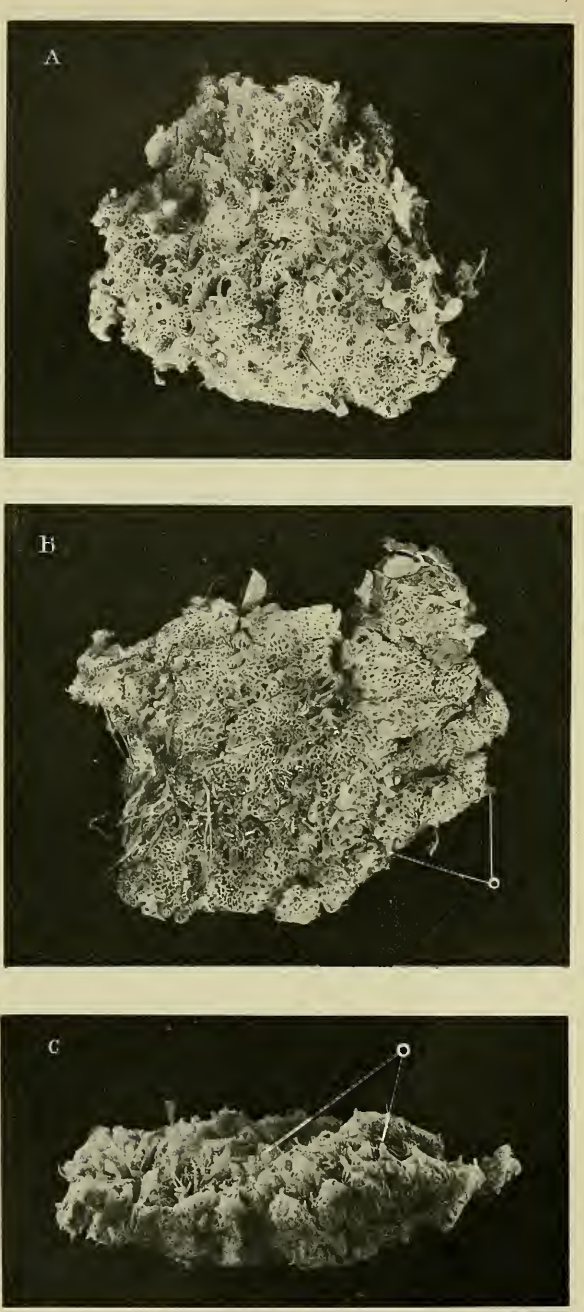

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CLATHRINA CONTORTA.

not prolong or retain youthful characters of the antlers, but, quite the contrary, caused them to grow irregularly or had the effect of entire suppression of the antler.

He stated that very frequently an aged Stag or Fallow buck would throw up supernumerary snags at the base of the antler (text-fig. 1, E) or along the side of the beam, which somewhat resembled, and were probably a reversion to, these immature characters, and that there were several records of aged or barren hinds growing the simple "pricket" antlers of the first year.

Mr. R. I. Pocock, F.Z.S., exhibited and made remarks on a specimen of the Spanish Tarantula, *Lycosa hispanica*, that had died in the Society's Gardens.

On behalf of Mr. R. C. Punnett, F.Z.S., and himself, Mr. W. Bateson, F.R.S., F.Z.S., exhibited specimens of Fowls illustrating peculiarities in the heredity of white plumage, and made the following remarks:—

A *pure* white breed such as White Leghorn, crossed with a dark breed such as Brown Leghorn, gives a cross-breed substantially white, the colour being recessive. The White Rose-comb Bantam, however, crossed with a coloured breed gives coloured cross breeds, the white being recessive. But in every specimen examined carefully these recessive whites were found to have one or more minute ticks of black pigment. Though, superficially regarded, these ticked whites would be classified as white, experiment proves them to be entirely different in nature. These facts elucidate the paradoxical accounts given by Darwin and others that Black and White Bantams crossed together give both blacks and whites; for the black may fully dominate over the white in this particular case.

The following papers were read:—

1. On the Sponge *Leucosolenia contorta* Bowerbank, *Ascandra contorta* Haeckel, and *Ascetta spinosa* Lendenfeld. By E. A. Minchin, F.Z.S., University College, London.

[Received March 16, 1905.]

(Plate I.* and Text-figures 2–6.)

The Calcareous Sponges have been a very unfortunate group, from the systematic point of view. From the time when Haeckel swept away all previous generic names, in order to found his so-called natural system, up to the present day, scarcely any two

* For explanation of the Plate, see p. 20.

authors have been in agreement as to the names to be employed for the genera or as regards the grouping of the species, especially in the more primitive and interesting section of the Calcarea Homocœla.

The characters, for instance, by which Breitfuss defines the genus *Leucosolenia* of Bowerbank (1864) are such as would exclude from it all, or nearly all, the species which I should refer to it, including, as I have shown elsewhere, even Bowerbank's type species of the genus, *L. botryoides*; while Lendenfeld has always consistently declined to make any use at all of the oldest generic name amongst the Ascons. In short, with the exception, perhaps, of the malarial parasites, there is probably no other group in the animal kingdom in which the nomenclature is in so confused a state as in the Homocœla. The species which forms the subject of the present memoir illustrates well the statement just made. It is a veritable comedy of errors that I have to set forth.

The name *Leucosolenia contorta* was given by Bowerbank in 1866 [1] to certain small sponges from the Channel Islands—Guernsey, and the Guliot Caves, Sark. It is not very clear, however, what Bowerbank considered the distinctive characters of his species, since his diagnosis would apply to almost any Ascon. He states that "the form of this sponge is so distinctly different from that of *L. botryoides* that . . . . it cannot well be mistaken for that species . . . . *L. contorta* always appears to consist of a mass of contorted inosculating fistulæ." Further, that "the external surface of *L. contorta* is also sparingly furnished with recumbent acerate spiculæ, mostly disposed in a longitudinal direction, and I have never observed like spiculæ on the surface of *L. botryoides*." He was a little doubtful if his sponge were not really identical with *Spongia complicata* Montagu (1816), but came to the conclusion that Montagu's figure of *complicata* was "really a very characteristic figure of *Spongia botryoides* of Ellis and Solander," and that therefore the name *complicata* was to be rejected. Finally, Bowerbank remarks that *contorta* and *coriacea* might be mistaken for each other in the dried condition, but that "the total absence of defensive spiculæ on the cloacal cavity of *L. coriacea*" (meaning apparently the gastral rays of the quadriradiates) readily distinguishes it.

If we put Bowerbank's description into more modern terms, it amounts to this—that *L. contorta* was characterised (1) by form and appearance (contorted inosculating tubes), (2) by the presence of triradiate, quadriradiate, and monaxon spicules. The term "equiangular" applied by him to the triradiate systems need not be taken into account, since he applies the same term to the sagittal spicules of *botryoides*. It is not necessary to point out that the characters given by Bowerbank are not sufficient to define a species of Ascon; and when it is seen that *botryoides* always has monaxon spicules, as I have shown elsewhere, and that *contorta* may frequently lack them; that the specimen of *botryoides* from which Bowerbank figured spicules (Brit. Spong. iii. pl. iii. figg. 3, 4)

was really a specimen of *variabilis*, while the specimen of *contorta* of which the spicules were figured (*l. c.* figg. 8, 9, 10) was really a specimen of *complicata*; and that amongst nine of Bowerbank's specimens examined by me I have found four distinct species confused together—to wit, *complicata*, *variabilis*, *coriacea*, and "*Ascetta spinosa* Lendenfeld": I think it is not necessary to say more in support of the statement that Bowerbank's species *contorta* was of absolutely no systematic value whatever, but represented merely an ill-defined jumble of different species.

In 1872 Haeckel, in his 'Kalkschwämme' [2], used Bowerbank's specific name *contorta* for a sponge which he described in detail. Haeckel pointed out quite rightly that the external characters of *contorta* as set forth by Bowerbank were no guide whatever to its identification, since a quite similar mode of growth characterises other Ascons. Haeckel therefore diagnosed *contorta* by details of its spiculation. The diagnosis given is incorrect in two points, namely, in stating that the monaxons possess a lance-head at their distal extremity, and that the gastral rays of the quadriradiates are "curved oralwards"; two statements that lead me to suspect that Haeckel's material of *contorta* was, like Bowerbank's, contaminated by admixture of *Leucosolenia complicata*. Haeckel, in his description, also affirmed, in his usual manner, definite characters in the spiculation without taking into consideration the variability which is so marked a feature of the sponge. It is a puzzle to me how Haeckel arrived at the definition which he gave of *Ascandra contorta*, since the specimens named and identified by him which I have seen do not agree with his description, and belong, indeed, to other species—a fact which easily explains any errors of description on his part. It is even more mysterious that Haeckel should have considered his *contorta* identical with Bowerbank's *contorta*, since, of Bowerbank's specimens examined by me, eight in all, not one agrees with Haeckel's diagnosis! These enigmas are not, however, of importance to the present enquiry. Taking Haeckel's description as it stands, and allowing for a certain margin of inaccuracy, I have been able without difficulty to refer to Haeckel's *Ascandra contorta* a sponge extremely abundant on the Mediterranean coasts of France, and occurring elsewhere also. As I have stated in a previous memoir, I consider that where previous writers leave us in doubt as to the characters of a species, Haeckel's description fixes the application of the name. I will proceed now to describe the sponge which I regard as the true *contorta*, and then to consider the synonymy and application of the name.

Ascandra contorta H. is a species which, for reasons stated elsewhere [**4**, &c.], I refer to the genus *Clathrina* Gray (1867). It has a closely reticulate mode of growth, equiangular triradiate systems, collar-cells with basal nucleus, and parenchymula larva; all these being characters which make up my diagnosis of the genus *Clathrina*.

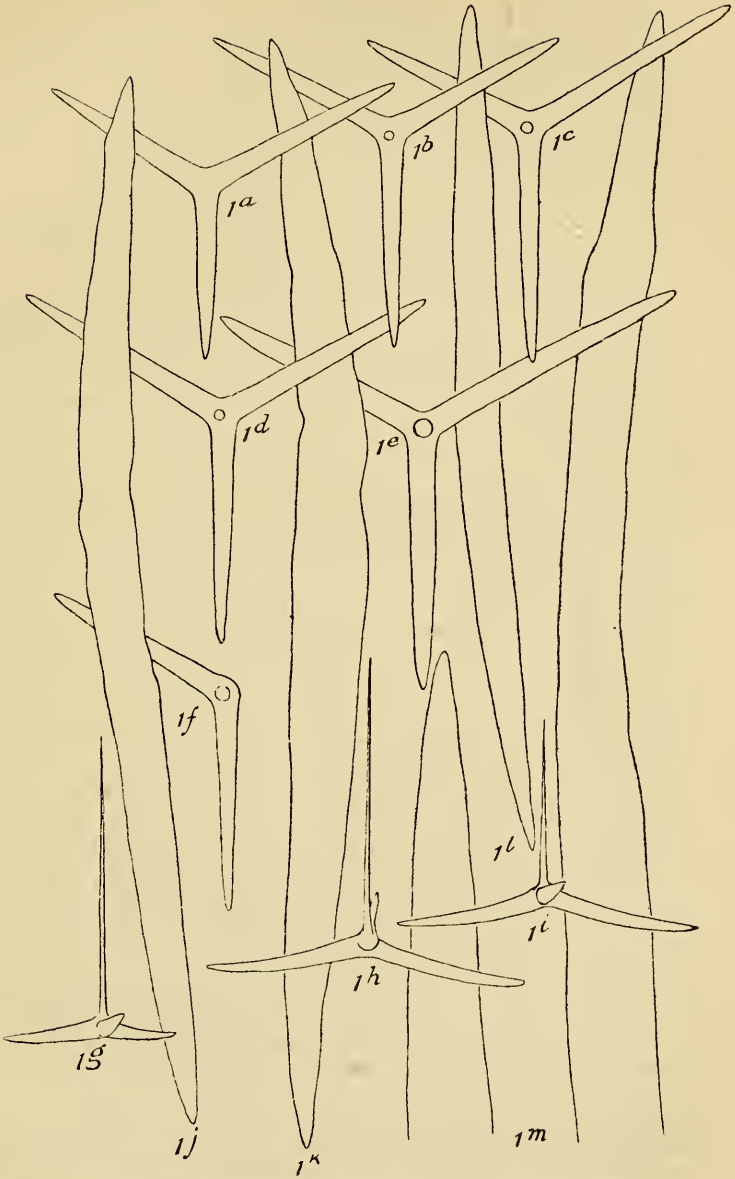
The specimens of this sponge which I have studied nearly all came from Banyuls-sur-Mer, where this species is extremely abundant. By the kindness of Monsieur Topsent, however, I have seen a specimen from Roscoff, not differing in any respect from the Mediterranean specimens. The sponge therefore has a wide range of distribution, and is almost certainly to be ranked as a member of the British Fauna, though it does not appear to be common on our coasts. Hanitsch has, indeed, recorded it from Liverpool: I have no reason to doubt the correctness of this record beyond the fact that my experience of specimens labelled *contorta* by the most eminent authorities has left me very sceptical as to the correctness of any identification of this species which I have not checked; a scepticism heightened, in the present instance, by the fact that Hanitsch names his specimens *Ascaltis contorta*. I may add that the sponges named *Ascandra contorta* by Breitfuss in various memoirs have nothing to do with this species, and should not therefore be taken into account in considering its geographical range.

At Banyuls-sur-Mer *Clathrina contorta* is not only one of the commonest, but also one of the largest Ascons occurring there. Colonies frequently measure 8 centimetres or more across. They consist of a massive or spreading growth of twisted anastomosing tubes, running in all planes, and forming a dense feltwork from which arise at intervals the short, straight, not very conspicuous oscular tubes, which reach two or three millimetres in height, and are of slightly larger calibre than the body-tubes, as the basal growth may be called. The body-tubes are centred round the oscular tubes more or less distinctly, and in the region of the oscular tube the basal system of tubes is usually slightly raised up to form a conulus bearing the oscular tube on its summit; but these conuli are generally very shallow, so that the upper surface of the spreading colony is nearly flat, not lobulated like that of *cerebrum*, nor cushion-like, as in *reticulum*—two species occurring commonly with *contorta*, but both very easily distinguished from it at sight. Photographs will make the external characters of *contorta* clearer than any description (Plate I.). Of its allies, it is perhaps *coriacea* with which *contorta* might be most easily confused, on simple inspection; the latter, however, with its greatly developed gastral rays, is not found contracted up, with closed oscula, like *coriacea*, and when expanded its body-wall is much thicker and less delicate.

The spiculation of *Clathrina contorta* comprises in typical specimens all the three kinds of spicules found in calcareous sponges.

The triradiate systems are equiangular, with the rays straight, tapering imperceptibly for the proximal half or two-thirds; after that tapering more rapidly to a sharp or moderately blunt point (text-fig. 2, 1 *a*–1 *f*). The distal extremities of the rays are often irregular in outline, sometimes markedly so. The rays vary in length from 80 to 130 μ in different specimens, but may be said to average 90–100 μ. The breadth at the proximal end of the

Text-fig. 2.



Spicules of a specimen of *Clathrina contorta* from Roscoff.

Figg. 1 *a*, triradiate; 1 *b*–1 *e*, quadriradiates in facial aspect; 1 *f*, abnormal quadriradiate with one basal ray wanting; 1 *g*–1 *i*, quadriradiates in side view, showing gastral rays in profile; 1 *j*–1 *m*, monaxons (the spicule represented by 1 *m*, being too long for the page, has been drawn in two pieces).

ray is usually 8 or 9 μ, but may reach 12 μ; speaking generally, slender triradiate systems, with rays not exceeding 10 μ in breadth, can be distinguished from thick ones with rays exceeding 10 μ (text-fig. 3, 2 *a*–2 *f*). In some specimens the triradiate systems are all, or nearly all, of the slender type; in others, triradiate systems of the thick type are more abundant.

Some of the triradiate systems develop gastral rays, becoming quadriradiates, and others do not. As a rule the quadriradiates are more abundant than the simple triradiates.

In some specimens there is a tendency for the simple triradiates to be of rather stouter build than the quadriradiates, but in other specimens this cannot be noticed.

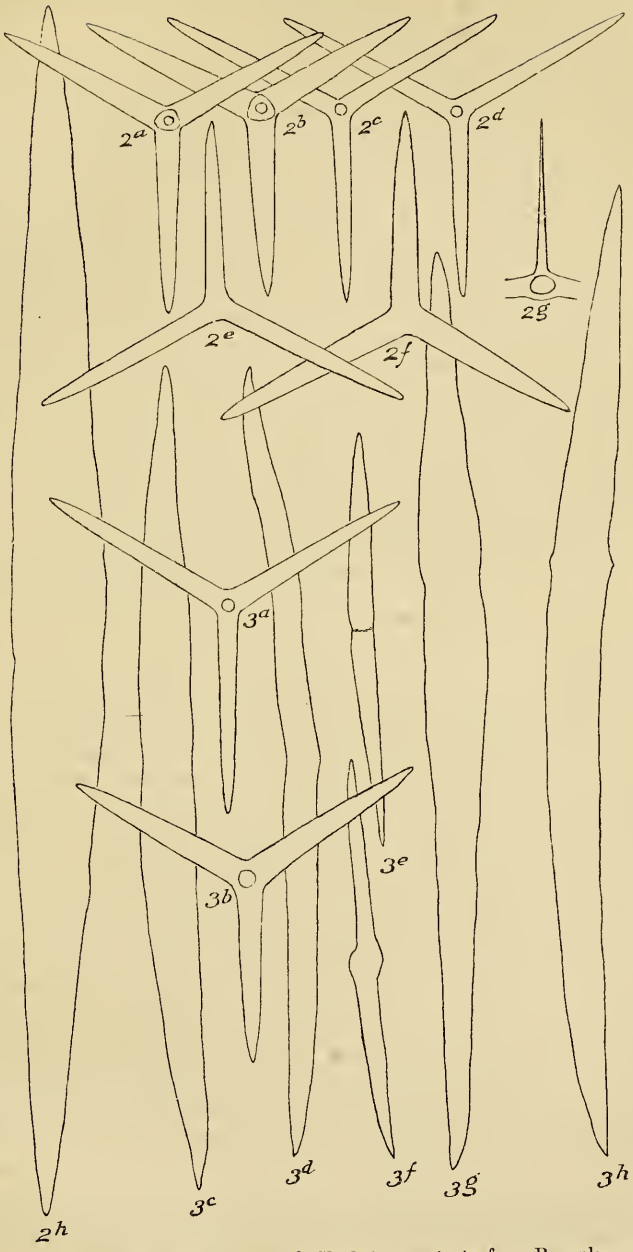
The gastral rays of the quadriradiates are attached at the centres of the triradiate system, and are remarkable for their slenderness and usually also for their length (text-fig. 2, 1 *g*–1 *i*). Arising from a slightly expanded base, the gastral ray sometimes tapers rapidly to a point, then reaching a length equal to about one-half or one-third of that of the basal rays; but more usually the gastral ray is prolonged to a considerably greater length than the basal rays, reaching 130 μ, 140 μ, or even 150 μ in length. The gastral ray then becomes excessively slender for the distal half or two-thirds of its length, and ends in a sharp point; it is not bent oralwards as Haeckel describes it, but it is either quite straight or irregularly curved. Haeckel's figure of a quadriradiate (Kalkschwämme, iii. pl. 14. fig. 6 *c*) obviously represents a spicule of *L. complicata* (compare his fig. 1 *e* on pl. 15, *l. c.*). Quadriradiates are also to be found in which, with gastral rays of great length, are found basal rays much shorter than usual (text-fig. 2, 1 *g*; text-fig. 4, 4 *e*); these are probably young forms in which the rapid growth of the gastral ray * has caused it to attain its full length before the basal rays have done so.

In the thick quadriradiates found in many specimens, I have observed a curious point with regard to the gastral ray, when seen in the facial aspect of the spicule. When the basal system is focussed so that the bases of the rays show sharp contours, the origin of the gastral ray appears as a dark central spot roughly triangular in outline, each side of the triangle being transverse to the base of one of the rays of the triradiate system, and the angles of the triangle rounded off (text-fig. 3, 2 *a*, 2 *b*). If now the focus is slightly raised, the base of the gastral ray appears as a sharp ring, within the triangle. The dark triangle appears to be the expanded base of the gastral ray, but it is only to be seen in the case of the thickened triradiate systems, not in the slender ones.

The monaxon spicules of *Clathrina contorta* vary in the most singular manner, constituting the most remarkable feature of the species. The variations are best considered, first, from the point

* As I have described in a former memoir (Quart. Journ. Micr. Sci., n. s. xl. pl. 42. fig. 55), the elongated gastral rays of *contorta* are covered by a plasmodial mass containing four nuclei, more than I have observed on the gastral rays of any other Ascon.

Text-fig. 3.



Spicules of two specimens of *Clathrina contorta* from Banyuls.

Figg. 2 *a* & *b*, thick quadriradiates; 2 *c* & *d*, slender quadriradiates; 2 *e* & *f*, triradiates; 2 *g*, quadriradiate showing gastral ray in profile; 2 *h*, a monaxon. 3 *a* & *b*, quadriradiates of another specimen; 3 *c*–3 *h*, monaxons.

of view of substantive variations of form and size; secondly, as regards numerical variation, that is to say abundance of monaxons compared with other types of spicule.

The monaxons are all of large size, being at least twice as thick as the basal rays of the triradiate systems, and not less than 300 μ in length, allowing for those which are apparently not full-grown. But in some specimens the monaxons reach a size which can only be called gigantic. In a specimen from Banyuls sent me by Topsent (which I will refer to as Topsent 12 *e*), the monaxons, when drawn to the same scale as the other spicules figured here, come out 32 centimetres in length, corresponding to an actual length exceeding 1000 μ (1 mm.), with a breadth of about 50 μ at the thickest part. Even these proportions are exceeded by a specimen in my collection from Banyuls, in which the monaxons when drawn to scale measure 75 centimetres in length, corresponding to an actual length of 2343 μ (2·3 mm.). I do not think that spicules of such size have been recorded from any Ascon. The large monaxons of *Ascandra densa* and *A. parus* figured by Haeckel (*l. c.* pl. 14. figg. 2 *c*, 3 *f*) fall far below those that I have mentioned in dimensions. With these extraordinary variations in size, the form and characters of the monaxons are fairly constant (text-figg. 2 and 3, 1 *j*–1 *m*, 2 *h*, 3 *c*–3 *h*). They are spindle-shaped, pointed at both ends, slightly curved, sometimes distinctly so when more slender, or nearly straight when very thick. There is no lancet-head present at the distal extremity, as figured by Haeckel; his figure (*l. c.* pl. 14. figg. 6 *d*, 6 *e*) almost certainly refers to *complicata* (compare his figg. 1 *g*–1 *k*, on pl. 15). It is, indeed, impossible to say which is the distal end of these monaxons, as they do not project from the sponge like the true (primary) monaxons of other Ascons. Near the middle of the spicule, sometimes at about one-third of the length from one end, a slight constriction can be observed, sometimes very distinct, in others very shallow, in others again represented by an annular thickening, and sometimes not to be made out at all. This constriction is more distinct in young spicules, and appears to become more or less obliterated with growth. In big spicules the contours are often so sinuous and irregular that the primary constriction may be masked by secondary curves. I consider this primary constriction, as I propose to call it, of great morphological importance, as indicating probably that these spicules are not primary monaxons *, comparable to those of *Leucosolenia complicata*, for example, but in reality derived from a triradiate by loss of one ray and shifting of the two others into approximately the same straight line. In very young monaxons of *contorta* I have noticed a delicate transverse line in the region of the constriction (text-fig. 3, 3 *e*), and I have also found a spicule of which it would be difficult to affirm whether it is a young

* A primary monaxon is derived from a single mother cell which divides into two formative cells, thus originating in exactly the same manner as a single ray of a triradiate system.

monaxon or an abnormal triradiate (text-fig. 3, 3*f*); probably it is both! My friend Mr. Alford has also found, in the slide of Topsent 12 *e*, four abnormal monaxons which have additional rays growing out laterally and thus become triradiates (text-fig. 6, 9 *a*–9 *c*). In one of these (9 *b*) the three rays are approximately equal in size and meet at the angles of an ordinary triradiate. For all these reasons I consider there is much to be said for regarding the monaxons of *contorta* as secondary monaxons derived from a triradiate system by suppression of one ray and hypertrophy of the two remaining, which become placed in the same straight line, or nearly so.

The numerical variation in the monaxons is not less remarkable. In some specimens scarcely any monaxons are to be found; in others they are extremely abundant. Thus in a specimen recently examined by me, I took a fairly large piece of the sponge, separated the spicules with Eau de Javelle, and mounted all I could get up with the pipette, covering three slides. After prolonged searching I found five monaxons to many thousands of triradiate systems. In another specimen in which I could find no monaxons, Mr. Alford by careful searching found two. It is often extremely difficult to be certain if a specimen has monaxons or not. Mr. Alford has kindly undertaken for me the task of counting the numbers of each kind of spicule found in different specimens, with the following results :—

Specimen.	Triradiates.		Quadriradiates.		Monaxons.		Kind of Monaxons observed.	Total of 3 kinds of Spicules.
	Actual number counted.	Per-centage of whole.	Actual number counted.	Per-centage of whole.	Actual number counted.	Per-centage of whole.		
No. 1 (ʒ 3 *a*–3 *h*).	93	3·278+	2727	96·123+	17	·599+	Large.	2837
No. 2 (ʒ 2 *a*–2 *h*).	311	8·304+	3423	91·402	11	·294+	Large.	3745
No. 3	386	12·512+	2658	86·158+	41	1·329+	Very large.	3085
No. 4 (Plate I. B).	247	5·835+	3965	93·668+	21	·496+	Very large.	4233
No. 5	146	5·144+	2686	94·644+	6	·211+	Gigantic.	2838
No. 6 (Topsent 12 *e*).	267	10·349+	2188	84·806+	125	4·844	Gigantic.	2580
Total for Species.	1450	7·506	17647	91·35	221	1·144		19318

These results were obtained in the following way :—"Each specimen was put into Eau de Javelle to separate the spicules, and after careful washing, and being allowed to stand for some

considerable time after each washing, the spicules were transferred to the slides by means of a pipette.

"Each slide, when ready, then had marked upon its under surface twenty circular areas, each being brought into the microscopic field in turn and all spicules in each area carefully counted. When all the spicules were counted the circle was erased and the next circular area dealt with.

"The counting was done with the aid of a camera lucida and three differently coloured crayons, thus ensuring that all spicules were counted and counted once only.

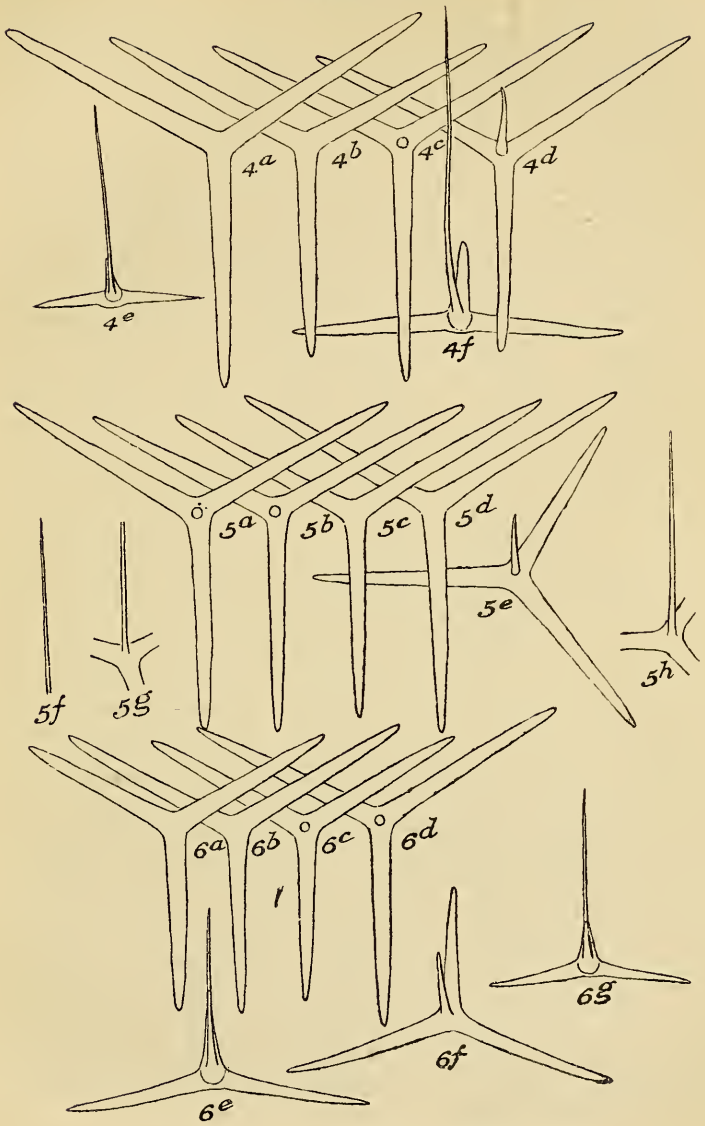
"Each quadriradiate spicule had a number in blue marked upon it; the triradiate spicules were marked with successive red numbers and a green number noted a monaxon. At each counting a check could be made, and the counting was complete when each spicule was seen to have one number of a special colour upon it."

The spiculation of *Clathrina contorta* thus shows, on the one hand, comparatively slight variation in the triradiate systems, and, on the other hand, extraordinary differences in number and size of the monaxons in different specimens. The variability is so marked, and the monaxons are frequently so difficult to find, as to suggest at once a possible extreme of variation in which the monaxons would be totally absent. Were this to occur we should have a variety of the sponge characterised by a type of spiculation which would lead to its being placed, in many current systems of classification, in a genus distinct from the variety in which monaxons occur.

As a matter of fact, I may state at once that the variety of *contorta* in which monaxons are completely lacking is very common, and it has been described by Lendenfeld from the Adriatic under the name of *Ascetta spinosa*. This is no mere surmise on my part; I have been able to examine, in the collection of Canon Norman, a slide obtained by him from Lendenfeld, and bearing in Lendenfeld's handwriting the label "*Ascetta spinosa*." Text-fig. 4, 5 *a*–5 *h*, represents some spicules drawn by me from this slide. As will be seen, the spiculation differs in no single particular from that of the true *contorta*, except for the lack of monaxons. Since the preparation consists of tubes of the sponge mounted whole, it was not possible to obtain profile views of the gastral rays, except at the torn ends of the tubes, and in no case was I able to see an unbroken gastral ray in side view, but the fragments which I have drawn (5 *f*–5 *h*) are sufficient to prove that the gastral rays of this specimen attain the degree of length and slenderness characteristic of the species. Lendenfeld's specimen is, in fact, identical in character with other specimens of "*spinosa*" which I have from Banyuls (text-fig. 4, 6 *a*–6 *g*), and these again differ in no respect from the true *contorta* except for the absence of monaxon spicules.

If *Ascetta spinosa* Lend. is to be regarded, as I believe, merely as a variety of *Ascandra contorta* H., how is this variation to be explained? The specimens of *spinosa* that have come under my notice agree perfectly in external characters with *contorta*, but are

Text-fig. 4.



Spicules of the "*spinosa*" variety of *Clathrina contorta*.

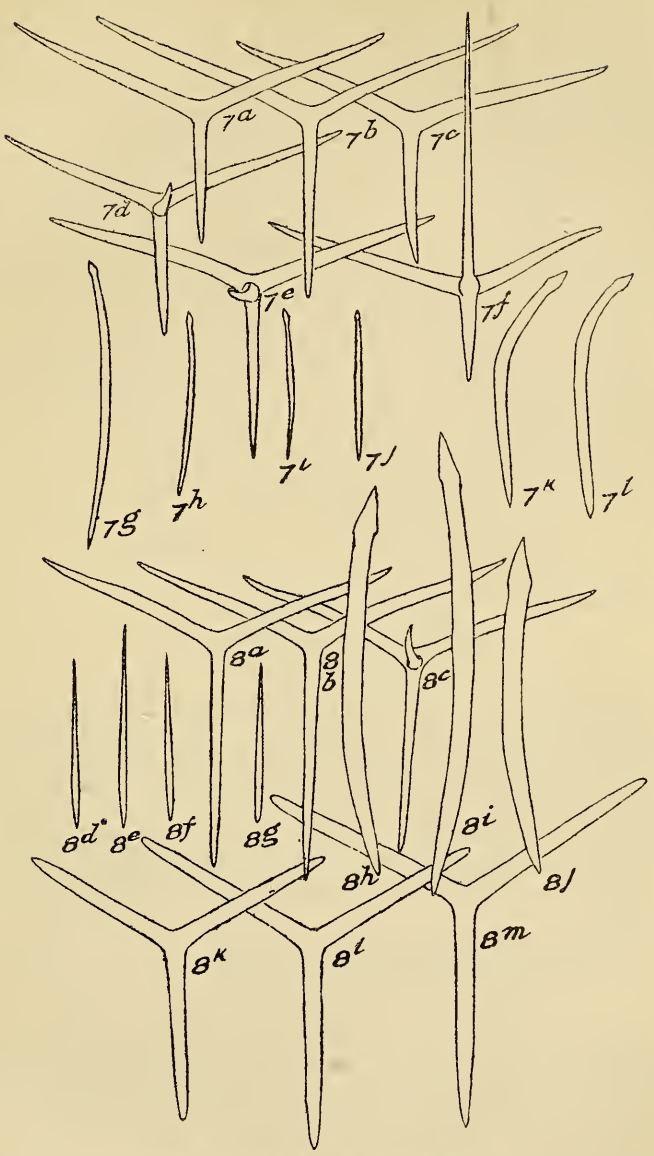
Figg. 4*a*-4*f*. Spicules of Bowerbank's type of *Leucosolenia contorta* in the British Museum (Bowerbank Coll. 988), showing gastral rays with tendency to irregular curvature.—Figg. 5*a*-5*h*. Spicules of a specimen in Canon Norman's collection labelled "*Ascetta spinosa*" in Lendenfeld's handwriting; the elongated gastral rays (5*f*-5*h*) are broken off.—Figg. 6*a*-6*g*. Spicules of a specimen from Banyuls.

all of small size. The big, spreading colonies of *contorta* always have monaxons. It is my belief that the absence of monaxons is simply a juvenile feature, so to speak, of the sponge, and that they are only formed when the sponge has grown to a certain size. Such changes of spiculation with age are probably more frequent in sponges than is usually supposed. For a parallel case I need only refer to Topsent's observations on *Cliona celata*.

A point which requires brief discussion, however, is why Lendenfeld found only the *spinosa*-form in the Adriatic, and not the *contorta*-form, if these two forms are really only age-variations in one species. Are we to suppose that in the Adriatic the sponge does not acquire monaxons? In my opinion the explanation of this point is to be sought in quite a different manner. In his 'Kalkschwämme der Adria' [3] Lendenfeld describes another species of *Clathrina* occurring commonly in the Adriatic, namely *C. reticulum*. I have also found this species very abundant at Banyuls, and I possess many specimens of it; but my experience of this species at Banyuls differs sharply in one respect from Lendenfeld's observations upon it in the Adriatic. I find *reticulum* to be more constant in external form and characters than any other species of *Ascon*. All the specimens I have seen—and at one time I had some hundreds of specimens, collected in order to obtain the larval development—are compact, rounded, cushion-like masses of slender, closely-knit tubes, forming a dense and finely-meshed reticulum from which arise one or more oscular tubes of much larger calibre than the tubes forming the body of the sponge. I have figured such a specimen elsewhere (4, p. 6, fig. 6). In short I have never had the slightest difficulty in recognising *reticulum* at sight, though its spiculation often approaches that of *contorta* very closely. My astonishment was therefore great to find that Lendenfeld describes this sponge as occurring (at Sebenica and Lessina) in nearly all the forms generally found in Ascons. There is thus a great discrepancy between Lendenfeld's observations and mine with regard to this species, and I am inclined to think that this is to be explained simply by Lendenfeld not having recognised the true *contorta*, but having confused it with *reticulum*. This is a supposition which I am unable to prove or test; but if correct, it would explain why Lendenfeld did not find the true *contorta* occurring in the Adriatic as well as *spinosa*, and also why he finds *reticulum* so variable in form when in my experience it is so extremely constant. I may add, finally, that the figures of monaxons of *reticulum* given by Lendenfeld (3, pl. viii. figg. 7 *e*–7*f*) are more like those of *contorta* than those of *reticulum*, though not exactly like those of either, as these sponges are known to me.

I will now describe some of the historically important specimens to which I have had access, and I begin with the type-specimens of Bowerbank's *Leucosolenia contorta* in the British Museum (Bowerbank Coll. 988). The "type" consists of seven dried specimens, all very small, stuck on a card. The largest specimen,

Text-fig. 5.



Spicules of *Leucosolenia*, *Sycon*, and *Clathrina*.

Figg. 7 *a*–7 *l*. Spicules of a specimen in Norman's collection, received from Bowerbank with label *Leucosolenia contorta* and identified by Haeckel as *Ascandra contorta*; showing spicules of *Leucosolenia variabilis* (7 *a*–7 *j*), mixed with spicules of *Sycon* sp. (7 *k*, 7 *l*).—Figg. 8 *a*–8 *m*. Spicules of a specimen in Norman's collection received from Bowerbank with label *Leucosolenia contorta*; showing spicules of *Leucosolenia complicata* (8 *a*–8 *j*) mixed with spicules of *Clathrina coriacea* (8 *k*–8 *m*).

the original of Bowerbank's fig. 7 on pl. iii. of Brit. Spong. vol. iii., is at the top over the middle of the card; the other six are in two vertical rows of three each to right and left. As I have stated elsewhere, I have examined six out of these seven specimens, and all of them, except the larger one at the top, are quite typical specimens of *Leucosolenia complicata*; the large specimen alone is a true *Clathrina*. I give figures of its spicules (text-fig. 4, 4 *a*–4 *f*), and it is not necessary for me to describe them in detail, for it is evident from the figures that this specimen agrees with the true *contorta* in all respects but one, namely, in that the monaxons are wanting. In short, Bowerbank's type-specimen of "*Leucosolenia contorta*," or, to be more accurate, the only one of his type-specimens which does not belong to a species of prior standing, is a specimen of "*Ascetta spinosa*" Lendenfeld!

I have also examined two other specimens of Bowerbank's *, given by him to Canon A. M. Norman, and now in the latter gentleman's collection. The first of these was sent by Canon Norman to Haeckel, and returned by him after examination. It has the following label in Norman's handwriting:—

"*Leucosolenia contorta* Bow.
"Guernsey
"(A type-specimen from Dr. Bowerbank)."

Also a label in Haeckel's handwriting:—

"*Ascandra contorta* H.
"(*Leucosolenia contorta* Bwbk.)
"Guernsey, Bowerbank."

If any specimen in the world ought to have been a specimen of *contorta*, surely this ought, bearing, as it does, a double testimonial to character from the two founders of the species. What, then, was my astonishment, on examining the spicules, to find it a quite typical example of *Leucosolenia variabilis* Haeckel! I figure its spicules in text-fig. 5, 7 *a*–7 *l*. The only point to notice about them is a certain admixture of *Sycon* spicules (7 *k*, 7 *l*), which, as I have set forth in another place, frequently occurs in preparations of *variabilis*.

The second specimen in Canon Norman's collection bears a label in Bowerbank's handwriting as follows:—

"*Leucosolenia contorta*, Guernsey."

According to information furnished me by Canon Norman, this particular specimen was not sent to Haeckel, but it is one of the same lot as the type sent to him, and has an equal claim to be regarded as a type. Examination of the specimen shows a mixture of *Leucosolenia complicata* and *Clathrina coriacea* (text-fig. 5, 8 *a*–8 *m*).

* Bowerbank in his Monograph mentions twenty-eight specimens of *contorta*, but I have had access to only nine of them. I do not know what has become of the others.

From the foregoing it will be seen, I think, that the name-question, in the case of the species under consideration, is a tangled problem, one, indeed, which I feel some diffidence in approaching. I could wish, in fact, as I have said elsewhere, that there were in existence some sort of International Hague Tribunal to which these knotty points of nomenclature could be referred for arbitration and authoritative settlement. In the absence, however, of any such body, I extract from the facts above set forth the following conclusions:—

(1) Bowerbank's *Leucosolenia contorta* was a jumble of different species, and his description could not be used for identification of any particular species. Hence *Leucosolenia contorta* Bowerbank is a *nomen nudum*, of no systematic validity.

(2) Haeckel's *Ascandra contorta*, though not in all respects correctly described, can be applied to an existing species of Ascon, which can be identified by his description. This I consider the true *contorta*: ought the species, however, to be written *contorta* Bwk. or *contorta* H.? Pending the constitution of the International Nomenclature Tribunal, in order to settle this important point, I content myself in following Haeckel in calling it *contorta* Bwk.

(3) *Ascetta spinosa* Lend. is probably the young form, without monaxons, of *contorta*.

I arrive therefore at the following synonymy and diagnosis:—

Clathrina contorta (Bowerbank).

? *Nardoa spongiosa* Kölliker *, 1864, Icones Histologicæ, Abth. i. pp. 63, 64, pl. vii. fig. 10, pl. ix. figg. 6–8.

Leucosolenia contorta Bowerbank 1866, Mon. Brit. Spong. ii. pp. 29–32; 1874, op. cit. iii. pp. 7–8, pl. iii. figg. 5–10.

Leucosolenia (*Nardoa*) *contorta* Gray, 1867, P. Z. S. p. 555.

Leucosolenia (*Leuciria*) *contorta* Haeckel, 1870, Jen. Zeitschr. v. p. 243.

Ascandra contorta Haeckel, 1872, Kalkschwämme, ii. pp. 91–93, iii. pl. 14. figg. 6 *a*–6 *e*.

? *Ascaltis contorta* Hanitsch, 1890, Tr. Biol. Soc. L'pool, iv. pp. 195 & 233.

Ascetta spinosa Lendenfeld, 1891, Zeitschr. wiss. Zool. liii. pp. 203–205, pl. viii. figg. 2, 16, 21, 22.

Leucosolenia contorta Topsent, 1891, Arch. Zool. Exp. (2) ix. p. 525; Bull. Soc. Zool. France, xvi. p. 128; 1892, Résult. Campagnes Sci. Albert 1er, fasc. ii. p. 22; 1894, Rev. Biol. Nord France, vii. pp. 7 & 22.

Clathrina contorta Minchin, 1896, Ann. & Mag. Nat. Hist. (6) xviii. p. 359.

* *Nardoa spongiosa* Kölliker has been put by Haeckel as a synonym of either *Ascaltis cerebrum* or *A. gegenbauri*, but the figures of the external form, no less than those of the spiculation, given by Kölliker, seem to me to indicate that the author was dealing with the *spinosa*-form of *contorta*. I have discussed this point elsewhere (Quart. Journ. Micr. Sci. n. s. xl. p. 533, footnote).

Clathrina spinosa Minchin, ibid.

Leucosolenia spinosa Breitfuss, 1898, Arch. f. Naturges. lxiii. 1, p. 213.

(The following references, on the other hand, probably do not relate to the true *contorta*.)

Ascandra contorta Barrois, 1876, Ann. Sci. Nat. (6) iii. Article 11, p. 35, probably refers to *Leucosolenia complicata*.

Leucosolenia contorta Carter, 1880, Midland Naturalist, ii. p. 195. The author remarks that "Bowerbank's illustration of the linear spicule is defective. There are *two* forms, quite different from each other and from Dr. Bowerbank's figure." I consider it probable from this statement that Carter was dealing with a specimen of *Leucosolenia complicata*.

Ascandra contorta Breitfuss, 1898, Arch. f. Naturges, lxiii. 1, p. 214, refers to a specimen of *Leucosolenia complicata*; so probably also the sponge described and figured by the same author in Mém. Ac. St. Pétersbourg, 1898 (viii.) vi. p. 15, pl. i. fig. 1, and cited by him in other memoirs.

And finally it should be mentioned that the numerous specimens sent out from Sinel and Hornell's Zoological Station, Jersey, are all, so far as I have seen, specimens of *Leucosolenia complicata*.

Diagnosis.—Triradiate systems equiangular, with or without gastral rays; the quadriradiates generally more numerous than the simple triradiates. Rays of the triradiate systems tapering imperceptibly for the proximal half or two-thirds, then narrowing more rapidly to a sharp or moderately blunt point. Gastral rays sometimes short, more usually longer than the basal rays, very slender, sharp, and straight or irregularly curved.

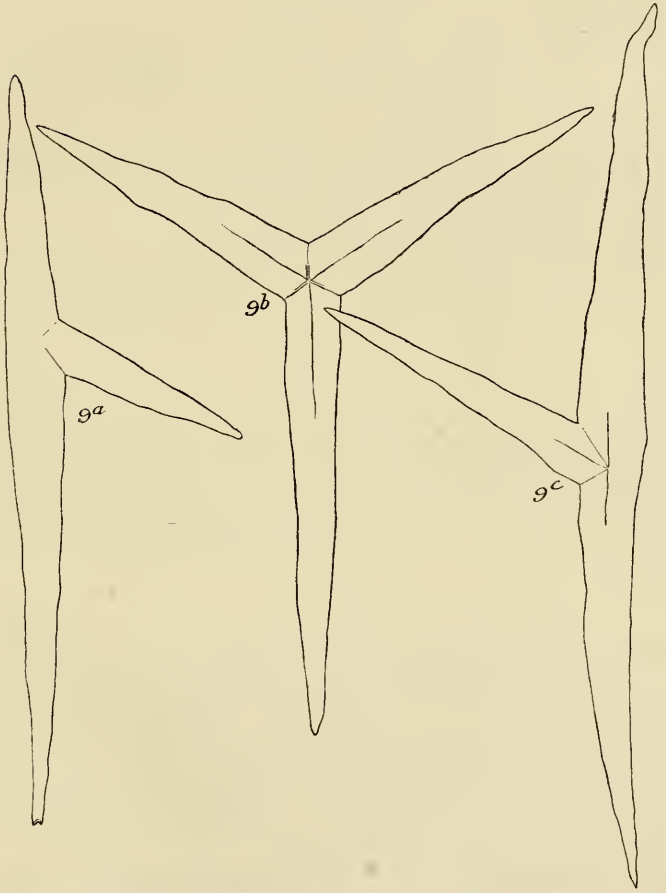
Monaxons at least twice as thick as the basal rays of the triradiate systems,—varying in different specimens from a moderate size to gigantic proportions, spindle-shaped, usually slightly curved, and usually with a distinct constriction near the middle of their length; sometimes very few in number, sometimes absent altogether.

The chief objection that can be made, it seems to me, with regard to my treatment of the species, relates to the position of *spinosa*. Naturalists concerned chiefly with the arrangement of specimens in bottles on shelves will perhaps object to my "lumping" together two forms which can be separated by a definite character, although by one only. Those who reason thus will, no doubt, prefer to retain *spinosa* as a "species" distinct from *contorta*; in that case the type of Bowerbank's *contorta* belongs to the former species, a fact which raises alarming problems of nomenclature. The range of variation seen in *contorta* has its natural and logical termination in the form *spinosa*, and justifies, in my opinion, placing the latter as a synonym. Moreover it is often extremely difficult to be certain that monaxons are really absent in a specimen of "*spinosa*." They may be so scarce that they have been simply overlooked.

After arriving at the above conclusions with regard to the

identity of *contorta* and *spinosa*, it is hardly necessary for me to express my opinion with regard to those systems of classification which define not only species but even genera of Ascons by the presence or absence of monaxon spicules. Before such a character as the presence or absence of monaxons can be used for systematic

Text-fig. 6.



Abnormal gigantic spicules of the class of the monaxons from a specimen of *Clathrina contorta* from Banyuls (Topsent 12 *e*). Magnified about 150 linear (*i. e.* half as much as the spicules figured in text-figg. 2–5).

purposes, it is necessary to understand clearly what is meant by a monaxon spicule. In calcareous sponges a spicule of this class may be one of two perfectly distinct things. It may be, on the one hand,

a primary monaxon spicule, derived from a single mother-cell, and developing exactly in the same way as a single ray in a triradiate system, with which it is strictly homologous. It may be, on the other hand, a secondary monaxon, derived by modification of an entire triradiate system by loss of one ray, perhaps in some cases two rays. Good examples of monaxons undoubtedly of secondary nature are the elbowed monaxons in the stalk of *Clathrina lacunosa* Johnston (renamed *Ascandra angulata* by Lendenfeld). I believe also, as stated above, that the monaxons of *contorta* are to be regarded as secondary. It is clear that a character which is sometimes one thing, in other cases quite another thing, cannot be usefully employed for purposes of systematic classification, not, at least, until more is known about it.

If *Ascetta spinosa* be put as a synonym of *Clathrina contorta*, it is seen that the species has a wide range, extending from the Adriatic round the coasts of France into the English Channel, and probably also on to the coasts of Great Britain.

It is my pleasant duty finally to express my thanks to friends who have assisted me in the preparation of this memoir, put together from observations for the most part of long standing, at a time when the stress of other work, caused by preparations for my departure for the Tropics, was very great. My friend Mr. G. R. Alford, who is making a special study of the variation of this sponge, has given me valuable assistance, as will be evident from the facts I have quoted from him above. Mr. Alford has also kindly undertaken to see this memoir through the press for me. My friend and pupil Mr. L. R. Crawshay has given me great help in preparing the illustrations. Finally, I have to thank Monsieur Topsent, of Caen, for his kindness in sending me specimens from Roscoff and elsewhere and for answering many queries.

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(4) Minchin, E. A. Sponges in: Lankester, 'A Treatise on Zoology,' London, 1900.

Other references are cited in the list of synonymy, p. 17 above.

EXPLANATION OF PLATE I.

Clathrina contorta from Banyuls.

A from above; B from above, and C from the side, to show the oscular tubes (O).