## HYALODENDRON NAVALIUM, A NEW GENUS AND SPECIES OF EUPLECTELLID SPONGE.

BY J. PERCY MOORE.

The type of this genus and species is one of a small collection of silicious sponges gathered in Japan in 1893 by Mr. Frederick Stearns, of Detroit, Michigan, and sent to the Academy of Natural Sciences of Philadelphia for determination. They were collected by native fishermen and brought into Yokohama harbor by the dredge boats. The single specimen of *Hyalodendron* is the only one which had been reported by the fishermen. Other than this, no data relating to the collection are available. The specimens are accompanied by a set of sketches by a native artist.

The species represented are, in addition to *Hyalodendron*, *Euplectella*, anchor spicules of probably *E. aspergillum* Owen, *Hyalonema reflexa* Ijima, a fine specimen of this recently described species and *Farrea occa* (Bowerbank) Carter, an unusually large example.

### HYALODENDRON nov. gen.

**Hyalodendron navalium** n. s.

The general appearance of the type and only specimen is well shown on Plate XIX, reproduced from a sketch by a Japanese artist which accompanied the collection. The sponge was originally about 18 inches high, but is now slightly mutilated at the summit. It presents a firm base, above which rises a slender tapering body or stalk, ending in a sharp apex, and bearing numerous lateral branches of various sizes, at the bases of which the sponge wall is perforated by large crater-like openings.

The base is a thin, flat and spreading, encrusting layer, which has evidently conformed itself to the rocky bottom to which the sponge was adherent, some fragments of which are still attached. Its upper surface is uneven, but smooth and without any spines or processes. It is perforated by three or four small holes. It measures $3\frac{1}{4} \times 3\frac{3}{4}$ inches in diameter, and is from $\frac{1}{16}$ to $\frac{1}{8}$ inch thick. The spicules of this region are mostly slender, more or less curved, pointed diacts of various sizes, most of them being almost fibre-like. They cross one another at various angles and are firmly united into

a hard stony mass by a secondary deposit of silica which encrusts and cements them, with the formation of numerous synaptacula (Plate XX, fig. 6). Regular or modified hexacts are occasionally found wedged in interstices, but the appearance is that the demalia and hypodermalia have been worn or decayed away from this region.

The sponge body or stalk rises from near the centre of the base to a height of 16 inches. Its summit is frayed out and must have been originally at least an inch higher. It is terete and tapers gently and regularly from the base, which is $\frac{11}{16}$ of an inch in diameter, to the broken apex, $\frac{3}{8}$ of an inch in diameter. A well developed gastral cavity extends through the sponge body from base to summit, so that it is hollow throughout. Toward the base the walls are thick and firm, owing to secondary incrustations of silica, while above they are much thinner and quite friable.

The lower $3\frac{1}{4}$ inches of the body have a texture and appearance similar to the base, but the transition to the branched upper region is gradual. A very few short blunt spines are borne on the sponge wall, and these partake of the stony hardness and silicious incrustations which characterize the walls of this region. Two longer spines, having more of the character of the upper branches, are present, the first 1 inch, and the second $2\frac{1}{2}$ inches above the base. These are respectively $\frac{3}{8}$ and $\frac{1}{4}$ of an inch long. The former is situated just above the first crater-like opening in the sponge walls. This region of the sponge has a smooth hard surface, and like the basal portion lacks the superficial layers of spicules.

At about $3\frac{1}{2}$ inches above the base, loose flesh spicules become more plentiful and soon form a thick soft layer, looking very much like a covering of a fine cotton wool paste, or as if the specimen had been dipped into a thick soap lather, which had been allowed to dry on its surface. Coincident with this change in the character of the surface, spinous processes become more numerous and very much longer, but in this specimen the lower spines are imperfect. While in the lower portion ($\frac{1}{3}$) of the sponge the processes remain comparatively simple and unbranched, those which densely cover the upper half of the stalk are often very long (the longest nearly 5 inches and $\frac{3}{16}$ of an inch in diameter at the base), much and complexly branched, sometimes to the third order. Wherever such branches cross they are united by secondary anastomoses, due to the concrescence of the parenchyma. The principal branches vary in diameter from $\frac{1}{16}$ to $\frac{3}{16}$ of an inch, but two may fuse at their bases and form

a much larger mass. The smaller may be unbranched and reach a length of two inches, but are usually provided with a few small branches. The larger are complexly branched, the secondary branches usually forming angles of about 60° with the principal branches, which latter arise from the central trunk at angles of 80°–90°.

While the base and lower part of the stalk are perforated by only a few small pores, the upper part has numerous conspicuous oscula. They perforate the sponge wall between the larger bundles of fibrous spicules, the outer flesh layers rising ⅛ of an inch as 7 delicate crater-like rims, scarcely thicker than a sheet of paper. The oscula are usually elongated in the longitudinal direction of the sponge, and in that case have a length of 5 to 6 mm., by a width of 2 to 3 millimeters. In such the rim flares out somewhat at the sides and contracts at the ends, so that its outer edge has a nearly circular outline. Some few of the oscula are circular at their gastral ends. With regard to their distribution on the sponge walls, the lower-most is situated 2½ inches above the base, and its rim is thickened like the neighboring sponge walls. Most of them evidently stand in some relation to the larger branches. Three occur at precisely the level where the largest spine arises, and two near each of most of the other large branches. In many cases the oscula lie directly at the bases of the large branches, their crater-like rims being continuous on one side, most often above, with the substance of the branch. Looking through the oscula on to the gastral surface, this is seen to be formed of a fibrous network of spicules, without the woolly surface covering of loose spicules.

The specimen is a macerated one; as I was unable to dissect or section it, the arrangement of the chambers and the exact arrangement of the spicules could not be determined. The bulk of the skeleton of the sponge wall is, however, chiefly composed of bundles of long fibre like diacts of various sizes and characters. These are disposed in bundles which run longitudinally through the sponge body, but divide and reunite in such a way as to form a network, in the meshes of which the oscula open, and which raise more or less evident ridges on both gastral and dermal surfaces. In the upper part of the sponge these diacts remain free, but below they are cemented together as above described. They exist in great variety, but the majority have the form represented in Plate XX, fig. 1, in which the transverse rays are reduced to minute nodules;

in others they are much more evident, or may be entirely wanting. Some of this type are straight, but most are more or less curved, those surrounding the oscula being often semicircular. The ends may be simply pointed, or variously enlarged, and either smooth or roughened with minute spines as shown by a few examples in Plate XX, figs. 2, 3, 4 and 5. The dermalia consist of sword shaped hexacts, which are so numerous as to suggest the specific name of the species. Like the diacts, these differ much in the relative development of the several limbs, any of which may be straight or more or less curved or even sharply bent. Fig. 9 shows the most typical proportions, but the handle may be scarcely longer than the blade or not more than $\frac{1}{3}$ as long. The cross pieces may be straight or curved, or sharply bent upward (Plate XX, fig. 12). The handle differs most, being slender and pointed, club-shaped or knobbed, and usually sculptured throughout or at the tip only. The points of the other rays are also usually spinose. The sword handles support the skin, and are not furnished with floricomes at their distal ends; instead they are surrounded by bundles of minute acicular diacts, Plate XX, fig. 7.

The hypodermalia are regular hexasts, oxy-hexasters, which have the principal rays prolonged (Plate XX, fig. 8), rosettes which vary in the length of the principal rays, as shown by two examples in Plate XX, figs. 14 and 15, and discohexasters of great beauty and symmetry of form. One of the simplest of the latter is shown in Plate XX, fig. 16. This has the principal rays well developed, while each group of terminal rays has sixteen members, the pin-head shaped disks having again 16 marginal teeth. Other discohexasters have the number of terminal rays much greater, or the principal rays shortened, so that all appear to arise from a central sphere.

The gastralia are also sword-shaped hexacts without bundles of accessory acicular spicules. This sponge would appear to be the type of a new subfamily of Euplectellidæ.

## Description of Plates.

Plate XIX. *Hyalodendron navalium* n. s. The type specimen as it appeared when first taken, from a drawing by a Japanese artist. x $1\frac{5}{12}$.

Plate XX. Illustrating some of the forms of the spicules of *Hyalodendron navalium*.

Fig. 1. One of the smaller simple diacts of the kind which make up the interior skeleton of the spines and processes, and

which run in bundles through the sponge walls. x 56. 1 a, middle region of the same showing a slight enlargement, and the axial fibre with the two reduced transverse axes. x 250.

Fig. 2. A short, thick diact, with transverse limbs entirely suppressed, with slightly enlarged rounded ends, and axial fibre almost gone. x 56.

Fig. 3. A small, slender and straight diact, with transverse limbs indicated as rounded nodules, with ends pointed and roughened, and axial fibres complete. x 56. 3 a, one of the ends of the same. x 250.

Fig. 4. A small, slender, curved oxy-diact, with transverse limbs distinctly indicated as four nodules. x 56. 3 a, middle region of the same. x 250. 3 b, one of the ends of the same. x 250.

Fig. 5. A peculiarly modified end of a large diact, showing a zig-zag course of the axial fibre. x 56.

Fig. 6. A portion of the sponge base showing the secondary union of spicules by the formation of encrusting and cementing deposits and numerous synaptacula. At a, the encrusting layers are represented as broken away, exhibiting the original diact. x 56.

Fig. 7. A group from one of the bundles of minute acicular diacts found in the superficial parenchyma about the handles of the sword-shaped hexacts. x 56.

Fig. 8. An oxy-hexaster in which the axial rays are continued beyond the place of branching. x 500

Fig. 9. One of the usual type of sword-shaped hexact. x 56. 9 a, b, c, are respectively enlarged views of the handle, tip of one of the cross pieces and the point. x 250.

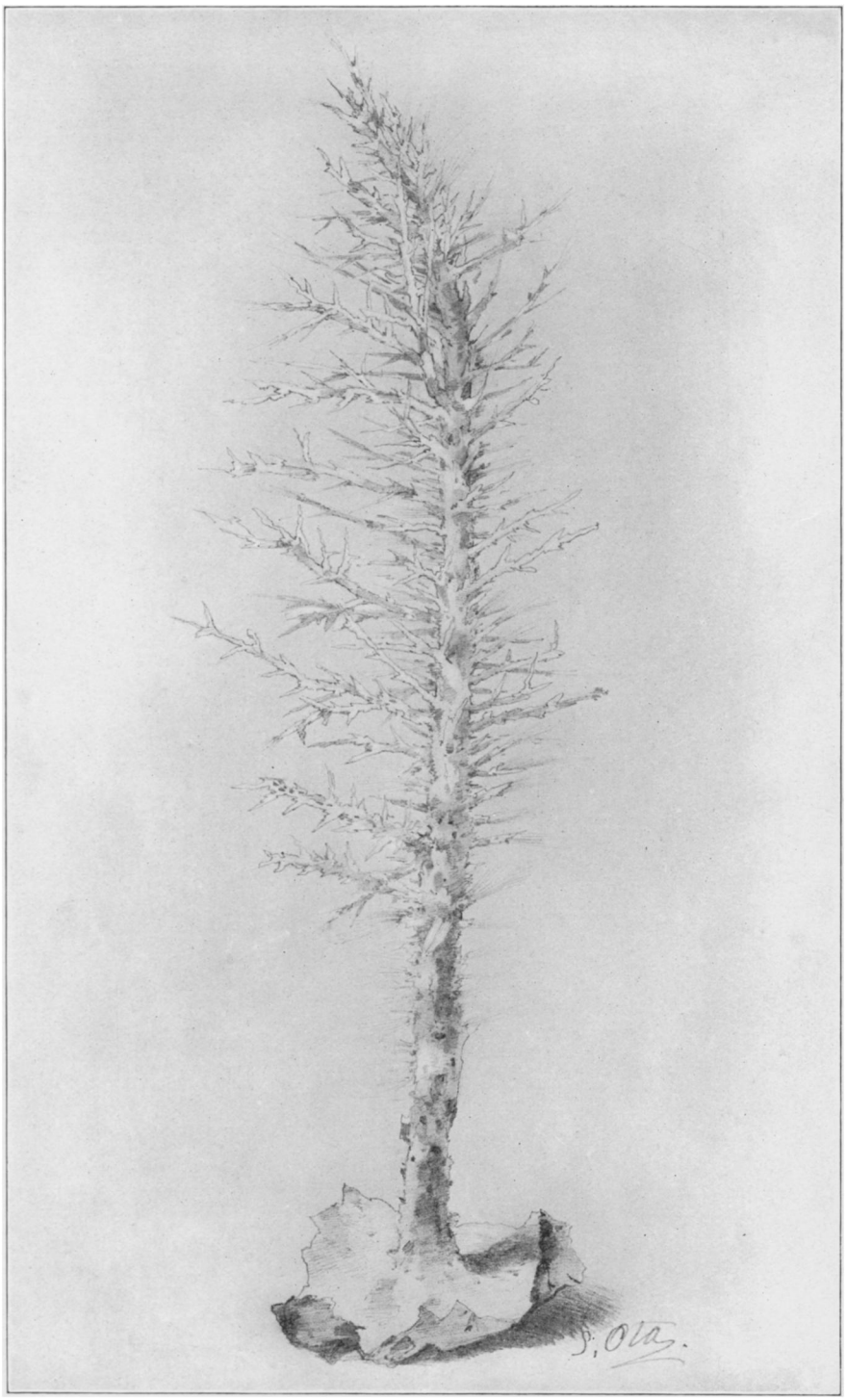
Figs. 10, 11 and 12. Three of the sword-shaped spicules. x 56. 10 is short and regular; 11 has the blade bent and the cross rays rough, uneven and thickened; 12 is straight, with the cross pieces bent sharply upward toward the handle.

Fig. 13. A small, spiny, regular oxy-hexact. x 56. 13 a, one of the rays enlarged. x 250.

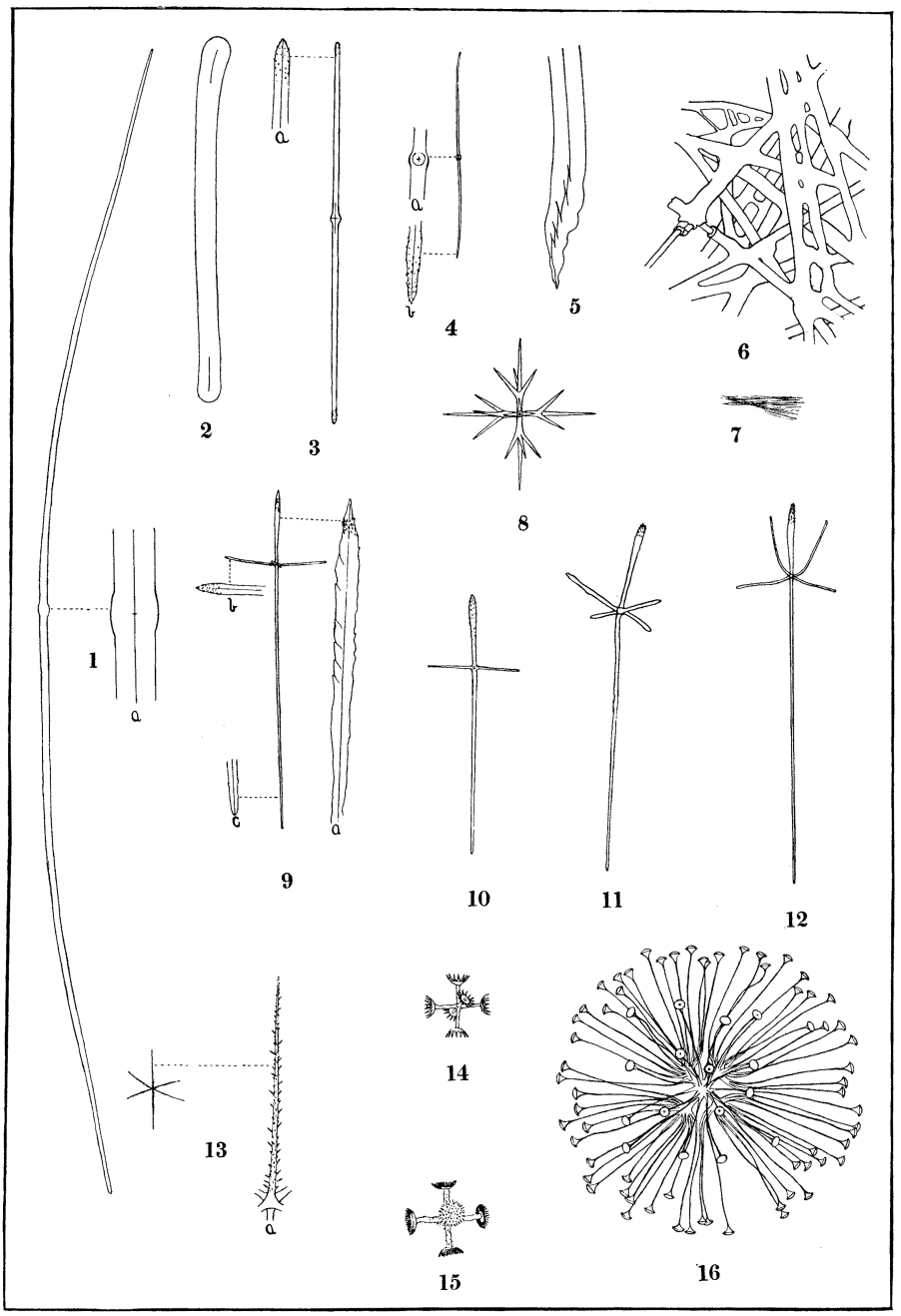
Fig. 14. A rosette in which the axial rays are continued beyond the disk, and the number of terminal rays is small and confined to the margin of the disk. x 250.

Fig. 15. A rosette with roughened axial or stem rays terminated by disks bearing a close brush of fine terminal rays. x 340.

Fig. 16. One of the simpler disco-hexasters with distinct stem rays, and sixteen terminal rays in each group. The disks or pin-heads have usually sixteen marginal teeth each. x 250.



HYALODENDRON NAVALIUM MOORE.




HYALODENDRON NAVALIUM MOORE.