by strong currents and river flow. Scour estimated to have formed within previous 24 hours, about 6 m wide, 0.5 m deep and over 50 m long. Scour bottom hard with very little loose sediment over large cobbles. Scour berm 5-10 cm high with stones and cobble. No epifauna visible within scour.

Ice Scour 3 : Resolute Bay, Cornwallis Island, 74°41' N, 94°50' W, depth 10 m; outside scour (zero specimens) sampled August 4, 1991, scour berm (125 specimens) and inside (44 specimens) 8 August 1991. Circular "crater" in area of 40-60 % *Laminaria* cover, estimated to have formed in previous 48 hours, more than 25 m in diameter, 0.25 m deep to hardpan. Berm 2-2.5 m high.

Ice Scour 4: Resolute Bay, Cornwallis Island, 74°41' N, 94°50' W, depth 7 m; outside (1 specimen) scour berm (51 specimens), and inside (two specimens), 8 August 1991. Scour estimated to have formed within previous 48 hours, about 30 m long, 3 m wide, cut to hardpan, 0.25 m deep. Berm about 1 m high, loose sediment with stones and gravel. Pockets of anoxic sediment along length of trough. Only a few *Buccinum* sp. seen within scour, *Mya* spp. and *Macoma* spp. on berm.

Resolute Bay is protected by a sill at the entrance. Bottom was fine sediment and cobble, about 20 cm deep, over a hardpan base that prevented bivalves such as *Mya* spp. and *Serripes groenlandicus* from burrowing deeper. Scours 3 and 4 were in the central part of the bay, close to shore, in an area of dense *Laminaria* cover.

SYSTEMATICS

Ophryotrocha spatula n. sp.

MATERIAL EXAMINED. — Holotype: CMNA1993-0046, mature specimen, 3.7 mm long, 0.5 mm wide anteriorly, flange 0.8 mm across at widest point. Type Locality: Assistance Bay, Cornwallis Island, Ice Scour 2, Core 2, scour berm, 7 m depth, collected 2 August 1991.

Paratypes: CMNA1992-0158, 79 specimens, remainder of sample from scour berm, core 2, Ice Scour 2, Assistance Bay, Cornwallis Island.

An additional 471 specimens have been found in the rest of the samples (Table 1).

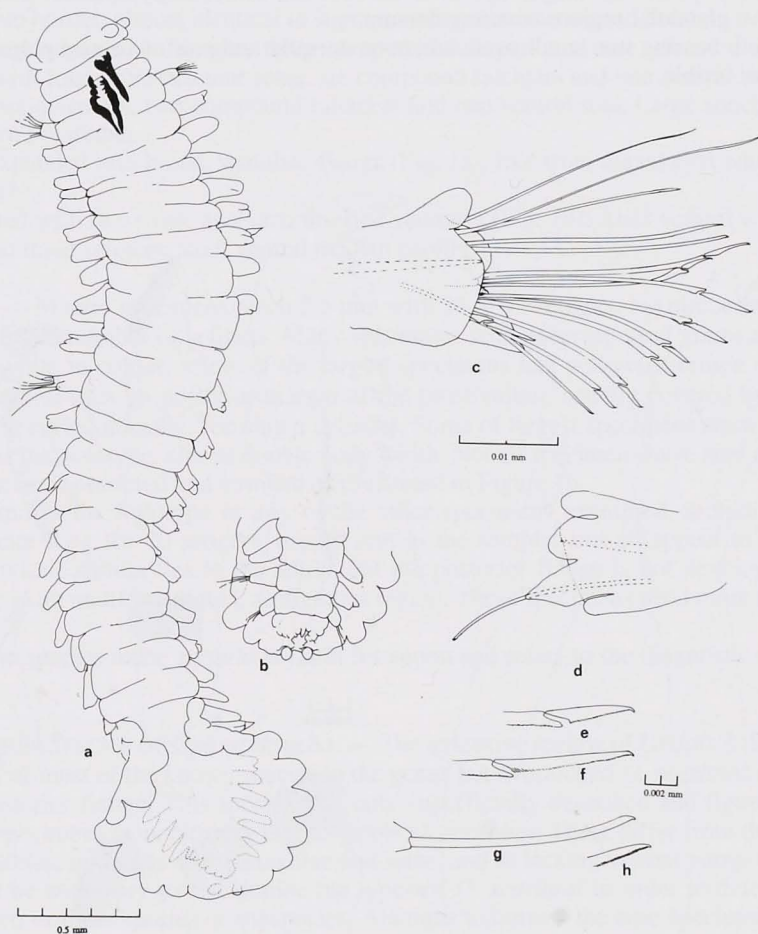


FIG. 1. — a. *Ophryotrocha spatula* sp. n., dorsal view, holotype, most setae omitted. b. Paratype, ventral view, posterior. c. Paratype, anterior view of median parapodium. d. Posterior view of posterior parapodium, setae omitted except for ventral simple seta. e, f. Long and short blades of compound falcigers. g. Ventral simple seta. h. Tip of simple seta.

SPECIES DIAGNOSIS. — Medium-sized *Ophryotrocha*, 3.7 to 5.5 mm long for 25-43 setigers, anterior body width about 0.5 mm, dorsum of posterior 5-12 segments laterally expanded into a lobulate flange (Fig. 1a). Prostomium with 1 pair each palps and antennae, ovate. Single pair of small eyes usually visible on posterior margin of prostomium. Jaw apparatus (Fig. 2) darkly sclerotized, mandibles rod-like with toothed, bifid anterior margin, forceps P-type, inner edge with one row of about 10 large teeth interspersed with smaller ones and secondary ridge with many fine teeth. Free denticles seven pairs in two groups. Parapodia with both dorsal and ventral cirri, former difficult to discern in anterior parapodia. Supra-acicular setae simple unidentate blades with very finely serrated edges. Sub-acicular setae compound, unidentate blades with very finely serrated edges, varying in length by factor of two. Pygidium flattened, anal cirri ovate, inserted ventrally. Anus ventral or terminal depending on state of dilation, bearing mid-ventral papilla.

DESCRIPTION OF HOLOTYPE. — Holotype (Fig. 1a) 3.7 mm long for 32 setigers, body width 0.5 mm anteriorly, 0.8 mm at widest point of posterior flange. Colour in alcohol off-white. Body sparsely ciliated but setigerous segments have extensive glandular regions covering dorsum.

Prostomium rounded, bearing two small ovate antennae dorsally and pair of ventral palps almost identical in size and shape. Eyes not visible.

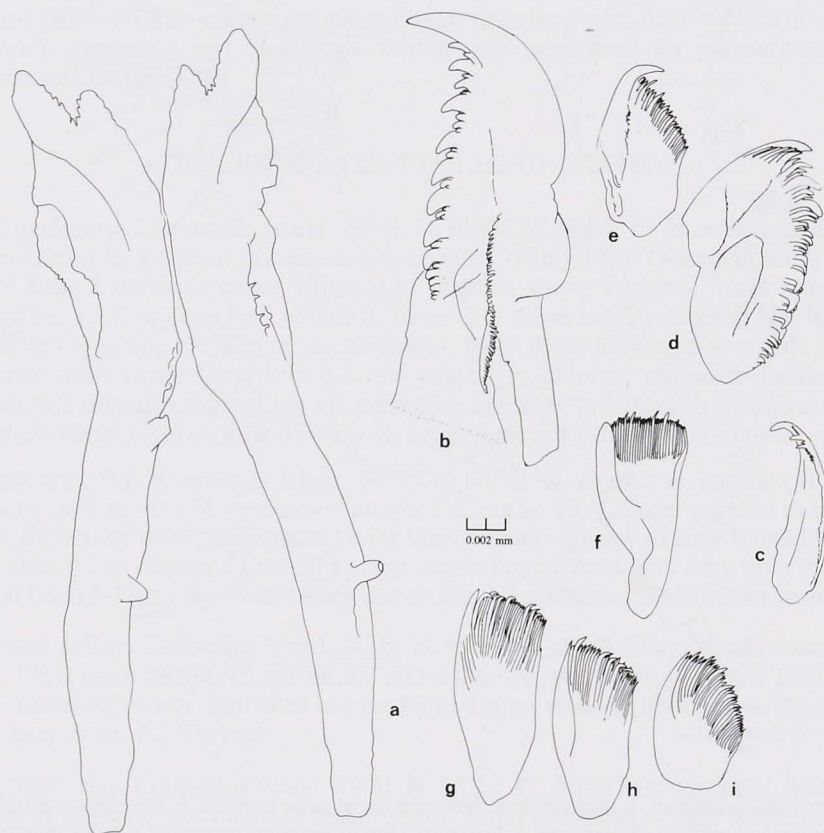


FIG. 2. — *Ophryotrocha spatula* sp. n., jaw apparatus from paratype. a. Mandibles. b. Forceps (base broken). c, d, e. First group of free denticles. f, g, h, i. second group of free denticles.

Peristomium followed by achaetous apparent first segment. Mouth parts (Fig. 2) darkly sclerotized. Forceps and free denticles forming separate group. Mandibles (Fig. 2a) partially protruding, rod-shaped with jagged

leading edge and several unpaired, irregular protrusions along length of shaft. Forceps (Fig. 2b) P-type (HILBIG & BLAKE, 1991) with single main tooth, inner edge with row of about 10 large teeth interspersed with at least 20 smaller ones, secondary median ridge bearing row of much finer teeth; main shaft darkly sclerotized but surrounded by thin flange.

Free denticles, seven pairs arranged in two primary groups (Fig. 2c-i). Denticles closest to the forceps (Fig. 2c-e) dark and strongly toothed; median member (Fig 2c) fang-shaped. Outer denticles (Fig. 2f-i) thin and broad with numerous long slender teeth interspersed with several stouter ones.

Parapodia uniform in shape; setae vary only in number. Dorsal and ventral cirri ovate but latter very difficult to distinguish in anterior setigers. Presetal lobe truncate. Dorsal postsetal lobe rounded; ventral, retractile lobe triangular and supported by single simple seta that resembles secondary emergent acicula (Fig. 1c-d). Aciculae very long and stout, seated proximally against row of longitudinal muscle group. Supra-acicular setae simple, unidentate flattened blades with very finely denticulate lower margin (Fig. 1, c-g-h). Second superior seta longer than others. Subacicular setae compound falcigers with blades varying in length by factor of two, unidentate with very finely denticulate border, almost identical to supra-acicular setae in size and form.

Setiger 1 with one supra-acicular seta, three compound falcigers and one subacicular simple ventral seta. Following setigers with four supra-acicular setae, six compound falcigers and one ventral simple seta. Last setiger with two simple supra-aciculars, two compound falcigers and one ventral seta. Large specimens have more setae per bundle but pattern invariable.

Last 9 setigers expanded into broad, spatulate flange (Fig. 1a), free from dorsal cirri which project freely from below flange. (Fig. 1b).

Pygidium flattened with two ovate anal cirri inserted ventrally (Fig. 1b). Anus ventral with opening occupying ventral surface of last three setigers; stout ventral median papilla.

OTHER SPECIMENS. — Mature specimens reach 5.5 mm with 25 to 43 setigers. No direct linear relationship found between body length and number of setigers. Many specimens with adhering sand grains and fine clay particles. While all were off-white in colour, a few of the largest specimens had yellowish-brown tinge. Most specimens have single pair of small eyes on posterior margin of the prostomium, usually covered by part of peristomium. Posterior flange often curled dorsally, forming a cylinder. Some of largest specimens show little expansion, other smaller ones, such as the holotype, almost double body width. Not all specimens have anal opening as extended as holotype; it is sometimes constricted and terminal as illustrated in Figure 1b.

No gametes found in the holotype or any of the other specimens examined, including the largest. A few juveniles, about 2 mm long for 20 setigers, are present in the samples but all appear to be damaged. The jaw apparatus shows obvious similarities to the adults but the posterior flange is not developed. Instead, the body appears to terminate in an undifferentiated, asetigerous region. These specimens need more study.

ETYMOLOGY. — The species name *spatula* is Latin for spoon and refers to the diagnostic unique structure of the posterior segments.

COMPARISON TO OTHER SPECIES OF *Ophryotrocha*. — The extensive review of HILBIG & BLAKE (1991) provided a table of characters of most of the known species in the genus but overlooked *O. scarlatoi* Averincev, 1989 which also has a broad posterior flange. This species was only superficially described and figured. OUG (in prep.) has discovered several specimens from Norway that resemble *O. scarlatoi*. These differ from the present specimens in having longer mandibles, in details of the maxillae and setae, and in lacking ventral parapodial cirri and a median anal papilla. It will be necessary to re-examine the types of *O. scarlatoi* in order to determine whether we are dealing with one, two or three species or subspecies. Attempts to borrow the type specimens of *O. scarlatoi* have been unsuccessful (E. OUG, pers. comm.).

The parapodia and setae of *O. spatula* resemble those of *O. puerilis sibirici* (McIntosh, 1885) as illustrated by GEORGE & HARTMANN-SCHRÖDER and HARTMANN-SCHRÖDER (1985). The parapodia are not as strongly lobed as those of *O. lobifera* Oug, 1978 but that species also has "puerilis-type" setae. Although HILBIG & BLAKE (1991) do not tabulate the presence/absence of anal cirri and papillae, there are species which lack anal cirri (*O. paralabidion* Hilbig & Blake, 1991; *O. sp. near scarlatoi* Oug), species with cirri reduced to "thread-like" appendages (*O. bacci* Parenti, 1961; *O. geryonicola* (Esmark, 1874), species with the anus dorsal (*O. lobifera* Oug, 1978), and species with a ventral papilla as well as anal cirri (*O. longidentata* Josephson, 1975; *O. maculata* Åkesson, 1973; *O. minuta* Levi, 1954; *O. puerilis sibirici* (McIntosh, 1885)). It is possible that the presence of a ventral papilla has been overlooked in other species.

TABLE 1. — Distribution of *Ophryotrocha spatula* sp. n., pooled totals of six samples each collected from outside, the berm and inside four different ice scours off Cornwallis Island, Canadian Arctic Archipelago.

Scour Number	Outside Scour	Berm	Inside Scour
N° 1, Cape Martyr, 15 m	1	18	27
N° 2, Assistance Bay, 7 m	31	157	94
N° 3, Resolute Bay, 10 m	0	125	44
N° 4, Resolute Bay, 7 m	1	51	2
Total	33	351	167
Mean	8.25	87.75	41.75
Standard Deviation	13.14	55.67	33.66

DISTRIBUTION

Ophryotrocha spatula sp.n. is known only from the shallow waters of Barrow Strait off Cornwallis Island. It shows a strong affinity for the disturbed sediments of ice scour berms or troughs as opposed to the compacted sediment outside the scour (Table 1). It was much more abundant on fresh scours (2, 3, and 4) than the older scour (1). Analysis of distribution against grain size (mean ϕ) failed to demonstrate a significant relationship ($r^2 = 0.255$).

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