REPORT ON THE CALCAREOUS SPONGES COLLECTED DURING 1906 BY THE UNITED STATES FISHERIES STEAMER ALBATROSS IN THE NORTHWESTERN PACIFIC.

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INTRODUCTION.

A number of calcareous sponges were set aside by Prof. I. Ijima from among the Hexactinellid material collected by the United States Fisheries steamer *Albatross* during her cruise in the northwest Pacific in 1906, and now being worked over by him for report. The Calcarea specimens were kindly placed in my hand for examination. Small as the collection is, it proved to be a highly interesting one, in that it was found to comprise in all 13 species, of which 11 seem to be new to science.

The following is the list of the species:

Family HOMOCOELIDAE Dendy.

1. *Leucosolenia albatrossi*, new species.
2. *Leucosolenia canariensis* (Michlucho-Maclay).

Family SYCETTIDAE Dendy.

3. *Sycon simushirensis*, new species.

Family HETEROPIIDAE Dendy.

4. *Heteropia medioarticulata*, new species.

Family GRANTIIDAE Dendy (emend).

5. *Grantia nipponica*, new species.
6. *Grantia beringiana*, new species.
7. *Achramorpha diomediae*, new species.
8. *Leucandra tuba*, new species.
9. *Leucandra poculiformis*, new species.
10. *Leucandra foliata*, new species.
11. *Leucandra kurilensis*, new species.
12. *Leucandra splendens*, new species.
13. *Leucopsila stylifera* (O. Schmidt).

Next follows a list of the stations, showing their position, depth, and the species obtained at each:

Station 4777. 52° 11′ N.; 179° 49′ E.; about 12 miles north of Semisopochnoi Island, Aleutian Islands; 52 fathoms____*Leucandra poculiformis*, new species.

Station 4788. 54° 50′ 24″ N.; 167° 13′ E.; 8.8 miles southwest of north point of Copper Island, Comandorski Islands; 57 fathoms—*Leucosolenia albatrossi*, new species. *Grantia beringiana*, new species.

Station 4789. 54° 49′ 45″ N.; 167° 12′ 30″ E.; 9.1 miles southwest of north point of Copper Island, Comandorski Islands; 56 fathoms—*Leucosolenia albatrossi*, new species. *Leucosolenia canariensis.*

Station 4790. 54° 38′ 45″ N.; 167° 11′ 45″ E.; 15 miles northwest of Cape Monati, Bering Island, Comandorski Islands; 64 fathoms—*Leucandra splendens*, new species. *Leucopsila stylifera.*

Station 4792. 54° 36′ 15″ N.; 166° 57′ 15″ E.; 8.2 miles southeast of Cape Monati, Bering Island, Comandorski Islands; 72 fathoms—*Leucandra splendens*, new species. *Leucopsila stylifera.*

Station 4803. 46° 42′ N.; 151° 45′ E.; 9 miles southeast of Cape Rollin, Simushir Island, Kurile Islands; 229 fathoms—*Sycon simushirensis*, new species. *Grantia nipponica*, new species. *Achramorpha diomediae*, new species. *Leucandra kurilensis*, new species. *Leucopsila stylifera.*

Station 4822. 37° 8′ 10″ N.; 137° 8′ E.; 4.5 miles northeast of Nosaki, Notojima, Noto; 130 fathoms—*Grantia nipponica*, new species.

Station 4877. 34° 20′ 30″ N.; 130° 11′ E.; 6.3 miles northeast of Okinoshima, Chikuzen, Kiushu; 59 fathoms—*Leucandra tuba*, new species.

Station 4894. 32° 33′ N.; 128° 32′ 10″ E.; 5 miles southwest of Osesaki, Hizen, Kiushu; 95 fathoms—*Leucandra foliata*, new species.

Station 5017. 46° 43′ 30″ N.; 143° 45′ E.; 12.5 miles southeast of Cape Tonin, Saghalin; 64 fathoms—*Heteropia medioarticulata*, new species.

Station 5024. 48° 43′ 10″ N.; 144° 59′ 30″ E.; northeast of Cape Patience, Saghalin; 67 fathoms—*Heteropia medioarticulata*, new species.

DESCRIPTION OF THE SPECIES.

1. LEUCOSOLENIA ALBATROSSI, new species.

Plate 84, fig. 1.

This new species is represented in the collection by two specimens obtained at two closely situated stations off Copper Island. Both are nearly alike in appearance and structure, only differing in size. I have selected the smaller specimen from Station 4788 as the type (Cat. No. 9182 U.S.N.M.), of which a portion (about one-third of the whole) is shown in natural size in plate 84, figure 1.

Structure.—The type-specimen forms an irregularly shaped colony consisting of numerous proliferous lobes of varying size and shape. The lobes are somewhat lamellar, irregularly ascending, and folded. They are hollow, the pseudogaster extending into them in the form of slitlike spaces. The pseudoscula, found in a few number on the upper surface of the sponge, measure up to about 7 mm. in diameter. They are each provided with an irregularly undulating membrane. The wall of the pseudogaster, ½–1 mm. thick, is made up of a close reticulation of ascon tubes. It appears on the outer surface closely and minutely punctate from the presence of very numerous pseudopores, which lead into the interspaces between the ascon tubes. The

pseudopores are, as usual, circular, with a diameter of 150–500μ. The ascon tubes are 150–450μ wide. The inner surface of the wall is perforated by numerous small oscula of 100–700μ diameter, each leading into a single or more gastral cavities of the ascon tubes. The prosopyles are circular appertures of about 20μ diameter.

The color of the sponge in alcohol is white, with a slight yellowish tint. Under the microscope there are visible in the wall numerous spherical granules of a yellowish color and with a diameter of 4–12μ. The sponge readily falls into pieces, being of a very delicate texture.

The skeleton consists of triradiates, quadriradiates, and oxea. The main part of the ascon wall is composed of triradiates and quadriradiates, both of which are arranged promiscuously in a single layer, the apical rays of the latter projecting into the gastral cavity, but

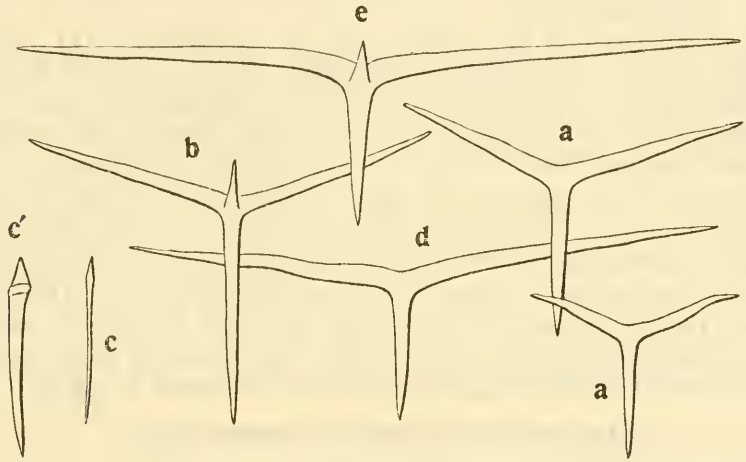


FIG. 1.—LEUCOSOLENIA ALBATROSSI. *a*, TRIRADIATES OF ASCON-TUBE. *b*, QUADRIRADIATE OF ASCON-TUBE. *c*, OXEA OF ASCON-TUBE. *c′*, SAME SEEN FROM SIDE. *d*, TRIRADIATE OF THE LINING LAYER OF PSEUDOGASTER. *e*, QUADRIRADIATE OF THE LINING LAYER OF PSEUDOGASTER. All ×300.

otherwise without any definiteness in the orientation of the rays of both. The skeletal layer lining the pseudogaster, and having a thickness of nearly 40μ, is made up of a somewhat different kind of triradiates and quadriradiates, both of which are fairly closely arranged in a few layers, the apical rays of the latter projecting into the pseudogaster. The oxea occur in a few number only in the outer parts of ascon tubes, running parallel to the tube surface, but showing no rule as to the direction they take.

Spicules (fig. 1).—Triradiates of ascon tubes (*a*) slightly sagittal, with paired rays slightly longer than basal ray. All rays are of equal thickness. Paired rays very slightly curved, often somewhat crooked, sharply pointed, 80–100μ long and 8μ thick at base. Basal ray straight, tapering gradually to sharp point, 70–90μ long and 8μ thick at base.

Quadriradiates of ascon tubes (*b*) nearly similar to the above triradiates except in the presence of apical ray. This is much shorter and slightly thinner than facial rays, gradually tapering and sharply pointed, slightly curved upwards, 40–60μ long and 6μ thick at base.

Oxea of ascon tubes (*c*) with distinct sharply pointed lance head, more or less curved, broadest at the lance head, 70–90μ long and 8μ broad at head.

Triradiates of the lining layer of pseudogaster (*d*) strongly sagittal, with paired rays much longer than basal ray and standing nearly at right angles to the latter. Basal ray straight, sometimes slightly thinner than paired rays, 60–90μ long and 8μ thick at base. Paired rays nearly straight except for the slight curvature at base, rarely crooked, gradually tapering to sharp point, 130–240μ long and 8–12μ thick at base.

Quadriradiates of the lining layer of pseudogaster (*e*) nearly similar to the triradiates just mentioned, but with a short slender curved apical ray of 40–60μ length and 6–8μ thickness at base.

Localities.—Off the north point of Copper Island, Comandorski Islands (Station 4788, 57 fathoms; Station 4789, 56 fathoms).

Remarks.—This species can not be identified with any species already known of the genus. The canal system of the reticulate type D[1] and the sagittal triradiates and quadriradiates in the lining layer of pseudogaster appear to be characteristic to it. The oxea closely resemble those of *Leucosolenia variabilis* Haeckel, *L. botryoides* (Ellis and Solander), etc. The other specimen from station 4789 alluded to above is entered under Cat. No. 9180, U.S.N.M.

2. LEUCOSOLENIA CANARIENSIS (Michlucho-Maclay).

Plate 84, fig. 2.

Nardoa canariensis Michlucho-Maclay, Jenaische Zeitschr., vol. 4, 1868, p. 230.
Nardoa sulphurea Michlucho-Maclay, Jenaische Zeitschr., vol. 4, 1868, p. 230.
Nardoa rubra Michlucho-Maclay, Jenaische Zeitschr., vol. 4, 1868, p. 230.
Tarroma canariense Haeckel, Prodromus, 1870, p. 244.
Tarroma rubrum Haeckel, Prodromus, 1870, p. 245.
Ascaltis canariensis Haeckel, Kalkschwämme, 1872, p. 52, pl. 9, figs. 1–3; pl. 10, figs. 1, *a–c*.
Ascaltis compacta Schuffner, Jenaische Zeitschr., vol. 11, 1877, p. 404, pl. 25, fig. 9.
Leucosolenia nanseni Breitfuss, Zoologische Anzeiger, vol. 19, 1896, p. 427; Zoologische Jahrb. Syst., Abt. 10, 1898, p. 106, pl. 12, figs. 1–9.
Leucosolenia canariensis Lakschewitsch, Zoologische Jahrb., vol. 1, 1886, p. 300, pl. 7, fig. 1.—Thacker, Proc. Zool. Soc. London, 1908, p. 762, pl. 40, fig. 3, text-figs. 157–160.—Dendy and Row, Proc. Zool. Soc. London, 1913, p. 724.

The collection contains a single specimen of this species (Cat. No. 9181, U.S.N.M.). The sponge (pl. 84, fig. 2) consists of a massive

[1] Dendy, A. A Monograph of the Victorian Sponges, Pt. I. The Organization and Classification of the Calcarea Homocoela, with descriptions of the Victorian Species. Trans. Roy. Soc. Victoria, vol. 3, No. 1, 1891, pp. 30–32.

assemblage of recticulating ascon tubes. It is of a flattened oval shape, broadest at the upper end and narrowed toward the lower end, which forms a short stalk for attachment. It is apparently devoid of either an osculum or a pseudosculum. Total length about 15 mm.; greatest breadth about 10 mm. The thickness is about 5 mm. as measured in the thickest part. The entire outer surface of the sponge seems to be covered with a finely folded continuous membrane. The recticulation of ascon tubes is rather loose. Grayish white in alcohol. Soft and delicate in texture.

Structure.—The bad state of preservation of the specimen made it difficult to ascertain the fine internal structure. However, it is probable that the ascon tubes have no papillae on the inner surface.

The skeleton is composed of triradiates and quadriradiates, arranged in a single layer in the wall of ascon tubes. Some of the former are provided with a small knob representing the rudimentary apical ray. The latter occur relatively sparsely and mixed together with the triradiates; their apical rays project into the gastral cavity. There is no conspicuous difference in size between the dermal and the more deeply situated spicules.

Spicules.—Triradiates regular, with rays straight, usually somewhat bluntly and sometimes sharply pointed, rather slender, 50–140μ long and 6–12μ thick at base.

Quadriradiates of the same shape and size as the triradiates, but with a short, slender, straight, and sharply pointed apical ray. In an example of the spicule, the apical ray measured 30μ long and 2μ thick at base.

Localities.—Canary Islands (Michlucho-Maclay, Haeckel); Cape Verde Islands (Thacker); Mauritius (Schuffner); Minorca (Lakschewitsch); Spitzbergen, Arctic Ocean (Breitfuss); off the north point of Copper Island, Comandorski Islands (Station 4789, 56 fathoms).

3. SYCON SIMUSHIRENSIS, new species.

Plate 84, fig. 6.

This new species is based on a single specimen in the collection (Cat. No. 9170 U.S.N.M.). It is a small solitary individual (pl. 84, fig. 6) of a slightly laterally compressed tubular shape, narrowed at base, which is torn off. The osculum at the upper end is in a collapsed state. Length about 9 mm.; the greatest breadth about 2 mm.; thickness of wall not over 0.4 mm. To the naked eye both dermal and gastral surfaces appear nearly smooth. Color grayish white in alcohol. Texture moderately firm.

Structure.—The canal system is of the syconoid type. The flagellate chambers are arranged radially around the rather wide gastral

cavity; they are more or less united at places where they come into contact with one another.

The articulate tubar skeleton is composed of triradiates, its proximal joints being formed by the basal rays of subgastral triradiates. Those tuber triradiates which form the distal joints have the basal rays grouped into tufts together with a number of oxea. The gastral skeleton is made up of triradiates, quadriradiates, and the paired rays of subgastral triradiates. The two former are fairly regularly arranged around gastral apertures with basal rays directed downward and with apical rays projecting into the gastral cavity. The quadriradiates are much less numerous than the triradiates. The oscular margin is very thin, but richly supplied with spicules; externally

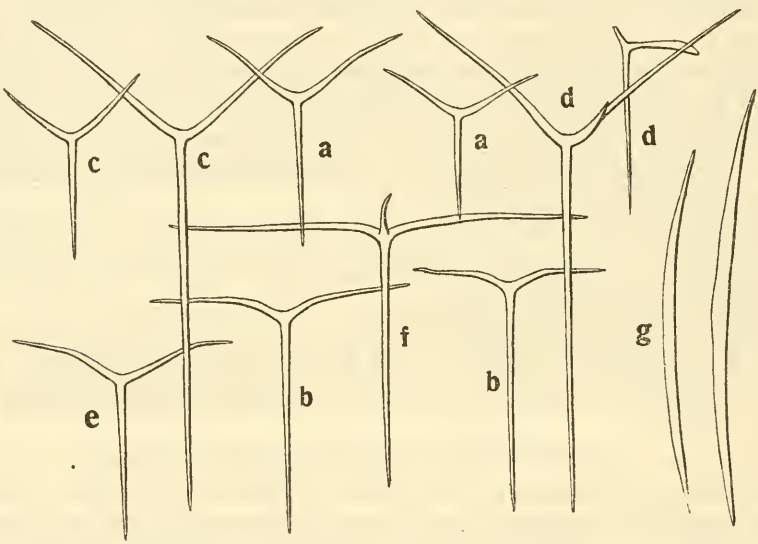


FIG. 2.—SYCON SIMUSHIRENSIS. *a*, TUBAR TRIRADIATES. *b*, SUBGASTRAL TRIRADIATES. *c*, GASTRAL TRIRADIATES. *d*, GASTRAL QUADRIRADIATES. *e*, TRIRADIATE OF OSCULAR MARGIN. *f*, QUADRIRADIATE OF OSCULAR MARGIN. *g*, OXEA OF OSCULAR MARGIN. All ×150.

there are found triradiates, large oxea, and linear spicules, all which form a thin fringe, and internally there exist quadriradiates in a layer. Both the tri- and the quadriradiates lie tangentially with downwardly directed basal rays.

Spicules.—Tubar triradiates (*a*) slightly sagittal with slender rays. Basal ray longer and slightly thinner than paired rays, tapering from base to sharp point, straight, 100–140μ long and 6μ thick at base. Paired rays slightly doubly curved forewards in basal parts and backwards in the remaining parts; 90–100μ long and 8μ thick at base. Subgastral triradiates (*b*) sagittal. All rays slender, tapering from base to sharp point, not lying in the same plane. Basal ray distinctly longer than paired rays, straight, about 200μ long and 6–8μ thick at base. Paired rays strongly diverging, distinctly curved

at a point a short distance from base, 80–120μ long and 6–8μ thick at base.

Gastral triradiates (*c*) sagittal. All rays slender, equally thick, tapering to sharp point. Basal ray straight, much longer than paired rays, 110–330μ long and about 8μ thick at base. Paired rays nearly equal, slightly doubly curved, first forewards and then backwards; 70–180μ long and about 8μ thick at base.

Gastral quadriradiates (*d*) similar to gastral triradiates, except in the presence of apical ray. Apical ray much shorter than facial rays, slightly curved and gradualy tapering to sharp point, 40–80μ long.

Oxea at distal end of flagellate chambers generally slightly curved, sharply pointed at both ends, about 80μ long and 4μ thick.

Triradiates of oscular margin (*e*) sagittal. All rays nearly equally thick, tapering from base to sharp point. Basal ray straight, slightly longer than paired rays. Paired rays rather strongly divergent, distinctly bent at the middle of their length. In an example of the spicule the basal ray measured 140μ long and 6μ thick at base, and the paired rays 110μ long and 6μ thick at base.

Quadriradiates of oscular margin (*f*) very strongly sagittal. Basal ray straight, sharply pointed, slightly longer than paired rays. Paired rays sightly curved at base, otherwise nearly straight, standing nearly at right angles to basal ray. Apical ray short, tapering to sharp point. In a large example of the spicule the basal ray measured 250μ long and 6μ thick, and the paired rays 190μ long and 8μ thick at base.

Oxea of oscular margin (*g*) spindle-shaped, slightly curved, generally thickest nearer inner than outer end, about 370μ long and 12μ thick.

Linear spicules of oscular margin straight or slightly curved, sharply pointed at both ends, 240μ or more long and 2–4μ thick.

Locality.—Off Cape Rollin, Simushir Island, Kuriles (Station 4803, 229 fathoms).

4. HETEROPIA MEDIOARTICULATA, new species.

Plate 84, fig. 7.

Four specimens of this new species exist in the collection. They are all of a closely similar appearance, being of a more or less bent and laterally compressed tubular shape, attached by the narrowed stalk-like base and showing at the somewhat contracted upper end an osculum, which is surrounded by a trace of a collar.

The largest specimen (pl. 84, fig. 7), which I make the type of the species (Cat. No. 9186 U.S.N.M.), is nearly 40 mm. long and 10 mm. broad in the broadest part, where the wall is about 2 mm. thick. The oval osculum measures 3 mm. by 2 mm. across. The dermal surface

is nearly smooth though not quite even. The gastral surface appears slightly hispid, due to the projecting apical rays of gastral quadriradiates. The color in alcohol is grayish white. The texture is pretty firm.

Structure.—The canal system is typically syconoid. The dermal cortex is rather thin, the gastral cortex thicker. Flagellate chambers are radially arranged around the gastral cavity. They are cylindrical, almost straight, slightly narrowed distally and scarcely branching. Each flagellate chamber communicates with the gastral cavity by means of a very short exhalant canal. The meshes of the lacework formed by the gastral spicules constitute the openings of exhalant canals into the gastral cavity. They are angularly circular or oval with a diameter of about $\frac{1}{3}$ mm.

The dermal skeleton is made up of oxea and of the paired rays of subdermal pseudosagittal triradiates. The oxea run somewhat longitudinally in a few layers, parallel to the surface. There may occur very slender hair-like oxea grouped into small sparsely distributed tufts, which project on the dermal surface. The tubar skeleton is composed of the centripetal basal rays of subdermal pseudosagittal triradiates, of the centrifugal basal rays of subgastral sagittal triradiates, and of tubar triradiates which are placed in several layers between the spicules just mentioned. The gastral skeleton consists of the paired rays of subgastral sagittal triradiates, of gastral triradiates arranged in several layers, and of a small number of gastral quadriradiates, the apical rays of which project into the gastral cavity pointing upwards. The basal rays of gastral tri- and quadriradiates are directed towards the sponge base and are grouped into bundles. The skeleton of the oscular margin is a close-meshed reticulum formed by fine longitudinally disposed linear spicules and by triradiates with strongly divergent paired rays.

Spicules.—Subdermal triradiates (*a*) pseudosagittal, irregular. All rays nearly equally thick, gradually tapering to sharp point, not lying in the same plane. Basal ray longer than paired rays, usually nearly straight except for a slight curvature at base, sometimes crooked, 140–240μ long and 12μ thick at base. Paired rays unequally long and differently shaped. The longer ray nearly twice as long as the shorter, doubly flexed, curving first backwards and then slightly forewards, sometimes crooked, 100–160μ long and 12μ thick at base. The shorter ray not straight, being distinctly curved in the middle parts, 60–80μ long and 12μ thick at base.

Tubar triradiates (*b*) sagittal, more or less varying in size and shape. Rays nearly equally thick, gradually tapering to sharply pointed end, not lying in the same plane. Basal ray distinctly or sometimes only slightly longer than paired rays, straight, 170–290μ long and 12μ thick at base. Paired rays slightly curved, rather irregular in outline, 100–190μ long and 12μ thick at base.

Subgastral triradiates (*c*) sagittal, with wide oral angle. All rays equally thick, lying nearly in the same plane and gradually tapering to sharp point. Basal ray slightly longer than paired

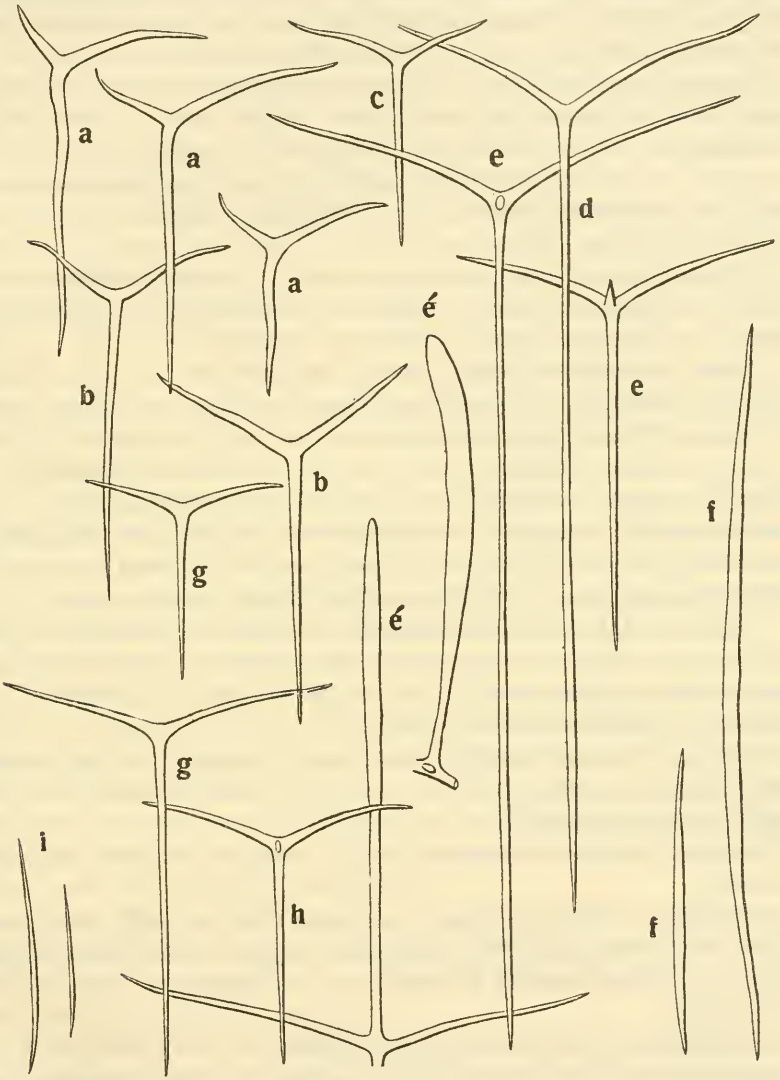


FIG. 3.—HETEROPIA MEDIOARTICULATA. *a*, SUBDERMAL TRIRADIATES. *b*, TUBAR TRIRADIATES. *c*, SUBGASTRAL TRIRADIATE. *d*, GASTRAL TRIRADIATE. *e*, GASTRAL QUADRIRADIATES. *e'*, APICAL RAYS OF GASTRAL QUADRIRADIATES. *f*, DERMAL OXEA. *g*, TRIRADIATES OF OSCULAR MARGIN. *h*, QUADRIRADIATE OF OSCULAR MARGIN. *i*, OXEA OF OSCULAR MARGIN. All ×150.

rays, straight, 170–200μ long and 10–12μ thick at base. Paired rays nearly equal, curving first backwards, and then very slightly forwards, 90–140μ long and 10–12μ thick at base.

Gastral triradiates (*d*) strongly sagittal, slender-rayed. Basal ray much longer than paired rays, straight, perceptibly narrowed in the middle parts, ending in sharp point, 560–730μ long and 8–12μ thick at base. Paired rays equal or but slightly differentiated in length, gradually tapering, showing more or less distinct double curvature, 180–240μ long and 8–12μ thick at base.

Gastral quadriradiates (*e*) similar to gastral triradiates, differing only in the presence of apical ray. Apical ray (*e'*) very strong, variable in length, slightly curved upwards, strongly laterally compressed, irregular in outline, narrow at base and broadening distally to terminate with obtuse end, 260–470μ in length, 16μ in breadth, and up to 25μ in thickness.

Dermal oxea (*f*) elongate spindle-shaped, usually slightly curved, rather irregular in outline, more or less sharply pointed at ends, 470–700μ long and 12–16μ thick in the middle.

Linear spicules of dermal cortex very slender, hair-like, straight, sharply pointed at both ends, may measure 240μ long and 1μ thick.

Triradiates of oscular margin (*g*) strongly sagittal. All rays nearly equally thick, gradually tapering. Basal ray straight, very finely pointed, 150–300μ long and 10–12μ thick at base. Paired rays strongly diverging, sharply pointed, slightly curved backwards in basal parts and either straight or slightly curved forewards in the remaining parts, 100–150μ long and 10–12μ thick at base.

Quadriradiates of oscular margin (*h*) like the triradiates of oscular margin except in the presence of apical ray. Apical ray much shorter than either basal or paired rays, slightly curved and very sharply pointed, directed upwards.

Oxea of oscular margin (*i*) slender, slightly curved, broadest nearer one end than the other, sharply pointed at both ends, 150–230μ long and 4μ thick.

Linear spicules of oscular margin similar to those of dermal cortex.

Localities.—Off Cape Tonin, Saghalin (Station 5017, 64 fathoms), Cat. No. 9186, U.S.N.M., type and paratype; off Cape Patience, Saghalin (Station 5024, 67 fathoms), two specimens, Cat. No. 9087, U.S.N.M.

Remarks.—This species is remarkable for the presence of some intermediate layers of triradiates, indicative of the articulate tubar skeleton, between the centripetally and centrifugally directed basal rays of subdermal and subgastral triradiates.

5. GRANTIA NIPPONICA, new species.

Plate 84, fig. 8.

This new species is represented in the collection by three specimens. The sponge represents a solitary person of a slightly laterally

compressed tubular form, gradually narrowed toward the base and showing at the upper truncate end an oval osculum provided with a weakly developed collar. The dermal surface is nearly smooth or slightly hispid. The gastral surface is distinctly echinated by the projecting apical rays of gastral quadriradiates.

The largest specimen (pl. 84, fig. 8), which I have selected as the type (Cat. No. 9188 U.S.N.M.), is 52 mm. long, 7 mm. broad in the middle and 4 mm. broad at base. The sponge wall is about 1 mm. thick. The osculum is 4 mm. long and 2 mm. wide. The color in alcohol is grayish white; the texture pretty firm.

Structure.—Dermal and gastral cortices are pretty well developed, containing some quantity of mesogloea. The former is slightly thicker than the latter. The canal system is of the syconoid type. The flagellate chambers are arranged radially around the gastral cavity. They are straight, circular in cross-section, nearly equally wide in all parts, unbranched or very slightly branched, and open either separately or several together through an exhalant canal into the gastral cavity. Further details concerning the soft parts could not be ascertained owing to the bad state of preservation.

The dermal skeleton is composed of triradiates which are either tangentially or more or less confusedly arranged in several layers. Oxea in sparse distribution project to a slight degree and nearly vertically from the dermal surface. The tubar skeleton is of the many-jointed articulate type. The gastral skeleton is made up of (1) the paired rays of subgastral triradiates, (2) gastral triradiates occuring generally in groups and with downwardly pointed basal rays, (3) gastral quadriradiates with their prolonged apical rays projecting into the gastral cavity, and (4) the small quadriradiates which surround the exhalant canals. The skeleton of oscular collar consists of oxea in two kinds and of triradiates and quadriradiates, all being closely set together. The last named two kinds of spicules have basal rays directed downwards.

Spicules.—Dermal triradiates (*a*) slightly sagittal or subregular. Rays equally thick, straight and gradually tapering to sharp point, not lying in the same plane but directed slightly inwards, 80–160μ long and 12–16μ thick at base.

Tubar triradiates (*b*) sagittal. Rays straight, sharply pointed, nearly equally thick, not lying all in one plane. Basal ray about one and half as long as paired ray, 130–160 μ long and 12 μ thick at base. Paired rays nearly equal, 70–90 μ long and 12 μ thick at base.

Subgastral triradiates (*c*) differing from the tubar triradiates only in having more widely open oral angle. In a typical example, basal ray 180 μ long, paired rays 100 μ long, all 12 μ thick at base.

Gastral triradiates (*d*) sagittal, rather slender-rayed. Basal ray straight, much longer and slightly thinner than paired ray, nearly uniformly thick throughout, except at the thickened basal parts and the tapering and sharply pointed end, sometimes slightly narrowed in the middle parts, 350–500 μ long and 12 μ thick at base. Paired rays slightly irregular in outline, curving first backwards and then slightly forewards, about 190 μ long and 16 μ thick at base.

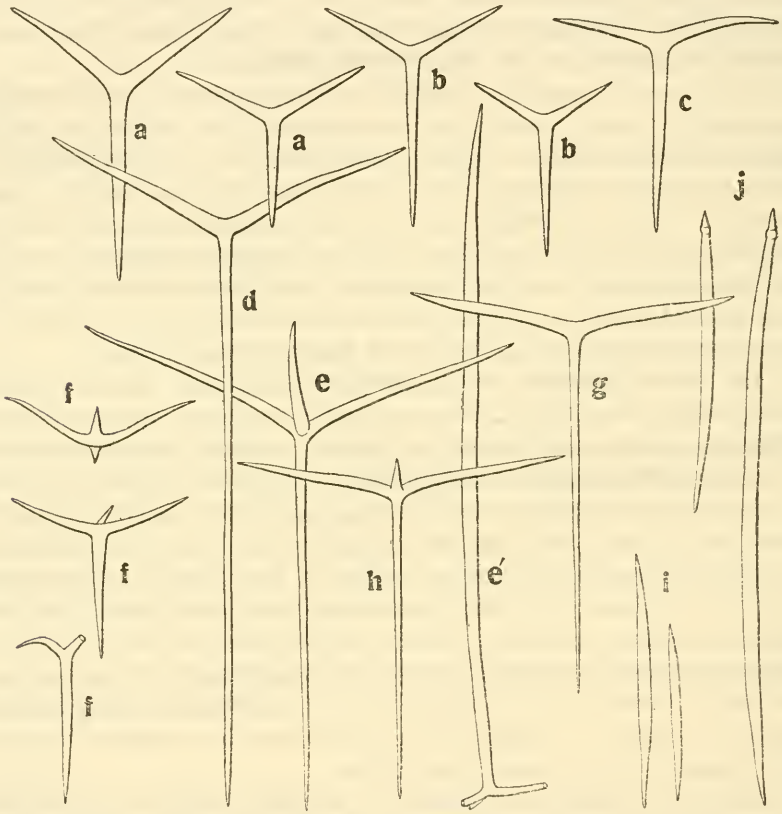


FIG. 4.—GRANTIA NIPPONICA. *a*, DERMAL TRIRADIATES. *b*, TUBAR TRIRADIATES. *c*, SUBGASTRAL TRIRADIATE. *d*, GASTRAL TRIRADIATE. *e*, GASTRAL QUADRIRADIATE. *e'*, APICAL RAY OF GASTRAL QUADRIRADIATE. *f*, QUADRIRADIATES OF EXHALANT CANALS. *f'*, SAME SEEN FROM LATERAL SIDE. *g*, TRIRADIATE OF OSCULAR COLLAR. *h*, QUADRIRADIATE OF OSCULAR COLLAR. *i*, OXEA PROJECTING FROM DERMAL SURFACE. *j*, OXEA OF OSCULAR COLLAR. All ×150.

Gastral quadriradiates (*e*) similar to the gastral triradiates, differing only in the presence of apical ray. Apical ray (*e'*) varying considerably in length, slightly curved upwards and occasionally at the same time crooked, nearly uniformly thick in the greater part of its length, but narrowed in the basal parts and at the pointed end, 330–700 μ long and 16 μ thick in the middle parts.

Quadriradiates of exhalant canals (*f*) small. Basal ray nearly straight, gradually tapering to sharp point, about 110 μ long and 10 μ

thick at base. Paired rays nearly as long as but slightly narrower than basal ray; curved in accommodation to the curvature of exhalant canal, about 80 μ long and 6 μ thick at base. Apical ray (*f'*) slender, sharply pointed, angularly curved in the middle, 30 μ long and 4 μ thick at base.

Triradiates of oscular collar (*g*) strongly sagittal. Basal ray much longer and thinner than paired rays, straight, finely pointed, 310 μ long and 10 μ thick at base. Paired rays very strongly diverging, standing nearly at right angles to basal ray, obsoletely showing double curvature, 160 μ long and 14 μ thick at base.

Quadriradiates of oscular collar (*h*) like the triradiates of same, except in the presence of apical ray. Apical ray much shorter than facial rays, never attaining so great a length as in gastral quadriradiates.

Oxea (*i*) slightly curved or nearly straight, sharply pointed at both ends, 130–300 μ long and 12 μ thick in the thickest parts.

Oxea of oscular collar (*j*) slightly curved and more or less irregular in outline, nearly uniformly thick for the most part of their length but tapering toward the pointed ends. Close to one end, provided with a feebly developed nodiform ring. They are 240–550μ long and 12–16μ thick in the middle.

Linear spicules of oscular collar slender, hair-like, straight, sharply pointed at both ends, the thickest part lying nearer one end than the other, 160–280μ long and 3μ thick.

Localities.—Off Nosaki, Notojima, Province Noto on the western coast of Japan (Station 4822, 130 fathoms); off Cape Rollin, Simushir Island, Kuriles (Station 4803, 229 fathoms).

Remarks.—The specimen from Station 4803 (Cat. No. 9172, U.S.N.M.) measures only about 11 mm. in total length and 2½ mm. in maximum breadth, the wall being nearly 0.4 mm. thick. It differs from the type-specimen in the smaller size of its spicules, in the less number of the layers of tubar triradiates, and in the presence of hair-like oxea projecting from the dermal surface. The most remarkable feature of the present species consists in the excessive prodongation of apical rays in gastral quadriradiates.

6. GRANTIA BERINGIANA, new species.

Plate 85, fig. 9.

A single specimen in the collection has served as the type of this new species (Cat. No. 9183, U.S.N.M.), Sponge (pl. 85, fig. 9), a solitary individual, cylindrical, slightly latellay compressed, broadened, and somewhat bent in the basal parts. The osculum at the upper end has a thin margin. The dermal surface is fairly hispid, due to projecting oxea. The gastral surface appears nearly smooth to the naked eye, in spite of numerous fine apical rays of gastral quadri-

radiates protruding through it. Total length of body 28 mm., greatest breadth about 10 mm., wall about 1 mm. thick, osculum about 5 mm. in major diameter. The color in alcohol is whitish. The texture is fairly firm and elastic.

Structure.—The dermal cortex is fairly thick. It is about 0.4 mm. thick. The gastral cortex is also well developed, but is distinctly thinner than the dermal, measuring about 0.25 mm. in thickness. The canal system is of the syconoid type. The flagellate chambers are rather short, cylindrical, straight, not unfrequently slightly branched; each passes at the apopyle into a long exhalant canal, a diaphragm occurring at the boundary. The dermal skeleton consists of few layers of triradiates, which are tangentially but otherwise rather irregularly disposed. Large oxea, grouped into small bundles and placed perpendicularly or somewhat obliquely to the dermal surface, project far beyond the surface, their proximal parts being deeply imbedded in the chamber layer. The tubar skeleton is made up of triradiates in two or three irregular layers, as well as of the basal rays of subgastral triradiates and quadriradiates. The gastral skeleton forms a thin layer, consisting mainly of gastral quadriradiates, of which the basal ray generally points toward the base and apical ray projects into the gastral cavity in oblique inclination toward the osculum. In addition to the quadriradiates there occur in the layer the paired rays of subgastral triradiates as well as the facial rays of subgastral quadriradiates. The skeleton of oscular margin consists of interlacing oxea, triradiates, and quadriradiates. The oxea are arranged longitudinally; the basal rays of tri- and quadriradiates are directed regularly downward.

Spicules.—Dermal triradiates (*a*) slightly sagittal. All rays slightly irregular in outline, nearly equally thick, lying in one plane. Basal rays nearly straight, usually slightly shorter than paired rays, 90–260μ long and 20μ thick at base. Paired rays subequal, nearly straight, excepting a slight curvature near base, 180–260μ long and 20μ thick at base.

Tubar triradiates (*b*) sagittal. Rays slightly irregular in outline, lying not in one plane. Basal ray much longer and slightly thicker than paired rays, nearly straight, 290–370μ long and 24–28μ thick at base. Paired rays slightly curved at base and nearly straight or weakly crooked in the remaining parts, 160–220μ long and 20–24μ thick at base.

Subgastral triradiates (*c*) strongly sagittal. Rays sharply pointed, nearly equally thick, lying not in one plane. Basal ray straight, much longer than paired rays, 150–240μ long and 12–16μ thick at base. Paired rays strongly diverging, curved rather angularly in the middle parts, 130–170μ long and 16–20μ thick at base.

Subgastrial quadriradiates (*d*) nearly similar to subgastral triradiates except in the presence of well-developed apical ray. Paired rays sometimes unequal. Apical ray very slender, slightly curved, sharply pointed, about 50μ long and 8μ thick at base.

Gastral quadriradiates (*e*) more or less sagittal. Rays nearly equally thick, gradually tapering to sharp point. Basal ray straight, longer than paired rays, 150–240μ long and 12–16μ thick at base. Paired rays usually slightly curved and irregular in outline, 110–170μ long and 16μ thick at base. Apical ray fairly well developed, slightly curved in distal parts, 100–210μ long and 12–16μ thick at base.

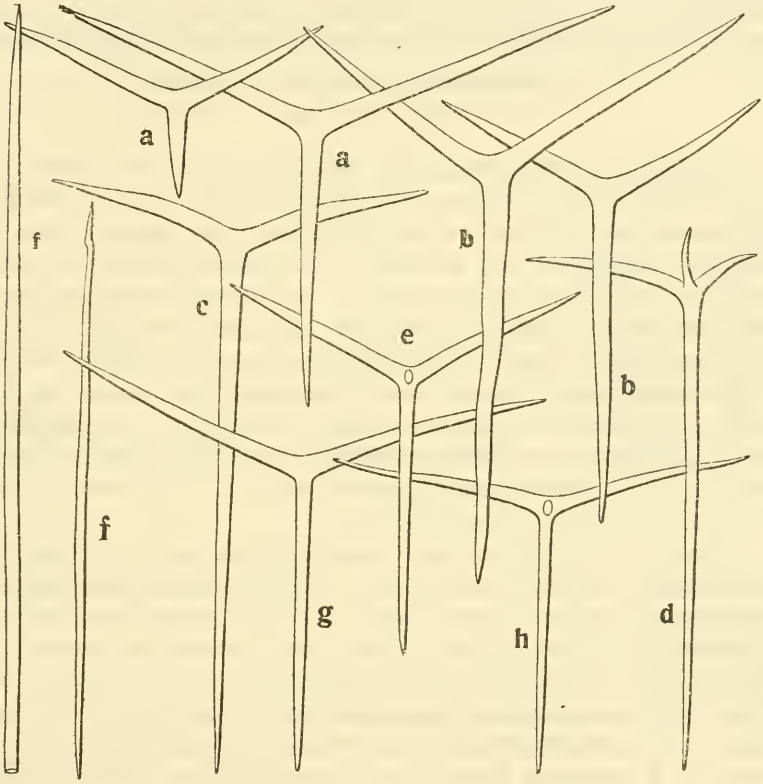


FIG. 5.—GRANTIA BERINGIANA. *a*, DERMAL TRIRADIATES. *b*, TUBAR TRIRADIATES. *c*, SUBGASTRAL TRIRADIATE. *d*, SUBGASTRAL QUADRIRADIATE. *e*, GASTRAL QUADRIRADIATE. *f*, OXEA. *g*, TRIRADIATE OF OSCULAR MARGIN. *h*, QUADRIRADIATE OF OSCULAR MARGIN. All ×150.

Large oxea (*f*) straight, nearly uniformly thick throughout entire length excepting the sharply pointed ends. A small example of the spicule measured 500μ long and 8μ thick; a large one over 1μ long by 12μ thickness.

Triradiates of oscular margin (*g*) strongly sagittal. Basal ray straight, slightly thinner than paired rays, finely pointed, 120–260μ long and 12–16μ thick at base. Paired rays strongly diverging, sharply pointed, 130–240μ long and 16–20μ thick at base.

Quadriradiates of oscular margin (*h*) strongly sagittal. Basal ray straight, finely pointed, 200–260μ long and 12μ thick at base. Paired rays strongly diverging, distinctly thicker than basal ray, obscurely showing double curvature, 160–200μ long and 16μ thick at base.

Large oxea of oscular margin similar to those which project from the dermal surface.

Locality.—Off the north point of Copper Island, Comandorski Islands (Station 4788, 57 fathoms).

Remarks.—This species resembles *Grantia comoxensis*[1], but shows some differences, chiefly in the external form and in the spiculation.

7. ACHRAMORPHA DIOMEDIAE, new species.

Plate 85, fig. 10.

The collection contains a single specimen of this new species (Cat. No. 9171, U.S.N.M.). The sponge (pl. 85, fig. 10) is in the form of a thin-walled and slightly curved cylindrical tube about 8 mm. long, inferiorly narrowed and swollen in the upper parts, the swelling beginning a little below the osculum. Maximum breadth of body 1½ mm. The terminal osculum leads into the gastral cavity of a habitus corresponding to that of the entire specimen. A feebly developed fringe exists around the osculum. The sponge wall is less than ½ mm. thick. The dermal surface is slightly hispid due to projecting oxas. The gastral surface is also more or less rough on account of the projecting apical rays of gastral quadriradiates. The color is nearly white in alcohol; the texture delicate.

Structure.—Both dermal and gastral cortices are very thin. The canal system is of the syconoid type. The flagellate chambers are of an elongate sac-like shape, circular or oval in cross-section with a diameter of 50–150μ. They extend nearly across the entire thickness of wall. Internally they communicate with exhalant canals which run through the gastral cortex before opening into the gastral cavity. The very wide inhalant canals start from beneath the dermal cortex and penetrate deeply into the interspaces between flagellate chambers.

The dermal skeleton is made up of tangential sagittal triradiates which are loosely distributed in a very thin layer with basal rays pointed downward. The larger oxea are grouped into tufts, with their proximal ends deeply stuck in the chamber layer and the distal ends projecting from the dermal surface. The tubar skeleton consists of the basal rays of subgastral triradiates and of the large oxea just mentioned. The gastral skeleton is composed of loosely arranged quadriradiates, lying parallel to the gastral surface in a single or two layers; their basal rays are directed toward the sponge base,

[1] *Grantia comoxensis* Lambe, Sponges from the Pacific Coast of Canada. Proc. and Trans. Roy. Soc. Canada, 1893, sec. 4, art. 3, pp. 39, 40, figs. 3, *a–c*.

while the apical rays project into the gastral cavity. The skeleton of the oscular margin is formed of two kinds of oxea forming a fringe and of very closely set triradiates and quadriradiates, both of which have very strongly diverging paired rays, the basal ray being directed downward in a regular manner.

Spicules.—Dermal triradiates (*a*) slightly sagittal, slender rayed. All rays nearly equally thick, tapering gradually to sharp point. Basal ray straight, slightly longer than paired rays, 140–240 μ long and 8–10 μ thick at base. Paired rays nearly equal, straight or slightly curved backward, 110–200 μ long and 8–10 μ thick at base.

Subgastral triradiates (*b*) strongly sagittal. All rays nearly equally thick, lying in one plane. Basal ray straight, tapering to

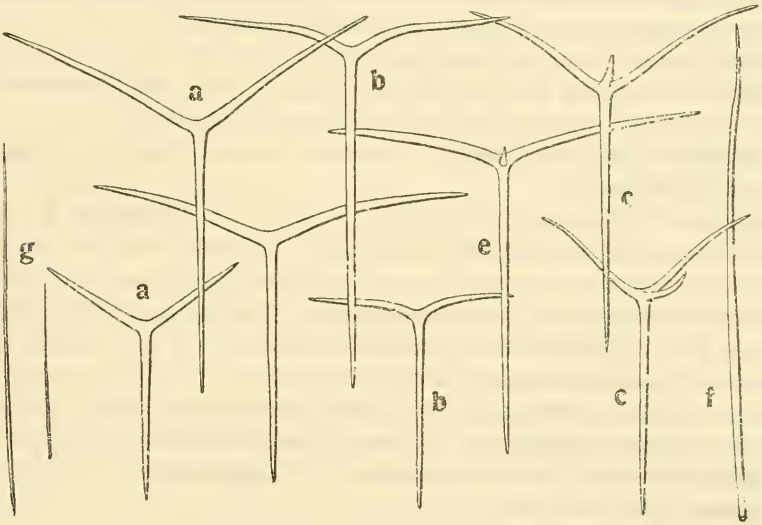


FIG. 6.—ACHRAMORPHA DIOMEDIAE. *a*, DERMAL TRIRADIATES. *b*, SUBGASTRAL TRIRADIATES. *c*, GASTRAL QUADRIRADIATES. *d*, TRIRADIATE OF OSCULAR MARGIN. *e*, QUADRIRADIATE OF OSCULAR MARGIN. *f*, OXEA PROJECTING FROM DERMAL SURFACE. *g*, OXEA OF OSCULAR MARGIN. All ×150.

fine point, 200–310 μ long and 8–10 μ thick at base. Paired rays strongly diverging, equal, nearly half as long as basal ray, curved backward at a point nearer the base than the sharply pointed end, 100–150 μ long and 8–10 μ thick at base.

Gastral quadriradiates (*c*) sagittal. Basal ray straight, much longer and slightly thicker than paired rays, 200–250 μ long and 10–12 μ thick at base. Paired rays equal, doubly curved, ending in sharp point, 110–150 μ long and 8–10 μ thick at base. Apical ray curved forward, tapering from base to very sharp point, about 100 μ long and 8 μ thick.

Triradiates of oscular margin (*d*) strongly sagittal. Basal ray straight, sharply pointed, slightly longer and distinctly thinner than paired rays, about 250 μ long and 12 μ thick at base. Paired rays

strongly diverging, slightly curved backward, somewhat bluntly pointed, about 200 μ long and 16 μ thick at base.

Quadradiates of oscular margin (*e*) nearly similar to the triradiates of oscular margin, except in the presence of short apical ray, which is slightly curved upward and tapering from base to sharply pointed end. In a large example of the spicule the basal ray measured 26 μ long by 8 μ thick at base, and the paired rays 16 μ long by 12 μ thick at base.

Oxea projecting from dermal surface (*f*) not very stout, rather slender, straight or slightly curved, and nearly uniformly thick in the greater part of their length, though tapering at ends, which are finely pointed. The majority of these spicules are found broken. A large fragment measured about 600 μ in length and 8 μ in thickness. The same spicules occur also in the oscular margin.

Oxea proper to oscular margin (*g*) very slender, hair-like, nearly straight or slightly curved, thickest nearer inner than outer end; both ends finely pointed; 280–600 μ long and 2–4 μ thick.

Locality.—Off Cape Rollin, Simushir Island, Kuriles (Station 4803, 229 fathoms).

Remarks.—This new species may easily be distinguished from Jenkin's species *Achramorpha glacialis*,[1] *A. nivalis*[2] and *A. grandinis*,[3] by the presence of the gastral skeleton containing tangential quadriradiates as well as by the absence of microxea. The species differs from Topsent's *Achramorpha truncata*[4] by the presence of tangential quadriradiates in the gastral skeleton and by the different share and size of the oxea which project from the dermal surface; and finally from Breitfuss's *Achramorpha schulzei*[5] by the absence of microxea and by the different shape of subgastral triradiates and of gastral quadriradiates.

8. LEUCANDRA TUBA, new species.

Plate 84, fig. 3.

This species is based on a single specimen found in the collection. (Cat. No. 9184, U.S.N.M.) It consists of a mass of complexly anastomosing tubes (pl. 84, fig. 3), partly blind and partly provided with an osculum at the free end. The tubes are cylindrical or more or less laterally compressed, and may be 5–10 mm. wide at their base, where the wall is about 2 mm. thick. The osculum is naked and circular in outline with a diameter of 1½–2½ mm. Both dermal and gastral

[1] Jenkins, The Calcarea of the National Antarctic Expedition. Natural History Reports, vol. 4, 1908, pp. 31, 32, pl. 34, figs. 98–102.

[2] Idem, pp. 33–35, pl. 27, figs. 7, 8; pls. 35, 36, figs. 105–112.

[3] Idem, pp. 32, 33, pl. 27, fig. 4; pls. 34, 35, figs. 103, 104.

[4] *Grantia truncata* Topsent, Éponges calcaires recueillis par le Français dans l'Antarctique. Bull. Mus. His. Nat., Paris, 1907, pp. 540, 541.

[5] *Ebnerella schulzei* Breitfuss, Kalkschwämme der Bremer Expedition nach Ost-Spitzbergen im Jahre 1889, Zool. Anzeiger, 1896, vol. 19, pp. 492, 430; Zool. Jahrb. Syst. Abt., 1898, vol. 11, pp. 113–115, pl. 13, figs. 39–52.

surfaces are smooth. The color in alcohol is white with a somewhat grayish tint. The texture is very compact and rather hard.
lation of small tangential triradiates, to which there may be added a small number of specially large tangential triradiates and some microxea in scattered distribution. The skeleton of oscular margin is a close interlacement of small triradiates and quadriradiates, both which have strongly divergent paired rays and downwardly directed basal ray. There may be found in addition some triradiates of an unusually large size.

Structure.—The canal system is leuconoid. The wide inhalant canals, starting from beneath the dermal surface, run centripetally into the chamber layer, becoming narrower as they divide into branches. The exhalant canals are also wide and branching. The gastral apertures, by which the exhalant canals open into the gastral cavity, are circular or oval measuring up to $\frac{1}{2}$ mm. across. The flagellate chambers, closely packed in the chamber layer, are oval or nearly spherical with diameter of 30–60 μ.

The dermal skeleton is made up of large and small triradiates placed tangentially in several confused layers. On the dermal surface are found microxea in thinly scattered distribution. The skeleton of the chamber layer likewise consists of large and small triradiates in dense and irregular disposition. Along the larger exhalant canals there occur a different sort of triradiates in addition to some quadriradiates with apical rays projecting into the canal. The gastral skeleton is fairly well developed; it is composed of a dense reticu-

Spicules.—The larger dermal triradiates (*a*) regular or subregular. Rays nearly straight, gradually tapering toward the pointed end, very variable in dimensions, 200–800μ long and 20–90μ thick at base. The smaller dermal triradiates (*b*) slightly sagital; the rays nearly uniformly thick, not lying all in one plane. Basal ray slightly longer than paired rays, straight, usually 200–300μ long and 16–28μ thick at base. Paired rays slightly curved, 150–270μ long.

Triradiates of chamber layer (*c*) regular, very variable in size. Rays straight, 350–800μ long and 40–90μ thick at base.

Quadriradiates of the larger exhalant canals (*d*) have gradually tapering and sharply pointed rays of nearly equal thickness, the facial rays not lying in one plane. Basal ray straight, about 200μ long and 16μ thick at base. Paired rays more or less curved around the exhalant canals, about 200μ long and 16μ thick at base. Apical ray much shorter and thinner than facial rays, slightly curved and very finely pointed, about 50μ long and 8μ thick at base.

Triradiates of the larger exhalant canals (*e*) nearly similar to the above quadriradiates, only differing in the absence of apical ray.

Gastral triradiates (*f*) strongly sagittal. Basal ray straight, sharply pointed, thinner and shorter than paired rays, 80–150μ

long and 16μ thick at base. Paired rays slightly curved and strongly divergent, often unequal in length and obtuse at end, 200–400μ long and 20–24μ thick.

Regular gastral triradiates large. Similar to large dermal triradiates.

Triradiates of oscular margin (*g*) strongly sagittal. Basal ray straight, nearly uniformly thick for the greater part of its length, sharply pointed, about 300μ long and 16μ thick at base. Paired rays

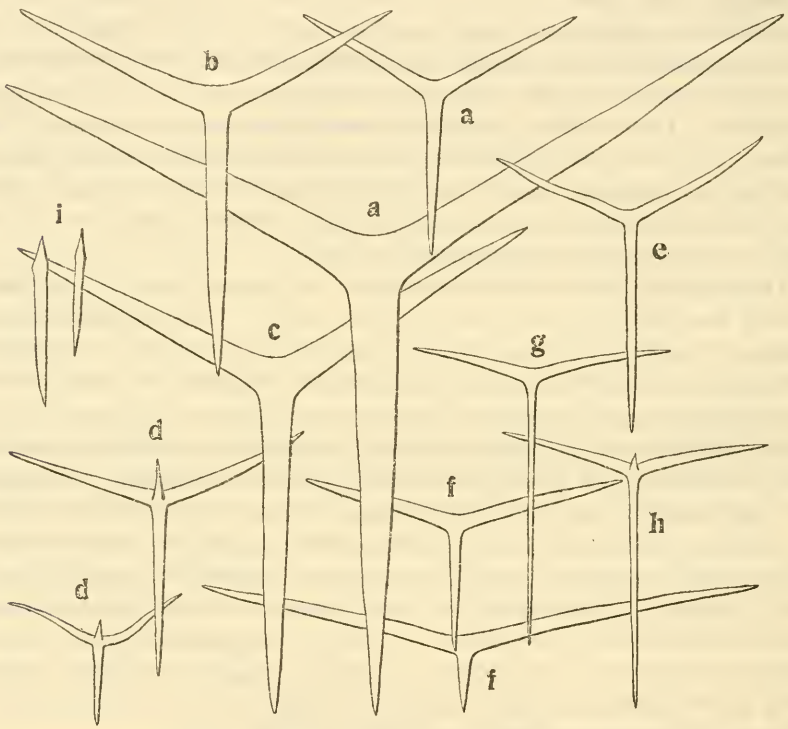


FIG. 7.—LEUCANDRA TUBA. *a*, REGULAR DERMAL TRIRADIATES. *b*, SAGITTAL DERMAL TRIRADIATE. *c*, TRIRADIATE OF CHAMBER LAYER. *d*, QUADRIRADIATES OF THE LARGER EXHALANT CANAL. *e*, TRIRADIATE OF THE LARGER EXHALANT CANAL. *f*, GASTRAL TRIRADIATES. *g*, TRIRADIATE OF OSCULAR MARGIN. *h*, QUADRIRADIATE OF OSCULAR MARGIN. *i*, GASTRAL MICROXEA. *a–h*, ×100; *i*, ×400.

much shorter and thicker than basal ray; slightly curved, very strongly diverging, about 160μ long and 20μ thick at base.

Quadriradiates of oscular margin (*h*) strongly sagittal, exactly similar to triradiates of oscular margin except in having slender apical ray.

Microxea (*i*) nearly straight, forming lance-head at one end, 40–56μ long and 2–4μ thick at head.

Locality.—Near Okinoshima, Prov. Chikuzen in Kiushu (Station 4877, 59 fathoms).

9. LEUCANDRA POCULIFORMIS, new species.

Plate 84, fig. 4.

Only a single specimen of this new species is represented in the collection (Cat. No. 9189, U.S.N.M.). It has the form of a thick-walled cup with a very irregular-shaped laterally compressed osculum at the upper end. The sponge was probably attached by the inferior, somewhat narrowed, and broken-off end. It is nearly 38 mm. high and 28 mm. broad in the broadest part. The gastral cavity is about 25 mm. deep The sponge wall is thickest in the lower parts, where it measures 13 mm. in thickness. This diminishes gradually toward the sharp-edged oscular margin. To the naked eye the outer surface appears nearly smooth. The gastral surface is perforated by numerous small exhalant apertures of 2 mm. and under in diameter. The color in alcohol is in part whitish and in part more or less brownish. The texture is not very compact, but rather soft and brittle.

Structure.—The canal system is leuconoid. The flagellate chambers are ovoid or nearly spherical, measuring about 70–120μ in their longest diameter. They are thickly and irregularly set between the branches of inhalant and exhalant canals, which are surrounded by a fairly thick layer of mesogloea.

The dermal skeleton is composed of several layers of variously sized tangential triradiates. Microxea cover the external surface all over, disposed at varying angles to it. The skeleton of the chamber layer consists in the main of triradiates, which are of very variable sizes and are thickly set together without any definite order. The wall of the larger exhalant canals is provided with a different sort of triradiates besides having quadriradiates with apical ray projecting into the lumen. There exists a gastral skeleton which is fairly well demarked from the chamber layer. It is composed of a thin layer of tangential triradiates and of microxea, which occur moderately densely together all over the gastral surface. The same kinds of spicules as those of the larger exhalant canals are also found in the gastral skeleton. Further, there occur in it some small and strongly sagittal tri- as well as quadriradiated, both of which are, however, not numerous. The oscular margin shows no special spicules.

Spicules.—Dermal triradiates (*a*) regular or subregular. Rays nearly equally thick, gradually tapering from base to sharp point, very variable in size, 130–680μ long and 20–60μ thick at base.

Triradiates of chamber layer (*b*) regular or subregular, similar to those of dermal skeleton, 280–640μ long and 40–60μ thick at base. Much smaller triradiates occur in a small number.

Triradiates of the larger exhalant canals (*c*) are sagittal. Rays nearly equally thick, now lying all in one plane. Basal ray nearly

straight, gradually tapering, sharply pointed, 130–260μ long and 12–32μ thick at base. Paired rays longer than basal ray, gently curved forwards and gradually tapering to sharp point, 170–370μ long and 16–32μ thick at base.

Quadriradiates of the larger exhalant canals (*d*) similar to the above triradiates, except in the presence of short and slightly curved apical ray. Basal ray 140–270μ long and 20–30μ thick at base. Paired rays 230–330μ long and 20–32μ thick. Apical ray about 60μ long and 16–20μ thick at base.

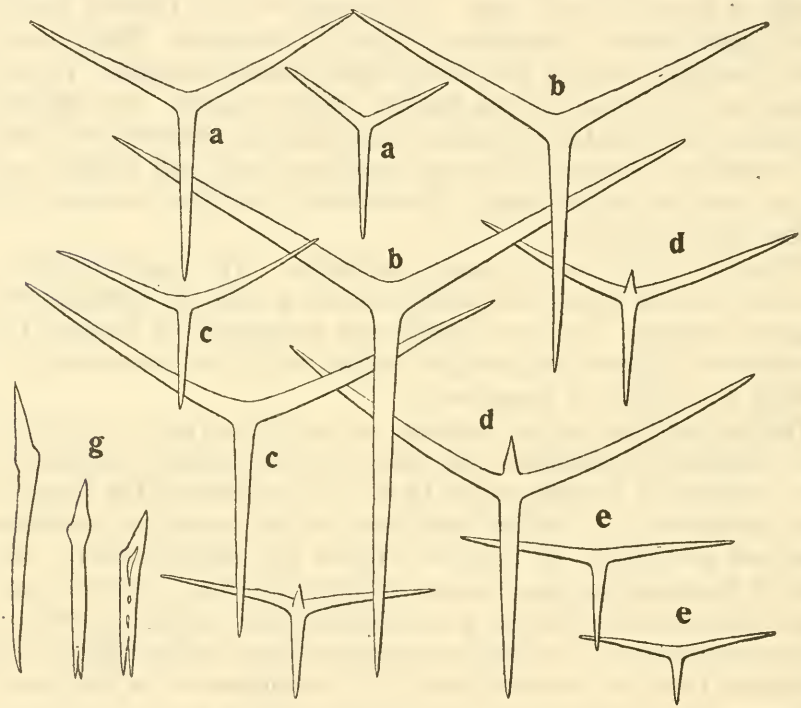


FIG. 8.—LEUCANDRA POCULIFORMIS. *a*, DERMAL TRIRADIATES. *b*, TRIRADIATES OF CHAMBER LAYER. *c*, TRIRADIATES OF THE LARGER EXHALANT CANAL. *d*, QUADRIRADIATES OF THE LARGER EXHALANT CANAL. *e*, GASTRAL TRIRADIATES. *f*, GASTRAL QUADRIRADIATE. *g*, DERMAL MICROXEA. *a–f*, ×100; *g*, ×400.

The larger gastral triradiates regular or subregular, nearly similar to those of dermal skeleton and of chamber layer.

The smaller gastral triradiates (*e*) strongly sagittal. All rays equally thick, sharply pointed. Basal ray nearly straight, distinctly shorter than paired rays, 80–120μ long and 16–20μ thick at base, lying slightly out of the plane of paired rays. These are nearly straight or slightly curved, very strongly divergent, 120–200μ long and 16–20μ thick at base.

Gastral quadriradiates (*f*) exactly similar to gastral triradiates, but with a short apical ray. Basal ray 90–110μ long and about 20μ

thick at base. Paired rays, 130–180μ long and about 20μ thick at base.

Microxea of dermal skeleton (*g*) slightly curved, proximally tapering to sharp point, distally terminating with a lance-head which is slightly bent and provided with sharp or obtuse apex, 60–90μ long and 4–6μ thick at head.

Microxea of gastral skeleton exactly similar to those of dermal skeleton.

Locality.—Off Semisopochnoi Island, Aleutian Islands (Station 4777, 52 fathoms).

Remarks.—This species differs from *Leucandra tuba*, new species, chiefly in the peculiar external form, in spiculation and in the absence of a skeleton proper to oscular margin. In external form it closely resembles the members of the genus *Pericharax* Poléjaeff.

10. LEUCANDRA FOLIATA, new species.

Plate 84, fig. 5.

This new species is founded on the strength of a single specimen in the collection (Cat. No. 9185, U.S.N.M.). The sponge (pl. 84, fig. 5) is foliate, consisting of a single continuous lamella, which is irregularly folded or convoluted. It is attached in the middle of its lower surface by means of several nipple-shaped basal processes. The lamella is about 55 mm. broad and about 4 mm. thick in the middle parts where it is thickest. The thickness decreases peripherally toward the very thin oscular margin. The inner surface of the lamella appears smooth to the naked eye; it is minutely punctuate, due to the apertures of exhalant canals, which are more distinct in the middle parts than in the periphery. The outer surface is likewise smooth, but without the punctate appearance of the inner surface. The color in alcohol is greyish white. The texture is fairly compact, rigid and brittle.

Structure.—Very wide inhalant canals arise just beneath the dermal surface and penetrate deep into the chamber layer, giving off numerous branches on the way. Small exhalant canals combine into a number of larger ones which open on the gastral surface by the apertures above alluded to. Between the inhalant and exhalant canal systems the flagellate chambers are quite irregularly scattered. They are oviid or spherical, with a diameter of 50–100μ.

The dermal skeleton is very thin and is composed of chiefly small and occasionally very large tangential triradiates, with basal ray pointing away from oscular margin. The skeleton of the chamber layer consists of large triradiates of a slightly variable size, which are densely set together without definite order. The larger exhalant canals are lined with quadriradiates, the apical ray of which projects into the canalar lumen. There exists a gastral skeleton made up of

triradiates in two sorts and of quadriradiates, all which spicules are disposed parallel to the gastral surface. The gastral surface is covered with microxea occurring irregularly, but moderately densely together.

Spicules.—Dermal triradiates in part (*a*) regular or subregular, very large though variable in size; rays nearly straight, tapering from base to sharp point, 190–900μ long and 28–100μ thick at base. Other dermal triradiates (*b*) sagittal, slender; rays nearly equally thick, not lying in one plane. Basal ray straight, usually slightly longer than paired rays, 110–250μ long and 8–20μ thick at base. Paired rays gently curved forewards, 80–210μ long and 8–20μ thick at base.

Triradiates of chamber layer regular or subregular, variable in size; similar to those of dermal skeleton.

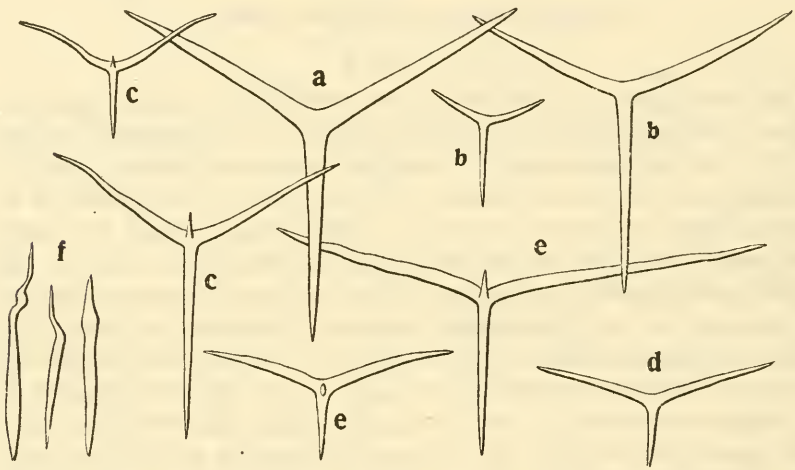


FIG. 9.—LEUCANDRA FOLIATA. *a*, REGULAR DERMAL TRIRADIATE. *b*, SAGITTAL DERMAL TRIRADIATES. *c*, QUADRIRADIATES OF THE LARGER EXHALANT CANAL. *d*, GASTRAL TRIRADIATE. *e*, GASTRAL QUADRIRADIATES. *f*, MICROXEA. *a–e*, ×100; *f*, ×400.

Quadriradiates of the larger exhalant canals (*c*) sagittal, slender. Basal ray straight, usually longer, but sometimes shorter than paired rays, not lying in the plane of paired rays. Paired rays curved, sometimes more or less crooked, usually slightly broader than basal ray, 150–200μ long and 12–16μ thick at base. Apical ray very slender, more or less curved, finely pointed, measuring up to 100μ long and 12μ thick at base.

Gastral triradiates regular or subregular, large; similar to those of dermal skeleton and of chamber layer.

The smaller gastral tiradiates (*d*) strongly sagittal, exactly like gastral quadriradiates except in the absence of apical ray.

Gastral quadriradiates (*e*) strongly sagittal, with basal ray straight, much shorter and slightly thinner than paired rays, 80–210μ long and 12–16μ thick at base. Paired rays doubly slightly curved,

first backwards and then forwards; irregular in outline, 170–330μ long and 20μ thick at base. Apical ray very short, tapering to sharp point, up to 70μ long.

Microxea (*f*) obtusely or sharply pointed at the inner end, more or less hastate and sharply pointed at the outer end. They are of a more or less irregular outline, being usually thickest nearest the inner end than the outer.

Locality.—Off Osesaki, Province Hizen in Kiushu (Station 4894, 95 fathoms).

Remarks.—This species is distinguished from *Leucandra tuba*, new species, by its remarkable external form, by having no proper oscular skeleton, by the presence of gastral quadriradiates, and by some other points of detail in the spiculation. It differs from *Leucandra poculiformis*, new species, by its external form, by the dimensions and characters of spiculation, etc.

11. LEUCANDRA KURILENSIS, new species.

Plate 85, fig. 11.

This species is represented by a single specimen in the collection (Cat. No. 9173, U.S.N.M.). The sponge (pl. 85, fig. 11) represents a solitary individual of a strongly laterally compressed oval shape attached by its one side to a foreign body. A circular osculum of about 1½ mm. and surrounded by a fringe of oxea opens near one end of the body. Total length, including the oscular fringe, about 12 mm.; greatest breadth, about 8mm.; thickness of wall, about 1 mm. The dermal surface is slightly rough from the projecting ends of oxea; the gastral surface is smooth, but is perforated by uniformly distributed circular exhalant apertures 0.4–0.5 mm. wide. The color in alcohol is grayish white. The texture is fairly firm.

Structure.—Unfortunately it is difficult to exactly determine the state of the canal system, owing to the bad state of preservation, but it seems to be of the sylleibid type, intermediate between the syconoid and the leuconoid. The flagellate chambers are more or less elongate and are arranged radially around the wide exhalant canals.

The dermal skeleton is well developed, attaining a thickness of about one-third that of the sponge wall or even somewhat thicker. It is made up of tangential triradiates in many confused layers. Large oxea and finer linear spicules project from the dermal surface, their proximal parts being imbedded in the chamber layer. The tubar skeleton consists in the main of irregularly distributed triradiates, but shows an indication of the articulate character in the presence of subgastral sagittal triradiates in a small number. The gastral skeleton is thin, consisting of triradiates closely set and disposed parallel to the gastral surface in several layers. The oscular margin contains large oxea and finer linear spicules which form a dense fringe, as well as regularly and closely set triradiates, which

have basal ray directed downward and paired rays standing out nearly at right angles from it.

Spicules.—Dermal triradiates (*a*) sagittal. All rays nearly equally thick, slightly irregular in outline. Basal ray straight, generally

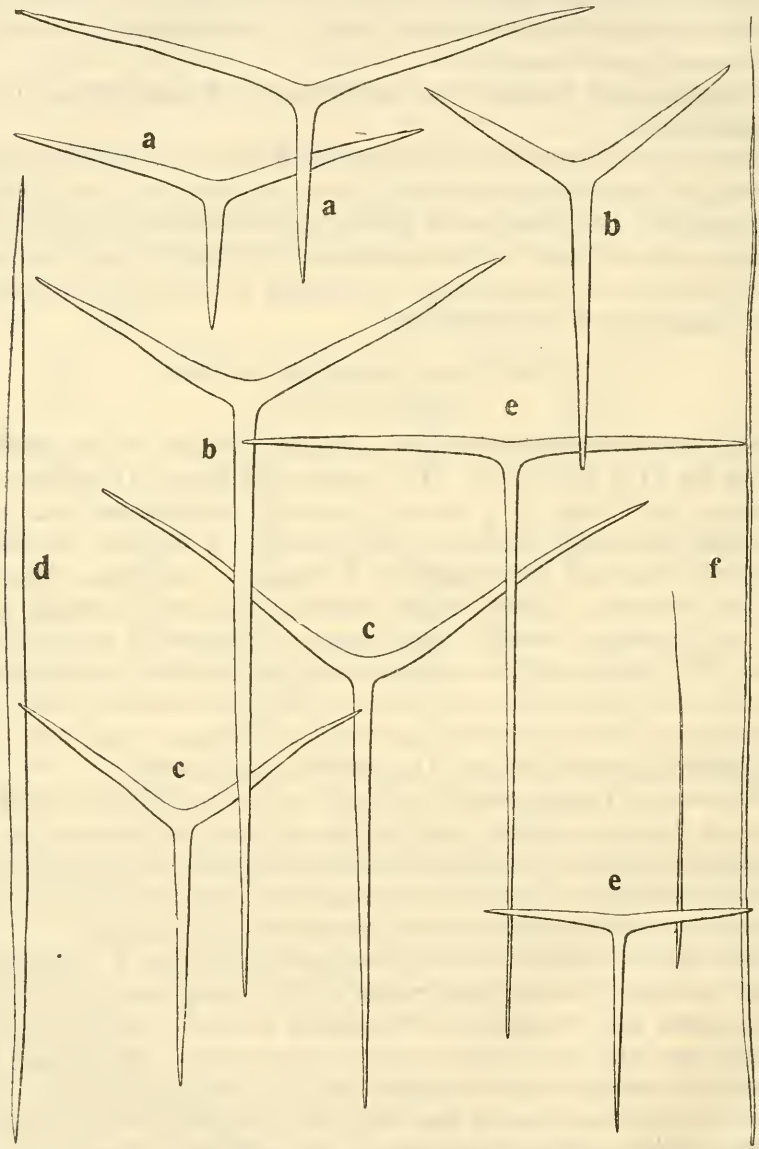


FIG. 10.—LEUCANDRA KURILENSIS. *a*, DERMAL TRIRADIATES. *b*, TUBAR TRIRADIATES. *c*, GASTRAL TRIRADIATES. *d*, OXEA. *e*, TRIRADIATES OF OSCULAR MARGIN. *f*, LINEAR SPICULES OF OSCULAR MARGIN. All ×150.

shorter than paired rays, 120–170μ long and 20μ thick at base. Paired rays usually equal, widely diverging, nearly straight or slightly curved backwards, 190–290μ long and 20μ thick at base.

Tubar triradiates (*b*) sagittal. Rays equally thick, moderately variable in size and shape. Basal ray nearly straight, tapering to sharp point. Paired rays nearly equal, simply slightly curved forward or doubly curved, first forward and then backward, ending in sharp point. Those tubar triradiates which lie directly beneath the gastral cortex have more widely diverging paired rays than the others. Basal ray 270–520μ and paired rays 170–230μ long; both 20–24μ thick at base.

Gastral triradiates (*c*) sagittal, with slender rays lying all in the same plane. Basal ray longer than paired rays, straight, 240–400μ long and 20μ thick at base. Paired rays sharply pointed, showing more or less distinct double curvature, being curved forward at basal parts and backward in the remaining parts, 190–300μ long and 20μ thick at base.

Triradiates of oscular margin (*e*) strongly sagittal. Basal ray usually much longer and thinner than paired rays, straight, sharply pointed at end, 180–570μ long and 12μ thick at base. Paired rays equal, more or less sharply pointed, very strongly diverging, standing out almost at right angles from basal ray, 110–220μ long and 16μ thick at base.

Large oxea of body surface and oscular margin (*d*) straight or slightly curved, sharply pointed at both ends, attaining a length of over 1 mm. and a thickness of 20–40μ in the middle.

Linear spicules very slender, straight, sharply pointed at both ends. Those of general body surface 370μ to 1 mm. long and 5–10μ thick; same of oscular margin (*f*) 1.4 mm. or more long and 4–20μ thick.

Locality.—Off Cape Rollin, Simushir Island, Kuriles (Station 4803, 229 fathoms).

Remarks.—This species seems to be nearly related to both *Leucandra anguinea* (Ridley[1]) and *L. pulvinar* (Haeckel[2]), but is readily distinguished from either by its external form and by the dimensions and other details of most of the spicules.

12. LEUCANDRA SPLENDENS, new species.

Plate 85, figs. 12–14.

Three specimens of this new species exist in the collection. One of them (pl. 85, fig. 12), which came from Station 4790, was selected as the type of the species (Cat. No. 9178, U.S.N.M.). It is of an ovoid shape, measuring 22 mm. in length and 11 mm. in greatest breadth. The outer surface is strongly hispid, owing to the presence of large oxea projecting from it. The osculum at the upper end is circular, provided with a well developed fringe of about 3½ mm.

[1] *Leucortis anguinea* Ridley, Spongida. Reports on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H. M. S. *Alert*, 1881–1882, pp. 629, 630, pl. 53, fig. L; pl. 54, figs. *d*, *d'*.

[2] *Leucortis pluvinar* Haeckel, Kalkschwämme, 1872, pp. 162–166, pl. 29.

height; it leads into a wide gastral cavity. The sponge wall is about 2 mm. thick in the middle parts of the body. The color in alcohol is grayish-white and the texture moderately firm.

Structure.—The canal system is of the leuconoid type. The dermal pores, thickly distributed all over the surface, lead into narrow canals which soon join together to form very wide inhalent canals running deep into the wall. The exhalant canals are also very wide and originate from deep parts of the wall. The apertures by which they open into the gastral cavity measure up to 2 mm. across. The flagellate chambers are densely and irregularly arranged between inhalant and exhalant canals. They are more or less spherical, measuring 100–150μ in diameter.

The skeleton of the dermal cortex is composed of tangential triradiates arranged in a few layers. Their basal ray is in most cases pointed toward the sponge base. The large oxea which occur thickly in vertical disposition in the sponge wall project out on the dermal surface. Microxea are found in two kinds on the dermal surface; the smaller kind is thinly scattered all over the surface in tangential disposition, while the larger kind is grouped into small tufts which project externally in association with large oxea. The skeleton of the chamber layer consists of quadriradiates of various sizes. Though seemingly irregularly scattered, the majority of them have basal rays directed centrifugally, thus presenting a trace of the articulate character. The gastral skeleton is very thin, being made up of quadriradiates, the apical ray of which projects into exhalant canals or into the gastral cavity. The skeleton of the oscular margin is composed of large oxea, microxea, triradiates and quadriradiates. The large oxea are longitudinally placed, paralled with the basal rays of tri- and quadriradiates. The microxea are thinly scattered on the outer surface. The tri- and quadriradiates have very strongly divergent paired rays which stand nearly at right angles to the basal ray.

Spicules.—Dermal triradiates (*a*) slightly sagittal, with rays sharply pointed and lying in the same plane. Basal ray nearly straight, usually slightly shorter and broader than paired rays, 250–400μ long and 20–24μ thick at base. Paired rays equal or slightly differentiated in length, slightly curved forewards at base and nearly straight or slightly curved in the remaining parts, 270–440μ long and 16–20μ thick at base.

Quadriradiates of chamber layer (*b*) slightly sagittal. All rays nearly equally thick and sharply pointed. Basal ray straight, 300–450μ long and 32μ thick at base. Paired rays slightly curved forewards at base and nearly straight or slightly curved backwards in the remaining parts, more or less irregular in outline, 300–450μ long and 32μ thick at base. Apical ray much shorter than facial rays, slightly curved.

Gastral quadriradiates (*c*) slightly sagittal, with slender, straight, and sharply pointed rays. Basal ray slightly shorter but not thinner than paired rays, 170–330μ long and 24–28μ thick at base. Paired rays widely divergent, 210–440μ long and 20–24μ thick at base. Apical ray thinner and shorter than facial rays, 150–170μ long and 16μ thick at base.

Triradiates of oscular margin (*d*) very strongly sagittal. Rays nearly equally thick. Basal ray longer than paired rays, 330–500μ

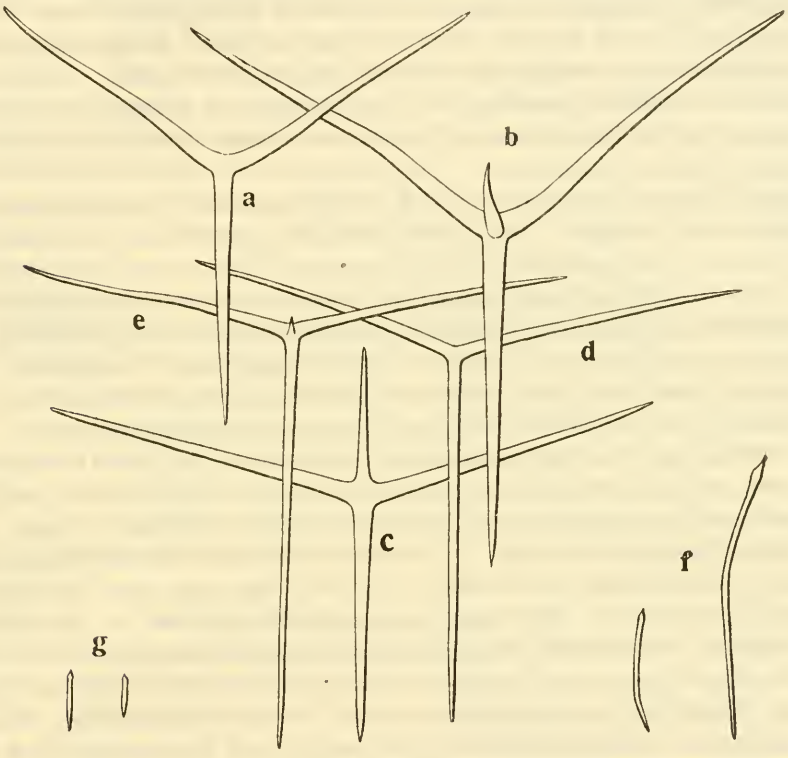


FIG. 11.—LEUCANDRA SPLENDENS. *a*, DERMAL TRIRADIATE. *b*, QUADRIRADIATE OF CHAMBER LAYER. *c*, GASTRAL QUADRIRADIATE. *d*, TRIRADIATE OF OSCULAR MARGIN. *f*, LARGER MICROXEA. *g*, SMALLER MICROXEA. All ×100.

long and 20–24μ thick at base. Paired rays strongly diverging, slightly curved backwards or nearly straight, 270–400μ long.

Quadriradiates of oscular margin (*e*) very strongly sagittal, slender-rayed. Basal ray straight, sharply pointed, 190–570μ long and 16–24μ thick at base. Paired rays nearly as thick as basal ray but slightly shorter, slightly curved, strongly diverging, 160–400μ long and 12–16μ thick at base. Apical ray very short, slightly curved, and finely pointed.

Large oxea of body surface slender, nearly straight, nearly uniformly thick in the middle greater parts and sharply pointed at both ends, up to 8 mm. or more long and 20–40μ thick in the middle.

The larger microxea (*f*) slender, more or less angularly curved, sharply pointed at proximal end, and provided with lance-head at distal end, 180–400μ long and 6–8μ thick in the middle.

The smaller microxea (*g*) very short, straight, or slightly curved, provided with lance-head, 60–80μ long and 6–8μ thick in the middle.

Locality.—Off Cape Monati, Bering Island, Comandorski Islands (Station 4790, 64 fathoms; Station 4792, 72 fathoms).

Remarks.—The other two specimens (Cat. Nos. 9176 and 9177, U.S.N.M.) on hand are much larger than the type-specimen. One of them (pl. 85, fig. 13) is of an elongate ovoid shape, measuring about 60 mm. in length and 35 mm. in greatest breadth. The osculum is irregularly circular, with a diameter of about 8 mm. The dermal surface is uneven and moreover strongly hispid, due to projecting tufts of large oxea. The sponge wall is thickest in the basal parts (about 10 mm. thick) and becomes gradually thinner toward the oscular margin. The gastral surface is perforated by numerous circular or oval apertures of exhalant canals, up to 3 mm. in diameter.

The second specimen agrees well with the first in both external and internal features. Plate 85, figure 14, represents a portion of it, as seen from the gastral surface. In this specimen, the hispidity of dermal surface as well as the oscular fringe are very weakly represented. The wall measures about 8 mm. in greatest thickness.

With regard to the microscopical structure of the above two specimens, there is an essential agreement with the type-specimen, though not without some points of deviation in their spiculation which require special mentioning. In both of them, the dermal triradiates, the quadriradiates of chamber layer, and the large oxea are found in dimensions on the whole somewhat larger than in the type-specimen. In addition to the quadriradiates, there may occur in the chamber layer a small number of similar triradiates. The microxea are found in greater abundance than in the type-specimen. They can not be distinguished into the larger and the smaller form so readily as in the latter.

13. LEUCOPSILA STYLIFERA (O. Schmidt).

Plate 85, figs. 15, 16.

Leuconia stilifera O. Schmidt, Atlant. Spong., 1870, p. 73, pl. 2, fig. 24.
Leuconia stilifera Haeckel, Prodromus., 1870, p. 247.
Leucandra stilifera Haeckel, Kalkschwämme, 1872, p. 225, pl. 33, figs. 4*a*–4*f*; pl. 40, fig. 11.
Leucopsila stylifera Dendy and Row, Proc. Zool. Soc. London, 1913, p. 776.

There exist five specimens of the species in the collection (Cat. Nos. 9169, 9174, 9175, 9179, U.S.N.M.). They are either tubular solitary individuals or irregular colonies consisting of a few persons broadly connected together and indicated by the several oscula present. The largest specimen (pl. 85, fig. 15), upon

which I base the further description, was obtained off Cape Monati, Bering Island (station 4792). It is a solitary person of an irregularly bent and strongly laterally compressed tubular shape. The osculum at the upper end is surrounded by a thin undulating oscular margin. The narrowed inferior parts of the body are provided with a number of irregularly shaped processes for attachment. Total length of body about 140 mm., greatest breadth about 30 mm., and the wall about 3 mm. thick. The dermal surface is nearly quite smooth. The gastral surface is also smooth, though not even, being perforated by exhalent apertures of varying size (50μ–303 mm. wide). The dermal surface appears white, and the chamber layer also the gastral surface grayish. The dermal cortex is rigid and elastic, and may easily be sparated from the chamber layer, which is very soft.

Structure.—The canal system is of the leuconoid type. The chamber layer is strongly lacunar, being traversed by well-developed inhalent and exhalent canals. Between these canals are thickly packed together the ovoid or spherical flagellate chambers of 60–100μ diameter. The exhalant canals unite into tolerably wide trunks which open into the gastral cavity. The latter is rather narrow.

The dermal skeleton is well developed, composed as it is of tangential triradiates and microxea. The triradiates are arranged in several layers with basal rays directed downward. The microxea are very closely set all over the dermal surface but leaving meshlike pores of inhalent canals measuring 50–100μ across. The skeleton of the chamber layer is made up of a confused mass of microxea and of very large quadriradiates irregularly scattered among the former. The gastral skeleton is formed solely of microxia disposed in a dense layer; only occasionally the quadriradiates of the chamber layer join the gastral skeleton with their apical rays which project into the gastral cavity. The oscular fringe is supported by irregularly and closely set microxea and triradiates, with an admixture of oxea occasionally occurring in longitudinal disposition.

Spicules.—Dermal triradiates sagittal. Rays nearly equally thick, straight, sharply pointed, lying in the same plane. Basal ray distinctly shorter than paired rays which are strongly divergent. Basal ray 450–950μ long and 50–70μ thick at base.

Quadriradiates of chamber layer sagittal, very large, variable in size, with rays of nearly equal thickness and slightly irregular outline. Basal ray straight, shorter than paired rays, 0.8–1.27 mm. long and 100–150μ thick at base. Paired rays usually equal, sometimes unequal, either curved simply forewards or showing double curvature, in the latter case curved distinctly forewards in the proximal parts and slightly backwards in the distal parts, 0.9–2 mm. long and 100–150μ thick at base. Apical ray shorter than basal ray, straight or slightly curved, 350–850μ long and 100–150μ thick at base.

Microxea slightly curved in an S-like manner. Its thinner end sharply pointed, the broader end forming a more or less sharply pointed head marked off by a nodiform ring.

Oxea of oscular margin slender, nearly straight. A small example of the spicule measured ½ mm. or over in length and 4μ in thickness.

Localities.—Greenland (O. Schmidt, Haeckel); off Cape Monati, Bering Island, Comandorski Islands (Station 4790, 64 fathoms; Station 4792, 72 fathoms); off Cape Rollin, Simushir Island, Kuriles (Station 4803, 229 fathoms).

Remarks.—Of the remaining specimens on hand of the species, I may call attention to the one from Station 4790, which is shown in plate 85, figure 16. In it the oscular oxea are more numerously present than in the type. They are broadest near the inner end, which is simply sharply pointed; the outer end forms a lance-head similar to that of microxea. They are 0.6–3 mm. or more long and 15–20μ thick.

EXPLANATION OF PLATES.

PLATE 84.

FIG. 1. *Leucosolenia albatrossi*, new species. A portion of the type-specimen, natural size. Station 4788.

2. *Leucosolenia canariensis* (Michlucho-Maclay). Station 4789. Natural size.

3. *Leucandra tuba*, new species. The type-specimen, natural size. Station 4877.

4. *Leucandra poculiformis*, new species. The type-specimen, natural size. Station 4777.

5. *Leucandra foliata*, new species. The type-specimen, natural size. Station 4894.

6. *Sycon simushirensis*, new species. The type-specimen. ×2. Station 4803.

7. *Heteropia medioarticulata*, new species. The type-specimen, natural size. Station 5017.

8. *Grantia nipponica*, new species. The type-specimen, natural size. Station 4822.

PLATE 85.

9. *Grantia beringiana*, new species. The type-specimen, natural size. Station 4788.

10. *Achramorpha diomedeae*, new species. The type-specimen. ×2. Station 4803.

11. *Leucandra kurilensis*, new species. The type-specimen, natural size. Station 4803.

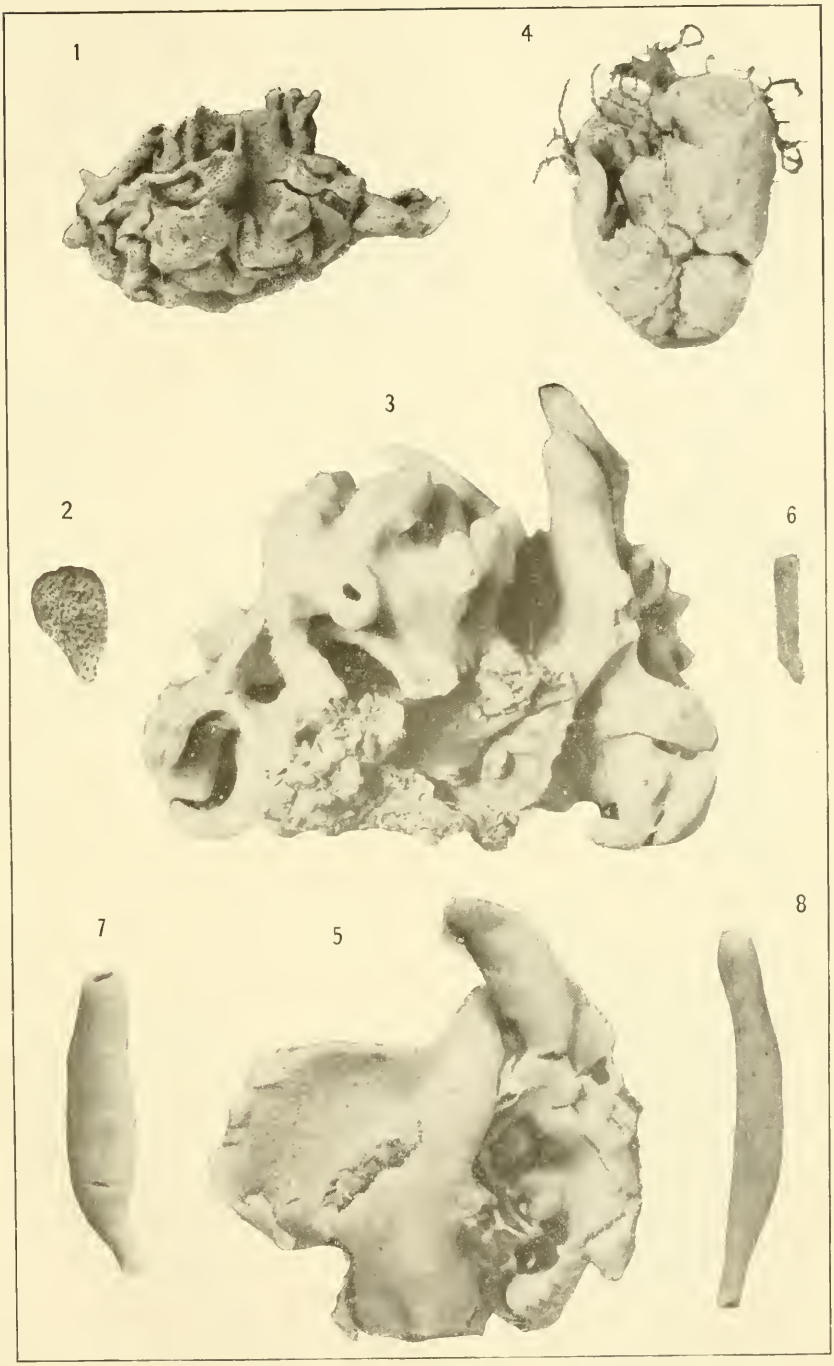
12. *Leucandra splendens*, new species. The type-specimen, natural size. Station 4790.

13. *Leucandra splendens*, new species. One of the specimens from Station 4792, natural size.

14. *Leucandra splendens*, new species. A portion of another specimen from Station 4792, natural size, to show the gastral surface.

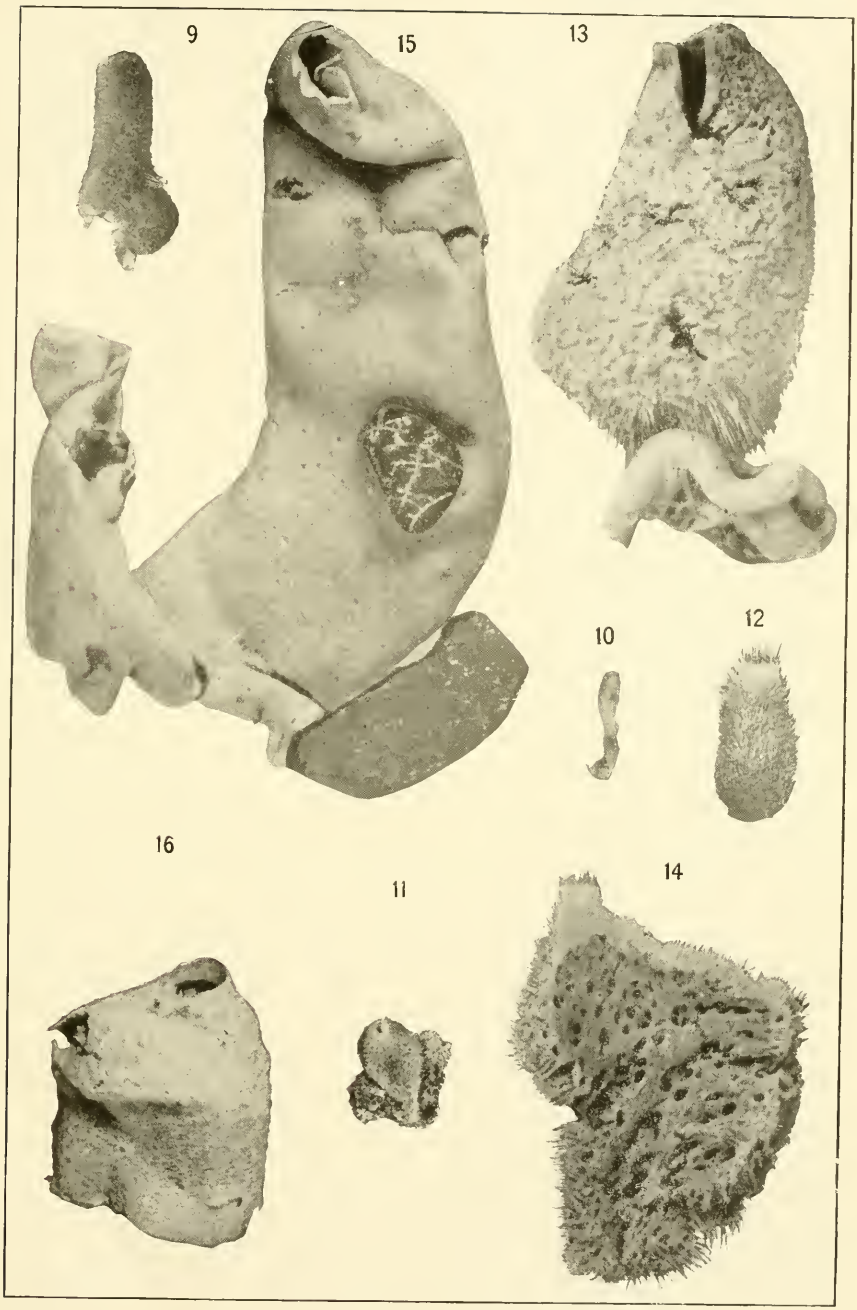
15. *Leucopsila stylifera* (O. Schmidt). A specimen from Station 4792, natural size.

16. *Leucopsila stylifera* (O. Schmidt). A specimen from Station 4790, natural size.



NEW NORTH PACIFIC CALCAREOUS SPONGES

FOR EXPLANATION OF PLATE SEE PAGE 556



NEW NORTH PACIFIC CALCAREOUS SPONGES

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