



Annals and Magazine of Natural History

Series 5

ISSN: 0374-5481 (Print) (Online) Journal homepage: <http://www.tandfonline.com/loi/tnah11>

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To cite this article: H.J. Carter F.R.S. (1885) XXVII.—Descriptions of sponges from the neighbourhood of Port Phillip Heads, South Australia, continued , Annals and Magazine of Natural History, 16:94, 277-294, DOI: [10.1080/00222938509459882](https://doi.org/10.1080/00222938509459882)

To link to this article: <http://dx.doi.org/10.1080/00222938509459882>



Published online: 09 Oct 2009.



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XXVII.—*Descriptions of Sponges from the Neighbourhood of Port Phillip Heads, South Australia, continued.* By H. J. CARTER, F.R.S. &c.

[Continued from vol. xv. p. 321.]

FOR ready reference I will also here insert a tabular view of my arrangement of the order RHAPHIDONEMA, as I shall take this (probably my last) opportunity of offering such revisionary remarks on it as my experience since it was published in 1875 seems to dictate. It is as follows :—

Order IV. RHAPHIDONEMA.

Families.	Groups.
1. <i>Chalinida</i>	{ 1. Digitata. 2. Palmata. 3. Reptata. 4. Spinifera. 5. Tubulodigitata. 6. Aculeata. 7. Subaculeata.
2. <i>Cavochalinida</i>	{ 8. Ciliata. 9. Bivalvata. 10. Compladata. 11. Plicata. 12. Solida.
3. <i>Acervochalinida</i>	{ 13. Clathrata. 14. Dictyalia.
4. <i>Pseudochalinida</i>	{ 15. Digitifera. 16. Fistulodigitata.

The diagnosis which I have given for this order—viz. “Possessing a skeleton composed of horny fibre with a core of proper spicules. Form of spicule chiefly simple acerate and chiefly confined to the interior of the fibre,”—is too short and indefinite to lead the student to the more useful or distinguishing characters of that kind of sponges which the order is intended to comprise, whose typical structure, to which I shall hereafter more particularly allude, may be taken from that of *Chalina polychotoma*, Esper. What this type is we learn from Johnston, who, with a specimen of the British species before him, identified it with Esper’s “*Spongia polychotoma*, tab. xxxvi.” (Johnston, Hist. Brit. Sponges, &c. p. 94, pl. iii.).

The name given by Johnston to this sponge is “*Halichondria oculata*,” which Dr. Bowerbank changed to “*Chalina oculata*” (Mon. Brit. Spongiadæ, vol. ii. p. 361), accompanied

by the statement that Dr. Grant, in his 'Tabular View of the Animal Kingdom' (1861, p. 76), had established the genus "*Chalina*" for sponges possessing the structure of Johnston's *Halichondria oculata* (Mon. vol. i. p. 209); so this is how we came by the term "*Chalina*."

But Johnston had previously identified his *foregoing* species, viz. *Halichondria palmata* (*op. cit.* p. 92, pl. ii. fig. 1), with Esper's *Spongia oculata*, "tab. i.," and also with Ellis's *Spongia palmata* (Ellis & Solander, p. 189, pl. lviii. fig. 6). Now all three of their illustrations represent the oscules as projecting (pustuliform) and scattered over the frond; while in Grant's illustration of *Spongia oculata* (Edinb. New Phil. Journ. 1826, vol. ii. p. 140, pl. ii. fig. 22), as well as in Johnston's *Halichondria oculata*, they are, as Johnston stated, "mostly disposed along the margin," that is on opposite sides of the cylindrical branch (*op. cit.* p. 95), which was probably the case in Esper's *Spongia polychotoma* (tab. xxxvi.), as they are not represented on the *surface* of the branches of his illustration. Hence it is evident that Esper's *Spongia oculata*, so far as appearance goes, is Johnston's *Halichondria palmata*.

But the latter is also stated by Johnston to be the "Mermaid's Glove" of the Shetlanders, which Bowerbank calls "*Isodictya palmata*" (Mon. vol. ii. p. 311, and vol. iii. pl. lii.), adding very properly to the simple skeletal acerate of this sponge in his illustration an equianchorate, which, on microscopic examination, I find to be so *peculiar* in shape, that the "flesh-spicule" in this instance becomes a distinguishing character, whereby I have been enabled to identify it with Johnston's *type* specimen of his *Halichondria palmata* in the British Museum*. Hence also Esper's *Spongia oculata* and Ellis's *Spongia palmata*, if they possessed this distinguishing character, become Dr. Bowerbank's "*Isodictya palmata*."

Be this as it may, however, the structure and skeletal spicule of Johnston's *type* specimen of *Halichondria palmata* are so like those of *Chalina polychotoma* that I have not hesitated, in opposition to Dr. Bowerbank's view, to change his generic term "*Halichondria*" to *Chalina palmata*, as may be seen by my description and illustration of the latter in the 'Annals' of 1882 (vol. x. p. 109, woodcut, fig. 1), where I have fully gone into the subject, therefore need not repeat any more of it here.

Why Johnston should have designated his sponge "*oculata*" after having identified it with Esper's "*polychotoma*" I am

* Schmidt's only instance of this is in the *inequianchorate* of his *Esperia sentinella* (Spong. Küste v. Algier, p. 30, Taf. v. fig. 11).

unable to conceive, unless he considered that both were only variations of the same sponge, which I think very likely, especially as the form of "*polychotoma*" very often runs into that of "*oculata*;" and Johnston himself, as before noticed, has placed them together, that is one after the other, in his 'British Sponges.' But then neither "*oculata*" nor "*polychotoma*" possesses a flesh-spicule, which *Chalina palmata* does, and Johnston did *not* know this; so something else must have influenced him in using this designation, probably the designation "*palmata*," which Ellis used for the sponge that Johnston considered to be his "*Halichondria palmata*;" still, as before stated, unless it could be proved that Ellis's sponge contained the *peculiarly* formed anchorate to which I have alluded, it is quite as likely, as just stated, that his sponge was a mere variety in form of *Chalina polychotoma*.

So much for confusion in nomenclature when names are based on mere resemblances; but it should be remembered that all this took place before the achromatic microscope had been invented, after which distinctions on minute differences which then came into view were rendered comparatively easy. We know, however, now that Johnston's *Halichondria palmata* differs in possessing the peculiarly-formed anchorate, to which I have above alluded, from all the other Chalinida, and that the species is identical with the "Mermaid's Glove."

The chief distinguishing characters of the order RHAPHIDONEMA, in addition to the diagnosis above mentioned, are their easily yielding to pressure and corresponding resiliency, from the keratose element of the fibre predominating, the spicular element more or less scanty, the structure loose, and, as Ellis noticed in 1786 (*op. cit.* p. 185), "the gelatinous part of the flesh [the sarcode] is so tender that when it is taken out of the water it soon dries away." In structure the deeper part is generally less dense than the circumference, which is also generally the opposite in the following order, viz. the ECHINONEMA; hence the former are for the most part easily compressible, while the latter are generally much less so, and often even absolutely hard. In spiculation there is generally only one form of spicule, and that is the simple or commonest form of acerate, viz. smooth, curved, fusiform, and sharp at both ends; while in the ECHINONEMA there is generally *more* than one form, of which one is generally acuate, that is an acerate with one end obtuse. In the RHAPHIDONEMA the skeletal is seldom accompanied by a flesh-spicule, while in the ECHINONEMA it is seldom without one. The spicule in the RHAPHIDONEMA is generally confined to the fibre, hence its

comparatively smooth surface ; while in the ECHINONEMA, as the name indicates, more or less of the pointed end always extends beyond it, echinatingly or in tufts. The oscules or vents are conspicuous in the RHAPHIDONEMA, while in the ECHINONEMA they are generally inconspicuous, from the excretory systems in the latter being generally smaller and thus more numerous, in accordance with their greater density of structure.

Thus I have contrasted the RHAPHIDONEMA with the ECHINONEMA because in many instances their forms otherwise are so much alike ; but the structural characters of the RHAPHIDONEMA run throughout the order so uninterruptedly that, different as the forms may be (which have chiefly led to the grouping), they will be found to be so constant that, although the order contains a number of species, they may easily be found out under the arrangement I have made, which, for the same reason, requires very little revisionary remark.

When I inserted the group "Palmata," which is the second on the list, I had not seen Bowerbank's specimen of the "Mermaid's Glove," now in the British Museum, nor had I identified it with Johnston's type specimen of *Halichondria palmata* there, by finding that the latter possessed the same peculiar form of anchorate ; so for the present this group can be considered to be represented by only one species, viz. *Chalina palmata*.

There are three other forms, in all of which the skeletal acerate is accompanied by the same kind of equianchorate flesh-spicule ; but this is of the common navicular shape, and all come from the neighbourhood of the Cape of Good Hope, as will be more particularly noticed hereafter.

Of the groups in the third family, viz. the Acervochalinida, I can state nothing decisive, excepting that there *are* solid forms of RHAPHIDONEMA, but their massive condition, aided only by the characters afforded by their structure and spiculation, so far have not enabled me to identify one in particular ; while the "footnote" to the group "Dictyalia" in my classification (*op. et loc. cit.* p. 143), whose purport is as follows, adds still more to the difficulties, viz. :—"In some instances the predominance of the keratine element in the RHAPHIDONEMA is exchanged for the predominance of the spicular one in the order HOLORHAPHIDOTA, when the same species must be placed in one or the other, as the case may be, while the group 'Isodictyosa' in the latter chiefly offers the species with which those of the RHAPHIDONEMA are most likely to be confounded." But such difficulties are inseparable from a classification made by man to aid his memory, and which nature ignores !

Thus, while the facts may be still fresh in the memory of those who have read my report on the collection of marine sponges from Japan &c. ('Annals,' 1885, vol. xv. p. 387), it might be observed that the polychotomous *Chalina* there referred to (p. 402), although possessing the same form of spicule as a similar species from the Mauritius, is a *bonâ fide* solid, branched, and stipitate Chalinoid form characteristic of my group "Digitata," while that from the Mauritius is an Isodictyal Chalinoid form, in which the skeletal spicule is not only larger, *but accompanied by a minute acerate flesh-spicule*. Hence, while the latter retains the proposed designation, viz. "*mauritiana*," the former, for distinction's sake, might be designated "*japonica*." (This, however, must be considered as an *ex post facto* statement, since I was not made aware of the presence of the flesh-spicule until after I had first written the passages to which I have referred.)

Now the Mauritius specimen (that Mr. B. W. Priest kindly submitted for my examination, which, with a true *Chalina*-like form, consisted only of a fragment about 3 inches long and half an inch in diameter), presents on one side a flat surface by which it had adhered to a mass of *Nullipore* on which it had been growing; and thus the specimen bears the same relation in this respect to a solid, digitate, erect *Chalina* of the British seas, that is *C. polychotoma*, that the latter does to our British *Halichondria simulans*, Johnston (pl. viii.), = *Isodictya simulans*, Bk. (Mon. vol. iii. pl. li. figs. 5 and 6), which, although occasionally rising up more or less into a *Chalina*-like branched stem, as frequently creeps in this form over the surface of the rocks on which it may be growing (see Johnston's illustrations, *l. c.*); but in the Mauritius specimen, as before stated, the skeletal is accompanied by a flesh-spicule. In short the spiculation of the Mauritius specimen consists of a large sausage-like form with several smaller ones in various stages of development chiefly about the angles of its reticulated structure; and a minute, sharp-pointed, fusiform, acerate flesh-spicule, chiefly arranged like a row of swallows on a telegraph-wire, along the course of the large spicule or spicular reticulation; while also, as before stated, the Japan specimen only presents *one* form, viz. the sausage-shaped one, which is much smaller, as may be seen by my illustrations ('Annals,' *l. c.* pl. xiv. figs. 12 and 13).

Again, in Dr. Bowerbank's representations of his *Chalina oculata* (Mon. vol. iii. pl. lxvi.) and that of his "*Isodictya varians*" (*ib.* pl. lxxxviii.), the former from a specimen from the open sea in the English Channel off Hastings, and the latter from one from the mouth or estuary of the Mersey at

Liverpool, close to the entrance of a *freshwater* tributary, the only difference that I can see, for I have specimens of both in my possession, amounts to the simple modification that arises from a predominance of keratine, whereby the open-sea specimen is tougher and more resilient than the estuary one, which, being the reverse, is softer and more fragile, the spicules being much the same in size and shape in both.

How far the general form and the sausage-shaped spicule of the freshwater sponge *Uruguaya corallioides*, Bk., which equally agrees in these respects with both *Chalina japonica* and *Chalina mauritiana*, may favour the view of those who would refer *Uruguaya* to a marine origin, I am not able to say; or to come to the conclusion of Dr. W. Dybowski that, because *Lubomirskia baicalensis*, viz. the solid, caulescent, branched, chaliniform freshwater sponge of Lake Baikal, in Central Asia, is identical in general structure and in the form and nature of its spicule with a similar but *marine* one which his brother sent him from the shores of Behring's Island, in the Kamtschatka Sea,—the former is necessarily the latter living in fresh water (“Die Behringsschwämme weichen weder in ihrer Struktur noch in der Gestalt und Beschaffenheit der Spiculen von denen der Baikalschen Exemplare ab, so dass alle diese, obgleich aus so sehr verschiedenen Fundorten herkommenden Schwämme, als vollkommen identisch anzusehen sind,” Sitzungsbericht d. Dorpater Naturforscher-Gesellschaft, Jahrg. 1884, p. 45), although geologically considered it is as easy to infer that the sea, when receding from the interior of continents, might have left saltwater lakes there, which have become as fresh as the marine formations beside them, in which there is now not a particle of salt left. But as yet, if neither *Uruguaya* nor *Lubomirskia baicalensis* has been found to possess statoblasts, so neither have they been found in an ovigerous condition—conditions, especially of the latter, which can *only* be maintained for home-demonstration by being at once preserved in some aqueous medium, such as spirit and water; *i. e.* on the spot.

I have entered more at length into this subject here than I had an opportunity of doing in my report on the Japan sponges, chiefly because the Mauritius sponge is, according to my view, a *Chalina* (*C. mauritiana*), and its spiculation so peculiar that it is deserving of special mention.

Lastly, for my observations on the fourth or concluding family of the order RHAPHIDONEMA, viz. the Pseudochalinida, I must refer the reader to the species described in the ‘Annals’ of 1882 (vol. ix. p. 280), and 1885 (vol. xv. p. 319).

Returning to the first family, viz. the Chalinida, it might be observed that this was, as before noticed, the name given by Dr. Grant to the third order of his PORIFERA (Tab. View An. Kingdom, 1861, p. 76, Walton and Maberly) for the purpose of including sponges "possessing the structure of Johnston's *Halichondria oculata*," which is our *Chalina polychotoma* = *Spongia polychotoma*, Esper, = *Chalina oculata*, Bk.; and it may also be observed in the "Key to my Classification of the Spongida" (*Op. et loc. cit.* p. 193) that I have given this as the *type* of group No. 1, viz. the "Digitata," whose "typical structure," to which I have before alluded only in a general way, may be more particularly stated as follows:—"A stipitate bunch of caulescent cylindrical stalks, more or less ramosely dividing dichotomously and polychotomously, more or less interuniting on their way to their termination in rounded ends. Easily yielding to pressure, but still very resilient. Colour, when dry, light sponge-yellow, often retaining traces of purple, which appears to be its original colour, at all events in many instances. Surface uniformly smooth, which is not the case in the ECHINONEMA. Vents chiefly in single lines, opposite to each other, on each side of the cylindrical stalk. Structure internally open, where the sarcode, which is very thin (as Ellis noticed), has disappeared, as is usually the case in dried specimens; more compact towards the surface, where the dermal structure is finer and closer than that which is below it. Fibre predominantly keratose; spicule acerate, curved, fusiform, smooth, sharp-pointed, variable in size, which is chiefly small, often minute. General form also variable."

As regards the latter character, viz. the variability in form, I cannot do better than refer the reader to Miklucho-Maclay's paper (*Mém. de l'Acad. de St. Pétersb.* vii. s. t. xv. no. 3, 1870) on the varieties of his "*Veluspa polymorpha*," which is an estuary specimen of *Chalina polymorpha*, as may be seen by reference to the typical form (Taf. i. fig. 1), among which the Baikal freshwater sponge *Lubomirskia baikalensis*, Pallas, is introduced as No. 11 (Taf. i. fig. 5).

This brings us to the consideration of the specimens of RHAPHIDONEMA in Mr. Wilson's collection from the neighbourhood of Port Phillip Heads, Victoria Col., S. Australia, which, although very numerous, belong to only three groups: viz. the Digitata, the Tubulodigitata, and the Bivalvata respectively, but mostly to the first, under which *Chalina polychotoma* and its varieties will presently be mentioned, followed by a single species of Tubulodigitata and the same of

Bivalvata. In all the spicule is of the same form, viz. acerate, smooth, curved, fusiform, and sharp-pointed, but for the most part very small and often minute, *i. e.* not exceeding 7-6000ths in. in length, with almost immeasurable thinness, combined with great thickness of keratine in the fibre, which, as before stated, leads to great toughness and resiliency. In my British specimens of *Chalina polychotoma*, obtained from the English Channel opposite this place (Budleigh-Salterton), the spicule is about 30 by $2\frac{1}{4}$ -6000ths inch in its greatest dimensions.

Fam. 1. Chalinida.

“*Char.* Digitations solid, vertical or procumbent.”

Group 1. DIGITATA.

Chalina polychotoma, Esper.

Of this species in Mr. Wilson's collection there are several specimens, whose characters having already been mentioned, need not be repeated here. Largest specimen 2 feet long. Depth not mentioned. Neither the colour when fresh nor the depth of the dried specimens is stated.

Chalina polychotoma, var. *trichotoma*.

Described in the ‘Annals’ for 1885 (vol. xv. p. 115). This variety only differs from the foregoing in most of the ends of the branches being more or less expanded and trichotomously divided. 19 inches long. Presented to the British Museum in the name of J. Bracebridge Wilson, Esq., M.A., F.L.S. Dried specimen.

Chalina polychotoma, var. *compressa*.

Where the stem becomes more or less expanded and compressed at the commencement of the branches, or where the latter becomes expanded towards their ends spatuliform (*spatulata*). Vents scattered over the expanded portions, chiefly on one side, comparatively small and not projected. Two wet specimens:—viz. 1, wholly compressed; colour, when fresh, “purple-slate;” $5\frac{1}{2}$ in. long. 2, subcompressed; colour, when fresh, “pale buff-brown;” 13 in. long. Depth of both 19 fath.

Chalina polychotoma, var. *oculata*.

Stems thick, more or less irregular in form, *i. e.* more or less irregularly expanded and united together in their whole length, flabelliform, proliferous. Colour dark-brown reddish.

Surface smooth. Vents large, circular, projected pustuliformly, scattered over the surface generally, or, where the branch is expanded, chiefly on one side.

Obs. Here I should be inclined to place Esper's *Spongia oculata* (tab. i.) and Ellis's *Spongia palmata* (tab. lviii. fig. 6), if, as before stated, they were not possessed of the peculiar anchorate of *Chalina palmata*, Johnston.

Chalina polychotoma, var. *robusta*.

In which the stems are few, thick, and large, with smallish vents on one side chiefly. Wet specimen. Colour, when fresh, "orange-buff." 11 in. long.

Depth 20 fath.

Chalina polychotoma, var. *angulata*.

Stem nodosely angulated, zigzag instead of being uniformly cylindrical; presenting a knotted appearance, in which the nodose portion may be slightly prolonged branch-like on each side, so as to give the stem an alternately jointed zigzag aspect. Colour dark black-brown on the surface, light brown interiorly, or light brown throughout. Surface soft, velvety from the fineness and compactness of the dermal tissue. Vents of two sizes, large and small, scattered over the nodose portions irregularly. Fibre and structure finer and more compact than in *C. polychotoma*, accompanied by more remains of the sarcode. Size of largest specimen, which is wet, 15 in. long. Colour, when fresh, not given.

Depth 19 fath.

Chalina polychotoma, var. *moniliformis*.

Stems successively inflated more or less regularly. Colour light brown. Surface velvety. Vents scattered over the bullate inflations. Texture, *i. e.* the fibre and structure, as in the foregoing variety, viz. "*angulata*."

Obs. This comes in as a sequence of very common occurrence, but not represented in Mr. Wilson's collection, although there are several large specimens in the British Museum which come from the south coast of Australia.

I have briefly enumerated these varieties in form, not only because they are chiefly present in Mr. Wilson's collection, but still more because they are of general occurrence: that is, the stalks, originally smooth and cylindrical in the typical form, viz. *Chalina polychotoma*, may become partially flattened; then expanded and more or less united laterally either at the com-

mencement or at the extremities ; then expanded and united generally into a flabellate more or less proliferous plane ; lastly, jagged or irregularly moniliform ; while the vents may be comparatively small and linearly arranged opposite to each other on the cylindrical branch in the typical species, scattered in the compressed forms, and projected pustuliformly in the oculate specimens. The colour may vary from light sponge-yellow to dark sponge-brown, more or less mixed with red, and often to reddish purple ; but, of course, this is useless for specific distinction.

Fam. 3. Cavochoalinida.

“Tubular, vasiform, aculeated, patulous or compressed flabellately ; plane and frondose or dactylloid.”

Group 3. TUBULODIGITATA.

Patuloscula procumbens, Carter (‘Annals,’ 1882, vol. ix. p. 365).

Short, thick, thumb-shaped, cylindrical, bullate, hollow, erect processes, growing side by side on a common expanded base, spreading in a branched form horizontally. Consistence resilient. Colour, when fresh, “purple-slate,” now sponge-yellow brown. Vent terminal, cloacal, circular at the end of the process, contracted, but still enormously large. Spicule acerate, as before. Size of specimens, of which there are two, varying from 2 to 6 in. high, and 6 × 4 horizontally.

Depth 7 to 14 fath.

Obs. This is also a West-Indian sponge and appears to have been noticed and illustrated by De Fonbressin and Michelotti under the name of “*Callyspongia bullata*” (‘Spongiaires de la mer Caraïbe,’ Harlem, 1864, p. 56, pl. x. fig. 5). I have already given the name to some beautiful specimens of it, brought home from the West Indies by the Rev. H. H. Higgins, now in the Liverpool Museum, in one of which the bullate processes, successively inflated, are extended upwards separately for 3 or 4 inches. A specimen of these was also presented to the British Museum in the month of March 1877. It is not the *Spongia bullata* of Lamarck = *Sp. tubulosa*, Esper, tab. 54, since the vents here are *ciliated*, as D. et M. have noticed, which allies it to their genus “*Tuba*,” that is typical of our groups Aculeata &c. (see my “Classification,” l. c. “Key,” p. 194 ; and for the genus “*Tuba*,” generally, ‘Annals,’ 1882, vol. ix. p. 277 *et seq.*, West Indian and Acapulco sponges).

Patuloscula procumbens, var. *flabelliformis*.

In this variety the successively dilated bullate tubes or

processes, which are very long comparatively, are united laterally throughout into a fan-shaped form, rising from a single stem, the large circular vents being arranged serially on the margin. Largest specimen about 8 in. high by 8×1 in. horizontally. Colour, when fresh, "buff-grey."

Depth 20 fath.

Group 9. BIVALVATA.

Cavochalina bilamellata, Lam.

Stipitate, placentiform, doubled up like a bivalved shell with a stem, *i. e.* vasiform compressed; infundibular below as the head approaches the stem, which is long and hard, ending in a root-like expansion, expanding, in the contrary direction, into a flabelliform bilamellar head above. Consistence leathery. Colour, when fresh, "pale pinkish brown," now mouse-brown. Surface externally wrinkled, rugosely reticulated in high relief, nodose; inside even, smooth, concentrically lineated. Vents small, scattered over the inner surface. Structure compact, fine, composed of short-jointed keratose fibre, scantily charged with the usual form of small spicule, viz. acerate, smooth, curved, fusiform, sharp-pointed, about 14 by $\frac{2}{3}$ -6000ths in. in its greatest dimensions. Size very variable, apparently increasing with the age of the specimen; the largest, of which there are several dry, but only one wet specimen, about a foot each way, including the stem, which may be 3 or 4 in. long, with a thickness of the head towards the stem about one inch where the nodular excrescences are most prominent, becoming gradually thinner in the opposite direction, that is towards the border, where the nodular processes ceasing leave a narrow smooth strip about one sixth of an inch in thickness.

Depth 19 fath.

Hab. Marine.

Loc. Port Phillip Heads, south coast of Australia.

Obs. This seems to me to be the species briefly described by Lamarck (1st ed. t. ii. p. 366, no. 61), so I have given it his designation. There are several dry specimens in Mr. Wilson's collection, but only one wet one. From the great number which I have seen it must be very plentiful under all forms on the south coast of Australia, but all modifications of that above mentioned; whilst its leathery imperishable nature and great toughness arising from the quantity of keratine in the composition of its fibre, scanty and small spiculation, and compact structure, render it as durable almost as the sole of a shoe. It is subject to considerable variety in form, being

sometimes expanded horizontally and proliferously foliated or cabbage-like.

Group 11. P_LICATA.

Although not in Mr. Wilson's collection, but coming from hard by, viz. the neighbourhood of the Cape of Good Hope, and therefore probably represented on the south coast of Australia, I would here insert the following description of the specimen, which is intended to typically illustrate the species for which this group was instituted, as although promised in my Classification, it has not hitherto been given.

Textiliforma foliata.

Large mass of cloth-like, flat, very thin and expanded frondose portions, rising from a contracted short stem, apparently independent of each other, but, in fact, all continuous, although so interfolded and deeply indented at the margin as to present a plurality of separate dissepiments; or, in a large, single, semicircular, stipitate, frondose form, more or less proliferous. Consistence firm, resilient. Colour, now in its dried state, pale yellow-brown, with traces of the original sarcode, which was purple. Surface uniformly even on both sides. Vents, in little groups, petaloid, rosette-like, scattered plentifully over the surface; each group about 1-24th in. in diameter and 1-12th in. apart; but while confined to one surface only this depends upon the position of the fold, so that on one part they may be on one side and on the other on the other; hence they are in patches, that is not continuous throughout the same side of the frond, in the interfolded or plicate form; while, of course, in the other form, where there is no plication, they are all on one side. Internal structure compact, tough, formed of short-jointed keratose fibre charged with the usual form of acerate spicule internally, and surrounded by sarcode equally charged with the same spicule together with a number of equianchorates or flesh-spicules. Skeletal spicule curved, smooth, fusiform, sharp-pointed, about 28- by 2½-6000ths in. in its greatest dimensions. Flesh-spicule, a navicular shaped equianchorate with rather obtuse ends when viewed in front, about 6-6000ths in. long. Size of largest specimen 17 in. high by 12 in. broad; wall of the frond or lamina ⅓ in. thick.

Hab. Marine.

Loc. Cape of Good Hope and its neighbourhood.

Obs. There are several specimens of this sponge in the British Museum (all dry, of course); viz. No. 60, registered 71. 5. 12. 1, &c. from Port Elizabeth; and No. 509, registered 40. 9. 28. 27, from "the Cape;" together with two other

forms from "the Cape," presenting a similar structure and spiculation, viz. *Chalina compressa*, which has already been described in the 'Annals' of 1882 (vol. x. p. 112), and might be relegated to the group "Palmata" for the present, as representing the "Mermaid's glove" at the Cape; and a third, which from its form might be relegated to the "Digitata" and termed "*Chalina polychotoma*, var. *anchorata*," as its skeletal acerate is also accompanied by an equianchorate flesh-spicule; but in the two latter the navicular anchorate is pointed at the ends instead of being round or obtuse; although in all three instances belonging to that kind which from its boat- or shuttle-like shape I have termed navicular.

These are the specimens from the "neighbourhood of the Cape of Good Hope" to which I have alluded, at p. 280, as possessing the same kind of naviculiform anchorate.

Ovigerous Specimens.

In the ovigerous specimens, of which there are a great many in Mr. Wilson's collection, not only of the RHAPHIDONEMA, but of all the other orders, the form and position of the ova remain; but the same astringent effect of the spirit which has kept them thus has contracted their *contents* into a cheesy consistence which defies all attempt at further elucidation. In short, to do anything with the soft parts of a sponge in the microscopical or more *minute* way it is absolutely necessary to examine them immediately after they have been taken from their native habitats, that is while they are living. Much may be done by putting them into spirit and water at once and examining them a few days after they have been thus preserved; but the longer they remain after this the more these parts become chemically altered by the methylated spirit and rendered unfit for anything but a display of the larger parts of which they are composed, from the change especially in the contents of the ova and the sperm-cells, to which I have above alluded; and the development of calcareous crystallizations in the general tissue.

Order V. ECHINONEMA.

For the reasons above mentioned I shall also insert here a tabular view of my arrangement of this order in 1875 (*op. et loc. cit.*), viz. :—

Families.	Groups.
1. <i>Ectyonida</i>	{ 1. Pluriformia. 2. Plumohalichondrina. 3. Microcionina. 4. Echinoclathrata. 5. Baculifera.
2. <i>Axinellida</i>	{ 6. Multiformia. 7. Durissima.

And here I would observe that this order is by far the most difficult of any that I have had to contend with; not so much probably in the first family, viz. the Ectyonida, as in the second, viz. the Axinellida; hence in both they are headed with a group *provisionally* named, which has thus been indefinitely given for the purpose of enabling the spongiologist to supply its place with a plurality of groups that of course must vary in amount, name, and description as more extended observation may dictate, which, judging from the enormous number of species and varieties from all parts of the world, represented by the dried and beach-specimens in the collection of the British Museum, almost tempts one to exclaim, "Where is this to end?" and as one species so often resembles another in one or more points, to ask "What character is there in one species which is not to be found in another?" But probably similar observations were made at the commencement of the study of conchology &c.; still it seems to me certain that, as in other branches of natural history, the class, orders, and families may be restricted to a few simple characters for leading to the groups and genera, but *nothing but a combination of characters* will lead the student to the *species*, which is the great thing after all, and those it is desirable, for practical purposes, to limit as much as possible to what can be seen with the commonest microscope, otherwise the distinctions become one for the rich man only who has plenty of leisure and can easily afford to purchase a fine instrument; which, of course, is also desirable; but then this cannot be for the many, but for the scientific, or, as it may be termed, *esoteric* few. Hence "equality" is as utopian, as *inequality* is absolutely necessary for progress in all human affairs. Such knowledge can only come to the poor *through* the rich.

The diagnosis of the order ECHINONEMA, viz. :—"Possessing a skeleton composed of horny fibre cored with proper spicules internally and echinated with proper spicules externally. Form of spicules chiefly acuate," so far as the first family, viz. the Ectyonida, goes, cannot be more practically

useful, for I know of no exception to it. But it does not apply so satisfactorily to the second family, viz. the Axinellida; neither does the special diagnosis of *this* family, viz.:—"Echinated with proper spicules projecting from the *interior* of the fibre," suffice for all, since it may be the case to a certain extent with species of the RHAPHIDONEMA; but by adding the words:—"Structure increasing in density *inwards* or towards the first-formed parts, that is the axis," which for the most part is a *peculiarity* common to the whole order, although not needed in the diagnosis of the first family, that of the second family is rendered almost equally useful.

It will be observed by referring to the above "table" that each of the families commences with a "group," whose name etymologically has the same signification, viz. "Pluriformia" and "Multiformia," which, as before stated, were *provisionally* instituted, because the specimens which appeared to belong to them respectively were at the time of classification so numerous as to be quite overwhelming; therefore all that I could do under the circumstances, that is with little or no literature for my guidance, was to keep them together, as I have before observed of the Psammonemata, under the families mentioned, for subsequent division into groups when their species, by individual description from undried and entire specimens, should be typically determined. It was this to which my dear old friend Dr. J. E. Gray alluded when he said:—"The greatest contributor to our knowledge and advancement of spongiology in its present state will be he who correctly describes and illustrates most species."

Fam. 1. Ectyonida.

Group 1. PLURIFORMIA.

In the "key" to my classification (*l. c.* p. 195) I have given the names of several kinds of sponges which I then thought might become types of the subdivisions of this group, and during the last ten years which have elapsed since that was published I have occasionally been able to substantiate it thus:—"Ectyon sparsus" has led to the formation of the group "Ectyonina" or "Ectyones" ('Annals,' 1883, vol. xii. p. 310, &c.); "*Echinonema typicum*" to one for which I would propose the name of "Echinonematina" (*ib.* 1881, vol. vii. p. 378, &c.); "*Dictyocylinndrus ramosus*, Bk.," &c. to that of "Dictyocylinndrina" (*ib.* 1879, vol. iii. p. 295); and "*Spongia muricata*, Pallas, = *Trikentrion muricatum*, Ehlers,"

to that of the group "Trichentrionina" (*ib.* 1879, vol. iii. p. 293, &c.).

Groups 2, 3, and 4 of the Ectyonida, viz. Plumohalichondrina, Microcionina, and Echinoclathrata, I must leave as they are, merely observing that "*Halichondria seriata*," Johnston, = *Ophlitospongia* (olim *Chalina*) *seriata*, Bk., unfortunately does not illustrate the group *etymologically*, on account of being solid instead of clathrate; but then it was, as it is now, the only species of the group that had been publicly described, so that I had no option, but will now endeavour to supply this apparent discrepancy by adding the description of a dried foreign species, equally remarkable for its clathrate character, which is solidly *cellular* throughout rather than *simply* solid, and thus resembles the nidamental mass of a whelk or a bee's honeycomb rather than a sponge:—

Echinoclathria favus, n. sp.

Massive, lobed, sessile or contracted towards the base, or divided digitately from this upwards into a bunch of coalescent cylindrical stems, dichotomously and polychotomously branched, like a digitate *Chalina*. Consistence now in its dried state soft and resilient. Colour reddish brown or yellowish. Surface even. Structure composed of a thin fibro-reticulate lamina, continuous in itself, but partitionally separating vermicular cavities, which are equally continuous throughout, thus producing a uniformly clathrous mass which, on the surface, presents a honeycomb appearance, in which the cells, which are irregular in outline, are about 3-12ths in. in diameter more or less. Fibre both cored and echinated with proper spicules. Core- or skeletal spicule very thin, subpin-like, smooth, fusiform, constricted towards the head, about 45-6000ths in. long. Echinating spicule smooth, also subpin-like, fusiform, and constricted towards the head, which is less in diameter than the shaft, about 15 by 1½-6000ths in. in its greatest dimensions. Size of specimens variable.

Hab. Marine.

Loc. South coast of Australia.

Obs. This sponge is so striking in its honeycomb algaoid appearance and soft though resilient consistence that it can hardly be mistaken for any other excepting the *areniferous* variety of the same sponge, which will be described hereafter in the new family which I propose to call "Pseudoechinonemida."

There are several specimens of it in the British Museum, mostly under 4 inches in their greatest diameter, of which nos. 554 and 555, each registered 59. 10. 7. 106, may be

mentioned as massive forms, and no. "208 bis," registered 37. 5. 13. 36 &c., as more or less digitate forms somewhat like those of *Chalina polychotoma*; so that it appears to be by no means common, although it is so remarkable in structure.

Again, in group 5, viz. the Baculifera, the echinating spicule is not spined, but its hammer-shaped or crutch-like head is imbedded in the surface of the fibre, together with a like form in its interior, which, combined with its cork-like consistence, unmistakably defines this type.

HIGGINSINA, new group.

Lastly, to this family I must add the group above mentioned, viz. "Higginsina," for sponges in which the apparent analogue of the spined echinating spicule is not club-shaped, but acerate, that is fusiform and sharp-pointed, and *not* echinating, but *loose* in the tissue; for a typical species of which I must refer the reader to the West-Indian sponge "*Higginsia coralloides*" and its varieties described and illustrated by Mr. Thomas H. Higgin, F.L.S., in the 'Annals' for 1877 (vol. xix. p. 291 &c. pl. xiv. figs. 1-5). Called after the Rev. H. H. Higgins.

To this I will add the following description of a Cape variety of this sponge, in which the *unattached* position of the echinating spicule is not so evident, and an *acute* is added to the acerate skeletal spicule.

Higginsia coralloides, var. *natalensis*, n. var.

Flabelliform, erect, stipitate, ridged on each side profusely; ridges thin, ragged, and in strong relief, radiating and branching from the stem to the circumference. Consistence tough, firm, in the dry state, with hard inspissated sarcode and compact structure. Colour orange. Surface uneven, hispid. Spicules of three forms, viz.:—1, skeletal, thick, smooth acute, 70 by 3-1800ths in. in its greatest dimensions; 2, subskeletal, thin, smooth acerate, about 50 by $\frac{1}{2}$ -1800ths in.; 3, echinating spicule, a spinous acerate rather bent than curved in the centre, about 8 by $\frac{1}{2}$ -1800th; no. 1 is arranged in tufts surrounded by no. 2 in great numbers, among which is no. 3, all projecting outwardly, as they successively and together emanate from the fibre. Size variable, the largest specimen $5\frac{1}{2}$ in. broad by $2\frac{1}{2}$ in. high.

Hab. Marine.

Loc. Port Elizabeth, Cape of Good Hope.

Obs. Of this species, whose spiculation is somewhat diffe-

rent, although evidently belonging to the genus *Higginsia* in other respects, there are several dry specimens in the British Museum, of which No. 18 is the largest. No. 40 is an elkhorn-shaped, rat-tailed, flat, branched variety, and Nos. 16, 17, and 19, all more or less like that above described, and all registered 71. 5. 12. 1 &c.

Gen. obs. In many of the Ectyonida there are flesh-spicules, viz. equianchorates, bihamates, or tricurvates, and these may be alone or combined. The anchorate is generally of that kind termed navicular from its boat-like form, *i. e.* sharp at each end; the bihamate a small simple C- or S-shaped one; and the tricurvate also small and simple. In one instance, however, the anchorate is "angulate," that is, the shaft is bow-shaped and turned up at the ends (see Bowerbank's illustration, Mon. Brit. Spong. vol. i. pl. vi. fig. 143), characterizing the Plumohalichondrina; but in the rest the flesh-spicules do not seem to be of much specific value, on account of the sameness of their form. One more observation I would add here, viz. that the curve of the acuate skeletal spicule in the ECHINONEMA is so generally on one side the middle, and towards the obtuse end, that when I see this I feel almost confident that the sponge from which it came belongs to this order.

[To be continued.]

XXVIII.—*Remarks on a Paper by Prof. E. D. Cope on the Reptiles of the Province Rio Grande do Sul, Brazil.* By G. A. BOULENGER.

PROF. COPE'S "Twelfth Contribution to the Herpetology of Tropical America"* contains a list of Reptiles and Batrachians from the Province Rio Grande do Sul, collected by the "Naturalist Brazilian Exploring Expedition." Having lately been engaged in naming large series of specimens from the same country, transmitted to the Natural-History Museum by the zealous Dr. H. von Ihering, and which have afforded material for several contributions published in these 'Annals'†, I am able to present a few critical remarks on Prof. Cope's identifications and new species. Besides, the nomenclature adopted by the American herpetologist differs in so many

* Proc. Amer. Phil. Soc. xxii. pp. 167-194; April 1885.

† March, April, and August numbers, 1885.