

III.—*Sponges from the Pacific Coast of Canada.*By LAWRENCE M. LAMBE, F.G.S., F.G.S.A., OF THE GEOLOGICAL SURVEY.

(Presented by Mr. J. F. Whiteaves, and read May 25, 1893.)

In a paper published in the last volume of 'Transactions' of this society,* some recent marine sponges collected by Dr. G. M. Dawson in 1885, on the Pacific coast of Canada, and in 1891 in Behring Sea, were identified or described, for the most part from dried specimens.

The sponges that form the subject of the present communication constitute the remaining portion of Dr. G. M. Dawson's 1885 collection and, unless otherwise stated, are preserved in alcohol.

Descriptions also are introduced of two sponges collected in 1878 by Dr. Dawson, in Houston Stewart Channel, Queen Charlotte Islands.

MONAXONIDA.

HALICHONDRIA PANICEA, Johnston.

Specimens of this species were collected at the following localities in addition to those already recorded in my former paper: at low tide on the shores of Queen Charlotte Sound and in Blunden Harbour, a number of specimens of the fistulous form †; near Suquash off Pulteney Point, Queen Charlotte Sound, in 25 fathoms, two specimens incrusting hydroids; Masset Inlet, Queen Charlotte Islands, one large massive specimen (dry), 150 mm. long with a height and breadth of about 70 mm., collected by Dr. Dawson in 1878. In mode of growth the latter specimen resembles the one represented by Fig. 1 of Plate III. of my previous paper.

HALICHONDRIA DISPARILIS. (Sp. nov.)

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

Sponge massive, flat, sessile, represented in the collection by a single specimen, 35 mm. long, 28 mm. broad and 11 mm. thick. *Colour* in spirit, brownish-yellow. *Texture* firm, unyielding. *Surface* even, smooth. *Dermal membrane* thin, transparent. In a portion of the membrane mounted in Canada balsam, no pores were apparent. *Oscula*

*On some sponges from the Pacific coast of Canada and Behring Sea, by Lawrence M. Lambe, F.G.S., F.G.S.A., of the Geological Survey. Trans. Roy. Soc. Canada, 1892, vol. x., p. 67.

†Wide Mon. Brit. Spong. Bowerbank, vol. iii., Plate xl., fig. 2.

circular, about 1.5 mm. in average diameter, occurring in the upper surface of the sponge. They are few in number and have their edges slightly depressed.

Skeleton.—(a) *Dermal*; consisting of a close irregular reticulation of oxea lying horizontally in the dermal membrane. (b) *Main*; an irregular massing of oxeote spicules with a tendency to form indistinct fibres. The whole body of the sponge is traversed, principally in a direction at right angles to the upper surface, by numerous canals, the largest of which are about 1.5 mm. wide.

Spicules.—Of two sizes. (1) Large, gradually and sharply pointed, slightly bent, smooth oxea varying in length from 1.287 to 0.438 mm. with an average thickness of 0.013 mm. (Plate II., fig. 1); occurring in the dermal membrane and throughout the main part of the sponge. (2) Very small, slightly bent, rather abruptly pointed, smooth oxea, extremely abundant, especially in the dermal membrane: average size 0.091 by 0.004 mm. (Plate II., fig. 1a).

The most noticeable feature in this sponge and one which has suggested the specific name is the great disparity in size between the large and the small oxeote spicules.

Locality.—Gulf of Georgia, near Comox, Vancouver Island, in about 40 fathoms. One specimen.

RENIERA CINEREA, Grant.

(Plate II., fig. 2.)

Spongia cinerea, Grant. 1827. Edin. New Phil. Journ., vol. ii., p. 204.

Halichondria cinerea, Fleming. 1828. History of British Animals, Edinburgh, p. 521.

Isodictya cinerea, Bowerbank. 1866. Mon. Brit. Spong., vol. ii., p. 274; vol. iii., pl. xlviii.

Reniera cinerea, Ridley and Dendy. 1887. Rep. Monaxonida, Zool. Chall. Exp., vol. xx., p. 15.

One small specimen of this sponge, of a dull yellow colour, was collected at low tide in Blunden Harbour. It measures 15 mm. across and is about 2 mm. in thickness. Three oscular openings are present each about 1 mm. wide; the pores are numerous with an average diameter of 0.027 mm. There is little variation in the size of the oxea, which range in length from 0.111 to 0.098 mm. and have an average thickness of 0.006 mm. (Plate II., fig. 2).

Locality.—Blunden Harbour, mainland of British Columbia, low tide. One specimen. Examined when dry.

RENIERA MOLLIS. (Sp. nov.)

(Plate II., figs. 3, 3a.)

Sponge massive, sessile, growing in sublobate masses. Represented in the collection by two specimens, one 90 mm. long, 55 mm. high and 33 mm. thick, the other (Plate II., fig. 3) much smaller, 50 mm. long, 33 mm. broad and 30 mm. high. *Colour* in spirit, dull brownish-yellow. *Texture* soft and fragile. *Surface* uneven, hispid. *Dermal membrane* thin, aspiculous. *Oscula* large, prominent, attaining a diameter of 5 mm.; in the larger specimen the oscula form an indistinct uniserial row along the sides, but in the smaller

specimen they are irregularly disposed. *Pores*, appearing as circular or oval openings in the dermal membrane over large subdermal cavities. They are about 0.065 mm. in width and less than their width apart.

Skeleton.—Composed of primary fibres which extend to the surface and vary from two to three spicules in breadth, though they occasionally become unispicular. Single spicules, at intervals of about 0.08 mm. apart and at right angles to the primary fibres, connect them together in such a way as to form a regular reticulation. There is no special dermal arrangement of the skeleton but the outward ends of the primary fibres project slightly beyond the dermal membrane.

Spicules.—Of one form only, viz., small, slightly bent, rather abruptly pointed, smooth oxea; size from 0.262 to 0.196 mm. by 0.013 mm. (Plate II., fig. 3a).

Locality.—Elk Bay, Discovery Passage, Vancouver Island, in from 20 to 25 fathoms.

ESPERELLA HISPIDA. (Sp. nov.)

(Plate II., figs. 4, 4a—c.)

Sponge small, sessile, subhemispherical or almost spherical, found growing on hydroids, etc.; greatest diameter 3 mm. *Colour* in spirit, light yellow. *Texture* firm. *Surface* strongly hispid.

Skeleton.—Composed of rather slender fibres, from two or three to six spicules in breadth, which radiate to the surface; they are crossed at right angles by individual spicules, at rather regular intervals, so that the primary fibres are seldom more than one spicule's length apart. The outward ends of the radiating fibres project beyond the surface, nearly one spicule's length, as loose, slender tufts, each tuft consisting of from five to ten outwardly directed spicules.

Spicules.—(a) *Megasclera*; large, stout, slightly bent, sharply pointed, smooth styli, thickest near the centre and varying in length from 0.170 to 0.412 mm., with a thickness of about 0.014 mm. (Plate II., fig. 4). (b) *Microsclera*, of two kinds. (1) Large palmate anisochelæ, distributed throughout the skeleton; length from 0.052 to 0.068 mm. (Plate II., figs. 4a, 4b). They are arranged in rosettes of as many as twenty spicules. Small palmate anisochelæ, not collected in rosettes and probably immature forms, are found associated with the large anisochelæ. (2) Sigmata (Plate II., fig. 4c), simple, in small numbers. Contort sigmata may occur, but they have not been observed by the writer.

Locality.—Near Suquash, off Pulteney Point, Queen Charlotte Sound, Vancouver Island, in 25 fathoms. There are in the collection, altogether, about twelve specimens of this minute and interesting sponge.

ESPERELLA ADHÆRENS. (Sp. nov.)

(Plate II., figs. 5, 5a—d.)

Sponge (Plate II., fig. 5) incrusting the upper valve of a shell of *Pecten hastatus*, Sby., to a thickness of 9 mm. in the centre. *Colour* in spirit, yellowish-brown. *Texture*,

soft, elastic. *Surface*, even, minutely hispid. *Dermal membrane* thin. *Pores*, circular openings in the dermal membrane, 0.065 mm. in diameter, occupying the spaces between the reticulations of the dermal skeleton. *Oscula* small, very slightly raised above the general surface, about 0.33 mm. wide.

Skeleton.—(a) *Dermal*; a rather regular reticulation of spiculo-fibre inclosing triangular and quadrangular spaces about 0.24 mm. across. The average thickness of the fibres is 0.041 mm. (b) *Main*; distinct, stout fibres of spicules, about 0.10 mm. thick, rising from the lower part of the sponge, which, branching frequently as they ascend, break up into definite brushes when the surface is reached. The spicules of the surface brushes support the dermal skeleton; their points project about 0.09 mm. beyond the dermal membrane and make the surface minutely hispid. Other fibres which partake more of the nature of branches of the primary fibres than of true secondary fibres, cross the main fibres and form an indefinite reticulation.

Spicules.—(a) *Megasclera*; of one kind only, viz., long, stout, sharply pointed, smooth styli, very slightly bent and rather thicker in the centre than near the basal end; length, from 0.242 to 0.324 mm., average thickness 0.013 mm. (Plate II., fig. 5a). (b) *Microsclera*; (1) large palmate anisochelæ occurring in rosettes formed by the junction of six or seven spicules (Plate II., figs. 5b, 5c). Small palmate anisochelæ, ranging in length from 0.019 to 0.032 mm., are present in great abundance and are probably the same as the large anisochelæ only in a young stage. (2) Sigmata, simple and contort, varying in length from 0.032 to 0.078 mm. (Plate II., fig. 5d). Both forms of the anisochelæ as well as the sigmata are found in large numbers in the dermal membrane and throughout the main skeleton. Near the base of the sponge are numerous spherical embryos, 0.27 mm. in diameter.

Locality.—Elk Bay, Discovery Passage, Vancouver Island, in from 20 to 25 fathoms. One specimen.

ESPERELLA OCCIDENTALIS. (Sp. nov.)

(Plate II., figs. 6, 6a—e.)

Sponge upright, cylindrical borne on a slender stalk and with lateral processes which extend outward horizontally, from all portions of the surface. The specimen has an entire height of 18 mm., a thickness of 0.8 mm. in its upper part and of 0.33 mm. at the middle of the stalk. Its expanded root is still attached to a small pebble and its upper extremity is slightly injured (Plate II., fig. 6).

The lateral processes reach a maximum length of 2.5 mm. in the upper portion of the sponge and decrease in size as the stalk is approached where they become almost obsolete. *Colour* when dry, light brownish-yellow. *Texture* firm. *Surface* rough. Examined when dry.

Skeleton (Plate II., fig. 6a).—Consisting of an upright, hollow, central core, 0.27 mm. in diameter, composed of longitudinally and closely disposed spicules. Other spicules arranged in groups, of one spicule's length and with their inner ends imbedded in the core, proceed outward nearly at right angles to the longitudinal axis of the sponge and serve as supports to the lateral processes. The spicules of each supporting group converge

to a point at the base of a lateral process. At a distance of about 0.27 mm. from the central core and parallel to it are longitudinal fibres of spicules forming an outer series and it is in this outer series that the inner ends of the lateral processes are met by their supporting bundles of spicules.

In the axial core and in the outer series of fibres the spicules have their pointed ends directed upward: the sharp ends of the spicules of the lateral processes are directed outward.

The general arrangement of the skeleton of this sponge is somewhat similar to that of *Esperiopsis symmetrica*, Ridley and Dendy, so lucidly described and figured in the twentieth volume of the Challenger Reports.

Spicules.—(a) *Megasclera*; of one kind only, viz., long, slender, smooth, fusiform, sharply pointed styli, having a maximum size of about 1.39 by 0.019 mm. (Plate II., fig. 6b). The spicules of the supporting bases of the lateral processes are somewhat shorter than those of the main skeleton and of the lateral processes; they vary in length from 0.41 to 0.68 mm. and are about 0.013 mm. thick. (b) *Microsclera*; of two kinds. (1) Small palmate anisochelæ (Plate II., figs. 6c, 6d), exceedingly abundant in the dermal membrane; length 0.013 mm. (2) Forcipiform spicules, having a minute inflation at the extremity of each arm; length 0.032 mm. (Plate II., fig. 6e).

In external appearance this sponge bears some resemblance to *Cladorhiza abyssicola*, Sars, var. *rectangularis*, Ridley and Dendy,* but there appears to be no approach to a four-rowed arrangement of the lateral processes. The presence of forcipiform spicules associated with anisochelæ might suggest a near relationship to a form like *Esperia cupressiformis*, Carter,† but the difference in external form between the latter sponge and the Vancouver specimen as well as the differences in the general skeletal arrangement and in the relative sizes of the spicules in the two species would prevent their being regarded as identical.

Locality.—Gulf of Georgia near Comox, Vancouver Island, in about 40 fathoms. One specimen.

ESPERIOPSIS QUATSINOENSIS.

Esperiopsis Quatsinoensis, Lambe. 1892. Trans. Roy. Soc. Canada, vol. x., p. 69, pl. iii., figs. 8, 9 and pl. v., figs. 8, 8a—c.

One large specimen of this sponge collected by Dr. G. M. Dawson in 1879. About forty subramose branchlets proceeding from a sessile base, 30 mm. long and 40 mm. broad, reach a maximum height of 80 mm. Some of the branchlets are cylindrical, others subflabellate. Dry.

Locality.—North Shore. Queen Charlotte Islands.

*Rep. Monaxonida, Zool. Chall. Exp., vol. xx., p. 88, pl. xx., fig. 10.

†Ann. and Mag. Nat. Hist., series 4, vol. xiv., p. 215, pl. xiv., figs. 16—19, and pl. xv., fig. 37.

IOPHON CHELIFER, Ridley and Dendy.

(Plate II., figs. 7, 7a—f.)

Iophon chelifer, Ridley and Dendy. 1886. Ann. and Mag. Nat. Hist., ser. 5, vol. xviii., p. 349.

" " Ridley and Dendy. 1887. Rep. Monaxonida, Zool. Chall. Exp., vol. xx., p. 119, pl. xvi., fig. 3; pl. xvii., figs. 1, 3, 8.

Referrable to this species, is a sponge (Plate II., fig. 7) from the waters between Vancouver Island and the mainland of British Columbia.

The "Challenger" sponge was obtained off the Cape of Good Hope and between Kerguelen Island and the former locality. It is interesting to note the occurrence of this sponge in two such widely separated regions. *Halichondria panicea*, Johnston, is also known to have a wide range; it was obtained during the voyage of the "Challenger," off Kerguelen Island and is found widely distributed in the northern Pacific, having been collected off the coast of Japan by the "Challenger" and in the Vancouver district and Behring Sea by Dr. Dawson.

The measurements of the spicules of the Vancouver Island specimens, are as follows:

Spined styli, varying in length from 0.262 to 0.327 mm., and in thickness from 0.013 to 0.019 mm. (Plate II., fig. 7a). The styli in some specimens are much more sparsely spined than in others.

Tylota (Plate II, fig. 7b) with slightly swollen, minutely spined ends; from 0.22 to 0.28 mm. long and from 0.006 to 0.008 mm. thick. The tylota are confined to the dermal membrane, throughout which they are scattered without order, although frequently they show a tendency to form loose strands.

Palmate anisorhela, from 0.029 to 0.036 mm. long. (Plate II., figs. 7c, 7d).

Bipocilli, from 0.013 to 0.018 mm. long; well developed and showing the characteristic pronged ends (Plate II., figs. 7e, 7f).

There are in the collection two specimens and a number of fragments, some of which are associated with hydroids.

The most perfect specimen (Plate II., fig. 7) is 80 mm. long and 55 mm. high. It is massive, perforate and consists of an inosculation of short, stout, irregularly shaped, nodose branches, which coalesce, frequently to such an extent as to become amorphous. The branches vary in thickness from about 3 to 10 mm. *Colour* in spirit, dark brown. *Texture* moderately firm. *Surface* smooth.

Localities.—Elk Bay, Discovery Passage, Vancouver Island, in from 20 to 25 fathoms, two specimens and some fragments; off Cortez and Hernando Islands, northern end of Strait of Georgia, Vancouver Island, in from 8 to 20 fathoms, sand, a few fragments; Strait of Georgia, near Comox, Vancouver Island, in about 40 fathoms, fragments.

MYXILLA ROSACEA, Lieberkühn, var.

Myxilla rosacea, var. Lambe. 1892. Trans. Roy. Soc. Canada, vol. x., sec. iv., p. 71.

The locality at which the specimen of this sponge was collected by Dr. G. M. Dawson in 1885, was unfortunately omitted in my first paper on the sponges of the Pacific coast. The specimen was collected at Oyster Bay, Vancouver Island.

MYXILLA PARASITICA. (Sp. nov.)

(Plate II., figs. 8, 8a—f.)

Sponge incrusting. Growing in flat expansions, with a maximum thickness of about 10 mm. *Colour*, in spirit, dull grayish or yellowish-brown. *Texture* firm, rather compact. *Surface* uneven and rough. *Dermal membrane* thin, semitransparent. *Pores*, occurring in the dermal membrane over the subdermal cavities and about 0.27 mm. in diameter. *Oscula* prominent, large, having an average diameter of 5 mm. There are in the collection three specimens in alcohol, the largest of which is 70 mm. long and 65 mm. broad (Plate II., fig. 8).

Skeleton.—(a) *Dermal*; a layer of irregularly disposed tornote spicules lying parallel to the surface. (b) *Main*; consisting of spined stylote spicules arranged in an irregular manner without the formation of definite fibres, but with a tendency to form hexagonal meshes having sides the length of one spicule and with spicules radiating outward toward the angles of the hexagon. Small spined echinating styli occur in clusters especially at points from which a number of spicules diverge. Tornote spicules are found in small numbers scattered throughout the main skeleton.

Spicules.—(a) *Megasclera*; of three kind. (1) Sparsely but entirely spined, rather bluntly pointed, stout styli varying in length from 0.196 up to 0.314 mm. and in thickness from 0.006 to 0.019 mm. (Plate II., fig. 8a). (2) Small stout, spined echinating styli, which range in length from 0.032 to 0.065 mm. and in thickness from 0.009 to 0.013 mm. (Plate II., fig. 8b). (3) Hastately pointed tornota, sometimes with a slightly greater thickness near the ends than at midlength, from 0.150 to 0.209 mm. long and about 0.006 mm. thick. (Plate II., fig. 8c). (b) *Microsclera*; (1) isochelæ, with a varying length of from 0.045 to 0.062 mm. (Plate II., figs. 8d, 8e). Much smaller isochelæ, from 0.013 to 0.026 mm. in length, occur in large numbers; they are probably immature forms. (2) Sigmata simple and infrequently contort, varying in length from 0.014 to 0.026 mm. (Plate II., fig. 8f).

The few specimens of this sponge that the writer has seen, are incrusting shells of *Pecten hastatus*, Sby. The greatest thickness of the sponge is generally near the centre of the valve.

Localities.—Between Mary and Cortez Islands in the Strait of Georgia, 15 to 20 fathoms, one dried specimen; Cortez and Hernando Islands in the Strait of Georgia, 8 to 20 fathoms, sand, one specimen; Elk Bay, Discovery Passage, Vancouver Island, 20 to 25 fathoms, one specimen.

CLATHRIA LÆVIGATA. (Sp. nov.)

(Plate II., figs. 9, 9a—f.)

Sponge upright, compressed laterally. The only specimen collected is 22 mm. high and 10 mm. broad; it terminates above in a small branch, with an osculum at its upper extremity. One side of the specimen from which evidently another branch proceeded, is considerably damaged and broken (Plate II., fig. 9). *Colour* light yellow. *Texture* delicate, fragile. *Surface* even, smooth. *Dermal membrane* thin. *Oscula*, the only one seen is 1.5 mm. in diameter and occupies the end of a branch. Examined when dry.

Skeleton.—Composed of styli, forming slender, loose primary fibres with a small proportion of horny matter. The fibres break up into obscure brushes at the surface. Loose secondary fibres or individual spicules cross the primary fibres irregularly. The whole skeleton is loosely reticulate and the fibres are echinated by small, spined tylostyli. Styli similar to those of the main skeleton are scattered without order in the dermal membrane.

Spicules.—(a) *Megasclera*; (1) large, stout, sharply and gradually pointed, slightly bent, smooth styli, varying in length from 0.493 to 0.630 mm. with an average thickness of 0.017 mm. (Plate II., fig. 9a). (2) Long, slender, sharply pointed, smooth styli, found associated everywhere with the large styli, but nowhere in large numbers; length from 0.232 to 0.356 mm. and about 0.008 mm. thick (Plate II., fig. 9b). Both forms of styli are minutely spined at the base. (3) Heavily spined, echinating tylostyli, abundant; of variable size, from 0.068 to 0.288 mm. in length and about 0.013 mm. thick near the head (Plate II., figs. 9c, 9d). (b) *Microsclera*; of two kinds, occurring in the dermal membrane and through the body of the sponge. (1) Small palmate isochelæ with an average length of 0.020 mm. (Plate II., figs. 9e, 9f). (2) Smooth toxa of unusually large size (Plate II., fig. 9g), from 0.183 to 0.641 mm. in length and with a thickness of 0.006 mm.

Locality.—Gulf of Georgia near Comox, Vancouver Island, in about 40 fathoms.

SUBERITES SIMPLEX. (Sp. nov.)

(Plate IV., figs. 4, 4a.)

Sponge small, sessile, hemispherical. The only specimen collected is 7 mm. broad and 13 mm. high. *Colour* in spirit, dull yellow. *Texture* compact, firm. *Surface*, even, minutely hispid. On no portion of the surface have any oscula been seen.

Skeleton.—Strong, compact fibres, from 0.082 to 0.137 mm. thick, composed of large, outwardly directed tylostyli, radiate to the surface where they pass into and support a cortical layer about 0.20 mm. thick, of closely packed, radiately disposed tylostyli of small size. The fibres of the main skeleton are about 0.026 mm. apart immediately beneath the cortex.

Spicules.—(a) *Megasclera*; of two sizes. (1) Long, slender, straight, very gradually pointed, smooth tylostyli with moderately well marked elongated heads (Plate IV., fig. 4), composing the stout fibres of the body of the sponge; length from 0.589 to 1.123 mm., average thickness 0.013 mm. (2) Short, stout, straight, sharply pointed, smooth tylostyli, with well developed somewhat angular heads; varying in length from 0.098 to 0.356 mm. and in thickness from 0.006 to 0.013 mm. (Plate IV., fig. 4a). The smaller spicules are not found in the interfibrous spaces but are confined to the cortical layer; they project slightly and uniformly beyond the surface.

Locality.—Gulf of Georgia near Comox, Vancouver Island, in about 40 fathoms.

POLYMASTIA PACIFICA. (Sp. nov.)

(Plate II., figs. 10, 10a—d.)

Sponge (Plate II., fig. 10) small, sessile, subhemispherical, 15 mm. long, 12 mm. broad and 7 mm. high, bearing on its surface fistular processes; attached to a fragment of

a hexactinellid sponge* of the suborder Dictyonina, Zittel. *Colour* in spirit, light brownish-yellow. *Texture* firm. *Surface* even, very strongly hispid; that of the processes minutely hispid but appearing smooth to the naked eye. In the specimen under consideration there are two fistulæ, one 8 mm. long, 3 mm. broad and 2 mm. thick, compressed laterally and narrowing rather rapidly above where it terminates in a small osculum about 0.09 mm. wide; the other 4 mm. long, broadest at its outer extremity and narrowest at its junction with the main body of the sponge. The distal end of the small fistula is rounded and gives no indication of an oscular opening.

Skeleton.—(a) *Of the main body*; consisting of (1) rather slender bands of spiculo-fibre, about 0.111 mm. thick which radiate to the surface and are composed of large tylostylote spicules with their pointed ends directed outward; (2) a cortical zone of closely packed spicules of small size beyond which project long, slender, subtylote spicules at right angles to the surface.

The radiating fibres of the main skeleton divide or break up and form obscure brushes before entering the cortical zone.

Occupying the outer portion of the cortex is a layer of closely packed, small, radiating tylostyli with their pointed ends projecting slightly beyond the surface; immediately beneath this layer and forming the greater portion of the cortex are tylostyli of larger size lying, for the most part, subparallel to the surface and rather loosely matted together. Spicules similar to those of the cortex are scattered throughout the main body of the sponge in the spaces between the vertical fibres.

(b) *Of the fistular processes*; fibres, continuations of the main fibres of the body, extend the full length of the fistulæ and form a supporting skeleton outside of which is a cortical arrangement of spicules similar in size, shape and disposition to those of the cortex of the main portion of the sponge except that the long, subtylote spicules, that make the surface of the main body so hispid, are here absent.

Spicules.—*Megasclera*; (1) Large, stout, straight, fusiform, gradually and sharply pointed, smooth tylostyli with scarcely perceptible heads, occurring in the radiating fibres; they vary in length from 0.739 and 1.205 mm. and in thickness from 0.013 to 0.019 mm. (Plate II., fig. 10a). (2) Stout, sharply pointed, smooth tylostyli, with very decidedly marked, subangular heads rather pointed at the base; varying in length from 0.191 to 0.630 mm. with an average thickness of 0.019 mm. (Plate II., fig. 10b); confined to the inner layer of the cortical zone. (3) Tylostyli similar in shape to the preceding but much smaller (Plate II., fig. 10c), forming the outer or surface layer of the cortex; average size 0.108 by 0.006 mm. (4) Long, slender, smooth, subtylote spicules decreasing gradually in thickness from the stout basal end to near the distal termination; from 1 to 3 mm. in length. They project outward at right angles to the surface and have their bases imbedded in the inner layer of the cortical zone. The basal end terminates in an obscure head and the thickness of the spicule, on approaching the rounded and somewhat inflated distal end, increases slightly. The spicule figured (Plate II., fig. 10d) is 2.77 mm. long, 0.016 mm. thick near the basal end and 0.006 mm. thick near the outer or distal end.

*Probably *Aphrocallistes Whiteavesianus*, Lambe. Trans. Roy. Soc. Canada. 1892, vol. x., p. 74; pl. III., fig. 11, and pl. VI., figs. 3, 3a—p.

Locality.—Gulf of Georgia near Comox, Vancouver Island, in about 40 fathoms. One specimen.

TETRACTINELLIDA.

CRANIELLA VILLOSA. (Sp. nov.)

(Plate III., figs. 1, 1a—f.)

Sponge subspherical, compressed vertically, surface even, villose, covered with long projecting spicules which lie close to the sponge and become matted together. When dry the sponge has a glistening white appearance. The only specimen collected is 40 mm. long, 34 mm. broad and 22 mm. high. There is no indication of a basal tuft or mass of spicules by which it could have been anchored to a muddy bottom nor is there any evidence of its having been attached to anything. *Colour* in spirit light brownish-yellow. *Texture* firm, solid. *Dermal membrane* thin, delicate. *Pores* oval or circular openings, from 0.027 to 0.137 mm. in diameter; occurring abundantly in the dermal membrane between the projecting fibres.

Skeleton.—Consisting of outwardly radiating fibres, about 0.411 mm. thick, composed of spicules closely packed together. The fibres originate near the centre of the sponge, radiate outward in strong curves and issue from the sponge at an angle of about 10° to the surface. There is an ill-defined cortex about 2 mm. thick with a special arrangement of spicules. Numerous canals having a diameter of about 0.137 mm. near the surface, run parallel to the direction of and between the fibres, to the centre where they frequently attain a width of 1 mm. The spongin in the interfibrous part is firm, uniting the whole in one compact mass. The number of the radiating fibres is large; they are so crowded as to be as a rule almost touching except where separated by the canals. On no part of the surface have any oscula been detected.

Spicules.—(a) *Megasclera*; (1) somal oxea (Plate III., fig. 1). These are confined to, and together with the pro. and anatriænes make up, the radiating fibres. They are smooth, fusiform and taper to an extremely fine point at either end; average size 3.07 by 0.026 mm. (2) Cortical oxea (Plate III., fig. 1a), smooth, rather abruptly bent, and sharply pointed, occurring at right angles to the surface in the inner part of the cortex; average size 1.13 by 0.027 mm. (3) Dermal oxea (Plate III., fig. 1b), found in loose bundles at right angles to the surface, forming the outer portion of the cortex and supporting the dermal membrane beyond which they project slightly. They are smooth, anisoactinate, rather bluntly pointed at the outer end and very finely pointed at the inner end; average size 0.506 by 0.008 mm., variation in length from 1.28 to 0.383 mm.

Associated with the dermal oxea, but found only in small numbers, are very slender protriænes varying in length from 0.327 to 0.550 mm., with a thickness of about 0.002 mm. (Plate III., fig. 1c). They lie parallel to the dermal oxea, project a short distance beyond the surface and are so slender as to readily escape notice even under a high power. One of the cladi is frequently much longer than the other two.

(4) Protriænes (Plate III., fig. 1d), long and straight, becoming filiform at their proximal ends and terminating outwardly in three short, robust, straight cladi which are as often of unequal as of equal length. They occur in the radiating fibres and extend a

maximum distance of 3.5 mm. beyond the point of issue from the surface; length of rhabdome 5 mm., thickness of rhabdome near the cladal end 0.013 mm., length of cladi 0.072 mm., chord 0.022 mm. (5) Anatriænes, long and straight with attenuated proximal ends. They occur in large numbers in the radial fibres and project beyond the surface where they become matted together. There seem to be two distinct forms of this spicule; (a) those having short, stout cladi and (b) those with long, slender cladi. The cladomes of the first form (Plate III., fig. 1e) are seen in large numbers at and just below the surface; those of the second form (Plate III., fig. 1f) project some distance beyond the surface and are generally matted together so that it is difficult to measure their length. Associated with the latter form are frequently observed those of the former, but in small numbers. Possibly the spicules having short, stout cladi may not be fully developed or, those having slender cladi may be true radical spicules although they seem to be present on all parts of the surface and apparently do not form a special basal tuft. Length of rhabdome, of anatriæne having short cladi, 11 mm., thickness of rhabdome near the cladal end 0.013 mm., length of cladi 0.078 mm., chord 0.085 mm., length of rhabdome, of anatriæne with slender cladi, about 11 mm., thickness of rhabdome near the cladal end 0.013 mm., maximum length of cladi 0.203 mm., chord 0.144 mm.

(b) *Microsclera*.—*Sigmaspores*, abundant in all parts of the sponge; length 0.009 mm.

Locality.—Houston Stewart Channel, Queen Charlotte Islands. One specimen. There is in addition, one dried specimen without a label, probably from the Queen Charlotte Islands. When alive it must have measured nearly 50 mm. in diameter.

CRANIELLA SPINOSA. (Sp. nov.)

(Plate IV., figs. 1, 1a—j.)

Sponge almost spherical, surface conulose with groups of projecting spicules which give the sponge a very spinose appearance; hence the specific name.

There are in the collection five specimens, two of which are mature; the other three are young sponges and measure 1.8, 2 and 3.5 mm. in diameter respectively. The older specimens have the appearance of having rested on a muddy bottom, as in each case there is a mass of mud and foreign matter adhering to what is evidently the lower side. The specimen figured (Plate IV., figs. 1, 1a) is somewhat ovate in shape, having the more pointed end downward; size, 18 mm. high and 19 mm. broad. The other specimen, the larger of the two, is 17 mm. high and 19 mm. broad. *Colour* in spirit, light grayish-yellow. *Texture* firm. *Surface* between the conules, even, smooth. The conules rising about 0.7 mm. above the surface, embrace the projecting fibres of spicules which extend about 5 mm. beyond the general surface. *Dermal membrane* thin. *Oscula* circular, from 1 to 2 mm. in diameter, situated in the upper portion of the sponge. In the specimen figured there are three oscula, each about 1 mm. in diameter, placed close together, a little to one side of the summit. *Pores*, round openings in the dermal membrane; about 0.32 mm. in diameter.

Skeleton.—Starting from a central point, strong, compact fibres of spicules radiate outward toward the surface in a curved direction and increase gradually in size until an average thickness of 0.07 mm. is gained beneath the cortex. The fibres pass through the cortex and project beyond the surface of the sponge a maximum distance of 5 mm. (Plate

IV., fig. 1a). The spicules of the fibres after having passed the cortex separate and diverge slightly. The cortex, which has a thickness of about 1.1 mm. contains large cavities beneath the dermal membrane and has its inner portion strengthened by radially disposed oxeote spicules.

Spicules.—(a) *Megasclera*; (1) Small oxea (Plate IV., fig. 1b) anisoactinate, sharply pointed at one end, attenuated and filiform at the other, occurring in the radiating fibres; they vary in length from 2.73 to 4.95 mm. with an average thickness of 0.037 mm. Their stouter ends point outward. (2) Cortical oxea (Plate IV., fig. 1c), confined to the inner portion of the cortex beneath the subdermal cavities. They are arranged at right angles to the surface and show little variation in size; they are stout, smooth, slightly bent at the middle and narrow rapidly to a sharp point at either end; size from 1.10 by 0.054 mm. to 0.726 by 0.051 mm. (3) Protriænes (Plate IV., figs. 1d, 1e), occurring in the radiating fibres and projecting far beyond the surface of the sponge. The measurements of an average sized spicule are as follows: length of rhabdome 5.7 mm., length of cladi 0.267 mm., chord 0.109 mm., thickness of rhabdome near cladal end 0.026 mm. The cladi are almost parallel for the first half of their length and then suddenly diverge. (4) Anatriænes (Plate IV., fig. 1f), associated with the somal oxea and the protriænes of the radial fibres. They do not project as far beyond the cortex as the protriænes do; their cladomes may be seen in considerable numbers slightly in advance of the surface; average length of rhabdome 8.22 mm., length of cladi 0.131 mm., chord 0.189 mm., thickness of rhabdome near the cladome 0.016 mm. The cladi are slender and have a thickness of only about 0.013 mm. near the base.

The sponge matter between the radiating fibres contains numerous immature forms of the somal oxea and of the pro. and anatriænes. The oxeote spicules (Plate IV., fig. 1i) are anisoactinate and vary in length from 0.328 to 0.780 mm. with an average thickness of 0.013 mm. The protriænes (Plate IV., fig. 1g) vary from 0.726 to 0.945 mm. in length and the anatriænes (Plate IV., fig. 1h) from 0.780 to 1.00 mm. in length. The three young specimens of this sponge, referred to above, have protriænes of this form only; the anatriænes and somal oxea are also in a similarly undeveloped state.

(b) *Microsclera*.—*Sigmaspires* (Plate IV., fig. 1j), 0.013 mm. long, found throughout the body of the sponge and particularly abundant in the dermal membrane.

In the interfibrous part of the sponge are numerous embryos whose oval bodies are traversed radially by separate oxeote spicules which curve gently in passing from the centre to the surface beyond which they project to a distance of from 0.037 to 0.041 mm.; average size of embryos 0.411 by 0.616 mm. Each point at which a spicule projects beyond the surface, is marked by a minute conule.

Localities.—Elk Bay, Discovery Passage, Vancouver Island, in from 20 to 25 fathoms. Two specimens. Gulf of Georgia near Comox, Vancouver Island, in about 40 fathoms. Three young specimens.

CYDONIUM MÜLLERI, Fleming.

In my first paper on Pacific sponges figures and measurements are given of the spicules of a specimen of *Cydonium Mulleri*, from Vancouver Island, and in the same paper, in a foot-note, mention is made of another specimen of this sponge from Cumshewa Harbour, Queen Charlotte Islands. In addition to the above mentioned is a third

specimen labelled Houston Stewart Channel, Queen Charlotte Islands, almost spherical in shape, 12 mm. high, 10 mm. broad, with a small basal tuft of pro. and anatriænes similar to the triænes of the Vancouver Island specimen and with a small conical protuberance at the summit, possibly of the nature of an osculum. The cladi of the orthotriænes in this specimen subdivide dichotomously once (Plate IV., fig. 2, 2a) and sometimes twice (Plate IV., fig. 2b); few examples of the simple orthotriænes (Plate IV., fig. 2c) are found. At times, only one of the cladi subdivides, while the other two remain simple (Plate IV., fig. 2d).

In a re-examination of the specimens referred to in my first paper, orthotriænes were noticed which have some of their cladi subdivided once but the simple orthotriæne seems to be the normal form. It would appear from this that dichotriænes and even trichotriænes may be developed from simple orthotriænes in individuals of the same species.

Locality.—Houston Stewart Channel, Queen Charlotte Islands. One specimen.

HEXACTINELLIDA.

RHABDOCALYPTUS DOWLINGII. (Sp. nov.)

(Plate III., figs. 2, 2a—h.)

Sponge (Plate III., fig. 2) cup-shaped, with a moderately thick wall and a deep gastral cavity. Starting at the base the breadth increases somewhat rapidly until mid-height is reached when it decreases slightly toward the large oscular opening. In the specimen described, the total height is 100 mm., the lower extremity is irregularly shaped and bluntly pointed, the maximum breadth at mid-height, is 60 mm., and the osculum which is narrowly oval in outline, has a maximum width of 45 mm. and a minimum of 25 mm. The wall decreases gradually in thickness from 10 mm. near the base to 2 or 3 mm. near the oscular margin. *Colour* in spirit, light brownish yellow. *Texture* firm. *Surface* even. *Dermal membrane* thin, transparent.

Projecting beyond all parts of the outer surface of the sponge are long, slender prostalia, many of which have evidently been broken off since the sponge was alive. They do not occur in very large numbers nor do they form a definite fringe at the oscular margin, but they are more abundant in the upper portion of the sponge than elsewhere. These marginal and pleural prostalia are smooth, simple oxydiacts; they frequently reach a length of 35 mm. and have a maximum thickness of about 0.124 mm.

The parenchymal skeleton exposed by the removal of the dermal membrane is seen to be made up of loose fibres or strands of spicules, crossing each other so as to inclose circular openings of two sizes. The larger openings have an average diameter of 1.5 mm., but the smaller ones, which are more numerous and are distributed between the larger openings, are about 0.75 mm. in diameter.

The gastral surface is smooth and exhibits numerous evenly distributed circular openings about 0.75 mm. in diameter.

The main skeleton is composed of long, slender diacts (Plate III., fig. 2a) with rough rounded ends which are occasionally slightly swollen and sometimes more or less pointed; they vary in size from 0.835 by 0.013 to 7.74 by 0.041 mm.

The spicules of the dermal skeleton are ; (a) large, hypodermal pentacts (Plate III., fig. 2b) with smooth tangential rays about 2.2 mm. long and proximal rays, reaching a length of 7.84 mm ; (b) rough autodermal pentacts (Plate III., fig. 2c) with rays averaging 0.16 mm. in length and with a thickness near their bases of 0.013 mm. ; (c) small diacts with roughened ends bearing two or four central or subcentral tubercles and varying in length from 0.28 to 1.37 mm. with a thickness of about 0.02 mm. (Plate III., fig. 2d).

The gastral skeleton consists of ; (a) rough, autogastral hexacts (Plate III., fig. 2e) with rays having an average length of 0.09 mm. with a basal thickness of 0.010 mm ; (b) diacts similar to those of the dermal surface but with the central inflations more fully developed.

Throughout the parenchyma are numerous oxyhexacts (Plate III., fig. 2f) and oxyhexasters, which are seen to be rough when viewed under a sufficiently high power. Any one of the principal rays of the oxyhexacts may bear two long, straight, divergent, terminal rays, thus giving rise to the oxyhexasters, so that all gradations between the six and twelve rayed spicules are seen. The length of the rays of an average sized hexact is 0.049 mm. Beneath the gastral surface and in moderately large numbers are eight rayed discohexasters of unusually large size (Plate III., fig. 2g) having an average diameter of 0.262 mm. ; each of the strong, stout, principal rays bears four long, straight, slightly divergent terminals ending in transverse discs. Distributed throughout the entire skeleton are numerous, minute discohexasters (Plate III., fig. 2h) whose short principal rays bear a variable number of exceedingly fine, slightly curved secondary rays which terminate in small discs. The average diameter of these rosettes is 0.019 mm.

The writer desires to name this species after Mr. D. B. Dowling, who was Dr. G. M. Dawson's assistant during the summer of 1885.

Locality.—Strait of Georgia, near Comox, Vancouver Island, in about 40 fathoms. One specimen.

CALCAREA.

SYCON COMPACTUM. (Sp. nov.)

(Plate IV., figs. 3 3a—f.)

Sponge (Plate IV., fig. 3) small, sessile, attached by its base to a hydroid, sub-cylindrical, slightly thicker at the centre than at either end, upper extremity rounded and terminating in a simple osculum. A deep gastral cavity extends the entire length of the sponge and has its ending in the osculum above. *Colour* in spirit, dull yellow. *Texture* firm, compact. *Surface* even, minutely papillose. Length of specimen 21 mm., breadth at mid-height a little over 3 mm., distance from dermal to gastral surface 1.2 mm., width of gastral cavity about 0.7 mm.

Radial tubes, 0.091 mm. in average diameter and separated from each other by thin walls, extend from the dermal to the gastral surface.

Skeleton.—(Plate IV., fig. 3a). Consisting principally of a regular disposition of triradiate spicules occurring in the walls of the radial tubes. At the dermal surface, numerous minute oxeote spicules arranged in loose bundles and at right angles to the surface, are associated with triradiate spicules lying in the plane of the surface ; the latter

are similar in form to and of the same size as those of the radial tubes. Parallel to the gastral surface and forming a layer about 0.098 mm. thick, are numerous closely disposed triradiate spicules, having one of their rays greatly prolonged. The general direction of the prolonged ray is parallel to the longitudinal axis of the sponge. Numerous quadriradiate spicules occur in the gastral surface; their long, distal rays project into the gastral cavity and their tangential rays are imbedded in the layer of subgastral triradiate spicules.

Spicules.—Of four forms. (1) *Triradiate spicules occurring in the walls of the radial tubes* (Plate IV., fig. 3b) with stout, gradually and sharply pointed, straight, but sometimes slightly curved rays lying in the same plane; the rays are about 0.006 mm. thick at the base, with an average length of 0.065 mm. The outwardly directed ray varies in length from 0.065 to 0.131 mm. and forms angles of about 120° with the other two. Occasionally a short, rudimentary fourth ray is developed. (2) *Subgastral triradiate spicules* (Plate IV., fig. 3c) with one long ray which makes angles of 120° with two short equal rays. The short rays are gradually and sharply pointed, curved slightly outward and 0.006 mm. thick at the base, with an average length of 0.091 mm. The long ray is straight, sharply pointed, 0.006 mm. thick at the base and near the extremity, but slender at the centre where it has a thickness of 0.003 mm. All the rays are in the same plane. (3) *Gastral quadriradiate spicules* (Plate IV., figs. 3d, 3e) with three short rays in the same plane and a long fourth ray at right angles to the other three. The most noticeable feature about this spicule is the long, stout, straight fourth ray which varies in length from 0.281 to 0.569 mm. and increases in thickness from 0.006 mm. near the base to sometimes as much as 0.013 mm. near the abruptly pointed outer end. The three short rays are slender, gradually and sharply pointed, scarcely 0.006 mm. thick at the base and attaining a maximum length of about 0.111 mm. (4) Minute, rather bluntly pointed, oxeote spicules (Plate IV., fig. 3f) occurring in the dermal skeleton; size 0.065 by 0.003 mm. Imbedded in the sponge mass are numerous spherical embryos varying in diameter from 0.058 to 0.098 mm.

Locality.—Elk Bay, Discovery Passage, Vancouver Island, in from 20 to 25 fathoms. One specimen.

GRANTIA COMOXENSIS. (Sp. nov.)

(Plate III., figs. 3, 3a—c.)

Sponge (Plate III., fig. 3) small, cylindrical, growing on a fragment of *Myxilla* sp. It has a deep cloacal cavity whose outer termination is furnished with a fringe of very slender, long straight spicules. The cloacal cavity extending the whole length of the sponge, is very narrow, being only about 0.25 mm. in average width and 0.54 wide at the osculum. The total length of the sponge is 6 mm., including the oscular fringe which measures 2.25 mm. in length; the breadth is 1.5 mm. *Colour* in spirit, light grayish-yellow. *Surface* made very hispid by numerous projecting oxeote spicules. *Osculum* circular.

Skeleton.—The wall of the sponge, about 0.55 thick, is made up of; (a) a thin cortical layer of triradiate spicules, lying in the plane of the surface; (b) a parenchymal portion, supported by a rather sparse disposition of triradiate spicules having one of the three rays, generally the longest, directed outward toward the surface; (c) a reticulation of quadriradiate spicules occupying the gastral surface. The short fourth ray projects into the gastral cavity and is curved slightly forward.

Circular openings, 0.082 mm. in average diameter, are visible in the dermal surface and similar openings are present in the gastral surface.

Spicules.—(a) *Dermal triradiate spicules* (Plate III., fig. 3a) with long, slender, sharply pointed rays lying in one plane. One of the rays is usually a little longer than the other two which include an angle of about 130° ; maximum length of ray 0.328 mm., average thickness of ray at base 0.013 mm. (2) *Triradiate spicules of the parenchyma*; similar to those of the dermal surface. (3) *Gastral quadriradiate spicules* (Plate III., fig. 3b) with three rays in one plane and a fourth ray at right angles to the other three. As in the case of the triradiate spicules, of the three rays in one plane, one is generally longer than the other two which include an angle of about 136° . (4) *Large oxeote spicules* (Plate III., fig. 3c) which project beyond the surface at right angles to the longitudinal axis of the sponge and have their proximal ends imbedded in the parenchyma near the gastral surface; maximum length 2.22 mm. with an average thickness of 0.013 mm. These spicules are abundant and give the sponge a very hispid appearance. (5) *Slender linear spicules* forming the fringe at the mouth of the cloacal cavity; maximum length 2.9 mm. with an average thickness of 0.006 mm.

Locality.—Strait of Georgia near Comox, Vancouver Island, in about 40 fathoms. One specimen.

LEUCONIA PYRIFORMIS. (Sp. nov.)

(Plate III., figs. 4, 4a—d.)

Sponge (Plate III., fig. 4) small, pear-shaped, sessile, attached by its base, narrowing somewhat rapidly from below upward and terminating above in an oscular fringe 3 mm. in length. The main portion of the sponge is 1 mm. broad at the osculum and has a maximum breadth of 3.5 mm. a little in advance of the rounded base. The total length of the sponge, including the oscular fringe is 6.5 mm. *Colour* in spirit, light yellow; that of the oscular fringe a shining white. *Surface* even. *Osculum*, the outer termination of the gastral cavity, circular, 0.548 mm. wide.

Skeleton.—Consisting of a wall of triradiate spicules which is thickest near the base and becomes thin at the mouth of the gastral cavity. The latter is considerably contracted a short distance from the osculum and reaches the lower part of the sponge by a number of subdivisions.

The outer surface is pierced by numerous circular openings, varying in width from 0.041 to 0.137 mm. situated in the spaces between large triradiate spicules. Similar openings of the same size, are seen leading into the gastral cavity and its subdivisions. The triradiate spicules of the wall are very variable in size, the largest being on the outside; their rays are parallel to the surface.

Spicules.—(1) *Dermal triradiate spicules* (Plate III., fig. 4a) of very large size, having stout, sharply and gradually pointed rays which are frequently considerably twisted. One of the rays makes angles of 112° with the other two. The rays attain a maximum length of 0.589 with a thickness of 0.061 at the base; they are all in the same plane. (2) *Triradiate spicules of the parenchyma*, similar in form to those of the dermal surface but very variable in size. There seems to be a regular increase in their size outward; the smallest (Plate III., fig. 4b), having rays 0.027 mm. in length with a thickness of 0.006 mm.

at the base, are situated near the surface of the gastral cavity; those near the dermal surface are almost as large as the dermal triradiate spicules. (3) *Quadriradiate spicules* (Plate III., fig. 4c) occurring in the gastral surface. They have a short, inwardly directed fourth ray, curved toward the opening of the gastral cavity. In an average sized spicule, the length of a ray is about 0.232 mm., the thickness at the base 0.013 mm. and the length of the inwardly directed fourth ray 0.082 mm. (4) *Oxeote spicules* (Plate III., fig. 4d) found dispersed through the parenchyma in small numbers; average length 0.118 mm., thickness 0.004 mm. (5) *Straight linear spicules*, attaining a maximum length of 3.00 mm. and about 0.003 mm. thick, project beyond the oscular margin and form a fringe. In the specimen under consideration they meet at a point in advance of the osculum.

Locality.—Strait of Georgia near Comox, Vancouver Island in about 40 fathoms. One specimen.

EXPLANATION OF PLATES.

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- Fig. 1.—*Halichondria disparilis* (page 25). Large oxeote spicule; $\times 136$.
 Fig. 1a. Small oxeote spicule; $\times 272$.
- Fig. 2.—*Reniera cinerea* (page 26). Oxeote spicule; $\times 272$.
- Fig. 3.—*Reniera mollis*, (page 26). Natural size.
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- Fig. 4.—*Esperella hispida* (page 27). Stylus; $\times 272$.
 Fig. 4a. Palmate anisochela, side view; $\times 272$.
 Fig. 4b. Palmate anisochela, front view; $\times 272$.
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- Fig. 5.—*Esperella adhaerens* (page 27). Natural size.
 Fig. 5a. Stylus; $\times 272$.
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- Fig. 6.—*Esperella occidentalis* (page 28). $\times 3$.
 Fig. 6a. A rather diagrammatic representation of the skeleton arrangement as seen in longitudinal section; $\times 22$.
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- Fig. 7.—*Iophon chelifera* (page 30). Natural size.
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PLATE III.

Fig. 1.—*Craniella villosa* (page 34). Somal oxete spicule; $\times 60$.Fig. 1a. Cortical oxete spicule; $\times 60$.Fig. 1b. Dermal oxete spicule; $\times 136$.Fig. 1c. Cladal end of minute protriæne; $\times 272$.Fig. 1d. Cladal end of protriæne; $\times 272$.Fig. 1e. Cladome of anatriæne with short cladi; $\times 272$.Fig. 1f. Cladome of anatriæne with long cladi; $\times 272$.Fig. 2.—*Rhabdocalyptus Dowlingii* (page 37). Natural size.Fig. 2a. Large diact; $\times 60$.Fig. 2b. Hypodermal pentact; $\times 28$.Fig. 2c. Autodermal pentact; $\times 136$.Fig. 2d. Small diact with central tubercles; $\times 60$.Fig. 2e. Autogastral hexacts; $\times 136$.Fig. 2f. Oxyhexact; $\times 272$.Fig. 2g. Eight-rayed discohexaster; $\times 272$.Fig. 2h. Minute discohexaster; $\times 400$.Fig. 3.—*Grantia Comoxensis* (page 39). $\times 2$.Fig. 3a. Dermal triradiate spicule; $\times 136$.Fig. 3b. Gastral quadriradiate spicule; $\times 136$.Fig. 3c. Large oxete spicule; $\times 60$.Fig. 4.—*Leuconia pyriformis* (page 40). $\times 2$.Fig. 4a. Dermal triradiate spicule; $\times 60$.Fig. 4b. Small parenchymal spicule; $\times 136$.Fig. 4c. Gastral quadriradiate spicule; $\times 136$.Fig. 4d. Oxete spicule; $\times 136$.

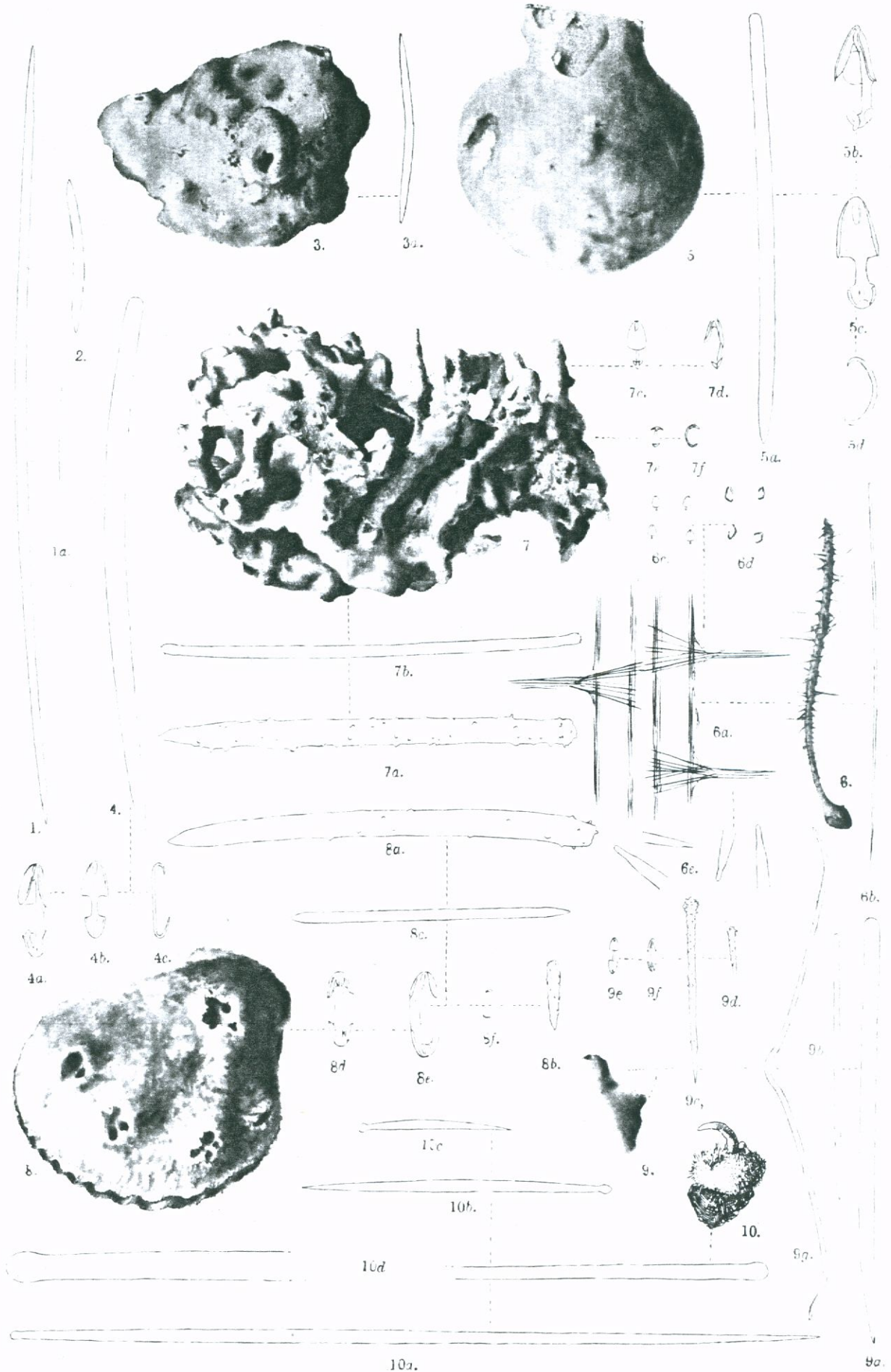
PLATE IV.

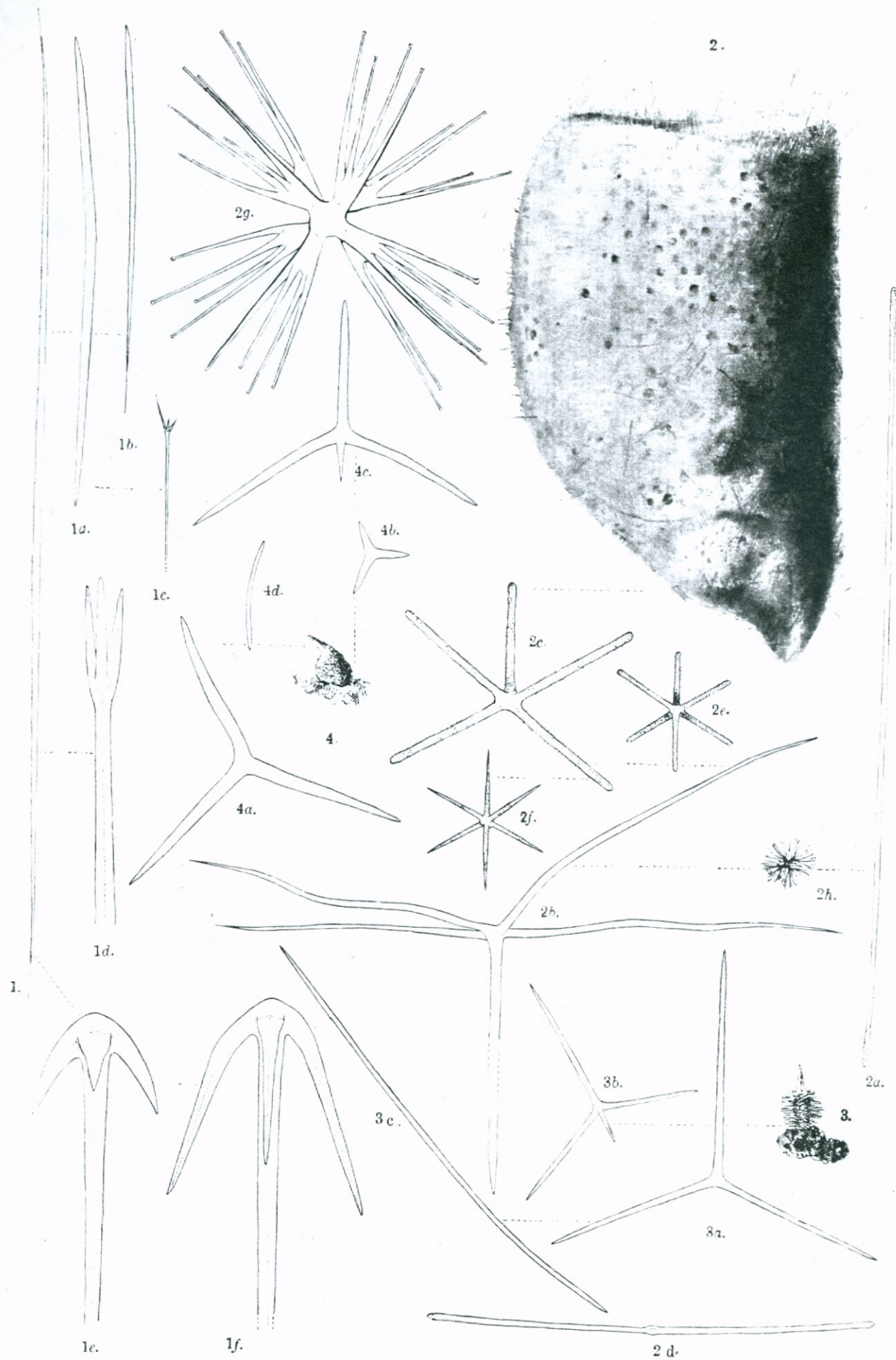
Fig. 1.—*Craniella spinosa* (page 35). Natural size.

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L. M. LAMBE, F. G. S. DEL.

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