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LIII.—*Suggestions for a Natural Classification of the Asconidæ.* By E. A. MINCHIN, M.A., Fellow of Merton College, Oxford.

ALTHOUGH various schemes for classifying the Ascons and grouping them into genera have been proposed at different times, few, except, perhaps, the authors responsible for these systems, would pretend that they any of them represent the true natural affinities of the species amongst themselves. The so-called "natürliches System" published by Hæckel in his famous monograph* of the Calcarea, probably the best-known classification of the group, with its seven genera founded exclusively on spicule characters, is a good instance to the point, for here we see, to take a single case, such closely allied forms as *coriacea*, *lacunosa*, and *contorta* separated from one another, and the last-named species placed in a genus together with species so distinct from it as *Lieberkühni* and *complicata*, which, in their turn, are separated from their nearly *botryoides*. Moreover, Hæckel's genera, even had they been absolutely natural, must sooner or later have been renamed, since he put on one side without scruple all the well-known laws of priority with regard to nomenclature which are now as fully recognized by zoologists on the Continent as in England. Exactly the same criticism applies to

* 'Die Kalkschwämme' (Berlin, 1872).

von Lendenfeld's classification *, the latest in the field. The obviously unnatural system of Hæckel induced Polejaeff † to place all the species of Ascons together in one genus, and most authors, since the publication of his work on Calcarea, have followed his example; but this is undoubtedly going too far, and such an arrangement can only be regarded as provisional.

Having been engaged for some years now in detailed investigation upon the histology, system, and development of the Ascons, I have been gradually led to recognize certain well-marked and, I believe, natural groups among them. As I hope soon to publish an account of the development of a number of species, it seemed to me best first to make an attempt, perhaps somewhat rash, to fix the nomenclature of at least the commoner and better known species of Ascons in accordance both with their natural affinities and with the laws of priority as regards their generic and specific names. A perfect classification can be obtained, of course, only when all species of Ascons have been studied, and as I cannot claim to have done that, my system is not to be expected to be absolutely complete; but I believe that, so far as it goes, the classification I am now about to put forward is a natural one, and that it indicates the lines upon which Ascons in general will have to be arranged. Since, moreover, the species I have investigated are, for the most part, just those which have been longest known and earliest described, it is by them that the generic nomenclature of the group as a whole must be determined. I hope to make up for the shortcomings of the present memoir in a subsequent work, where I shall treat the subject more fully and extend my classification to all known Ascons.

Before proceeding further, however, I must first protest against a notion which has been prevalent since Hæckel's writings, and due largely to them, namely that the form of an Ascon colony is useless for purposes of generic or specific determination. It cannot be denied that many classifications, based upon external form, have been tried and found wanting; but this seems to me to be due to two causes—first, that the individuals selected were often such as had not yet attained their full growth and characteristic form, and, secondly, that the very great changes in appearance due to contractility were overlooked. Both these propositions may be illustrated from

* "Die Spongien der Adria," Zeitschr. f. wiss. Zool. liii. (1891) pp. 185-321 and pp. 361-433, Taf. viii.-xv.

† "Report on the Calcarea," 'Challenger' Reports, Zoology, vol. viii. part 2.

the system given by Hæckel in his "Prodrömus eines Systems der Kalkschwämme" *, where the principle of classification by external characters was carried to its furthest logical conclusion. Many of the genera were based simply upon young forms, such as *Olynthus* and *Olynthium*. The species *blanca* is a good illustration of this. Miklucho-Maclay †, in his description of this species, gave admirable figures to show the changes of form passed through in the growth of the young "*Olynthus*" into the reticulate mass formed by the large colonies; yet this species figures under no less than four genera, and might easily have figured under more still. It might be urged that, since Hæckel himself fully recognized the artificial nature of his classification, it is hardly fair to subject it to criticism; but, on the other hand, it might be replied that it is hardly fair to push a principle to an absolutely ridiculous extent and then point to the result as a proof of the badness of the principle in question. Contracted and partly contracted forms, again, play an even larger part in the classifications not only of Hæckel but of others also. No one, I think, will now dispute the statement that Hæckel's genus *Prosyca* was founded on individuals with closed pores, and his genera *Clistolynthus*, *Sycorrhiza*, *Auloplegma*, &c. on specimens with closed oscula. But the height of absurdity is reached when we find a whole order of calcareous sponges, *Metrosyca*, with two families and several genera, founded by Hæckel on specimens in which different parts of the colony were in different states of contraction. Similarly I was able to show ‡ that Hæckel's different varieties of *Ascetta clathrus* were based on specimens in different degrees of contraction, and that the form which he named *Ascetta mirabilis*, in order to express his astonishment at finding two varieties united in one specimen, was simply a colony which was in parts more, in parts less, contracted. Yet it is this form which Polejaeff § regards as proving that the guidance of external differences in classification is very uncertain. It was on contracted specimens of *clathrus*, or perhaps of *coriacea*, that Gray founded his genus *Clathrina*, a genus which nevertheless, as I shall try to show, the laws of priority oblige us to retain. Contractility is so marked a feature of a large section of the Ascons that its being overlooked almost entirely by Hæckel, and by many others who came both before and after him, is

* Jen. Zeitschr. v. (1870) pp. 236-254.

† "Beiträge zur Kenntniss der Spongien, I.," Jen. Zeitschr. iv. (1868) pp. 221-232, Taf. iv., v.

‡ Quart. Journ. Micr. Sci. n. s. xxiii. p. 490.

§ *Loc. cit.* p. 4.

a proof to my mind that their acquaintance with Ascons must have been practically limited to preserved specimens.

It is my experience, on the contrary, that almost any species of Ascon can be identified at sight when one is acquainted with it, especially when it is living healthily or when preserved in a healthy and expanded condition—a state of things not always found even in many specimens of Ascons sent out by great zoological stations—and that the mode of growth of the colony is a character of great generic value. It is true that it is almost hopeless to recognize an Ascon by its exterior from the figures given by Hæckel, but that is hardly the fault of the Ascons. Indeed, it is not too much to say that the “Habitusbilder” given by Hæckel, though no doubt of great artistic merit, are practically useless for scientific purposes.

Apart from the interesting species *falcata*, Hæckel, I recognize two main groups in the Ascons, which, perhaps, at a later and more advanced stage of zoological science, will attain to the rank of families or subfamilies, but which at present must rank as genera*. In the first group are such forms as *coriacea*, Mont., *lacunosa*, Johnston, *reticulum*, O. S., *clathrus*, O. S., *contorta*, Bwk., *blanca*, M. M., *primordialis*, H., *cerebrum*, H., and *spinosa*, Lend. In the second group are *botryoides*, Ell. & Sol., *complicata*, Mont., *Lieberkühni*, O. S., and *variabilis*, H.

In the first group, of which *coriacea* may be taken as the type, the full-grown colony always has a reticulate form, and the osculum has the value of a cloaca or vent. The form typically assumed by members of this genus is that of a dense reticulum of ramifying and anastomosing tubes, which are usually of smaller diameter at the base and outskirts of the colony, and gradually become enlarged as they approach the osculum. Sometimes, as in the encrusting “leathery” forms of *coriacea*, the tubes form a simple network in one plane, from which the oscula rise perpendicularly. Sometimes the point of attachment of the colony is drawn out into a single long stalk, as in *lacunosa*, into one or several stalks, as in *blanca*. The osculum may be very inconspicuous, or it may be of relatively great diameter, forming a central basin with raised edges, into which a system of tubes empties itself; or, again, it may be narrow and elevated, shaped like a chimney,

* It may become possible later to subdivide these groups on characters of canal-system and so forth. Thus, in the group I have called below by the generic name *Clathrina*, Gray, the two species *cerebrum* and *reticulum* seem to differ in some details from the other species of the genus.

and scarcely or not at all wider than the surrounding tubes ; but in any case it has distinctly the appearance of a mere exhalant opening for the system of tubes of which it is the central point. The Ascons of this group correspond very nearly to Hæckel's families Tarromida and Nardopsida.

In the second group, of which *botryoïdes* is the type species, the osculum is large in comparison with the network of tubes, which it completely dominates. The tubes, often very minute, as in *botryoïdes* itself, form a basal or subbasal network, from which arise the erect oscula, the latter having much more the appearance of individuals than of simple cloacæ. The oscula grow in height and send out radial diverticula, sometimes over their whole surface, which continue to grow and become ramified, forming branches which either may themselves become new oscular tubes, giving rise to an arborescent colony, or may anastomose to form a network of tubes, from which new oscula in their turn arise. Thus the adult colony consists usually of two parts—a fine network of tubes, from which arise at intervals the erect oscula, often of great size. This mode of growth is liable to considerable variation, from the grape-like cluster of oscula presented by *botryoïdes* on the one hand to the arborescent "*pinus*"* form of *complicata* on the other; but the adult colonies of this group can never be confused with the reticulate masses formed by the *coriacea* type.

These differences of form and growth, so hard to describe accurately but so easy to recognize, are shown to be of generic value by the fact that they occur correlated with a great number of other characters—structural, histological, and embryological—of which I can only mention here the most salient.

In the first or *coriacea* group the principal skeletal spicules are equiangular triradiates, some or even the majority of which may become quadriradiate by the addition of a fourth or gastral ray, but without the three basal rays (or, as we may conveniently term them, the *triradiate systems*†) losing

* Hæckel's figure of "*Ascandra pinus*" gives quite a false notion of this form, for it does not really stand erect and foursquare to all the winds that blow, as his figure would lead one to believe, but it is a creeping form, attached at numerous points to the algæ &c. among which it grows. The oscular tubes only become erect to any considerable degree when it grows in dense clumps, such as are not uncommon in deep water off the Mewstone at Plymouth.

† I shall use the phrase "*triradiate systems*" in this paper to denote the triradiate spicules or the basal rays of the quadriradiates. While in the quadriradiates the basal rays are formed exactly in the same manner as the triradiates, the fourth or gastral ray has a distinct origin and appears later.

thereby their equiangular character. The triradiate systems may become bilateral in form by alterations in the length of a ray relatively to the other two, but never, except abnormally, by changes in the angles at which they meet, at least in the case of the principal spicules of which the general skeleton is composed, and which are found in all parts of the sponge. In other words, the triradiate systems may become "ungleichstrahlig," but never "ungleichwinkelig." When triradiate systems with paired angles occur, sagittal triradiates as Häckel has well termed them, they form a special dermal or other layer restricted to some region of the sponge colony. Monaxons may be present in addition to tri- and quadriradiates. All the species of this group are very contractile and have a well-developed contractile flat epithelium distinct from the skeletogenous layer. In the forms without quadriradiate spicules the contraction may reach a pitch at which the tubes become solid. In those with quadriradiates the projecting gastral rays exercise a hindrance to the contraction of the tubes in proportion to the length of the rays, and contraction is not possible to the same extent as in the "Ascetta" forms, but it is still very marked. In the histology we may notice, as a striking and very constant character, that in the collar-cell the nucleus is situated at the base of the cell. In the embryology the larva is a *parenchymella**—that is to say, a ciliated blastula in which cells migrate inwards to form an inner mass or future dermal layer, which is completely covered by the ciliated or gastral layer. Finally, we may note that the first spicules to appear after fixation are triradiate systems, so that the young sponge passes through what may be called a "Protascetta" stage †.

In the *botryoïdes* group, on the other hand, the principal triradiate systems of the skeleton are sagittal, having become bilaterally symmetrical through the basal rays meeting in such a way as to form an unpaired and two paired angles. So far as I know, equiangular triradiate systems never occur among the spicules of this group. The sponges of this genus are in contrast with those of the preceding through their non-contractility, due apparently to the fact that the cells of

* Using this term in a descriptive sense only, without wishing to imply any homologies of the component layers.

† I have found the *parenchymella* larva and the *Protascetta* stage in *coriacea*, *blanca*, *cerebrum*, *reticulum*, and *contorta*. In the last-named Barrois has described and figured an amphiblastula larva ("Mémoires sur l'embryologie de quelques Éponges de la Manche," Ann. d. Sci. nat. (6) iii. 1876, pp. 35-37, pl. xiv. figs. 21, 22), but this statement must rest on an error of identification. *Parenchymella* larvæ have also been described in *clathrus* and *primordialis* by Metschnikoff and Schmidt.

the superficial flat epithelium secrete the monaxon spicules with which the surface always bristles, and have given up or have not acquired the contractile function. My histological studies are not yet sufficiently advanced to enable me to state this as a general proposition for the whole group; but in the young specimens, bred from the larva of *variabilis*, I found very clearly that each cell of the flat epithelium secretes a single monaxon spicule, and I believe the same to be true of the adults also. In the histology the collar-cells have the nucleus in the upper part of the cell close under the collar*. The larva, so far as it has been observed, is an amphiblastula †, the dermal cells not being covered by the gastral layer, and the first spicules to appear in the development are monaxons, so that the sponge passes through what may be termed a "Protascyssa" stage.

Finally, there remains for consideration the interesting *Ascandra falcata*, H. This Ascon is remarkable for the fact that the interior of the gastral cavity is thrown into folds, forming radial tubes like a *Sycon*, though it should be noted that these diverticula are not foldings of the whole body-wall of the sponge, as in a *Sycon*, but of the inner layer alone. The colony has the form of a loose reticulum of tubes, from which arise at intervals the chimney-like oscula, whose diameter is scarcely greater than that of the tubes. Thus in form it more approaches the *coriacea* rather than the *botryoides* group, and in all other important points of structure, histology, and development it also belongs to the former group. The triradiate systems are equiangular, there is a well-marked contractile epithelium distinct from the skeletogenous layer, the collar-cells have the nucleus at the base, the larva is a parenchymella ‡, and the first spicules to appear are tri-radiates. In fact, the only character which separates this species at all sharply from the *coriacea* group is furnished by the folds of the gastral epithelium. Admitting this to be a character which is sufficient to permit of separating *falcata*

* The collar-cells of individuals of this group are often to be found remarkably shortened, almost flattened, so that the height of the cell is scarcely greater than the diameter of the nucleus. In such cases it is, of course, impossible to say if the nucleus is basal or terminal in position. Where, however, the cell has its normal more or less columnar form, the nucleus is always distinctly terminal. The figures given by Bidder of the collar-cells of *Sycon compressum* &c. serve admirably to illustrate this point (Quart. Journ. Micr. Sci. n. s. vol. xxxviii. pl. ii.).

† Seen in *Lieberkühni* (Keller) and *variabilis*.

‡ I found the larva at Banyuls-sur-Mer in July of this year. It closely resembles the larvæ of *blanca* and *contorta*, scarcely differing from the latter except in size and shape.

from *coriacea* and its allies, we find ourselves confronted with three generic groups amongst the Ascons. The question at once arises, What are these three genera to be called? To decide the problem of their proper nomenclature we must shortly review the systematic history of the Ascons, noting the generic names that have been proposed in chronological order.

In 1786 Ellis and Solander* described the first-known Ascon under the name of *Spongia botryoides*.

In 1812 Montagu† described two more species—*Spongia complicata* and *S. coriacea*.

In 1828 Fleming‡ instituted the genus *Grantia* for calcareous sponges, the first species being *G. compressa*, Fabr., the second *G. botryoides*, under which he wrongly placed *complicata* as a synonym.

(At slightly later dates the names *Leucalia* and *Calci-spongia* were proposed by Grant and de Blainville respectively in the same sense as *Grantia*, but never obtained a place in the literature.)

In 1862 Schmidt§ described two new species (*Grantia Lieberkühnii* and *G. pulchra*) and instituted a new genus (*Nardoa*) for a third new species (*Nardoa reticulum*). But the name *Nardoa* had been used by Gray in 1840 for a genus of Asteroidea, and cannot therefore be employed for calcareous sponges.

In 1864 Bowerbank|| founded a new genus for Ascons—*Leucosolenia*—with *L. botryoides*, Ellis, as typespecies, *Grantia* being used for Sycons, with type *G. compressa*, Fabr.

In the same year O. Schmidt¶ described "*Grantia clathrus*," sp. n.

In 1866 Bowerbank** enumerated four species of his genus *Leucosolenia*—*L. botryoides*, *L. contorta*, sp. n., *L. lacunosa*, and *L. coriacea*.

In the same year Schmidt†† published a criticism of Bower-

* 'The Natural History of many curious and uncommon Zoophytes' (London), p. 190, tab. lviii. figs. 1-4.

† "An Essay on Sponges &c.," Mem. Wernerian Nat. Hist. Soc. vol. ii. pp. 89 et seq., pl. ix. figs. 2, 3.

‡ 'A History of British Animals' (Edinburgh, 1828), p. 525.

§ 'Die Spongien des adriatischen Meeres' (Leipzig, 1862), pp. 13-19, Taf. i. figs. 8-8 b.

|| 'A Monograph of the British Spongiadæ,' vol. i. (Ray Society), p. 164, figs. 347, 348.

¶ 'Spongien des adriatischen Meeres,' I. Supplement (Leipzig, 1864), p. 24, Taf. iii. figs. 3, 3 a.

** *Op. cit.* vol. ii. pp. 28-36.

†† *Op. cit.* II. Supplement, pp. 7, 8.

bank's genera and species of sponges. He retained the name *Leucosolenia* for "*Grantia botryoides* und ähnliche," while for the "massive Grantien" he maintains his own genus *Nardoa*. Thus he classifies the Ascons known to him as follows:—*Leucosolenia botryoides* and *pulchra**, *Nardoa lacunosa*, *reticulum*, and *spongiosa**, Kölliker.

In 1867 Gray † published a classification of calcareous sponges in which the Ascons were distributed among two genera:—(1) *Leucosolenia*, which was further divided into "arborescent" forms, as *L. botryoides*, "massive, *Nardoa*," as *L. contorta* and *L. lacunosa*, and "incrusting," as *L. coriacea*; (2) *Clathrina*, gen. nov., for *C. sulphurea*=*Grantia clathrus*, O. S. Had the author known *coriacea* in its "massive" forms and *clathrus* in its expanded condition, there can be no doubt he would have put them in his *Nardoa* group, and then his classification would have been practically the same as the one I propose here.

In 1868 Miklucho-Maclay ‡ described a new genus and species of Ascons—*Guancha blanca*.

In 1870 appeared Hæckel's confused and perplexing 'Prodromus' §, which, after what has been said above, need not detain us longer; and in 1872 he put forth || his well-known "natural system," in which the sponges we are here concerned with appeared under generic names as follows:—

- (1) *Ascetta coriacea*, *blanca*, *clathrus*, and *primordialis*,
sp. n.
- (2) *Ascortis lacunosa*.
- (3) *Ascaltis botryoides* and *cerebrum*, sp. n.
- (4) *Ascandra Lieberkühni*, *contorta*, *complicata*, *variabilis*,
sp. n., and *falcata*, sp. n.

In 1883 Polejaeff ¶ united all Ascons in Bowerbank's old genus *Leucosolenia*.

In 1891 von Lendenfeld ** tried to improve on Hæckel's scheme, with the following result:—

* *Pulchra*, O. S., and *spongiosa*, Kölliker, are doubtful species. The former is asserted by von Lendenfeld to be a synonym of *primordialis*, and *spongiosa* is doubtfully identified by Hæckel as *cerebrum*. It seems to me not improbable that *pulchra*, and perhaps *spongiosa* also, are synonyms of *coriacea*.

† "Notes on the Arrangement of Sponges, with the Description of some new Genera," Proc. Zool. Soc. 1867, pp. 553-558.

‡ "Beiträge zur Kenntniss der Spongien," Jen. Zeitschr. iv. pp. 221-232, Taf. iv., v.

§ *T. c. suprâ.*

¶ *Loc. cit.*

|| *T. c. suprâ.*

** *Loc. cit.*

- (1) *Ascetta primordialis*, *spinosa*, sp. n., *cerebrum*, *clathrus*, *blanca*, and *Gæthei*.
- (2) *Ascandra reticulum*, *Lieberkühni*, and *angulata*, sp. n., = *lacunosa*, Johnston.
- (3) *Homandra*, gen. nov., for *H. falcata*, H.

Other recent writers have followed, sometimes one, sometimes another of these many and various schemes of classification, though the majority incline to follow Polejaeff.

From the above summary it seems clear that—

(1) *Leucosolenia*, with type species *botryoides*, is the generic name which belongs to the second of my groups.

(2) The first of my groups, the group to which I have generally referred as the *coriacea* group, would claim as generic title the name *Nardoa* of Schmidt, with *reticulum* as type species, were not this name preoccupied in another class of the animal kingdom, and therefore inadmissible. The first of the names by which any member of this group was afterwards described must therefore be taken instead of *Nardoa*, which gives as generic name *Clathrina*, Gray, type species *C. clathrus*, O. S.

(3) *Falcata* was first described as *Ascandra falcata*, H. Since all other species of Hæckel's genus *Ascandra* are to be distributed among the genera *Clathrina* and *Leucosolenia*, it remains alone in the genus*, and therefore claims the name. Should any other species of *Ascandra* prove to have a prior claim to the name, then Lendenfeld's name *Homandra* would have to be used.

Hence my classification of the Ascons will run as follows:—

I. Genus CLATHRINA, Gray, 1867, emend.

The full-grown colony forms a system or systems of reticulate and anastomosing tubes, each system terminating in a cloaca-like osculum; incrusting, massive, or stalked. The principal spicules of the skeleton are equiangular triradiate systems, to which may be added sagittal triradiates in certain parts of the sponge, and monaxons. Collar-cells with nucleus at the base.

* Of the other species enumerated by Hæckel in his genus *Ascandra*, the species *cordata*, *densa*, and *panis* appear to be true *Clathrinas*, and the species *echinoides*, *sertularia*, *botrys*, *nitida*, and *pinus* are *Leucosolenias*. From the examination of type specimens in the collection of the Rev. A. M. Norman and elsewhere, types which were used by Hæckel for the preparation of his monograph, and named by him, I have the clearest evidence that *botrys*, and probably also *nitida*, are synonyms of *botryoides*, and *pinus* of *complicata*. It is probable that careful examination will prove many other of Hæckel's species to be equally unfounded.

To these diagnostic points we may add, as constant characters, so far as has been observed:—

Larva a parenchymella. First spicules to appear triradiate systems.

1. *Clathrina clathrus* (type species).
Grantia clathrus, Schmidt, 1864.
2. *Clathrina coriacea*.
Spongia coriacea, Montagu, 1812.
3. *Clathrina lacunosa*.
Grantia lacunosa, Johnston, 1842.
Syn.: *Ascandra angulata*, Lendenfeld, 1891.
4. *Clathrina reticulum*.
Nardoa reticulum, Schmidt, 1862.
5. *Clathrina contorta*.
Leucosolenia contorta, Bowerbank, 1866.
6. *Clathrina blanca*.
Guancha blanca, Miklucho-Maclay, 1868.
7. *Clathrina primordialis*.
Ascetta primordialis, Hæckel, 1872.
8. *Clathrina cerebrum*.
Ascaltis cerebrum, Hæckel, 1872.
9. *Clathrina spinosa*.
Ascetta spinosa, Lendenfeld, 1891.

II. GENUS LEUCOSOLENIA, Bowerbank, 1864.

The adult colony has the form of a cluster of relatively large erect oscular tubes, which send out numerous diverticula and are often arborescent, united typically by a more or less stolon-like system of finer tubes. Triradiate systems always sagittal. Collar-cells with nucleus at apex, close under the collar.

To this may be added, as probably constant characters:—

Larva an amphiblastula. First spicules to appear monaxons.

1. *Leucosolenia botryoides* (type species).
Spongia botryoides, Ellis and Solander, 1786.
Syn.: *Ascandra botrys*, Hæckel, 1872.
? *Ascandra nitida*, Hæckel, 1872.
2. *Leucosolenia complicata*.
Spongia complicata, Montagu, 1812.
Syn.: *Ascandra pinus*, Hæckel, 1872.
3. *Leucosolenia Lieberkühnii*.
Grantia Lieberkühnii, Schmidt, 1862.
4. *Leucosolenia variabilis*.
Ascandra variabilis, Hæckel, 1872.
Syn.: *Leuconia Somesii*, Bowerbank, 1874*.

* I have been able to examine in the British Museum the three specimens of "*Leuconia Somesii*" figured by Bowerbank on plate xci. figs. 6-8 of vol. iii. of his 'Monograph of the British Spongiadæ' (Ray Society, 1874). They are simply specimens of *Leucosolenia variabilis* in which the monaxons attain a great development, and their label bears on it, in

III. Genus ASCANDRA, Häckel, 1872, emend.

The full-grown colony has the form of a loose reticulum of tubes with numerous erect chimney-like oscula. The gastral layer thrown into folds, forming radial diverticula. All other characters as in *Clathrina*.

With one species :

Ascandra falcata, Häckel, 1872.

There remain many other known species of Ascons, as, for instance, the interesting forms from Australia described by Carter and Dendy, to which this classification must be fitted, either in its present or in a modified form, if it is to be rendered complete ; but, as I have already said above, I defer for the present any discussion as to their place in my system, handling here only those species with which I am familiar in the flesh. But the two interesting species which Häckel has described in his genus *Ascyssa* deserve a few passing remarks. They are peculiar for the fact that the skeleton consists only of monaxon spicules, thus reminding us of the stage which is transitory in *Leucosolenia variabilis*, and also, as Metschnikoff first pointed out, in *Sycon*.

It is remarkable that no naturalist since Häckel's time appears to have met with these sponges, a peculiarity which they share with many other striking forms of animal life discovered by Häckel. Considering the precise locality given by Häckel in the case of *Ascyssa troglodytes*, "on colonies . . . of *Astroides calycularis* . . . in the Blue Grotto of the Island of Capri . . . and in other caves of the island," and, further, his description of it as "small, delicate, brown tubes, which were seated, some singly, some together in clumps, on dead colonies of *Astroides*," it is astonishing that it should not have been found, so far as I am aware, up to the present by the energetic naturalists of the Zoological Station at Naples.

Carter's handwriting, the name "*Soleniscus variabilis*, H." The monaxons vary from minute to those of very large size, and the first specimen—fig. 6 of Bowerbank—is further remarkable for the great number of irregular triradiate spicules it contains. In fact, it might be said of this specimen that abnormality has become the rule, and regularity the exception, in respect to its triradiate spicules, and it appears to be from this specimen that Bowerbank took his figures of the spicules. Nevertheless enough regular triradiate systems can be found to characterize the sponge beyond all doubt, and the other two specimens are perfectly normal colonies of *variabilis*. In view of the fact that these specimens came originally from the Brighton Aquarium, it would be interesting to see how far the peculiarities of spiculation are due to life in the aquarium. Compare Bidder's account of "*Sycon raphanus*, var. *aquariensis*, nova," from the Naples Aquarium (Quart. Journ. Micr. Sci. n. s. xxxviii. p. 10).

Nevertheless it does not seem to me improbable that these forms should exist, and their relations to other Ascons would certainly prove of great interest. They probably occupy somewhat the same relation to the species of the genus *Leucosolenia* that the *Ascetta* forms of the genus *Clathrina* occupy to the remaining species: but in one respect they are probably much more primitive than any other Ascons; for if the monaxon spicules composing the skeleton are, like those of the young *variabilis*, secreted each by a cell of the flat external epithelium, then, since the layer of triradiate systems is absent, there should be no cells between the flat epithelium and the gastral collar-cell layer, except the wandering and genital cells—in other words, the so-called mesoderm might be expected to be practically entirely absent, and, if so, the two species of *Ascyssa* would be more primitive in structure than any other known Ascons.

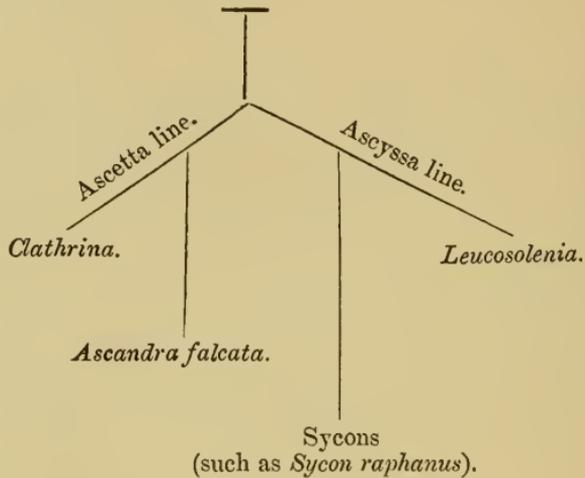
To predict is always dangerous; but I venture to believe that these *Ascyssa* species, if they exist, will prove on investigation to be on the *Leucosolenia* stem, so to speak, and will be found to have collar-cells with the nucleus in the upper portion and an amphiblastula larva, or, at least, a larva more resembling the amphiblastula than the parenchymella. Hæckel's figure of *Ascyssa acufera*, it may be noticed, shows a typical arborescent *Leucosolenia*-like colony*.

Ascandra falcata is an interesting form which has often been regarded as intermediate to a great extent between Ascons and Sycons. But this does not seem to be true, at least if we take as typical of the Sycons such a form as *Sycon raphanus*; for while *Ascandra falcata* is shown, by all its characters, to be distinctly on the *Clathrina* stem, *Sycon raphanus*, on the other hand, is plainly allied to the genus *Leucosolenia*; it is distinguished from the latter only by its form and mode of growth and by the restriction of the collar-cells to the radial tubes; but in all other characters it agrees with it, namely in the sagittal spicules, the collar-cells with terminal nucleus, the amphiblastula larva, and the transitory *Ascyssa* stage in the development. Bidder † has well pointed out the importance of the arrangement of the spicules in the radial diverticula of the oscular tubes of *Leucosolenia Lieberkühni*, an arrangement which shows plainly that in these diverticula the current is at first centripetal, so that they are strictly comparable, as long as they have not exceeded a certain length, to the radial tubes of a Sycon. The number

* Hæckel, 'Die Kalkschwämme,' Taf. vii. fig. 4.

† "Review of Dendy's 'Monograph of the Victorian Sponges,'" Q. uart. Journ. Micr. Sci. n. s. xxxii. (1891) p. 627.

of characters in which *Leucosolenia* approaches *Sycon* seem to me indubitable proof of their genetic relationship, just as the characters of *Ascandra falcata* show it to be on quite a different line. The relations of the genera can best be indicated by the graphic method as a genealogical tree:—



It seems to me an open question, however, whether there may not be amongst the Heterocœla—Sycons or Leucons—forms which are on the Ascetta line and which approach *Clathrina* or *Ascandra* in the same way that *Sycon raphanus* approaches *Leucosolenia*.

Oxford,
October 1896.

LIV.—On *Scolecithrix hibernica*, a new Species of Copepod, with some Remarks on the Distribution of the Crustacea. By ANDREW SCOTT, Fisheries Assistant, University College, Liverpool.

[Plates XVII. & XVIII.]

Description of the Species.—*Female.* Length, exclusive of caudal setæ, 1.2 millim. ($\frac{1}{20}$ inch). Body moderately robust; cephalothoracic segment large, nearly as long as the combined lengths of the remaining body-segments and abdomen; last segment of the body produced laterally on each side into spine-like processes. Antennules of moderate length, slender,