XXXVII.—*Note on the "Glass-Rope"* Hyalonema. By Dr. J. E. Gray, F.R.S., V.P.Z.S., F.L.S. &c.

In the 'Proceedings of the Zoological Society' for 1835, p. 63, I described and formed the genus *Hyalonema* for a specimen that had been sent from China to the India House in London, under the name of the *Glass Plant*. I afterwards procured a specimen from Leyden, and found that it was an inhabitant of the Japan seas, whence it had been procured by Dr. Siebold. Since the trade with Japan has been opened, many specimens of the coral have been received from the latter country, where they do not seem to be uncommon, and where at least they are collected, on account of their beauty, as objects of commerce.

In 1857, Prof. John Frederick Brandt, of St. Petersburg, described a coral that had been brought from Japan by M. Possiet, one of the officers of the Russian Expedition, which agrees with the Glass-Rope of Japan in many particulars, but has the polypes much more produced and crowded; therefore he formed it into a genus, which he described under the name of *Hyalochæta Possieti*, Bull. Scien. de l'Acad. d. Scienc. d. St. Pétersb. xvi. n. 5, Mélanges, Biolog. ii. 606.

Both these Japanese corals and a species of *Hyalonema* which he calls *Hyalonema affine* are described in detail and well figured in a special work on the subject, entitled "Joannes Fredericus Brandtii Symbolæ ad Polypos Hyalochætides spectantes, tabulis iv. illustratæ. Petropoli 1859," large folio.

My *Hyalonema Sieboldi*, of Japan, has been well figured and described by Professor Max Schultze in 'Die Hyalonemen, ein Beitrag zur Naturgeschichte der Spongien,' von Max Schultze, mit fünf zum Theil in Farbendruck ausgeführten Tafeln: Bonn, 1860, 4to.

These works leave very little more to be said on the structure of these corals.

Very recently a species of the genus has been discovered on the coast of Portugal, which has been described and figured in the 'Proceedings of the Zoological Society,' in two papers by Professor J. V. Barboza du Bocage, of Lisbon:—1. "Note sur la Découverte d'un Zoophyte de la Famille *Hyalochætides* sur la côte du Portugal" (P. Z. S. 1864, p. 265); 2. "Sur l'Habitat du *Hyalonema lusitanicum*" (P. Z. S. 1865, p. 662).

The Japanese species, according to the observations of Prof. Brandt, have only twenty tentacles, while Prof. Bocage describes the Portuguese species as having forty, and also as seeming to differ in its habits.

I may note that Dr. Leidy, who agrees with Valenciennes in thinking the bark of *Hyalonema* a parasite, says there is a sponge

in the Museum of the Academy of Sciences of Philadelphia which has a corona of twisted siliceous spicula, about 2 inches long, which mainly differ from those of *Hyalonema* in size (Proc. Acad. Nat. Sci. Philad. 1860, p. 85). It is said to have come from Santa Cruz. May this not be a young *Hyalonema* in the sponge? The two specimens of the genus *Hyalonema* which Dr. Leidy examined appear to have been without the sponges at the base; and as the genus is found on the coast of Portugal as well as Japan, there is no reason one may not be found at Santa Cruz.

Before proceeding to make some observations on the extraordinary theories that some zoologists, and some even of high repute, have entertained respecting this genus, I wish to correct an error into which I have fallen.

Misled by the dry and imperfect state of the bark of the specimen which I first described, and also perhaps by a preconceived opinion that then existed that a bark-coral must be an *Alcyonaria* with pinnate tentacles, in the Synopsis of the British Museum (1840), and in a paper, on the arrangement of Corals, in the 'Annals and Magazine of Natural History' for 1859, I arranged the genus with the Barked *Alcyonaria*, and formed an order for its reception, under the name of *Spongicolæ* or *Hyalophyta* (Ann. & Mag. Nat. Hist. ser. 3. iv. p. 441). Professor Brandt in his work has shown that they are Zoantharia allied to *Corticaria*, or Polyzoa having many simple conical tentacles in two rows; and Professor Bocage has also shown this to be the case in the species found on the coast of Portugal. The Japanese species have twenty, and the Portuguese forty tentacles.

Professor Schultze also figured the conical tentacles of the Japanese species, and shows that they are, like other Zoantharia, furnished with stinging darts (t. 5. f. 4 & 5). This latter author goes so far as to describe the animal as a species of *Polythoa*, under the name of *P. fatua*; but of this more hereafter.

I admit that I ought not to have made this mistake; for a closer inspection of the contracted cell of the polypes ought to have shown me that probably they had more than eight tentacles; and now my attention is called to the fact, I am astonished how it could have escaped my observation before.

The specimens which I first described from Japan had the thinner tapering lower end of the coral inserted in a sponge of the genus *Halichondra*, the lower end of the axis forming a pencil of spicula at the base of the sponge.

Professor Max Schultze figured three specimens similarly attached to a sponge, the outer surface of the sponge being in a much more perfect condition, showing the oscula, than in the one

I described (t. 1, & t. 2. f. 1 & 2)—all the sponges having a flat base, by which they were evidently attached to some marine body.

Professor Brandt also figured (t. 1. f. 4 & 5) a specimen which has the basal part surrounded by a slender oblong mass of sponge; but this sponge does not show any expanded base, and seems only like a parasitic sponge attached to the base of the coral, as sponges are often found on sea-weeds; and the figure shows a sponge of a much finer texture, so that it does not seem to be the same kind of sponge as that attached to my specimen or those described and figured by Professor Schultze.

Observing that the polypes on all sides of the cylindrical coral were equally developed, I came to the conclusion that the coral must have grown in an erect position, so that the animals could all have equal access to the sea and an equal opportunity of procuring their food.

Again, the specimens being sunk in a sponge that had a flat base by which it was attached to some marine body, I concluded that the natural habit of the animal was to develope itself in a sponge, so as to support itself in an erect position; and this idea was strengthened by finding that the sponge near the part where the coral perforated it was of a more condensed and harder texture than the other parts of it. I concluded that there was a kind of mutual understanding (such as we often find between animals that are parasitic on one another) between the sponge and the coral.

It was for that reason that I formed for the genus the order before referred to, which I called *Spongicolæ* or *Hyalophyta*. (See Ann. & Mag. Nat. Hist. 1859, iv. p. 439.)

It is true that the larger number of the specimens that are imported from Japan are without any appearance of a sponge at their more slender base; but I think it is very probable that the Japanese, who collect them as ornaments for sale, and who generally take off the larger part of the bark of the upper portion of the coral, may also carefully remove any sponge which they may think disfigures the specimen.

This habit of living sunk in a sponge does not seem to belong to all the species of the genus, and may not be universal, or even general among the species found in Japan; and that may explain why the specimens imported are generally destitute of any appearance of ever having been immersed in a sponge.

Professor Barboza du Bocage specially observes that the Portuguese species has never been found living in a sponge; his words are,—"La cohabitation ou l'existence simultanée sur le même axis de polypes et d'éponges, qu'on a remarquée sur quel-

ques spécimens du Japon, n'a pas lieu sur aucun des exemplaires du Portugal;" and he further observes that the thin basal portion of the axis which is inserted in the sponge in some of the Japanese specimens is covered with the polype-bearing bark, the polypes near the base being smaller. "Chez ces derniers (les exemplaires du Portugal) le *corium polypigerum* enveloppe l'axis d'une manière uniforme, il recouvre parfaitement l'une des extrémités de l'axis, la plus étroite, et de là il s'étend sans aucune interruption jusqu'aux $\frac{2}{3}$ ou les $\frac{3}{5}$ de la longueur totale. Les polypes placés sur l'extrémité de l'axis sont les plus petits de tous" (Proc. Zool. Soc. 1865, p. 663, & 1864, t. 22. f. 2).

These observations seem to have been carefully made; and they not only show that the living sunk in the sponge is not universal in the genus, but they completely dispose of the theory to which I shall have to refer, that what is called the axis of the coral is in fact an integral part of the sponge, in which the coral lives, and that what is called the bark is only a parasitic *Polythoa* that accidentally grows on the elongated spicula of the sponge.

It would be very interesting to know how the Portuguese species lives, and how it keeps itself erect in the sea, as in those species also the polypes seem to be equally developed on every side of the cylindrical coral; and this could not be the case if it did not live erect or nearly so. It cannot float like the cylindrical compound Medusæ, as the axis renders the coral too heavy for that purpose, and there is no inflated float to overcome the specific gravity of the coral.

It is to be hoped that Professor Bocage, who is still studying the subject, will be able to explain this part of the history of the animal.

The Japanese, who collect these "Glass Ropes" as ornaments, are in the habit of inserting a bunch of them in the holes made in the rock by the *Pholades*. A series of specimens so stuck into a *Pholas*-hole was exhibited by Mr. Huxley at the Linnean Society last year. Professor Brandt has figured a similar group (t. 2. f. 1). But it is quite a mistake to suppose that this is the way in which the "Glass Rope" lives in the sea. In the specimen which I examined, the cement could be seen by which they were attached to the holes; and the specimens in the same group varied from 2 inches to 16 inches in length, and they all had the bark pushed down so as to be near the surface of the hole. I saw one specimen placed in a hole, affixed with the thick end of the spicula and the broadest end of the rope downwards.

In 1857, MM. Milne-Edwards and Haime, in the first volume

of the 'Histoire Naturelle des Coralliaires, ou Polypes proprement' etc., observe, "Nous sommes portés à croire qu'il faudra ranger dans ce sous-ordre des Zoanthaires sclérodermes, à la suite des Antipathiens, un zoophyte très-remarquable des mers du Japon, qui se compose d'un cœnenchyme cortical, renfermant un faisceau de baguettes siliceuses très-grèles, tordu en spirale comme une corde dont les crins seraient faits avec du cristal. Le cœnenchyme est farci de petits spicules, et porte des tubercules déprimés dont le sommet est perforé et paraît être le calice du polype. Souvent l'axe fasciculé se dénude par sa base, et se trouve implanté dans une éponge; mais, d'après M. Gray, celle-ci y est étrangère. Je dois ajouter cependant que suivant M. Valenciennes ce singulier zoophyte appartiendrait à la famille des éponges" (p. 324). And in their Monograph of British Fossil Corals, p. lxxxi, they observe, "The genus *Hyalonema* established by Mr. Gray is also referred by some zoologists to the tribe *Gorgoniæ*; but the recent observations of M. Valenciennes tend to establish that the fasciculus of siliceous thread which constitutes the axis of this singular production belongs to the class of *Spongiæ*; and the polypes which we have observed in a dried state on different parts of the axis appear to be parasites belonging to the order *Zoantharia*."

In 1860 Professor Max Schultze published the elaborate essay above quoted; and he regards the rope of siliceous spicula as part of a sponge, and the polypes as parasitic on it, calling the polypes "*Polythoa fatua* mihi" (pp. 28 & 42).

Dr. Bowerbank, adopting the same view, in his lately published work on British Sponges, gives the following as the generic character of the genus *Hyalonema*:—"Skeleton an indefinite network of siliceous spicula, composed of separate elongated fasciculi, reposing on a continuous membrane, having the middle of the sponge perforated vertically by an extended spiral fasciculus of single elongated and very large spicula, forming an axial skeleton of a columnar cloacal system" (vol. ii. p. 9).

I must confess that I do not understand this description. If the fasciculus of fibres is "a cloacal system," how is it that the fibres have no connexion with the sponges, but are separated from the spiral fascicle by a hardened coat most closely attached to the elongated spicula? And if the rope is entirely covered with the zoophytes, as we have every reason to believe is the case, and as M. Brandt's figures show, what is the use of a "cloacal system" which has no exit? It has occurred to me, as Dr. Bowerbank does not take any notice of the polype-bearing bark that covers the axis, that he confounds the polypes with the oscula of the sponge, and, believing them to be oscula, thinks they are the exits from the cloacal system he describes.

The only pretence of a reason that Dr. Bowerbank gives for considering "the basal sponge" an "undoubted part of the animal" is, that "the sponge in the specimens that I described and the one attached to the specimen at Bristol are identical in structure,"—as if it were not to be expected that the sponge from Japan to which the various specimens of the Japan coral are attached would most probably be of the same species. (See vol. i. p. 196.)

On referring to the explanation of the plates in the first volume, I see my suspicions are verified. Dr. Bowerbank observes, "Figure 371, plate 35, represents a portion of the great cloacal column, exhibiting part of the spiral axial fasciculus surrounded by the remains of the dermal (!) coat with numerous *oscula* projecting from its surface. Copied from the 'Zoological Proceedings' for 1857" (vol. i. 197).

Unfortunately Dr. Bowerbank does not seem to have considered it necessary to examine the specimens, but simply copies the plate, or to examine other genera of corals; or he would have found that what he calls *oscula* are, as I called them in the description he quotes, polype-cells containing polypes having tentacles and all the internal organization, including a distinctly plicated stomach, exactly like the zoanthoid polype named *Polythoa* or *Corticaria*. Other naturalists, as Dr. Max Schultze, who have considered the axis as belonging to the sponge, have avoided this extraordinary error, and have regarded "the dermal coat with oscula" of Dr. Bowerbank as a parasitic *Polythoa*.

Dr. Bowerbank also observes, "There is a close approximate alliance to the forms of the cloacal appendages of *Hyalonema* in the corresponding organs of the British genus *Ciocalypta*, Bowerbank" (vol. i. p. 197). If this comparison is correct, possibly *Ciocalypta* is not a sponge; and the figure (vol. i. t. 30. f. 360 & 361) renders it doubtful. But all the descriptions of this work are so indistinct and crowded with technicalities peculiar to the author, that they are very difficult to understand, and render a new examination of the species and a new work on the subject requisite.

I am not aware that any reason has been assigned for the theory above referred to, unless the enigmatical description of the genus above quoted of Dr. Bowerbank can be considered one; and I can only suppose that it arose in M. Valenciennes's mind from the fact of the spicula being siliceous and in chemical composition like the spicula of the sponge to which some of the Japanese specimens are attached.

Professor Max Schultze enters into a long description of the spicula of the sponge, and figures several of them; but I cannot see what bearing that has on the subject; for he does not

show that any spicula of a true sponge are like the spicula that form the axis of the coral. They certainly have little affinity to the elongated siliceous spicula of the genus *Alcyonellum* or *Euplatella*, with which they have been compared.

The chemical part of the question I do not think of much importance: we know so little of the power of animals to secrete different substances. It is true that *Hyalonema* is the only Zoantharian yet discovered that secretes siliceous spicula; but if the marine and freshwater sponges secrete both calcareous and siliceous spicula, and a horny axis more or less hardened with calcareous matter, and the Alcyonaria and Zoantharia secrete a horny axis more or less hardened with calcareous matter and abundance of calcareous spicula, why should we say that these much more highly organized animals have not also the same power as the sponges to secrete from the sea-water silica, and therefore that a Zoantharia-polype that lives on a siliceous axis is a parasite, especially when we find that this Zoantharian polype has its bark and polype-cell strengthened by siliceous spicula, some of them exactly similar in form and structure to the spicula of the axis, which must have been secreted by the animal? And therefore it is, to my mind, most unphilosophical to believe that the spicula of the axis are formed by the sponge, and the similar spicula in the polypes formed by the animal which the advocates of this theory regard as a parasite having only an accidental connexion with the axis.

The discovery of a species of *Hyalonema* on the coast of Portugal has proved that there is a species of the genus (and a most distinct one) that secretes siliceous spicula exactly like the spicula of the Japan species, that has no sponge attached to it or forming part of its body; so that it cannot be the "cloacal system" of a sponge that does not exist.

Professor Max Schultze, who regards the bark and polype of the Japanese species as a parasite, describes it as a species of the genus *Polythoa*, under the name of *Polythoa fatua*; but it differs from all the species of the genus *Polythoa* that I have examined in having the parietes of the polype-cells strengthened with siliceous spicules which are exactly similar in structure and form to the spicula of the axis.

This peculiarity, which I should consider conclusive that the axis is formed by the same animal as the bark, is common to the Japanese and Portuguese species.

Professor Barboza du Bocage observes:—

"Le *corium polypigerum* et les polypes sont formés de plusieurs tissus en couches superposées, dans lesquels on trouve une quantité très-considérable de spicules siliceux, dont les caractères morphologiques varient pour chaque couche.

"L'aspect granuleux, chagriné, que présente la surface extérieure du *corium* et des polypes n'est pas le résultat d'une simple incrustation de détritus de sable (comme on l'affirme pour les individus du Japon), mais il est dû à la présence d'un nombre infini de spicules réguliers, en forme de massue et hérissés de pointes. Ces spicules font partie intégrante de la couche la plus extérieure ou tégumentaire.

"Chaque polype est soutenu par une charpente siliceuse de spicules filiformes, disposés longitudinalement et à intervalles égaux sur la paroi interne de la cavité du corps." (Proc. Zool. Soc. 1865, p. 663).

The thickness of the elongated spicula of the axis is commensurate with the size of the entire coral, they being thin in the short young specimens, and thicker in the longer and more developed specimens. As they increase in length, they gradually become thicker by the deposit of fresh layers of siliceous matter on the outer surface, which is, doubtless, deposited by the flesh of the bark that surrounds each of the fibres; and new spicules also appear to be developed as the coral becomes thickened, as there are intermixed between the thicker spicula thin ones of different degrees of thickness; but generally they are of the same length as the rest. This seems to show that they are developed by the animal that lives in the bark, and are not shot out from the sponge at the base. But I might go on giving reasons without end, showing that the theory of those that believe the animal is a parasite is at variance with all parts of the organization of the coral and the animal that forms it.

If we note the number of persons who have expressed an opinion on this subject, there is no doubt that the general opinion of zoologists, including some of high scientific reputation, as Valenciennes, Milne-Edwards, Max Schultze, Leidy, Bowerbank, and others, is against my view of the subject; but it is to be observed that I am supported by Professor Brandt and by Professor Barboza du Bocage, both of whom have paid great attention to the subject, and have given the reasons for their belief; while most of the others above quoted have only expressed an opinion, without giving the facts on which it is founded.

I may add that, after much calm consideration of the question, and with the utmost willingness to change my opinion, if I found any evidence to induce me to do so, I still believe that the bark and the axis are parts of the same coral, and made by the same animal. In a former paper I observed that "the idea (that the bark of the coral is a parasite) requires the belief in the existence of two peculiar bodies which are always found together and are unknown in any other state, instead of regard-

ing them as parts of the same animal" (Ann. & Mag. Nat. Hist. 1859, iv. 441). And the discovery of a second species in Japan, and a third on the coast of Portugal, in all of which the bark and axis are found together, I think entirely destroys any idea that there is the slightest reason for believing the theory propounded by Valenciennes, and which has been so readily adopted, I may almost say without re-examination, by other naturalists.

This theory has had the effect of confusing the nomenclature of the Japanese species, which I first described as under:—

I. *The coral consisting of the bark and axis.*

Hyalonema Sieboldii, Gray, P. Z. S. ii. 1835, p. 63; Brandt, Symbolæ, &c. t. 1. f. 1, 10.
Halinema, Ehrenb. Monatsb. Berlin, 1840, p. 2 & 3 (a misprint?).

II. *The bark only, without the axis or sponge.*

Polythoa fatua, Max Schultze, Hyalonemæ.

III. *The sponge without the rope-like axis or bark.*

Spongia octancyræ, Brandt, Symbolæ, 14, note; Ehrenberg, Monatsb. 1860, p. 170.
Spongia crucigera, Ehrenb. Monatsber.

IV. *The sponge and the elongated united axis without the bark and animal.*

Hyalonema Sieboldii, Max Schultze, Die Hyalonemen, 9.
Hyalonema mirabilis, Gray, Bowerbank, Brit. Spongiadæ, 49.
Hyalonema, Valenciennes, Milne-Edwards and Haime.

This coral, which was first regarded as a plant and then as a sponge, has been considered by one of the first microscopists an artificial production! Thus Professor Ehrenberg, in an elaborate paper in which he gives an abstract of the various essays that have been written on the *Hyalonema Sieboldii*, concludes thus:—

"Glass-corals must be considered an artificial production, not less than those Indian idols produced in the shells of mother-of-pearl. The long siliceous threads, widely distributed over the Pacific, are with much labour collected in small quantities, probably from an unknown large species of *Tethya*; they are formed into bundles, which are forced into or through the tubular leather-corals allied to *Polythoa*, so that the fine end of the bundle, which is first pushed through, remains simple, whilst the remainder obtains a spiral form through the rotatory mani-

pulations. It is also possible that the bundles of fibres with polypes attached are immersed into the sea, so that the leather-corals (which always cover other objects) continue their development, forming a larger or smaller covering. At all events, the siliceous axis appears to be foreign, and not living. It is an innocent fraud, which became a branch of industry, and which, like the transplanted spur on the head of a living cock, may be a source of silent pleasure to the sentimental speculating Japanese" (Monatsb. Berlin, 1860, pp. 181–182).

XXXVIII.—*On new British* Hydroida.

By the Rev. Thomas Hincks, B.A.

The species that are briefly characterized in the following paper will be more fully described and figured in the general history of the British Hydroid Zoophytes on which I am now engaged, and which I hope will soon be ready for the press.

Subkingdom *CŒLENTERATA.*

Class *HYDROZOA.*

Order **HYDROIDA.**

Suborder TUBULARIDA.

Family **Corynidæ.**

Genus Coryne.

C. vermicularis, n. sp.

Zoophyte forming dense shrubby tufts; *hydrocaulus* smooth, branched dichotomously, of a very light straw-colour and delicate texture, wavy, annulated, especially towards the base, the branches and upper portions of the stem often smooth or slightly wrinkled; *polypites* of great length (about $\frac{1}{6}$ inch when mature), stout, almost cylindrical for half their length, when extended, and then tapering off very gradually towards the oral extremity; tentacles in irregular and very distant whorls, rather stout, with large capitula, about twenty-five in number. *Reproductive sacs* borne at the base of the tentacles over the lower part of the body, spherical, shortly stalked.

Height of the tufts about $\frac{3}{4}$ inch.

Distinguished by the great size and worm-like appearance of its polypites and the sparing distribution of the tentacles over the body.

Hab. Shetland, from deep water.