VIII.—*Sponges from the Western Coast of North America.*[1]

By Lawrence M. Lambe, F.G.S., F.G.S.A., of the Geological Survey.

(Presented by Mr. J. F. Whiteaves.)

The following paper is the result of a study of a number of recent marine sponges collected by Dr. Wm. H. Dall and others in the northern Pacific Ocean, in Behring Sea and in the Arctic Ocean off the shores of the northwestern portion of Alaska, and now deposited in the U. S. National Museum at Washington, D.C.

All the specimens referred to belong to the *Monaxonida* and were dredged at various depths down to about eighty fathoms or picked up on the beach; the former are preserved in alcohol and are in a good state of preservation, the latter were kept as dried specimens and have been examined in that state. The collection comprises about twelve hundred and fifty specimens many of which, as might have been expected, are duplicates which afford a good series of many of the species showing the variation in external form and manner of growth. Some of the specimens picked up on the beach have probably come from a considerable depth. Referring to the beach specimens in the collection Dr. Dall in a letter to the writer says: "In regard to the specimens which were not dredged, but were collected by hand on beaches, there is some discrimination to be exercised. Most of the specimens of most of the species were picked up on the shore, after storms, where they had been thrown by the waves, with some species not growing in shallow water or near the shore. There are however, some of the sponges to which this does not apply, and among these are the specimens obtained at the locality entered in the catalogue as Chika Island near Unalaska. This island is situated in a strait separating Unalaska Island from the next island. Owing to the fact that the tides run through this strait with great force and that in the frequent storms the wind blows in a contrary direction to the current, thereby producing a tremendous surf, a great many deep-sea species are thrown upon the beaches of this island. We observed on one of the cliffs of the island the spars of some wreck which had been thrown by the waves over eighty feet above the level of the sea and lodged in the crevices of the rocks, which will give some idea of the force of the waves in this vicinity. There are several tree-like silicious sponges which were only obtained at this place and from deep water on the cod-fishing banks to the eastward. These sponges undoubtedly come from a depth of about one hundred fathoms, although the specimens sent were picked up on the beach. It is probable that they were carried from the deep-sea bed attached to some stone to which the giant kelp was attached and which by the waves was transported on to

[1] Communicated by permission of the Director of the Geological Survey of Canada.

the beach. At all events, I am confident that these sponges do not grow in depths as little as twenty fathoms." Dr. Dall further says: "Most of my collections were made by dredging from an ordinary ship's boat, in depths of one hundred fathoms and less, particularly twenty fathoms or less, and stations where collecting was done are scattered along the coast of Alaska south of Point Barrow and especially in the line of the Aleutian Islands and eastward from them as far as Sitka. Specimens obtained by dredging were usually preserved in alcohol, especially in the case of sponges, but a very large number of sponges were picked up on the beaches at various places, and the bulk of the dry collection was obtained in this way. So far as I can remember, specimens of nearly all the species found in this manner are represented in the alcoholic collection but there were some of which no living specimens were obtained. The temperature of the water was determined at the surface and at the bottom at many of these places. In general it may be said for the whole Alaskan region, south of the Seal Islands, that there is little difference in the temperature of the sea. That part of the territory north of the Seal Islands has a longer term of cold weather than that south of them, but in other respects there is little difference."

In addition to the sponges obtained by Dr. Dall a number, forming part of the U. S. National Museum collection and included amongst those examined by the writer, were collected in Alaskan waters by W. J. Fisher, E. W. Nelson, R. E. C. Stearns, J. G. Swan, W. B. Anderson, G. Davidson, L. M. Turner, the U. S. Revenue Str. "Wyandotte," L. Stejneger, Commander L. A. Beardslee, U. S. Navy, Lieut.-Commander H. S. Nichols, U. S. Navy, N. Grebnitski, Lieut. Geo. M. Stoney, U. S. Navy, the U. S. Revenue Str. "Corwin," Captain M. A. Healy commanding, and Dr. T. H. Streets, U. S. Navy.

A small but very interesting sponge was collected by Dr. Dall off the coast of California and is referred to at length in this paper.

It has been thought desirable to include in the following paper a description of one apparently new sponge, and references to a few already described species from Comox and Sooke, Vancouver Island, B. C., collected by Prof. John Macoun of the Geological Survey Department at Ottawa.

The thanks of the writer are due to the Director of the United States National Museum at Washington, D. C., for the opportunity afforded him of studying so large and excellent a collection of recent marine sponges.

The writer is also greatly indebted to Dr. Wm. H. Dall, for many suggestions and notes relative to these collections, as well as to Prof. Richard Rathbun, Dr. G. Brown Goode and Mr. F. W. True of the United States National Museum for their courtesy and hearty co-operation whilst the examination and study of the collection were in progress.

MONAXONIDA.

Halichondria panicea, Johnston.

Halichondria panicea, Johnston. 1842. British Sponges, p. 114, pl. x. and pl. xi., fig. 5 and of European authors.
" " Whiteaves. 1874. Report on deep-sea dredging operations in the Gulf of St. Lawrence, p. 9.
" " Verrill. 1874. Am. Jour. Sci. and Arts, vol. vii., p. 505.
" " Lambe. 1892. Trans. Royal Soc. Canada, vol. x., p 69; 1893, vol. xi., p. 25.

There are, in the collection, over one hundred and fifty specimens of this species, which illustrate admirably its great variability in external form and mode of growth.

The length of the largest spicules, in different specimens, ranges from 0·328 to 0·589 mm.

There are, besides, a number of specimens of a rugose form[1] that not only have a surface made irregular, in the most typical specimens, by the development of numerous short protuberances but are also characterized by having somewhat larger spicules. The largest oxea, in different specimens, vary in length from 1·096 to 0·685 mm.

Distribution.—Arctic Ocean, Behring Sea and North Pacific Ocean.

Eumastia sitiens, O. Schmidt.

Eumastia sitiens, O. Schmidt. 1870. Grundz. einer Spong.—Fauna des Atl. Geb., p. 42, pl. v.; fig. 12.
" " Fristedt. 1887. Sponges from the Atlantic and Arctic Oceans and the Behring Sea, (translation), Vega-expeditionens vetenskapliga arbeten, p. 426, pl. 24, fig. 13, and pl. 27, fig. 11.

This species is represented by over a dozen specimens, some of which are of considerable size; one a particularly fine specimen is about 150 mm. in length, 90 mm. in breadth and 75 mm. high, its fistulæ reach a length of 30 mm. with a basal breadth frequently of 9 mm. The fistular processes are so delicate and brittle when dry, that, unless the sponge be preserved in alcohol, they are difficult to preserve intact.

The oxea vary considerably in length in the same individual; the greatest length attained in the specimens under consideration is 1·15 mm.

Distribution.—Behring Sea and North Pacific Ocean.

Petrosia hispida, Ridley and Dendy.
(Plate II., Fig. 1.)

Petrosia hispida, Ridley and Dendy. 1886. Ann. and Mag. Nat. Hist., series 5, vol. xviii., p 327.
" " Ridley and Dendy. 1887. Rep. Monaxonida, Zool. Chall. Exp., vol. xx., p. 14, pl. ii., fig. 16; pl. iii., fig. 2.

This species is represented by a small sessile specimen, 40 mm. long, 22 mm. broad and 16 mm. high, of a rich brownish-yellow colour in alcohol, and with numerous circular oscula about 1·5 mm. in average diameter, as in the type specimens. There is also in the collection a fragment of another specimen from the same locality.

The oxea (Plate II., fig. 1) vary in size from 0·327 by 0·026 mm. to 0·242 by 0·016 mm.

Locality.—Middleton Island.

Reniera rufescens, Lambe.

Reniera rufescens, Lambe. 1892. Trans. Royal Soc. Canada, vol. x., p 75, pl. iv., fig. 6, pl. v., figs. 12, 12a.

A number of specimens referable to this species are represented in this collection; from them it is seen that the sponge is sometimes arborescent, though still retaining the peculiar lobate manner of growth of the specimens originally described; the branches frequently coalesce and usually terminate in somewhat knobbed extremities. A few specimens approach more nearly in outward form to the type specimens.

The oxeote spicules attain a maximum length in different specimens of from 0·157 to 0·216 mm., with an average breadth of 0·013 mm.

Distribution.—Arctic Ocean, Behring Sea and North Pacific Ocean.

Toxochalina borealis. (Sp. nov.)
(Plate II., figs. 2, 2a—e.)

Sponge (Plate II., fig. 2) sessile, forming irregularly shaped thickly incrusting masses. *Colour*, in spirit, a dull yellowish-brown. *Texture* rather soft, spongy. *Surface* mammate,

[1] Sponges from the Pacific Coast of Canada and Behring Sea, Trans. Royal Soc. Canada, 1892, vol. x., p. 75, pl. iv., fig. 3, pl. v., figs. 9, 9*a*.

smooth. *Dermal membrane* moderately thin, fragile, very easily separated from the underlying portions of the sponge. *Oscula* large, conspicuous, about 3·5 mm. in average diameter; each opening is situated at the summit of one of the rounded protuberances. No pores have been observed. Of this species there are four specimens, preserved in alcohol, the largest of which is about 105 mm. long, 56 mm. broad and 23 mm. high in its thickest part.

Skeleton.—(*a*) *Dermal;* a beautiful network of spicules (oxea) lying in and strengthening the dermal membrane. (*b*) *Main;* consisting of an irregular reticulation of fibres having an average breadth of 0·108 mm. and made up of many spicules lying side by side with a very small proportion of horny matter.

Spicules.—(*a*) *Megasclera;* short, stout, slightly curved, abruptly and sharply pointed smooth oxea (Plate II., fig. 2a), from 0·144 to 0·176 mm. long and 0·013 mm. broad, forming the principal part of the skeleton. (*b*) *Microsclera;* smooth toxa (Plate II., figs. 2b-e), sharply pointed at both ends and of varying curvature, about 0·111 mm. long, measured in a straight line from point to point and 0·002 mm. thick; these spicules do not occur in large numbers and seem to be confined exclusively to the main skeleton, very few having been observed in the dermal membrane.

Locality.—Kyska Harbour.

Tedania fragilis. (Sp. nov.)

(Plate II., figs. 3, 3 a—c.)

This species is represented in the collection by a single dried specimen in the form of an irregular flat mass about 50 mm. across and 15 mm. thick. *Colour*, brownish-yellow. *Texture*, very fragile, crumbling. *Surface*, rough. *Dermal membrane*, very thin, delicate.

Skeleton.—(*a*) *Main*, consisting of an indefinite reticulation of loose strands of stylote spicules, inclosing triangular and quadrangular meshes having sides generally of one spicule's length, with many loose styli and tylota throughout. (*b*) *Dermal.* The dermal skeleton is made up of tylota lying in the plane of the dermal membrane; the tylota occur scattered about without order, but show a tendency in places to form loose fibres and to converge toward a central point over the subdermal cavities. The interior of the sponge is very open in its structure, and has small canals leading through it in all directions.

Spicules.—(*a*) *Megasclera*, of two kinds. (1) Stout, slightly bent, smooth styli, evenly rounded at one end and coming abruptly to a sharp point at the other (Plate II., fig 3), varying in size from 0·314 by 0·011 mm. to 0·406 by 0·016 mm.; occurring in the main skeleton. (2) Straight, slender tylota with slightly inflated spined ends, generally terminating in a sharp point, but often rounded (Plate II., figs. 3a, 3b), from 0·229 to 0·262 mm. long and 0·006 mm. thick; present in large numbers at the surface and scattered throughout the main skeleton. (*b*) *Microsclera;* long, minutely spined rhaphides, pointed at each end and generally curved or twisted (Plate II., fig. 3c); average size, 0·275 by 0·003 mm.; abundant throughout all parts of the sponge.

Localities.—Amaknak Island (Dall); Sooke, Vancouver Island (J. Macoun).

Esperella lingua, Bow.

Hymeniacidon lingua, Bow. 1866. Mon. Brit. Spong., vol. ii., p. 187.

Raphiodesma lingua, Bow. 1874. Mon. Brit. Spong., vol. iii., p. 237, pl. lxxii., figs. 1–6.

Esperia lingua, Vosmaer. 1885. The sponges of the "Willem Barents" Expedition, 1880 and 1881, p. 30, pl. i., fig. 17, pl. iv., figs. 21, 22, and pl. v., figs. 73–77.

Two specimens of this species, rather small in size, but showing the typical pore-areas or "cracks," were collected in Behring Sea. This sponge is now known to be circumpolar in its distribution. Fristedt has described a new variety[1] of *Esperella lingua* from Behring Sea, but does not state in what respect his variety differs from the type specimen; no mention is made of the localization of the pores, which is the chief characteristic of *Esperella lingua*, Bow.

Locality.—Bay of Islands, Adak Island.

Esperella helios, Fristedt.

(Plate II., figs. 4, 4 a—c.)

Esperia helios, Fristedt. 1887. Sponges from the Atlantic and Arctic Oceans and the Behring Sea (translation), Vega-expeditionens vetenskapliga arbeten, p. 450, pl. 25, figs. 25–29.

This sponge is found attached to shells, sea-weed, etc., or growing freely, forming subspherical or flattened masses of moderate size. There are four specimens, the two largest of which are about 40 mm. across by about 25 mm. high. *Colour*, a light yellowish-brown. *Texture*, firm. *Surface*, hispid, roughened by numerous small protuberances. *Dermal membrane*, very thin and fragile. *Pores*, scattered, about 0·111 in diameter. *Oscula*, dispersed, generally small but often of considerable size, communicating with the interior of the sponge by a number of canals.

Skeleton.—Well defined main fibres of spicules run to the surface, where they become diffuse without the formation of definite brushes. Secondary fibres are feebly developed in places, otherwise they are represented by individual spicules which cross the primary fibres at right angles, connecting them together, or by spicules occurring without order between the primary fibres. The hispidity of the surface is caused by the slight projection of the spicules of the outer ends of the primary fibres beyond the dermal membrane. The surface protuberances are aggregations of spicules, arranged in a plumose manner, which rise from one to two mm. above the general surface of the sponge; they are formed by the union of two or more primary fibres which form an indefinite central axis from which spicules radiate outward and upward. There is only a small proportion of spongin present in the skeleton.

Spicules.—(*a*) *Megasclera*: of one kind only, viz., stout, sharply and rather abruptly pointed smooth styli (Plate II., fig. 4), often somewhat curved, from 0·327 to 0·438 mm. long and about 0·018 mm. thick. (*b*) *Microsclera*: (1) palmate anisochelæ (Plate II., figs. 4a, 4b), occurring in beautiful rosettes of from ten to thirty spicules, in the dermal membrane and scattered separately throughout the skeleton; average length 0·058 mm. (2) Sigmata (Plate II., fig. 4c), slender, simple and contort, abundant in the dermal membrane and throughout the sponge generally.

Distribution.—Arctic Ocean, Behring Strait and Behring Sea.

Esperella adhærens, Lambe.

(Plate II., figs. 5, 5a—f.)

Esperella adhærens, Lambe. 1893. Trans. Royal Soc. Canada, vol. xi., p. 27, pl. ii., figs. 5, 5a—d.

[1] *Esperella lingua*, Bow. var Arctica, Fristedt, 1877. Sponges from the Atlantic and Arctic Oceans and Behring Sea (translation), Vega-expeditionens vetenskapliga arbeten, p. 449, pl. 25, figs. 20–24, pl. 29, fig. 18.

A number of sponges represent this species in the collection; some are preserved in alcohol, others are dry.

Most of the specimens have an uneven, irregularly tuberculate surface or as is found in a few cases the tubercles are somewhat prolonged and pointed, differing thus from the type specimen from Elk Bay, Discovery Passage, Vancouver Island, which had a rather even surface. In all cases the pores are found to be dispersed as in the type specimen.

The styli (Plate II., fig. 5) vary in length from 0·315 to 0·369 mm. with an average thickness of 0·013 mm.

The anisochelæ (Plate II., figs. 5a, 5b) have an average length of 0·072 mm.

The sigmata (Plate II., fig. 5d), simple and contort, are about 0·058 mm. long.

The small anisochelæ (Plate II., fig. 5c) are also present; they vary in length from 0·019 to 0·032 mm.

Numerous trichodragmata (Plate II., figs. 5e, 5f) loose and in bundles, occur in the Alaskan specimens; on account of their scarcity in the specimen from Vancouver Island, the type of the species, their presence was overlooked and no mention is made of them in the original description. The trichodragmata are 0·032 mm. in length.

Distribution.—Behring Sea and North Pacific Ocean.

Esperella modesta. (Sp. nov.)

(Plate III., figs. 1, 1a—d.)

Sponge slightly lobed; found growing on sea-weeds, stones, &c. *Colour*, when dry, light brownish-yellow. *Texture*, moderately firm, not elastic. *Surface*, even, somewhat rough. *Oscula*, circular openings, level with the general surface, about 1·5 mm. in diameter.

Skeleton.—Irregular, with an indistinct reticulate arrangement of stylote spicules. Loose, rather slender fibres of spicules pass to the surface and are connected together by spicules which show very little tendency to form definite fibres but which are loosely and irregularly disposed. There is seemingly no distinct dermal arrangement of the skeleton. A rather large proportion of spongin is present.

Spicules.—(*a*) *Megasclera*, of two sizes. (1) Stout, rather abruptly pointed, strongly bent, smooth styli (Plate III., fig. 1); average size 0·183 by 0·009 mm. (2) Slender, gradually and sharply pointed, strongly bent, smooth styli (Plate III., fig. 1a); length varying from 0·124 to 0·150 mm., average thickness 0·003 mm. (*b*) *Microsclera;* small palmate anisochelæ (Plate III., figs. 1b-d,) varying from 0·019 to 0·026 mm. in length; occurring in moderate numbers.

Distribution.—Behring Sea and North Pacific Ocean.

Esperiopsis Quatsinoensis, Lambe.

(Plate II., figs. 6, 6a.)

Esperiopsis Quatsinoensis, Lambe. 1892. Trans. Royal Soc. Canada, vol. x., pp. 69, 76, pl. iii., figs. 8, 9; pl. iv., fig. 7; pl. v., figs. 8, 8a, 8b, 8c; pl. vi., fig. 4, and vol. xi., p. 29.

The specimens originally described varied in shape from irregularly subflabellate to subramose but the numerous additional specimens, now before me, numbering in all about one hundred and fifty, show that the sponge is frequently funnel or cup-shaped with numerous intermediate varieties between these and the typical forms which are also abundantly represented.

Distribution.—Behring Sea, North Pacific Ocean as far south as the State of Washington.

Chondrocladia Alaskensis. (Sp. nov.)

(Plate II., figs. 7, 7a—e.)

Sponge (Plate II., fig. 7), erect, borne on a short stalk, showing a considerable variation in external form, flabellate, sometimes palmate and digitate, often irregularly lobate. *Colour*, in spirit, dark brown. *Texture*, elastic, spongy. *Dermal membrane*, thin, not easily separated from the supporting fibres. *Oscula*, numerous, from 1 to 3 mm. in diameter, occurring on the sides and edges of the fan-shaped and palmate forms. In digitate specimens they may be dispersed or ranged along the sides of the branches. In the irregularly lobate forms the oscula are nearly always confined to the upper surfaces of the lobes (Plate II., fig. 7), when there may be many small oscula or a few large ones. *Pores*, in sets of three or four between the brushes of the dermal skeleton ; average diameter 0·032 mm.

Skeleton.—(*a*) *Main.* Strong primary fibres of spicules crossed at right angles and at rather irregular intervals by less robust secondary fibres, proceed to the surface and subdivide before the surface is reached. (*b*) *Dermal*, consisting of the outer ends of the primary fibres which terminate in brushes at the surface ; the brushes support and project slightly beyond the dermal membrane, which is sparsely supplied with spicules lying horizontally in it. A considerable amount of spongin is present.

Spicules.—(*a*) *Megasclera*, of two sizes. (1) Stout, slightly bent, smooth, somewhat abruptly but sharply pointed styli (Plate II., fig. 7a) with an average size of 0·262 by 0·019 mm. ; composing the main skeleton and the greater part of the dermal brushes. (2) Small, slightly curved, rather bluntly pointed, smooth styli (Plate II., fig. 7b) occurring in the dermal membrane and supplementing the large styli in the dermal brushes ; average size, 0·144 by 0·008 mm. (*b*) *Microsclera ;* isochelæ (Plate II., figs. 7c, 7d), large, with slightly bent shafts bearing four or five large teeth at each end ; length, 0·091 mm. Small isochelæ (Plate II., fig. 7e) occur in large numbers, about 0·032 mm. long ; probably an immature stage of the large isochelæ. Both forms are abundant in all parts of the sponge. In some specimens numbers of spherical embryos 0·131 mm. in diameter were observed in the inner parts of the sponge.

This sponge possesses the characteristic isochelæ of the genus, viz., equal ended spicules having a curved shaft with a number of teeth at each end. It differs in outward form, in which it has a considerable variability, from any hitherto described species of this genus, but is easily recognized by its very characteristic spicules, as well as by its external shape.

Distribution.—Behring Sea and North Pacific Ocean.

Chondrocladia pulchra. (Sp. nov.)

(Plate II., figs. 8, 8 a—d.)

Sponge (Plate II., fig. 8) erect, proceeding from a short thick stem, in most of the specimens seen irregularly ramose ; branches somewhat compressed, anastomosing and becoming broadly expanded in places ; in one specimen the anastomosing of the branches is carried so far that the sponge takes the shape of a number of fan-shaped expansions, arising either from the stout basal support or from some of those already formed. *Colour*, when dry, a light brownish-yellow. *Texture*, very firm. *Surface*, rather uneven, slightly hispid. *Dermal membrane*, very thin, delicate, spiculous. Oscula and pores have not been observed.

Skeleton.—(*a*) *Main;* composed of stout stylote spicules, arranged in rather loose plumose fibres running to the surface, which are crossed at irregular intervals by loose secondary fibres or individual spicules. (*b*) *Dermal;* brushes of small styli, with outwardly directed points, supporting the dermal membrane, beyond which they project but slightly, are interlaced with similar styli lying horizontally. The brushes are the surface terminations of the fibres of the main skeleton, and they, together with the horizontally disposed styli, form a thick dermal skeletal zone at the surface. A large proportion of rather transparent spongin is present.

Spicules.—(*a*) *Megasclera;* of two sizes. (1) Stout, somewhat curved, smooth styli with the basal end very slightly enlarged and tapering gradually to an acute point at the other end (Plate II., fig. 8a); up to 1·10 by 0·041 mm. in size; forming the main skeleton. (2) Small, slender, not very sharply pointed, smooth styli (Plate II., fig. 8b); confined to the dermal skeleton; varying in size from 0·176 by 0·009 to 0·478 by 0·013 mm. (*b*) *Microsclera;* of two kinds; (1) very small isochelæ (Plate II., fig. 8c), with curved shafts and three minute teeth at each end; 0·019 mm. long. (2) Simple sigmata (Plate II., fig. 8d); 0·013 mm. in length. The chelæ of this species differ only from the characteristic chelæ of the various species of *Cladorhiza* in being equal ended instead of unequal ended.

Locality.—Aleutian Islands.

Iotrochota magna. (Sp. nov.)

(Plate III., figs. 2, 2a—d.)

Sponge (Plate III., fig. 2) massive, of irregular shape, represented in the collection by two specimens, one preserved in alcohol, about 105 mm. long, 50 mm. broad and 50 mm. high, the other dry, roughly 150 mm. by 115 mm. and 70 mm. high. *Colour*, in spirit, a yellowish-brown. *Texture* firm but spongy. *Surface* intersected by broad, raised, smooth, flat ridges, with abrupt sides, which branch in different directions and enclose sunken areas having a very uneven surface. *Dermal membrane*, tough, spiculous, separated with difficulty from the underlying tissues. *Oscula*, circular openings about 3·5 mm. in diameter, occupying the raised ridges and at short intervals apart, often in a uniserial row. They are the outer terminations of broad canals leading from the inner parts of the sponge. *Pores*, scattered, about 0·041 mm. in diameter.

Skeleton.—Consisting of an irregular reticulation of rather loose fibres of stout styli with a moderate proportion of horny matter. At the surface is a thick layer of smaller styli, interlaced horizontally, supporting the dermal membrane.

Spicules.—(*a*) *Megasclera;* of two sizes. (1) Stout, often slightly bent, rather abruptly but sharply pointed smooth styli with broadly rounded basal ends (Plate III., fig. 2a); average size 0·438 by 0·024 mm.; forming the main skeleton. (2) Slender, smooth, generally somewhat bent, sharply pointed styli (Plate III., fig. 2b); varying in length from 0·242 to 0·333 mm. and in thickness from 0·006 to 0·009 mm.; composing the dermal skeleton and distributed in considerable numbers throughout the main skeleton. (*b*) *Microsclera*, amphiasters (birotulates) with straight shafts and with from fourteen to eighteen minute teeth encircling the inner edges of the hemispherical terminations; length 0·229 mm.; very abundant in all parts of the sponge. On account of the small size of the spicule and

the difficulty of obtaining a good end view, the number of the teeth has not been ascertained with a great degree of certainty (Plate III., figs. 2c, 2d).

Localities.—Kyska Island and Nagai Island.

Myxilla Barentsi, Vosmaer.

(Plate II., figs. 9, 9a—c.)

Myxilla barentsi, Vosmaer. 1885. The sponges of the "William Barents" Expedition, 1880 and 1881, p. 27, pl. iv., figs. 15, 16; pl. v., figs. 56-59.

A few specimens referable to this species were collected at various localities.

The measurements of the spicules taken from different specimens are as follows:—

Spined styli (Plate II., fig. 9); varying in size from 0·163 by 0·006 mm. to 0·314 by 0·016 mm.

Tornota (Plate II., fig. 9a) with minutely spined ends; from 0·176 to 0·229 mm. long and from 0·004 to 0·008 mm. thick.

Isochelæ (Plate II., fig. 9b); average length, 0·045 mm.

Sigmata (Plate II., fig. 9c), simple and contort; average length 0·022 mm.

Distribution.—Arctic Ocean, Behring Sea and North Pacific Ocean as far south as Vancouver Island.

Myxilla parasitica, Lambe.

Myxilla parasitica, Lambe. 1893. Trans. Royal Soc. Canada, vol. xi., p. 31, pl. ii., figs, 8, 8a—f.

Two specimens of this species, both incrusting shells of *Pecten hastatus*, Sby., were collected at Iliuliuk Harbour and Captain's Harbour, Unalaska Island.

Myxilla Behringensis. (Sp. nov.)

(Plate III., figs. 3, 3a—f.)

Sponge (Plate III., fig. 3) massive, growing in irregular masses around algæ and other foreign objects. *Colour*, when dry, yellowish-white or a light brown. *Texture*, firm. *Surface*, undulating presenting a honey-comb appearance caused by the presence of polygonal or circular openings which cover nearly the entire surface of the sponge. These openings are seen to be of two distinct sizes; the larger are distant from each other, circular and generally occur in the elevated portions of the surface, the smaller are polygonal in shape and are crowded together in the depressed parts of the surface. *Dermal membrane*, thin, fragile, stretched across the openings. The larger surface openings appear to have the nature of oscula and the smaller may have had pores leading into them although no evidence of them has been observed in the membrane. The large openings in some cases have a diameter of 3 mm. The small ones measure on an average about 1·5 mm. across but are often much smaller.

Skeleton.—Consisting of a very irregular reticulation of loose strands of stylote spicules which is superseded at the surface by a dense felting of tylota, making a surface layer about 0·13 mm. thick. The dermal membrane covering the large surface openings is strengthened by tylota which converge toward the centre of the opening, but the membrane across the small openings is comparatively free of spicules.

Spicules.—(*a*) *Megasclera;* of two kinds; (1) Stout, slightly curved, rather abruptly but sharply pointed styli, (Plate III., figs. 3a, 3b) which are often spined at the base and

frequently develop a few spines toward the pointed end; varying in length from 0·209 to 0·235 mm., with an average width of 0·013 mm. The basal end when not spined generally terminates centrally in a single point. (2) Tylota (Plate III., fig. 3c) more slender than the styli, straight or slightly curved with a pronounced inflation at either end which becomes attenuated and pointed at the outer termination; size 0·196 by 0·009 mm. This form of spicule also occurs in considerable numbers throughout the main skeleton. (*b*) *Microsclera;* (1) *isochelæ* (Plate III., fig. 3d) from 0·022 to 0·052 mm. long. (2) *Sigmata* (Plate III., figs. 3e, 3f), simple and contort; from 0·019 to 0·39 mm. long. Both forms of microsclera are abundant in all parts of the sponge especially in the dermal membrane.

There are a number of specimens, the largest of which is about 120 mm. across.

Distribution.—Behring Sea and North Pacific Ocean.

Myxilla Amaknakensis. (Sp. nov.)

(Plate II., figs. 10, 10a—e.)

Sponge (Plate II., fig. 10) thickly incrusting or growing in irregular masses. The largest specimen in the collection is nearly 60 mm. across and 35 mm. high. *Colour*, in spirit, a rather dark yellowish-brown or, when dry, very much lighter. *Texture*, moderately firm. *Surface*, undulating, rough, with short, broken up ridges or separate elevations between which wind depressed areas or furrows. *Dermal membrane*, thin, delicate, spiculous. *Oscula* well marked, distinct, usually elevated, about 2·5 mm. in diameter. *Pores* scattered, averaging 0·098 mm. diameter.

Skeleton.—(*a*) *Main;* a definite network of stylote spicules inclosing triangular or quadrangular meshes having sides of one spicule's length and made up of from one to four or five spicules placed loosely together. This arrangement of the main skeleton is very typical of sponges belonging to this genus. (*b*) *Dermal.* The ridges and elevations of the surface are composed of an aggregation of tornota and the dermal membrane is abundantly supplied with the same spicules strewn about horizontally in it without order.

Spicules.—(*a*) *Megasclera* of two kinds: (1.) Small, stout, entirely spined styli (Plate II., fig. 10a) with sharp points; average size 0·144 by 0·013 mm., forming the main skeleton. (2) Sparsely spined tornota (Plate II., figs. 10b, 10c) with rather blunt ends; found throughout the main skeleton, but chiefly occurring in the dermal skeleton; average size 0·137 by 0·008 mm. (*b*) *Microsclera;* small isochelæ, with strongly curved shafts, (Plate II., figs. 10d, 10e) very abundant in all parts of the sponge; average length 0·022 mm.

Distribution.—Behring Sea and North Pacific Ocean as far south as Vancouver Island.

Myxilla firma. (Sp. nov.)

(Plate III., figs. 4, 4a—f.)

Sponge (Plate III., fig. 4) massive, of irregular shape, represented in the collection by a large specimen, roughly, 111 mm. long, 90 mm. broad and 55 mm. high, preserved in alcohol. *Colour*, in spirit, brownish-yellow. *Texture*, firm, compact with no elasticity. *Surface*, uneven, rough with narrow ridges beset with small sharp protuberances, forming a network over most of the surface of the sponge but more particularly over the depressed areas. *Dermal membrane* comparatively thick and tough, spiculous, stretched across the

spaces between and at a lower level than the surface ridges and covering the subdermal cavities. *Oscula* large, often prominent, the opening sometimes measuring 3·5 mm. across; they are the outer terminations of large canals that traverse the interior in all directions. *Pores* scattered, few in number, about 0·75 mm. in average diameter, piercing the dermal membrane over the subdermal cavities.

Skeleton.—Short, thick, loose strands of stylote spicules form an indefinite reticulation. At the surface the dermal membrane is thickly strewn with tylota and microsclera lying in it horizontally without order. The outer ends of some of the strands project beyond the dermal membrane thus forming the sharp protuberances of the surface ridges. The roughness of the surface is very probably accentuated by shrinkage in the substance of the sponge due to preservation in alcohol. A considerable proportion of horny matter is present.

Spicules.—(*a*) *Megasclera;* of two kinds viz.: (1) Stout, slightly bent, smooth, sometimes slightly spined styli (Plate III., fig. 4a) ending rather abruptly in a sharp point; from 0·281 to 0·366 mm. in length and 0·016 to 0·019 mm. thick. (2) Strongyla with smooth, even ends, often slightly inflated (Plate III., fig. 4b); from 0·222 to 0·262 mm. long and about 0·008 mm. thick; found in great abundance in the dermal membrane and in small numbers in the main skeleton. *Microsclera;* (1) Stout, tridentate isochelæ, with curved shafts and short broad teeth, (Plate III., figs. 4c, 4d); average length 0·052 mm. Small isochelæ evidently young forms of the large isochelæ are abundant; from 0·013 to 0·019 mm. long. (2) *Sigmata* (Plate III., figs. 4e, 4f), simple and contort; up to 0·045 mm. in length. The microsclera are present in large numbers in all parts of the sponge.

Locality.—Kyska Harbour, Kyska Island (Dall), also Vancouver Island (Macoun).

Clathria Loveni, Fristedt.

(Plate IV., figs. 1, 1a.)

Clathria Loveni, Fristedt. 1887. Sponges from the Atlantic and Arctic Oceans and Behring Sea, (translation), Vega-expeditionens vetenskapliga arbeten, p. 458, pl. 25, figs. 70-72; pl. 36, fig. 24.

This species which can be readily recognized by its external form, is represented in the collection by four dried specimens. The spicules are: (*a*) Rather stout, sharply pointed styli with slightly inflated basal terminations (Plate IV., fig. 1); from 0·383 to 0·465 mm. long with an average thickness of 0·013 mm. (*b*) Anisochelæ (Plate IV., fig. 1a) with an average length of 0·072 mm. Very few of the anisochelæ were found owing to the soft parts of the sponge being washed away, leaving only the firm, compact skeleton composed of closely packed stylote spicules.

The writer is inclined to regard the sponge from Cape Jakan (Siberian Arctic Ocean), first described by Fristedt under the name *C. Loveni*, as not properly referable to the genus *Clathria*. The typical microsclera of that genus are isochelæ and the fibres are echinated by small, spined styli, whereas the microsclera of the type specimen of *C. Loveni* and of those from Alaska are anisochelæ while there is no evidence of any echination of the fibres.

On account of these differences, of the general manner of growth, of the spicules of which the skeleton is made up and of their arrangement, the writer considers that *C. Loveni* is most nearly related to *Esperella* and would be inclined to refer it to that genus.

Localities.—Chika Island, Akutan Pass; Unalaska Island.

Plocamia Manaarensis, Carter.

(Plate II., figs. 11, 11a—g.)

Dictyocylindrus Manaarensis, Carter. 1880. Ann. and Mag. Nat. Hist., series 5, vol. vi., p. 37, pl. iv., figs. 1a—g.

One small specimen incrusting the entire surface of a fragment of shell 15 mm. long and 10 mm. broad. The sponge has a thickness of about 1 mm. *Colour*, in spirit, brownish-gray. *Texture* firm. *Surface* even, strongly hispid. *Dermal membrane* thin, spiculous. The characters of the oscula and pores have not been ascertained.

Skeleton.—Composed of a fairly regular reticulation of dumb-bell-shaped spicules (tylota) supporting a dermal arrangement of outwardly pointed stylote and tylostylote spicules. The dermal styli are large and project some distance beyond the general surface; the tylostyli are much smaller and are collected round the bases of the styli.

Spicules.—(*a*) *Megasclera;* of four kinds: (1) Stout, slightly curved, smooth tylota: (Plate II., fig. 11) with very decidedly marked terminal heads which appear to have their outer ends slightly roughened; the shafts of these spicules are thickest at the centre; up to 0·10 mm. in length, average thickness 0·008 mm. Among the tylota one was observed that had the shaft strongly spined. (2) Large, smooth, slightly bent styli (Plate II., fig. 11a) thickest near the base and gradually tapering to an acute point; up to 0·687 mm. long and from 0·016 to 0·019 mm. thick. (3) Slightly curved, smooth, sharply pointed tylostyli (Plate II., fig. 11b), thickest a short distance from the distinctly marked, rounded head which appears to be, like the heads of the tylota somewhat roughened or minutely spined; about 0·183 mm. in length and from 0·009 to 0·013 mm. thick. These spicules project only slightly beyond the surface of the sponge and are much more numerous than the large styli at whose bases they are arranged in groups. (4) Very slender, smooth tylostyli (Plate II., fig. 11c), with an average size of 0·176 by 0·003 mm.; found at the surface scattered in the dermal membrane. (*b*) *Microsclera;* (1) Minute, palmate isochelæ (Plate II., figs. 11d, 11e) 0·013 mm., in length. (2) Slender toxa (Plate II., figs. 11f, 11g) 0·065 mm. long, measured in a straight line between the terminal ends; found only in small numbers. In a vertical section a number of spherical gemmules were observed near the base of the sponge; they were reddish-brown in colour and about 0·052 mm. in diameter.

There is so very little difference between the spiculation of the incrusting Californian sponge and the erect branching one from the Gulf of Manaar, that it is thought advisable to refer the former to Carter's species although there is so great a difference in outward form between the two and the localities where they were obtained are so widely separated. The Californian sponge although incrusting may be in a young stage of growth; additional specimens are needed to show the form and variations in growth of mature individuals.

The spicules of the type specimen as given by Carter (op. cit) are:—(1) *Acuate spicules* (*styli*), 0·64 mm. long; (2) *shorter acuate spicules* (*tylostyli*), 0·38 mm. long; (3) *hair-like spicules* (*slender tylostyli*), about 0·24 mm. in length; (4) *spicules with inflated extremities* (*tylota*), 0·24 mm. long; (5) *tricurrate spicules* (*toxa*), 0·051 mm. in length; (6) *equianchorate spicules* (*isochelæ*), 0·01 mm. in length.

Locality.—California.

Phakellia ventilabrum, Johnston.

Halichondria ventilabrum, Johnston. 1842. British sponges, p. 107, pl. vii.

Phakellia ventilabrum, Bowerbank. 1864. Mon. Brit. Spong., vol. i., p. 186; vol. ii., p. 122; vol. iii., p. 57, pl. xxii., figs. 1-7.

" " Verrill. 1873. Am. Jour. Sci. and Arts, vol. vi., p. 440 and vol. vii., p. 413.

" " ? Whiteaves. 1874. Report on deep-sea dredging operations in the Gulf of St. Lawrence, p. 9.

" " var. *connexiva*, Ridley and Dendy. 1887. Rep. Monaxonida, Zool. Chall. Exp., vol. xx., p. 170, pl. xxxv., figs. 3, 3a.

There are a number of cup-shaped specimens of this species from Alaska, the largest of which has a height of 250 mm., a width at the top of 170 mm. and a thickness of 13 mm. half way up the stalk. The growth of this sponge, in most instances, is much more robust in this region than in the Gulf of St Lawrence, although large specimens have been found further south, off the coast of Maine. A few of the specimens, however, are quite small and bear a strong resemblance in general appearance to the Gulf of St. Lawrence sponge.

In spiculation a considerable variation is noticeable; whilst in some specimens there is a decided tendency toward the separation of the spicules into two sizes, the smaller spicules being at the surface, in others the difference in size is less marked or not apparent at all. The maximum length of the spicules in different specimens, varies from 0·353 to 0·628 mm. with an average thickness of 0·013 mm. In individual specimens the variation in length of the spicules is considerable. Three sponges from St. Matthew Island, Behring Sea, described in the 'Transactions of the Royal Society of Canada, 1892,' as a variety of *Phakellia papyracea*, Ridley and Dendy, are now seen to be evidently a form of *Phakellia ventilabrum*, Johnston, in which the spicules show a marked tendency to division into two sizes, a character which is, as shown by other specimens in the present collection from Alaska, not a permanent character.

Distribution.—Arctic Ocean, Behring Sea and North Pacific Ocean.

Phakellia Dalli. (Sp. nov.)

(Plate III., figs. 5, 5a–d.)

Sponge (Plate III., fig. 5) erect, with a spreading root and a long, stout stem, divided at a considerable height above the base into three branches which again subdivide once or twice, anastomose and terminate in cup-shaped expansions; total height of sponge 344 mm.; height of stem 205 mm.; length of branches before subdivision 70 mm.; diameter of stem 15 mm.; diameter of main branches about 12 mm. The stem is of about the same thickness throughout its length and the main branches are nearly as stout as the stem whilst the subdivisions of the branches are short and only slightly reduced in thickness. The largest of the cup-shaped expansions, of which there are four, has a diameter of nearly 45 mm. *Colour*, when dry, dull brownish-yellow. *Texture*, of stem and branches, compact, firm, unyielding, of the terminal cups, more open, elastic.

Skeleton.—Separate, well defined fibres of spicules pass along the central portion of the branches and of the walls of the cups: these by subdivision and branching give rise to subsidiary fibres which run to the surface. The fibres are connected by individual spicules crossing them at right angles. The stem and lower portions of the branches are strengthened by the development of horny fibres covered by stylote spicules running longitudinally in the stem and branches and crossed at right angles by fibres of spicules passing to the surface, the whole forming a somewhat compact reticulation. The surface ends of the fibres terminate in indistinct brushes.

Spicules.—Megasclera; of three sizes: (1) Long, generally somewhat curved, smooth styli (Plate III., fig. 5a), up to 0·530 mm. in length and with an average width of 0·009 mm.; occurring in the upper portions of the sponge. (2) Stout, slightly curved, gradually and sharply pointed, smooth styli (Plate III., fig. 5b), from 0·235 to 0·393 mm. long, with an average thickness of 0·014 mm.; mixed with the larger spicules of the upper parts of the sponge and forming the skeleton of the stem and lower parts of the branches. The smaller spicules of this size are found in the surface brushes. (3) Long, slender, irregularly bent, smooth, sharply pointed styli (Plate III., figs. 5c, 5d) up to 0·393 by 0·0049 mm. in size; occurring in all parts of the sponge; those found in the stem are smaller than those of the terminal cups. The spicules vary much in size and seem to grade one into the other, those of the stem being shorter than those found in the upper parts of the sponge.

The above diagnosis is based upon a single but well preserved dried specimen from Chika Island, Alaska; the description of the external form will doubtless have to be enlarged when additional specimens are obtained.

It is the author's wish to connect with this interesting species the name of Dr. W. H. Dall, to whose investigations in the Alaskan Arctic Ocean, Behring Sea and the North Pacific Ocean science is so much indebted.

Axinella rugosa, Bowerbank.

(Plate IV., figs. 2, 2a, 2b.)

Dictyocylindrus rugosus, Bowerbank. 1866. Mon. Brit Spong., vol. ii., p. 119; vol. iii., p. 51, pl. xx., figs. 1–4.
Axinella rugosa, Fristedt. 1877. Sponges from the Atlantic and Arctic Oceans and Behring Sea (translation), Vega-expeditionens vetenskapliga arbeten, p. 461.

Four specimens of this sponge represent this species in the collection; they agree admirably with Bowerbank's description and figure. The largest specimen, 85 mm. in height, divides close to the base into two main branches which subdivide above into lobate expansions. The other specimens are smaller, but have a similar style of growth.

The spicules of the Alaskan sponges are: *megasclera*, of three kinds: (1) Large, smooth, sharply pointed oxea (Plate IV., fig. 2), occurring in the subsidiary fibres passing to the surface; their maximum size is about 1·57 by 0·027 mm. (2) Long, slightly curved, smooth styli (Plate IV., fig. 2a), thickest at midlength, up to 1·02 by 0·027 mm. in size; found in comparatively small numbers mixed with the oxea at the surface. (3) Long, irregularly bent, smooth oxea (Plate IV., fig. 2b), up to 1·7 by 0·027 mm. in size; occurring in the axial fibres. These spicules are occasionally rounded at one or both ends, becoming stylote or strongylote.

The spicules of this species attain a large size, but show a considerable variation in length and thickness. The spicules of the axial fibres differ from those of the subsidiary fibres principally in being twisted and generally longer.

Localities.—Chika Island and Unalaska Island.

Suberites suberea, Johnston.

(Plate IV., figs. 3, 3a—d.)

Halichondria suberea, Johnston. 1842. British Sponges, p. 139, pl. xii., figs. 5, 6, also p. 197.
Halina suberea, Bowerbank. 1861. List of Brit. marine invert. fauna, Report Brit. Assoc., 1860, p. 235.

Suberites domuncula, Schmidt. 1862. Spong. Adriat. Meeres, p. 67.
Hymeniacidon suberea, Bowerbank. 1864. Mon. Brit. Spong., vol. i., p. 191; vol. ii., p. 200; vol. iii., pl. xxxvi., figs. 1, 2, 3, 4: vol. iv., p. 88.

There are nearly sixty specimens of this species from Alaska. Carter, in the Ann. and Mag. Nat. Hist., series 5, vol. ix., p. 353, has noticed the occurrence of a "flesh-spicule" in this species, which he describes as being "a short, curved, cylindrical acerate with obtuse ends, inflated in the centre and microspined."

In the Alaskan specimens the flesh-spicules are present in the majority of cases, but absent in a few; in some specimens they occur in great abundance, in others only one or two were seen. Evidently the presence or absence of the flesh-spicules cannot be considered of specific value. In the 'Transactions of the Royal Society of Canada,' 1892, the writer described a sponge, of which there were five specimens, from Vancouver Island, under the name *S. latus*, believing them to be distinct from *S. suberea* on account of the non-existence of flesh-spicules in the Vancouver specimens. Since then one or two of these spicules have been seen in some of these specimens, in which case the Vancouver specimens must be regarded as identical with *S. suberea*, Johnston.

In some of the sponges the tylostyli were rounded off and quite blunt at the end that is normally rather sharply pointed (Plate IV., fig. 3). The flesh-spicules were also seen in all stages of transition, from being almost spherical in shape to the perfect spicule (Plate IV., fig. 3d).

The tylostyli have a maximum size of about 0·406 by 0·009 mm. (Plate IV., figs. 3a, 3b); the small cortical tylostyli have an average size of 0·091 by 0·006 mm. (Plate IV., fig. 3c).

The "inflato-cylindrical flesh-spicules" attain a length of 0·032 mm. and vary in thickness from 0·003 to 0·0049 mm.

Distribution.—Behring Sea and North Pacific Ocean.

Suberites montalbidus, Carter.

(Plate III., figs. 6, 6a—c.)

Suberites montalbidus, Carter. 1880. Ann. and Mag. Nat. Hist., series 5, vol. vi., p. 256; vol. ix., p. 353.
Suberites spec., Vosmaer. 1882. Report on the sponges dredged up in the Arctic Sea by the "Willem Barents" in the years 1878 and 1879 (reprinted from the "Nied. Arch. für Zool.," Suppl. Band i.), p. 32, pl. i., figs. 22, 23; pl. iv., figs. 140–144.
Suberites montalbidus, Fristedt. 1887. Sponges from the Atlantic and Arctic Oceans and the Behring Sea (translation), Vega-expeditionens vetenskapliga arbeten, p. 428.

This sponge was first described by Carter from a specimen from Barent's Sea, near the southwest end of Novaya Zemlya. Vosmaer's specimens were from the same region, and later Fristedt records the occurrence of the same sponge in Behring Sea and Strait, in Beaufort's Sea, the Siberian Arctic Ocean, the Kara Sea, the European Arctic Sea and Barent's Sea and the sea west from Greenland.

A single specimen, west from Unalaska Island, represents the species in the present instance; it is amorphous, about 25 mm. long, 13 mm. broad, and quite soft and spongy to the touch.

The spicules of the Alaskan specimen are:—(1) Large tylostyli with scarcely any increase in thickness at the basal end (Plate III., fig. 6); varying in length from 0·334 to

0·622 mm., with an average thickness of 0·009 mm.; forming the main skeleton. (2) Small tylostyli with rounded heads (Plate III., fig. 6a), occurring at the surface; from 0·117 to 0·301 mm. long and averaging 0·008 mm. in thickness. (3) Small, minutely spined oxeote spicules, inflated at midlength (Plate III., fig. 6b); from 0·026 to 0·058 mm. long. (4) Small, minutely spined, cylindrical spicules with rounded ends and inflated in the centre; always smaller than the oxeote spicules (No. 3), from 0·013 to 0·026 mm. long (Plate III., fig. 6c).

The main skeleton is lax and made up of the large tylostyli irregularly intermixed; the dermal skeleton is composed of the two forms of small spined spicules with loose, distinct brushes of the smaller tylostyli disposed at right angles to and projecting slightly beyond the surface; the small spined spicules are also distributed throughout the interior.

Locality.—Iliuliuk Harbour and Captain's Harbour, Unalaska Island.

Suberites montiniger, Carter.

(Plate IV., fig. 4.)

Suberites montiniger, Carter. 1880. Ann. and Mag. Nat. Hist., series 5, vol. vi., p. 256.

A specimen growing over portions of shells and in places thinly incrusting is doubtfully referred to this species. Its surface is raised at short intervals into low, rounded monticules each with a small osculum at the top.

The tylostyli vary in length from 0·288 to 0·471 mm. in length and have an average thickness of 0·016 mm. (Plate IV., fig. 4); they are thickest in the centre, generally slightly bent, sharply pointed at one end and terminate in a long oval head at the other.

Locality.—Granite Cove, Port Althorp.

Suberites concinnus. (Sp. nov.)

(Plate II., figs. 12, 12a.)

Sponge of irregular shape, attached and growing freely; the largest specimen in the collection being 88 by 52 by 32 mm. in size. *Colour*, in spirit, a light yellowish to a dark brown. *Texture*, very firm, compact. *Surface*, even, slightly hispid. *Pores*, scattered, visible only in thin sections at right angles to the surface. The most perfect specimen (Plate II., fig. 12), and the only one in which oscula are seen, is small, sessile and subspherical, measuring about 20 mm. in height and breadth; its basal attachment is about 10 mm. across. *Oscula* small, about 0·5 mm. in diameter, each occupying the summit of a low prominence.

Skeleton.—Composed of stylote spicules arranged in a somewhat loose *halichondroid* fashion. At the surface the styli are arranged in bundles placed side by side at right angles to the surface, forming a compact cortex. It is between these surface bundles of spicules that minute openings (pores) are seen, in sections at right angles to the surface, leading into the interior of the sponge. The styli project but slightly beyond the surface.

Spicules.—Megasclera; of one kind only, viz., rather slender, straight, sharply pointed, smooth styli (Plate II., fig. 12a), with evenly rounded basal ends; varying in length from 0·229 to 0·301 mm., with an average thickness of 0·005 mm. There is no difference in size between the spicules of the cortex and those of the main skeleton.

Distribution.—Arctic Ocean, Behring Sea and North Pacific Ocean.

Polymastia laganoides. (Sp. nov.)

(Plate IV., figs. 5, 5a—c.)

Sponge (Plate IV., fig. 5) sessile, thin, coating a considerable area, represented by a single specimen measuring 115 mm. across, 8 mm. thick in the centre and thinning off toward the edges. *Colour*, in spirit, a light yellow. *Texture* compact, leathery. *Surface* even, hispid, bearing in places low, warty protuberances averaging 5 mm. in breadth. *Oscula*. Translucent rings are disposed at intervals over the surface and also occupy the summit of the mammiform protuberances; each ring incloses what appears to be a minute osculum averaging 0·68 mm. in diameter. *Pores* (*?*) scattered.

Skeleton.—Stout fibres of long styli pass toward the surface, entering but not reaching the surface of a cortical layer of irregularly disposed smaller styli. The projection of some of the smaller styli beyond the surface causes a slight hispidity. The translucent rings on the surface are seen to be caused by the absence of the cortical layer of spicules; the stout fibres here continue beyond the surface, causing a circular or star-shaped area surrounding each osculum to be strongly hispid. Near the edge of the sponge in places, and where portions of the surface are below the general level, a marked hispidity is also apparent.

Spicules.—Megasclera; styli, of three sizes. (1) Large, gradually and sharply pointed, smooth tylostyli (Plate IV., fig. 5a), thickest at midlength and generally with a well developed head; up to 1·50 by 0·020 mm. in size; forming the fibres and projecting beyond the surface in places, viz., surrounding the oscula, near the edge of the sponge and where the surface is sunken. (2) Short, sharply pointed, smooth tylostyli, thickest at the middle, with a strongly marked head (Plate IV., fig. 5b); average size 0·479 by 0·013 mm.; composing the dermal layer. A noticeable feature in this sponge is the absence of a regular radiating arrangement of the spicules of the cortex; the spicules are closely intermixed and lie at all angles to the surface, those that project beyond it causing a slight hispidity. (3) Very small, slender tylostyli with rounded heads (Plate IV., fig. 5c); average size 0·117 by 0·003 mm.; distributed in large numbers throughout all portions of the sponge, especially in the soft parts between the fibres.

Locality.—Behring Island.

Desmacella pennata. (Sp. nov.)

(Plate IV., figs. 6, 6a—d.)

Sponge (Plate IV., fig. 6) thinly coating, forming small irregularly shaped patches; the largest of the four specimens representing the species is about 50 mm. across and does not exceed 5 mm. in thickness. *Colour*, in spirit, dark grayish-brown. *Texture* firm with little elasticity. *Surface* hispid, rather uneven, traversed in all directions by shallow ramifying grooves which in many places diverge from a common centre forming irregularly star-shaped depressions. The surface between the grooves is at times considerably elevated. *Dermal membrane* spiculous, adhering firmly to the spicules that project beyond it. *Oscula* small, dispersed, circular, about 0·131 mm. in diameter. *Pores* scattered, averaging 0·032 mm. in diameter. Found growing on rocks at low tide.

Skeleton.—Fibres, composed of stout styli with a large proportion of horny matter, ascend from the base to the surface remaining separate until near the surface where they

show a tendency to branch and anastomose and to become diffuse. The styli have their bases embedded in the horny matter of the fibres and are directed outward and upward (Plate IV., fig. 6a); separate styli connect the fibres together at irregular intervals. The spicules at the outer terminations of the fibres project considerably beyond the dermal membrane. There is no special dermal arrangement of the skeleton but numbers of slender styli occur without definite order in the dermal membrane and are also found less abundantly throughout the main mass.

Spicules.—(a) *Megasclera;* of two sizes; (1) Large, stout, slightly bent, sharply pointed, smooth styli, thickest at midlength and with a slightly inflated basal end which is generally smooth but at times shows indications of being spined (Plate IV., fig. 6b); varying in size from 0·170 by 0·016 mm. to 0·379 by 0·019 mm. (2) Slender, sharply pointed, smooth styli, thickest at the basal end which is minutely spined and often decidedly inflated (Plate IV., fig. 6c); varying in length from 0·176 to 0·222 mm. and in thickness from 0·006 to 0·0049 mm. (b) *Microsclera;* smooth toxa (Plate IV., fig. 6d) varying in size from 0·072 by 0·002 mm. to 0·255 by 0·006 mm.; distributed in considerable numbers throughout the sponge.

Judging from its spiculation this sponge evidently belongs to the genus *Desmacella;* the skeletal arrangement is somewhat *plumohalichondroid* in its character and at the same time is indefinitely reticulate, the single styli connecting the fibres representing secondary fibres, a combination of characters which in itself is highly interesting.

Locality.—Sooke, Vancouver Island.

Esperella serratohamata, Carter.

(Plate IV., figs. 7, 7a—j.)

Esperia serratohamata, Carter. 1880. Ann. and Mag. Nat. Hist., series 5, vol. vi., p. 49, pl. v., fig. 20a—b.

Sponge (Plate IV., fig. 7) massive, amorphous, consisting of a close aggregation of anastomosing fibres, inclosing rounded or oval meshes which are seldom more than 2 or 3 mm. in length. The fibres are generally flattened and expanded laterally where they join each other. *Texture* firm. *Surface* moderately even. *Dermal membrane* thin, spiculous. *Oscula* small, dispersed, about 1 mm. in diameter. A few specimens of this species were collected by Prof. John Macoun in July, 1893, at Sooke, Vancouver Island; the largest measures about 70 mm. across in all directions.

Skeleton.—Compact anastomosing fibres about 0·5 mm. in thickness at their thinnest parts and composed of tylostyli, form the main skeleton. The dermal skeleton consists of tylostyli lying without order in the dermal membrane, parallel to the surface.

Spicules.—(a) *Megasclera;* of one kind only, viz., straight, rather sharply pointed, smooth tylostyli with basal ends only slightly inflated (Plate IV., fig. 7a), composing the main and dermal skeletons; ranging in length from 0·320 to 0·353 mm. with an average thickness of 0·011 mm. (b) *Microsclera;* of three kinds; (1) Palmate anisochelæ (Plate IV., figs. 7i, 7j); averaging in length 0·036 mm.; not very abundant but found in all parts of the sponge. (2) Very large, simple and contort sigmata (Plate IV., figs. 7b, 7e, 7d) notable for their strongly serrated curved ends; average length 0·157 mm.; distributed abundantly through the sponge. Small forms of the sigmata are present which are likewise serrated. (3) Minute, smooth toxa (Plate IV., fig. 7f) about 0·039 mm. in length; found throughout the soft parts of the sponge and at the surface.

The measurements given by Carter (op. cit.) of the spicules of the type specimen from the Gulf of Manaar, India, are as follows :—*tylostyli* (*sub-pinlike spicules*) 0·18 mm. in length ; *sigmata* (*bihamate spicules*) 0·102 mm. in length ; *toxa* (*tricurvate spicules*) 0·051 mm. long ; *anisochelæ* (*inequianchorate spicules*) 0·017 mm. long.

The specimen first described by Carter was of very small size. That author with reference to his sponge says "a minute portion has grown on one of the Melobesian nodules, which has yielded sufficient for mounting and retaining in the dried state respectively." "Size of specimen about 1-6th inch in horizontal diameter." The smallness of the type specimen precluded a description of the general arrangement of the skeleton. There are no appreciable differences to be found in the size and form of the spicules of the Vancouver specimens and those of the type from the Gulf of Manaar.

One of the four specimens collected by Prof. Macoun differs slightly in spiculation from the other three but not sufficiently to warrant its being regarded as specifically distinct. Its sigmata are smaller (Plate IV., fig. 7e), averaging 0·065 mm. in length and are without the serration at the ends. The tylostyli are shorter, varying in length from 0·314 to 0·262 mm. but of about the same thickness. The toxa have a greater variation in size (Plate IV., figs. 7g, 7h), the largest attaining a length of 0·085 mm. The anisochelæ are of the same dimensions. The evenly rounded ends of the sigmata of this Vancouver specimen, however, would lead one to believe that the serration of the outer curve toward the ends of these spicules, the character which has evidently suggested the specific name, is not constant.

List of localities at which specimens were collected.

1. ARCTIC OCEAN.

Pearl Bay.—Lat. 71° 02′ N., Long, 157° 46′ W., U. S. Revenue Steamer "Corwin," Capt. M. A. Healy commanding, Aug. 24th, 1884. 19 fathoms.

Halichondria panicea.
Myxilla Barentsi.
Suberites concinnus.

Near Icy Cape.—W. H. Dall, 1880.

Esperella helios.
Phakellia ventilabrum.

Arctic Ocean.—U. S Revenue Steamer "Corwin."

Phakellia ventilabrum.

2. KOTZEBUE SOUND.

Port Clarence.—W. H. Dall, 1880. Beach.

Reniera rufescens.
Myxilla Barentsi.
Phakellia ventilabrum.

Chamisso Island.—W. H. Dall, 1880. 5-8 fathoms.

Reniera rufescens.
Phakellia ventilabrum.

3. BEHRING STRAIT.

Lat. 66° 45′ N., Long. 166° 35′ W.—W. H. Dall. 10 fathoms, sand.

Halichondria panicea.

Lat. 66° 12′ N., Long. 168° 54′ W.—Lieut. Geo. M. Stoney, U. S. N., July 3, 1884. 30 fathoms.

Halichondria panicea.

Lat. 65° 49′ N., 169° 04′ W.—U. S. Revenue Steamer "Corwin," Capt. M. A. Healy commanding, June 14th, 1884. 26 fathoms.

Halichondria panicea.
Esperella helios.

4. PLOVER BAY.

W. H. Dall.—Sept. 14th, 1880. 10-25 fathoms, rocks.

Halichondria panicea.
Eumastia sitiens.
Phakellia ventilabrum.
Suberites concinnus.

5. BETWEEN ST. LAWRENCE ISLAND AND CAPE RUMIANTZOF.

Lat. 62° 15′ N., Long. 167° 48′ W.—Lieut. Geo. M. Stoney, U. S. N., June 13th, 1884. 20½ fathoms, fine greenish sand.

Halichondria panicea.

6. ST. MICHAELS.

L. M. Turner.—October 17th, 1875. Low tide.

Halichondria panicea (abundant, very low water).
Reniera rufescens (beach, abundant).
Phakellia ventilabrum (rare, extreme low water).

7. NUNIVAK ISLAND.

Anchorage, Cape Etolin.—W. H. Dall.

Halichondria panicea (beach).
Eumastia sitiens (8 fathoms, stones).

Five Miles S. W. of west cape of Nunivak Island.—W. H. Dall.

Halichondria panicea (24 fathoms, sand).

8. ST. MATTHEW ISLAND.

W. H. Dall, beach.

Phakellia ventilabrum.

9. HAGEMEISTER ISLAND.

W. H. Dall.

Halichondria panicea (beach).
Esperiopsis Quatsinoensis.

10. PORT MÖLLER, ALASKA PENINSULA.

W. H. Dall, beach to 17 fathoms, sand.

Halichondria panicea.

11. AKUTAN PASS.

Chika Island.—W. H. Dall.

Halichondria panicea (beach).
Esperella modesta (beach).
Esperiopsis Quatsinoensis (beach).
Chondroeladia Alaskensis (beach).
Chondroeladia pulchra (beach).
Clathria Loveni.
Phakellia Dalli (beach).
Axinella rugosa.
Suberites suberea.

Gull Island.—W. H. Dall, beach.

Chondroeladia pulchra.

Akutan Pass.—W. H. Dall.

Esperiopsis Quatsinoensis.
Chondroeladia Alaskensis.

12. UNALASKA ISLAND.

Iliuliuk Harbour and Captain's Harbour.—W. H. Dall.

Halichondria panicea, 1871 (also 80 fathoms and 6 fathoms, mud).
Esperella adhærens, (10 fathoms, shingle).
Esperiopsis Quatsinoensis, (after gale, low water mark).
Chondroeladia Alaskensis, (3-6 fathoms, stones; 6 fathoms, mud; 9 fathoms, stones; 12-15 fathoms, stones, shells; 5-16 fathoms, stones; 9-16 fathoms; 25-75 fathoms, coarse sand).
Myxilla Barentsi (10 fathoms, shingle).
Myxilla parasitica.
Myxilla Amaknakensis (30 fathoms, sand).
Phakellia ventilabrum (80 fathoms).
Suberites suberea (after gale, low water mark; 6 fathoms, mud; 25-75 fathoms, coarse sand; 70 fathoms, coarse sand; 80 fathoms).
Suberites montalbidus (80 fathoms).

AMAKNAK ISLAND.—W. H. Dall. 1871.
Halichondria panicea.
Tedania fragilis (beach).
Esperella helios.
Esperiopsis Quatsinoensis (also 1880, beach).
Chondrocladia Alaskensis.
Myxilla Barentsi (beach).
Myxilla Behringensis.
Suberites suberea.

WEST OF AMAKNAK ISLAND.—W. H. Dall.
Halichondria panicea (beach and 60 fathoms).
Esperella adhærens (60 fathoms, rocks, stones, mud).
Chondrocladia Alaskensis (60 fathoms).
Myxilla Barentsi (60 fathoms).
Suberites suberea (60 fathoms).

PORT LEVASKEF, AMONG ISLANDS.—W. H. Dall.
Myxilla Amaknakensis (20 fathoms, mud, shells).

CHERNOFSKY BAY.—W. H. Dall, beach.
Halichondria panicea.
Esperiopsis Quatsinoensis.
Chondroeladia Alaskensis.

UNALASKA.—W. H. Dall.
Halichondria panicea. 1873, (beach).
Eumastia siliens. 1873, (beach).
Esperiopsis Quatsinoensis. 1873, (beach also E. W. Nelson, 1877, beach and U. S. Revenue Steamer "Wyandotte," 1868, beach).
Chondroeladia Alaskensis. 1873, (beach).
Chondrocladia pulchra. 1873, (beach).
Myxilla Behringensis 1873, (beach).
Myxilla Amaknakensis, (beach).
Clathria Loveni. 1873, (beach).
Phakellia Dalli, (beach).
Axinella rugosa, (beach).
Suberites suberea. 1873, (beach).

13. ATKA ISLAND.

NAZAN BAY.—W. H. Dall, 10-16 fathoms, sand.
Suberites suberea.

ATKA.—W. H. Dall.
Esperiopsis Quatsinoensis.

14. BAY OF ISLANDS, ADAK ISLAND.

W. H. Dall.—9-16 fathoms, sand, mud.
Eumastia siliens.
Esperella lingua.
Esperella adhærens.
Suberites suberea.

15. CONSTANTINE HARBOUR, AMCHITKA ISLAND.

W. H. Dall, beach.
Halichondria panicea.

16. KYSKA ISLAND.

W. H. Dall.
Halichondria panicea.
Esperiopsis Quatsinoensis.
Myxilla Behringensis.

KYSKA HARBOUR.—W. H. Dall.
Halichondria panicea (beach; 9-14 fathoms, sand).
Eumastia siliens (9-14 fathoms, sand).
Toxochalina borealis (9-14 fathoms, sand; 9-12 fathoms, sand, mud).
Esperella adhærens (9-12 fathoms, sand).
Esperiopsis Quatsinoensis (beach; 9-14 fathoms, sand; 9-12 fathoms, sand, mud).
Iotrochota magna (10 fathoms).
Myxilla Amaknakensis (beach; 9-14 fathoms, sand; 9-12 fathoms, sand, mud).
Myxilla firma (9-14 fathoms, sand).

17. ATTU ISLAND.

CHICHAGOF HARBOUR.—W. H. Dall, beach.
Esperiopsis Quatsinoensis.
Chondrocladia Alaskensis.
ATTU ISLAND.—W. H. Dall, beach.
Halichondria panicea.
Esperiopsis Qualsinoensis.
Chondrocladia Alaskensis.
Myxilla Behringensis.

18. BEHRING ISLAND.

Halichondria panicea.—(N. Grebnitski, 6 fathoms and L. Stejneger, beach).
Eumastia sitiens.
Reniera rufescens.—(N. Grebnitski, 6 fathoms).
Esperiopsis Quatsinoensis (L. Stejneger, beach).
Chondrocladia Alaskensis.
Myxilla Amaknakensis (L. Stejneger, beach).
Suberites concinnus (L. Stejneger, beach).
Polymastia laganoides (L. Stejneger, beach).

19. KAMTCHATKA.

RAKOVAYA BUCHTA.—L. Stejneger (less than 10 fathoms).
Reniera rufescens.
AWATCHA BAY.—L. Stejneger (less than 10 fathoms).
Halichondria panicea.

20. ALASKA.

Halichondria panicea.—(W. H. Dall, beach and U. S. Revenue Steamer "Corwin").
Eumastia sitiens.—(U. S. Revenue Steamer "Corwin").
Esperella helios.—(U. S. Revenue Steamer "Corwin").
Myxilla Amaknakensis.—(W. H. Dall).
Phakellia ventilabrum.—(W. H. Dall, beach and U. S. Revenue Steamer "Corwin").
Suberites concinnus.—(W. H. Dall, beach).

21. SANNAK ISLAND.

Esperiopsis Quatsinoensis.—(W. H. Dall, 1877, beach also E. W. Nelson, 1877, beach).
Chondrocladia Alaskensis.—(E. W. Nelson, 1877, beach).

22. BELKOFSKY BAY.

W. H. Dall.
Esperiopsis Quatsinoensis (beach).
Myxilla Behringensis, (beach).
Suberites suberea.

23. SHUMAGIN ISLANDS.

UNGA ISLAND.—W. H. Dall, beach.
Halichondria panicea.
Esperella adhærens.
Esperiopsis Quatsinoensis.
Chondrocladia Alaskensis.
Suberites suberea.
UNGA ISLAND AND SANBORN HARBOUR, NAGAI ISLAND.—W. H. Dall, beach.
Esperiopsis Quatsinoensis.
NEW HARBOUR, UNGA ISLAND.—W. H. Dall, beach.
Esperella adhærens.
COAL HARBOUR, UNGA ISLAND.—W. H. Dall.
Halichondria panicea (8-9 fathoms, sand, stones also beach, extra low tide).
Esperella adhærens (3 fathoms, shingle).
Esperiopsis Quatsinoensis (8-9 fathoms, sand, stones and beach, extra low tide).
Suberites suberea (8-9 fathoms, sand, stones).
ROUND ISLAND, COAL HARBOUR, UNGA ISLAND.—W. H. Dall.
Suberites suberea (beach, neap tide).
UNGA AND POPOF ISLANDS.—W. H. Dall.
Halichondria panicea (beach).
Esperiopsis Quatsinoensis (beach).
Chrondrocladia Alaskensis (beach).
Suberites suberea.

Uuga Island and Popof Strait.—W. H. Dall, beach.
Halichondria panicea.
Eumastia sitens.
Esperella adhærens.
Chrondroeladia Alaskensis.
Myxilla Barentsi.
Suberites suberea.

Popof Strait.—W. H. Dall.
Halichondria panicea (6 fathoms sand).
Esperella helios? (6 fathoms sand).
Esperella adhærens (6 fathoms sand).
Chondrocladia Alaskensis.
Suberites suberea (low water).

Sanborn Harbour, Nagai Island.—W. H. Dall.
Halichondria panicea (beach).
Esperiopsis Quatsinoensis (beach).
Chondroeladia Alaskensis (beach and in shoal water).
Iotrochota magna (beach).
Myxilla Behringensis (beach).
Suberites suberea (beach and at lowest water).

East Shore of Nagai Island.—W. H. Dall, beach.
Esperiopsis Quatsinoensis.
Chondrocladia Alaskensis.
Myxilla Behringensis.

Big Koniushi Island.—W. H. Dall, 6-20 fathoms, sand, rocks.
Halichondria panicea.
Suberites suberea.

North-east harbour, Little Koniusha Island.—W. H. Dall, beach.
Chondrocladia Alaskensis.

Simeonof Island.—W. H. Dall, beach.
Halichondria panicea.
Esperella modesta.
Esperiopsis Qualsinoensis.
Chondrocladia Alaskensis.
Myxilla Behringensis.

24. CHIGNIK BAY, ALASKA PENINSULA.

W. H. Dall, 7-18 fathoms, sand.
Suberites suberea.

25. SEMIDI ISLANDS.

W. H. Dall.
Chondrocladia Alaskensis (12-28 fathoms, gravel).
Suberites suberea (15-23 fathoms, gravel).

26. KADIAK ISLAND.

Chajapka Cove, Kadiak Island.—W. H. Dall.
Suberites suberea.

Kadiak Island.
Halichondria panicea.—(W. J. Fisher, beach).
Eumastia sitiens.—(W. J. Fisher, beach).
Esperella adhærens.—(W. J. Fisher, beach).
Esperiopsis Quatsinoensis.—(W. J. Fisher, beach).
Chondroeladia Alaskensis.
Phakellia ventilabrum.—(W. J. Fisher, beach).
Suberites suberea.—(W. J. Fisher, beach and R. E. C. Stearns).

27. PORT CHATHAM, COOK INLET.

W. H. Dall, beach.
Chondrocladia Alaskensis.

28. PORT ETCHES.

W. H. Dall, 12-18 fathoms.
Suberites suberea.

29. MIDDLETON ISLAND.

W. H. Dall.

Petrosia hispida (beach, low water mark, also 10-12 fathoms, gravel, sand).
Esperella adhærens (beach, low water mark).
Myxilla Amaknakensis (beach, low water mark).
Suberites concinnus (beach, low water mark).

30. CROSS SOUND.

Halichondria panicea.—(Commander L. A. Beardslee, U.S.N.).

Granite Cove, Port Althorp.—W. H. Dall.

Halichondria panicea.
Suberites suberea.
Suberites montiniger.

31. SITKA.

Esperiopsis Quatsinoensis.—(E. W. Nelson).
Myxilla Barentsi.—(W. H. Dall, 15 fathoms, gravel, mud).

32. KASA—AN BAY.

Suberites suberea.—(Dr. T. H. Streets, U.S.N.)

33. TONGAS BEACH.

Esperiopsis Quatsinoensis.—(Lieut.-Comdr. H. E. Nichols, U.S.N.).

34. QUEEN CHARLOTTE ISLANDS.

Esperiopsis Quatsinoensis?—(W. B. Anderson).

35. STATE OF WASHINGTON.

Whidbey Island.—G. Davidson, 1877.

Halichondria panicea.

Neah Bay.—J. G. Swan.

Esperiopsis Quatsinoensis.

36. CALIFORNIA.

Plocamia Manaarensis (in bottle labelled Catalina Harbour, 30-40 fathoms, sandy mud; same locality, beach; Monterey, 8-12 fathoms, sandy mud).—W. H. Dall.

37. VANCOUVER ISLAND.

Sooke.—John Macoun, 1893.

Halichondria panicea (low tide).
Eumastia siliens (beach).
Tedania fragilis (beach).
Desmacella pennata (low tide).
Esperella serratohamata (beach).
Myxilla Barentsi (beach).
Myxilla Amaknakensis (beach).
Myxilla firma (low tide and beach).

Comox.—John Macoun, 1893.

Myxilla firma (between tides).

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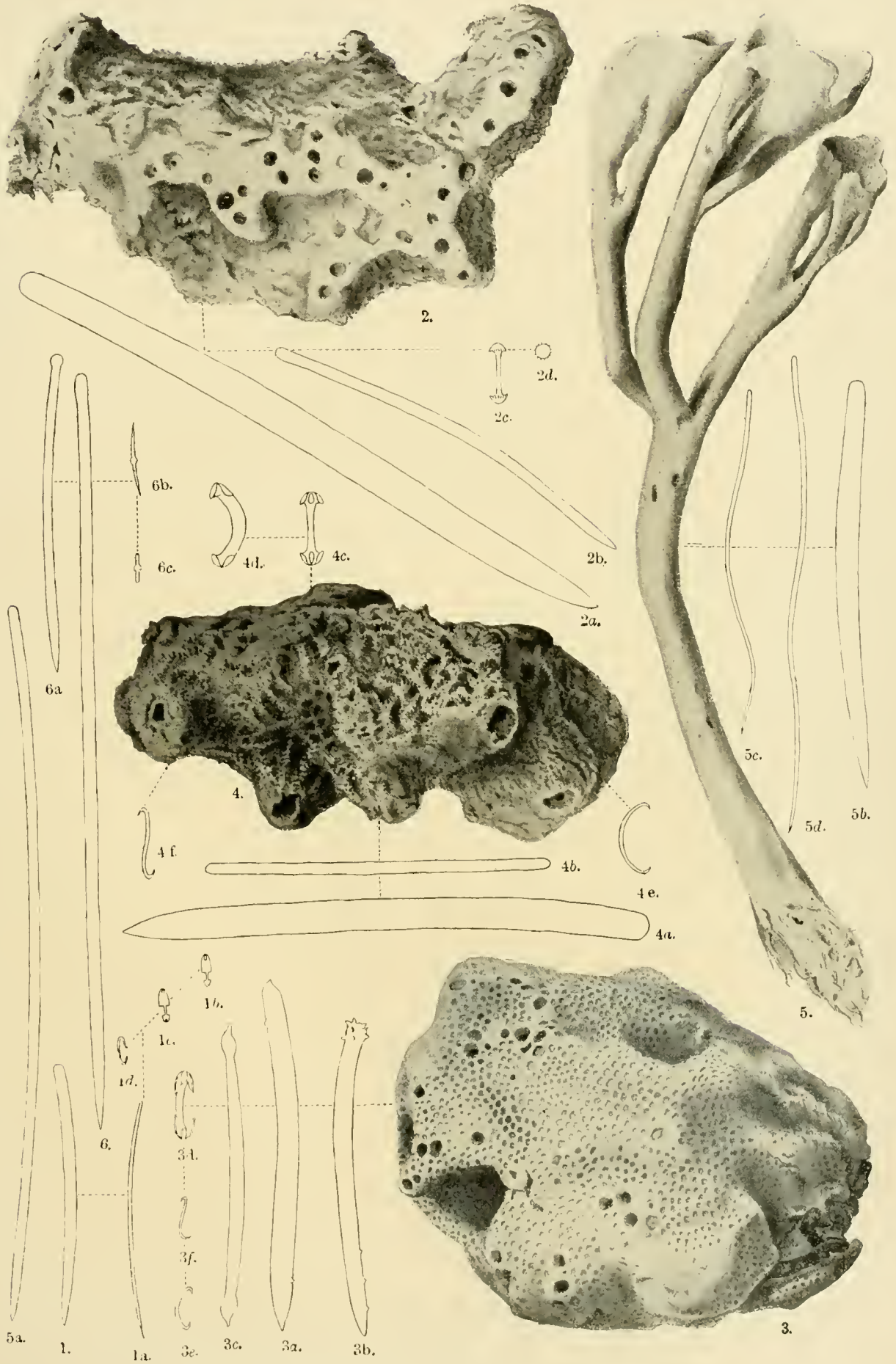

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