



A new species of *Haliclona* (*Flagellia*) Van Soest, 2017 (Porifera, Demospongiae, Heteroscleromorpha) from the Gulf of St. Lawrence, Canada

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Haliclona (*Flagellia*) Van Soest, 2017 is a recently erected subgenus characterized by the presence of flagellosigma microscleres which are often distinctive between species (Van Soest 2017). Members of the taxon also have normal sigmas within a confused skeleton formed by oxea megascleres. The subgenus has a global distribution and contains 10 species (Van Soest *et al.* 2019). A large and abundant new species collected throughout the southern Gulf of St. Lawrence is characterized by thick and abnormally shaped flagellosigmas, two sizes of oxea, and abundant normal sigmas. Lambe (1896) previously reported *Haliclona* (*Flagellia*) *porosa* (Fristedt, 1887) from the Gulf of St. Lawrence, and the species is known to occur in nearby Arctic waters (Fristedt 1887; Lundbeck 1902; Hentschel 1916; Koltun 1959, 1966; Van Soest 2017; Dinn & Leys 2018). However, *H. (F.) porosa* is characterized by the presence of very few normal sigmas and no thick flagellosigmas. Type specimens were preserved in 95% ethanol and were deposited in the Atlantic Reference Centre (ARC) in St. Andrews, New Brunswick, Canada. The taxonomic identification was performed through spicule analysis using light and scanning electron microscopy, following methods described by Dinn *et al.* (2020).

Order Haplosclerida Topsent, 1928

Family Chalinidae Gray, 1867

Genus *Haliclona* Grant, 1841

Subgenus *Haliclona* (*Flagellia*) Van Soest, 2017

Haliclona (*Flagellia*) *xenomorpha* sp. nov.

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Type specimens. Holotype: ARC 81426, north of Brion Island, Canada (48.0568N, 61.50641W), 69 m depth, DFO CCGS *Teleost* RV Survey, September 17, 2018.

Paratypes: ARC 81427, central Gulf of St. Lawrence, Canada (47.9871N, 63.0248W), 63.5 m depth, DFO CCGS *Teleost* RV Survey, September 13, 2018; ARC 81428, East of Cap d'Espoir, Canada (48.3587N, 63.6829W), 49 m depth, DFO snow crab survey aboard the *Jean Mathieu*, August 17, 2018.

External morphology. (Fig. 1A–D). Massively encrusting with raised oscula. The sponge is very friable and is thus often broken into pieces upon collection. The largest specimens are over 10 cm in diameter, but no consistent growth form is apparent. Larger specimens are often seen fully encrusting small pebbles and may have shell fragments incorporated into the tissue. The surface is generally smooth in more intact specimens, while fragments are more irregular and porous. In less damaged specimens, a fine transparent mesh covers the surface, but this often collapses after collection. Oscula are < 0.5 cm wide and are raised above the surrounding tissue. Below the surface, the sponge tissue is irregularly punctate. The consistency of large pieces is firm, compressible, but very brittle if pressure is applied, resulting in small crumbled pieces. The colour is pale yellow to light brown, with some specimens appearing pinkish.

Skeleton. (Fig. 1 E, F). Confused, with a loose reticulation of paucispicular tracts which are irregularly connected by single spicules. Thick and thin oxeas do not appear to be localized in the skeleton. There is no surface specialization of spicules, but a layer of thick spongin is present at the surface in undamaged specimens. Flagellosigmas and sigmas are found throughout the choanosome, with regular sigmas often occurring in groups, especially evident near canal openings.

Spicules. (Fig. 2 A–J). Megascleres are oxeas in two size categories. Thick oxeas are often slightly bent and have sharp tapered points, 250–271–298 × 12–13–17 μm. Thin oxeas are similarly shaped but with sharper ends which taper further along the shaft, 183–219–245 × 3.6–6.1–9.0 μm. Microscleres are flagellosigmas in two size categories and abun-

dant normal sigmas. The distinctive thick category of flagellosigmas consists of spicules with curved ends that may be steeply curved (Fig. 2 C, D), branched into two or more points (Fig. 2 D–F), or not curved at all with endings pointing outwards, length of long endings 56–68–108 μm , of short endings 46–57–73 μm , width 58–72–98 μm , thickness 6.5–9.0–13 μm . Normal flagellosigmas are ovoid with widely curved ends, but are variable in size and overall shape, length of long endings 32–51–95 μm , of short endings 26–42–56 μm , width 40–58–77 μm , thickness 2.7–4.1–5.6 μm . Regular sigmas are variable in size, and have incurved apices, 39–62–82 μm in length and 3.2–5.1–7.1 μm thick. In some specimens thick flagellosigmas may appear more sigma-like with ends of similar lengths and a crescent shape, but these spicules may also have irregular ends (Fig. 2 F).

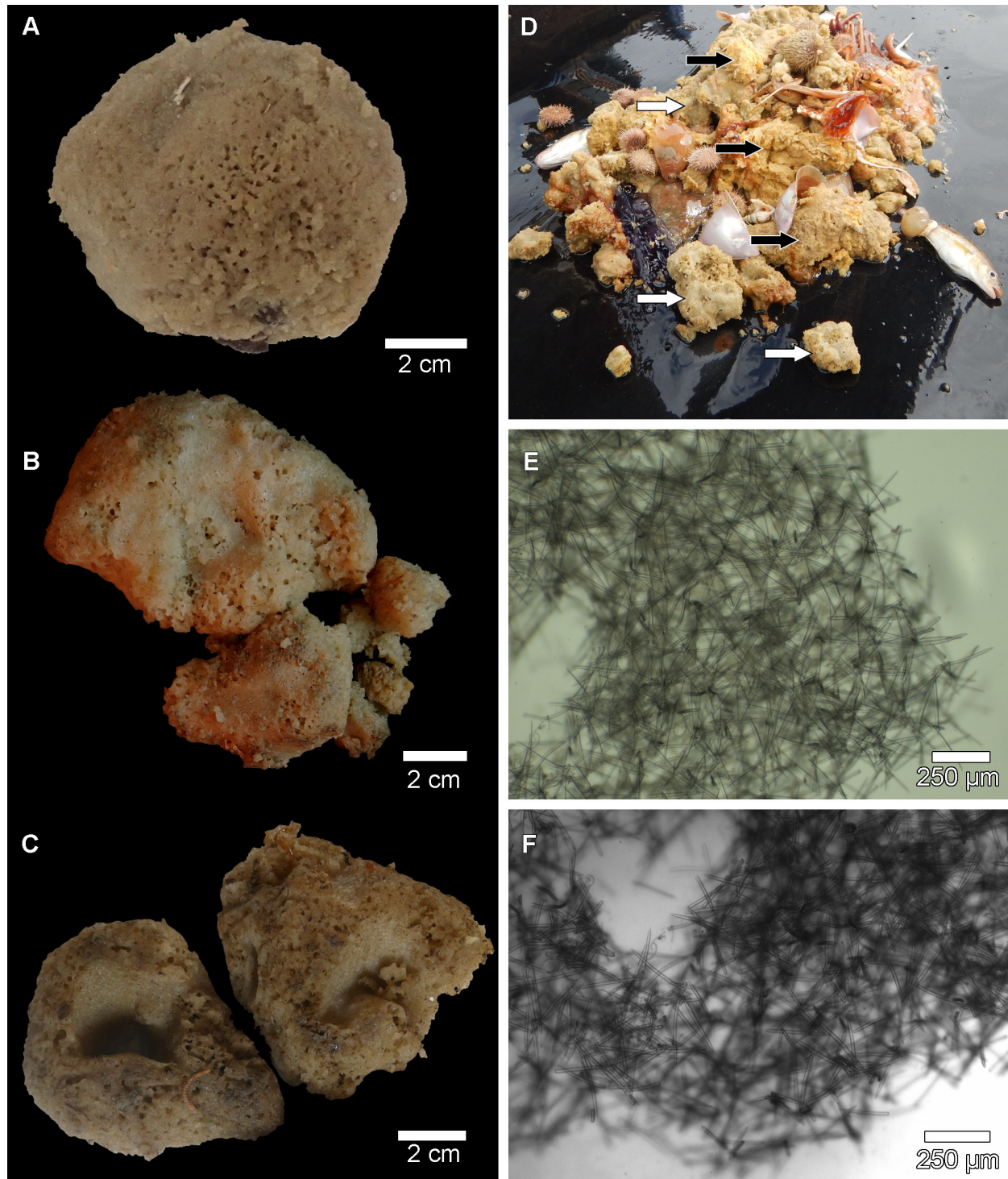


FIGURE 1. *Haliclona (Flagellia) xenomorpha* sp. nov. A. Holotype ARC 81426. B. Paratype ARC 81428 showing portions of smooth surface. C. Specimen with smooth surface along an inner portion. D. Large multispecies catch with *H. (F.) xenomorpha* sp. nov. (white arrows) and *Mycale lingua* (Bowerbank, 1866) (black arrows). E, F. Skeleton.

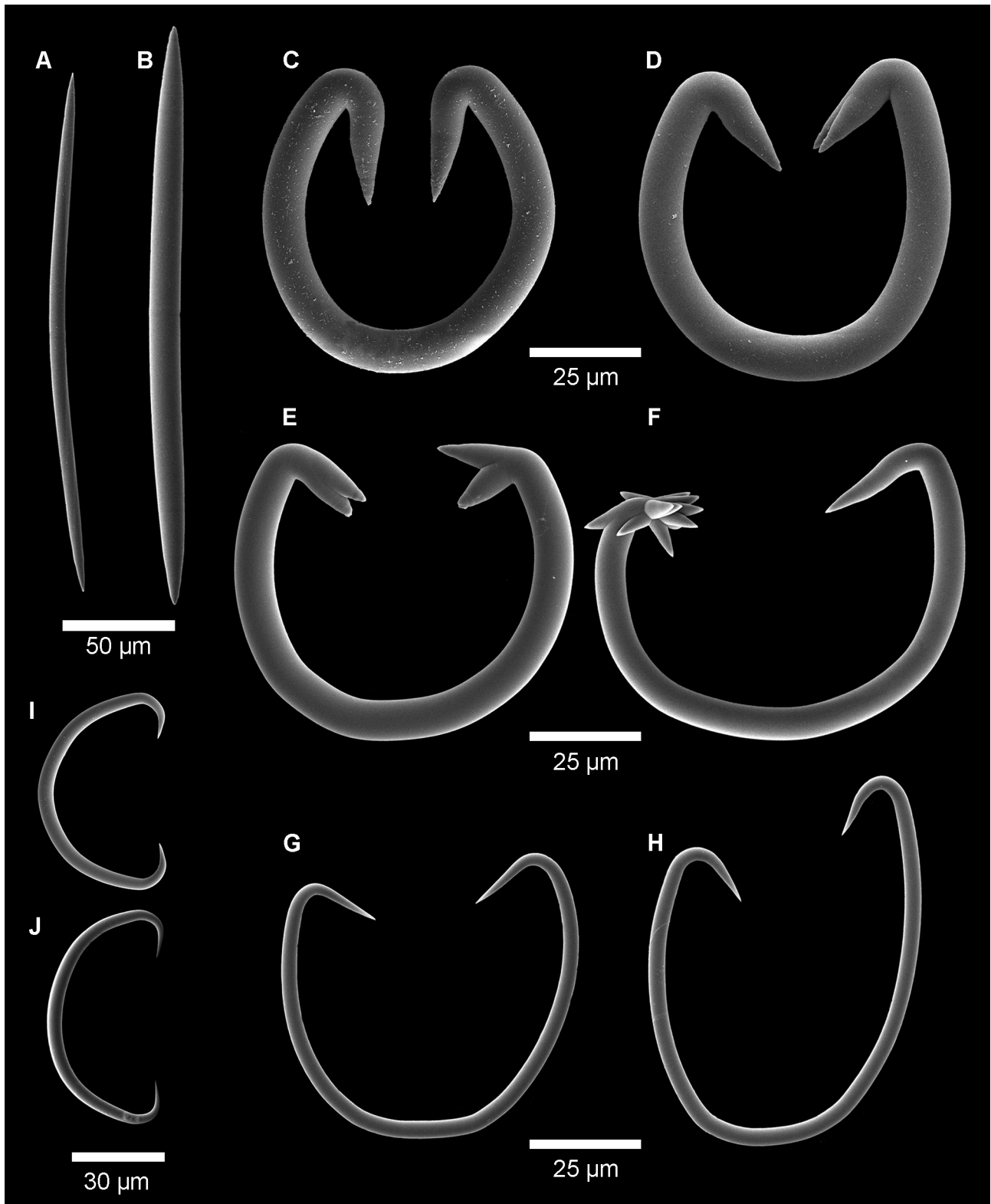


FIGURE 2. *Haliclona (Flagellia) xenomorpha* sp. nov. spicules. A–B. Oxeas. C–F. Thick flagellosigmas showing various degrees of irregularity. G–H. Regular flagellosigmas. I–J. Regular sigmas.

Distribution and ecology. Several specimens were collected along the American Bank near the Gaspé Peninsula and southern fringe of the Laurentian Channel. The holotype was collected north of Brion Island (Magdalen Island archipelago) near the shelf edge and was encrusting a rock. The species was collected at depths ranging from 41–89 m. Multiple

specimens were collected in single trawls (Fig. 1 D), but only single individuals from trawls were retained for taxonomic analysis.

Etymology. From the Greek *xénos* meaning alien or strange and *morphé* meaning shape, in reference to the thick and often irregular flagellosigmas. These spicules also resemble the derelict spacecraft from the 1979 film *Alien* directed by Ridley Scott, and the name pays homage to the titular antagonist of the series.

Discussion. Global representative members of the subgenus are reviewed in Van Soest (2017). Most species in the subgenus are thin and encrusting, however, *H. (F.) indonesiae* Van Soest, 2017 and *H. (F.) edaphus* De Laubenfels, 1930 have plate-like growth forms and *H. (F.) hamata* (Thiele, 1903) has an erect, arborescent habit. *Haliclona (Flagellia) porosa* (Fristedt, 1887) is most similar to *H. (F.) xenomorpha* **sp. nov.** and is described as attaining a large size of up to 9 cm in diameter by Fristedt (1887, as *Desmacella porosa*) and larger than 5.5 cm broad and 2 cm high by Lambe, (1896, as *Gellius flagellifer* Ridley & Dendy, 1886). An Arctic specimen of *H. (F.) porosa* reported by Dinn & Leys (2018) has a soft consistency and has a thick transparent surface whereas *H. (F.) xenomorpha* **sp. nov.** specimens from the Gulf of St. Lawrence have dense tissue and are uniform in colour with a very thin transparent surface.

The congeneric *H. (F.) porosa* has been previously reported from the Gulf of St. Lawrence (Lambe 1896) and further north in Baffin Bay/ Davis Strait (Fristedt 1887; Dinn & Leys 2018), usually in deep water. Drawings of specimens and spicules by Lambe (1896) are reminiscent of *H. (F.) xenomorpha* **sp. nov.**, however, the presence of rare, small (ca. 26 µm) normal sigmas and no mention of thick flagellosigmas suggest that the species are indeed very different. Specimens of *Haliclona (Flagellia) xenomorpha* **sp. nov.** collected from the Gulf of St. Lawrence also have abundant normal sigmas that vary considerably in size, a clear departure from *H. (F.) porosa* (Van Soest 2017). Flagellosigmas of *H. (F.) porosa* can be much longer and wider, extending beyond 100 µm for short and long endings and overall width (Van Soest 2017), but never attain a similar thickness to the flagellosigmas of *H. (F.) xenomorpha* **sp. nov.** Additional spicule measurements of an Arctic specimen identified as *H. (F.) porosa* by Dinn & Leys (2018) are reported here (Table 1).

TABLE 1. Comparison of individual variation of spicule dimensions of *Haliclona (Flagellia)* in the North Atlantic given in µm as minimum–mean–maximum. Flagellosigma measurements are ordered as follows: length of long endings, length of short endings, width, thickness. n=30 unless otherwise stated.

<i>H. (F.)</i> Species	Location	Depth (m)	Spicules (µm)				
			Oxeas I	Oxeas II	Flagellosigmas I	Flagellosigmas II	Sigmas
<i>xenomorpha</i> sp. nov. Holotype ARC 81426	Gulf of St. Lawrence	69	250–272–298	183–219–245	56–68–108,	32–51–95,	39–58–82 ×
	48.0568N,		× 12–13–17	× 3.7–6.1–9.0	46–57–73,	26–42–56,	3.2–5.1–7.1
	61.50641W				58–72–98,	40–58–77,	
<i>xenomorpha</i> sp. nov. Paratype ARC 81427	Gulf of St. Lawrence	63.5	240–283–325	161–204–257	58–79–99,	36–48–79,	44–67–81 ×
	47.9871N,		× 10–14–18	× 2.8–5.3–7.4	53–66–82,	33–43–68,	2.8–5.5–7.3
	63.0248W				61–73–90,	42–51–68,	
<i>xenomorpha</i> sp. nov. Paratype ARC 81428	Gulf of St. Lawrence	49	262–298–335	172–234–284	47–74–108,	35–67–98,	39–67–84 ×
	48.3587N,		× 9.9–13–15	× 3.1–5.2–7.8	39–60–82,	30–51–69,	3.1–6.0–7.6
	63.6829W				57–75–96,	33–54–71,	
<i>porosa</i> (Fristedt, 1887) CMNI 2018-0197	Northern Baffin Bay	333	250–282–314	-	38–58–70,	-	60–62–63 ×
	76.3170N,		× 11–14–16		29–49–64,		6.1–6.4–6.6
	75.77W				39–58–68,		(n=2)
<i>porosa</i> (Fristedt, 1887) (from Van Soest, 2017)	Barents Sea & Mauritania	90–400	243–333 ×	-	48–156,	-	40–61 ×
			8–13		27–106,		2–5
					32–117, 1–5		
<i>hiberniae</i> Van Soest, 2017	SE Rockall Bank	560–785	288–419 ×	-	64–159,	13–55,	53–92 ×
	55.4994N,		6–14		48–106,	10–39,	2.5–5 &
	15.8007W				51–102,	12–45,	28–39 ×
					1.5–4	0.5–2	1–2.5

The unique features of *Haliclona (Flagellia) xenomorpha* **sp. nov.** are the presence of thick flagellosigmas and two categories of oxeads. The thickness of the flagellosigma spicules exceed, and in most cases more than double the maximum thickness of spicules from other members of the genus (Van Soest 2017). The flagellosigmas in *H. (F.) xenomorpha* **sp. nov.** reach a maximum thickness 13 µm, while flagellosigmas of *H. (F.) porosa* reach a maximum thickness of 5 µm reported by Van Soest (2017), but up to 6.3 µm in an Arctic specimen (Dinn & Leys 2018). Thick flagellosigmas are common in the skeleton, and are thus considered as a second size category, though there may be intermediately sized flagellosigmas which are difficult to place in either size category. The consistently irregular endings of the thick flagellosigmas are also a defining character of the species.

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References

- Dinn, C., Leys, S.P., Roussel, M., and Méthé, D. (2020). Geographic range extensions of stalked, flabelliform sponges (Porifera) from eastern Canada with a new combination of a species of *Plicatellopsis* in the North Atlantic. *Zootaxa*, 4755 (2), 301–321.
<https://doi.org/10.11646/zootaxa.4755.2.6>
- Dinn, C. & Leys, S.P. (2018) Field Guide to Sponges of the Eastern Canadian Arctic. Department of Biological Sciences, Education and Resource Archive, University of Alberta, Edmonton, Alberta, 102 pp.
<https://doi.org/10.7939/R3DF6KJ4G>
- Fristedt, K. (1887) Sponges from the Atlantic and Arctic Oceans and the Behring Sea. In: *Vega-Expeditionens Vetenskap. Vol. 4. Iakttagelser*, Nordenskiöld, pp. 401–471.
- Hentschel, E. (1916) Die Spongien des Eisfjords In: *Zoologische Ergebnisse der Schwedischen Expedition nach Spitzbergen, 1908. Teil II. Kungliga Svenska vetenskapsakademiens Handlingar*, 54 (3), 1–18.
- Koltun, V.M. (1959) Siliceous horny sponges of the northern and far-eastern seas of the U.S.S.R. *Opredeliteli po faune SSR, izdavaemye Zoologicheskim muzeem Akademii nauk*, 67, 1–236. [Fisheries Research Board of Canada Translation Series No. 1842, in Russian]
- Koltun, V.M. (1966) Four-rayed sponges of Northern and Far Eastern seas of the USSR (order Tetraxonida). In: *Opredeliti Faunei SSSR 90*. Zoological Institute of the Academy of Sciences of the USSR, Moscow, Leningrad, pp. 1–112.
- Lambe, L.M. (1896) Sponges from the Atlantic coast of Canada. *Transactions of the Royal Society of Canada*, 2, 181–211.
- Lundbeck, W. (1902) Porifera. (Part I.) Homorrhaphidae and Heterorrhaphidae. In: *The Danish Ingolf-Expedition. 6 (1)*. Bianco Luno, Copenhagen, pp. 1–108.
- Ridley, S.O. & Dendy, A. (1886). Preliminary report on the Monaxonida collected by H.M.S. Challenger. Part I. *Annals and Magazine of Natural History*, 18, 325–493.
<https://doi.org/10.1080/00222938609459982>
- Van Soest, R.W.M. (2017) Flagellia, a new subgenus of *Haliclona* (Porifera, Haplosclerida). *European Journal of Taxonomy*, 351, 1–48.
<https://doi.org/10.5852/ejt.2017.351>
- Van Soest, R.W.M., Boury-Esnault, N., Hooper, J.N., Rützler, K., De Voogd, N.J., Alvarez, B., Hajdu, E., Piscera, A.B., Manconi, R., Schoenberg, C., Janussen, D., Tabachnick, K.R., Klautau, M., Picton, B.E., Kelly, M., Vacelet, J., Dohrmann, M., Diaz, C. & Cárdenas, P. (2019) World Porifera Database. Available from: <http://www.marinespecies.org/porifera>. (accessed 23 April 2019)