

XXX THE FRESHWATER SPONGES OF THE MALABAR ZONE.

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent of the
Indian Museum.*

The Malabar Zone is defined as consisting of the narrow strip of land on the west coast of Peninsular India between the Western Ghats and the Arabian Sea and of the Western Ghats themselves from the Tapti River in the northern part of Bombay proper to the extreme south of the Peninsula at Cape Comorin. The Western Ghats are a mountain-range (or rather a somewhat interrupted series of ranges) about 800 miles long and occupying in Peninsular India somewhat the same position as the Andes do in South America. They have not, however, anything like the same relative importance from a geographical point of view, for as a whole they cannot be reckoned among the higher ranges of the Indian Empire and they become insignificant in every way if compared with the Himalayas. It is true that in the so-called High Range in the north of Travancore an altitude of over 9,000 feet above sea-level is attained and that there are numerous peaks of over 3,000 feet at other points; but on the eastern side the mountains fall away gradually in the northern part of the Ghats into the plateau of the Deccan trap, while in the south they are inextricably confused with the ranges of the central part of the Madras Presidency, so that, although their height is often striking when they are viewed from the plains that lie below them to the west, it is difficult to distinguish them as a separate range at all from the east.

The freshwater sponges of the Malabar Zone were first studied by the late Dr. H. J. Carter over sixty years ago, but his investigations were confined to the Island of Bombay, the fauna of which is not nearly so characteristic as that of the Ghats. Recently large collections have been obtained by Mr. S. P. Agharkar of the Elphinstone College, Bombay, Mr. F. H. Gravely of the Indian Museum, Mr. R. Shunkara Narayana Pillay of the Trivandrum Museum, and myself in the Nasik, Poona, Satara and Ratnagiri districts of Bombay and in the Native State of Travancore. With this material in my hands I have thought it worth while to discuss the Spongillid fauna of the Malabar Zone as a whole.

LIST OF THE FRESHWATER SPONGES OF THE MALABAR ZONE.

Genus SPONGILLA, Lamarck.

Subgenus EUSPONGILLA, Vejdovsky.

1. *S. lacustris* subsp. *reticulata*, Annandale.
2. *S. proliferens*, Annandale.
3. *S. alba*, Carter.
4. *S. cinerea*, Carter.
5. *S. travancorica*,* Annandale.
6. *S. crateriformis* (Potts).

Subgenus EUNAPIUS, Gray.

7. *S. carteri*, Carter.
- 7a. „ „ subsp. *lobosa*, Annandale.

Subgenus STRATOSPONGILLA, Annandale.

8. *S. gravelyi*,* nov.
9. *S. indica*,* Annandale.
10. *S. bombayensis*, Carter.

Genus PECTISPONGILLA,* Annandale.

11. *P. aurea*,* Annandale.
- 11a. „ „ var. *subspinosa*,* Annandale.

Genus EPHYDATIA, Lamouroux.

12. *E. meyeri* (Carter).

Genus DOSILIA, Gray.

13. *D. plumosa* (Carter).

Genus TROCHOSPONGILLA, Vejdovsky.

14. *T. pennsylvanica* (Potts).

Genus CORVOSPONGILLA, Annandale.

15. *C. caunteri*, Annandale.
16. *C. ultima*, Annandale.
- 16a. „ „ var. *spinosa*,* nov.
17. *C. burmanica* subsp. *bombayensis*, Annandale.
18. *C. lapidosa*,* Annandale.

In the above list the names of those genera, species, etc. that are only known from the Malabar Zone are distinguished by an asterisk (*).

I.—SYSTEMATIC.

The great majority of the Malabar sponges have recently been discussed very fully in my volume on the Freshwater Sponges, etc. in the *Fauna of British India* and in subsequent papers, and it is not necessary to say anything more about them from a systematic point of view. So much new material has, however, been obtained in the genus *Corvospongilla* that I propose to revise this genus, so far as the Indian forms are concerned. It is also necessary to describe a new species of the subgenus *Stratospongilla* (genus *Spongilla*) discovered by Mr. Gravely.

Genus SPONGILLA.

Subgenus STRATOSPONGILLA.

The essential characters of this subgenus are, (1) that the gemmule-spicules lie parallel to the surface of the gemmule and (2) that the pneumatic coat, which is often poorly developed or altogether absent, lies entirely outside the gemmule-spicules. The skeleton is hard owing to the large number of megascleres present but friable owing to the poor development of spongin. Spicule-fibres are never very distinct, at any rate in the Indian species.

Key to the Indian species of Stratospongilla.

1. Skeleton-spicules sharply pointed.
 - A. Gemmules attached to base of sponge; gemmule-spicules cylindrical *S. bombayensis.*
 - B. Gemmules free in parenchyma; gemmule-spicules knobbed at the ends *S. gravelyi, nov.*
2. Skeleton spicules abruptly rounded at the ends.
 - Gemmules attached to base of sponge; their spicules sausage-shaped *S. indica.*

SPONGILLA (STRATOSPONGILLA) GRAVELYI, sp. nov.

Sponge forming small, shallow cushions, very hard but easily broken; external surface smooth and rounded to the eye, with very long and shallow channels radiating beneath the dermal membrane from the oscula, which are minute and not raised above the surface. Colour bright green.

Skeleton forming a regular network of single spicules and slender, ill-defined spicule-fibres of which the radiating or vertical ones are a little more distinct than the transverse. At the external surface the spicules project vertically upwards without being grouped together in any very definite manner.

Spicules.—The megascleres are slender, sharply pointed and almost straight amphioxi. Their surface is neither smooth nor spiny but covered with minute, irregular projections; sometimes a ring of short spines encircles the spicule near one or both ends. The length is about 12 to 14 times the greatest breadth. There are very few flesh-spicules, which appear to be confined to the dermal membrane and the neighbourhood of the gemmules. The few that I have seen are short, slender, almost straight, sharply pointed amphioxi covered with relatively long and very irregular spines that project at right angles to their main axis. The gemmule-spicules are of peculiar form. Each is curved in a

wide arc and bears at either end a more or less distinct knob; the concave surface is slightly flattened and almost smooth, whereas the convex is rounded and densely covered with minute spines of somewhat unequal size; the length is usually from 3 to 4 times the thickness in the middle, but the proportions are variable.

Gemmules.—The gemmules are spherical and lie each in a little loculus in the skeleton near the base of the sponge. They do not, however, appear to be fixed to its support and the specimens

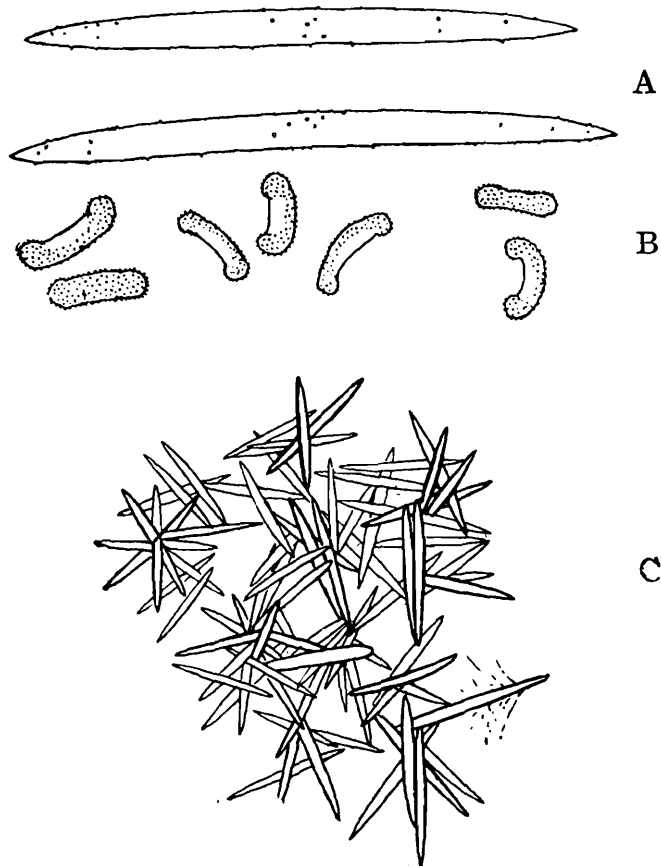


FIG. 1.—Spicules and skeleton of *Spongilla graveleyi*.

A. Megascleres, $\times 250$.

B. Gemmule-spicules, $\times 250$.

C. Vertical section through part of skeleton from external surface downwards, $\times 70$.

do not possess a basal membrane. Each gemmule has a single aperture provided with a short cylindrical foraminal tubule.

Type.—No. Z.E.V $\frac{5107}{7}$, Ind. Mus. (a dried specimen collected by Mr. Graveley in May, 1912).

Locality.—Pool in the Koyna River at Taloshi, Satara district, on the eastern slope of the Ghats.

This sponge is closely related to *Spongilla sumatrana*, Weber, which (*vide* Weltner) occurs in tropical Africa (in varietal forms) as well as in Sumatra. It is distinguished from that species by its peculiar gemmule-spicules, much more strongly spined flesh-spicules and smoother megascleres. From *S. indica*, its closest

Indian ally, it is distinguished by the sharp points of its megascleres as well as by the form of the gemmule-spicules and its free gemmules. In external appearance and in the form of its megascleres *S. graveleyi* closely resembles the mountain form of *Spongilla* (*Euspongilla*) *cinerea*, Carter, which Mr. Graveley took at Medha on the eastern side of the Ghats, but the structure both of the skeleton and of the gemmule are completely different.

Genus CORVOSPONGILLA.

Annandale, *Faun. Brit. Ind.*, Freshwater Sponges, etc., pp. 122, 243 (1911); *Rec. Ind. Mus.*, vii, p. 99 (1912).

When this genus was originally described only two Indian species (*C. burmanica* and *C. lapidosa*) were assigned to it, but it shortly became necessary, owing to the acquisition of fresh material, first to describe another Indian species and then to transfer to *Corvospongilla* a fourth species originally referred to *Stratospongilla*. A new race of one of the already-known species was also added, and I propose to describe here a new variety of another known species. The list of Indian forms now comprises, therefore, four species, a subspecies and a variety.

Owing to these additions to our knowledge of the genus its position and characters have become much less obscure, and, thanks to specimens recently obtained, a new fact has come to light, *viz.*, that certain forms of the genus produce two kinds of gemmules, which differ from one another not only in that one kind is fixed to the solid support of the sponge while the other lies free in the parenchyma, but also in form, in the structure of the external layers and in spiculation. The genus may be redescribed as follows:—

Sponge.—The sponge encrusts rocks or brick-structures in the form of a film or a more or less solid layer. It never possesses branches or bulky upward projections. There is always a stout chitinous membrane at the base

Skeleton.—The skeleton is always remarkably hard and sometimes has an almost stony consistency. Except in the basal membrane, however, and in the covering of the gemmules, chitinous substance is often present only in small quantities, although in some species it is unusually abundant. In some species it is difficult to detect a definite skeletal network, while in others the skeleton-fibres, and especially the radiating or vertical fibres are very stoutly formed.

Spicules.—The megascleres are never very slender and are often stout and amphistrongylous. They are always very numerous. Flesh-spicules are always present in the form of birotulates in which each rotule consists of a ring of very long and slender recurved spines.

The free spicules of the parenchyma have a very characteristic form, closely resembling that of the longer gemmule-spicules of *Heteromeyenia* and *Asteromeyenia*. Each has a slender cylindrical

shaft, which is always more or less curved and invariably smooth. It bears at both ends a circle of relatively long and strongly recurved, slender spines, which are proportionately long enough, as well as sufficiently close together, to give the appearance of a regular rotule with back-turned margin.

The skeleton spicules are normally short, stout, cylindrical, blunt and spiny. They are, however, subject to great individual variation and in some species (*e.g.*, *C. ultima*) exhibit many abnormal forms.

Gemmules.—The gemmules are sometimes of two kinds, fixed and free. The latter are either spherical or subcylindrical. In either case they have a close layer of spicules arranged like a mosaic on the external surface and are further enclosed in a dense case formed of chitinous substance in which true gemmule-spicules, more or less deformed, or modified megascleres and sometimes even birotulate flesh-spicules are firmly bound together. Sometimes the wall of this outer case can be separated into definite layers. Its inner surface is separated from the gemmule by an empty space. Pneumatic substance is altogether absent or very poorly developed. The wall of the case is in continuity with the basal membrane of the sponge.

The free gemmules are situated in the parenchyma, lying in interstices of the skeleton. They are invariably spherical. Each has a horizontal layer of spicules on its external surface and is surrounded, outside these spicules, by a pneumatic coat. Outside the pneumatic coat there is, in some species, a cage of more or less deformed megascleres. The microscleres of the free gemmules are as a rule longer and more slender than those of the fixed ones. Thus the former differ from those of certain species of the subgenus *Eunapius* (*e.g.*, *Spongilla fragilis*) in which a "pavement-layer" of gemmules is sometimes formed, in that they have a different structure from the fixed gemmules.

Both fixed and free gemmules sometimes occur in the same sponge, but probably only free ones are produced in some species.

Remarks.—Even the more delicate forms of the genus can be distinguished, so far as my experience goes, from any other oriental Spongillidae (except certain *Spongillae* of the subgenera *Eunapius* and *Stratospongilla*) by their very hard consistency. In skeletal structure the species vary considerably; but the skeleton, owing to the large number of megascleres, is always extremely massive.

Although free microscleres of the type described are always present, their number is very variable even in sponges of the same species taken at different times and they are sometimes scattered so scantily in the parenchyma that it is difficult to find them.¹ The dermal membrane is apparently aspiculous.

¹ Great care is also necessary to prevent them floating away if spicule-preparations are made by allowing the spicules to settle in a liquid.

The fixed and free gemmules are apparently analogous in function to the fixed and free statoblasts of *Plumatella*. The fixed reproductive bodies of both sponge and polyzoon serve to ensure renewed growth of the organism in a situation that has already, in certain conditions, proved favourable for its proper development. Their production is either correlated with a change in conditions or perhaps in some few cases precedes any such change and is due rather to a form of senescence. Conditions suitable for renewed activity on the part of the organism are similarly either correlated with or antecedent to renewed vegetative growth on the part of the resting bodies. The free gemmules, on the other hand, are carried away by floods and thus aid in the dispersal of the species. So far as the facts as yet ascertained justify a statement as to conditions that bring about or precede the production of the two kinds of gemmules in *Corvospongilla*, it would seem that the fixed gemmules are formed as soon as the sponge is in full vigour or just past its prime, and that the free gemmules are formed at a later season. Sponges of the genus frequently occur on the beds of rocky streams that rise with great violence in the "rains" but sink to a series of more or less dis-connective pools in the cool season. They are often left high and dry at the latter time of year. Their compact skeletons remain firmly adherent to the rock until the floods come again. Then, in all probability, the free gemmules are washed away to places down stream, while the fixed gemmules cling fast and in due course produce a new sponge on the old basis.

Key to the Indian Forms of Corvospongilla.

- I. Majority of the megascleres sharply pointed.
 1. Delicate species with only free gemmules . . . *C. caunteri*.
 2. Much stouter species with fixed (and sometimes also free) megascleres.
 - (a) External surface rough but not spiny *C. ultima* (typical).
 - (b) External surface distinctly spiny *C. ultima* var. *spinosa*.
- II. Majority of the megascleres distinctly amphistrongylous.
 1. Sponge hard but brittle, radial spicule-fibres produced vertically upwards to form spines on external surface.
 - (a) Oscula elevated on cylindrical, turret-like eminences. *C. burmanica*.

- (b) Oscula either not elevated or on eminences of irregular form *C. burmanica bombayensis.*
2. Sponge of almost stony consistency, external surface without spines; radiating fibres indistinct *C. lapidosa.*

CORVOSPONGILLA CAUNTERI, Annandale.

Faun. Brit. Ind., Freshwater Sponges, etc., p. 243, fig. 48 (1911).

The first specimens of this species were taken in April, 1911, on the pier of a brick-work bridge near Lucknow. Mr. Gravely obtained others in April, 1912, on rocks in the pool of a stream at Medha on the eastern side of the Western Ghats. Both sets of specimens were taken in running water. Both contained only free gemmules with well-developed pneumatic coats and formed only very thin films on their supports. It is improbable that fixed gemmules are ever formed in this species, unless it sometimes attains a very much greater thickness than the specimens examined have attained, for the outer cases of such gemmules would be almost as deep as the sponge itself. Although the sponge only forms a thin film of two or three millimetres' thickness, its hardness can be readily felt if it is squeezed between the finger and thumb. Mr. Gravely's specimens are a trifle thicker than the types and darker in colour.

CORVOSPONGILLA ULTIMA (Annandale).

Spongilla (Stratospongilla) ultima, Annandale, *tom. cit.*, p. 104, fig. 19.

Corvospongilla ultima, *id.*, *Rec. Ind. Mus.*, vii, p. 99 (1912).

Specimens obtained by Mr. Gravely on rocks in a pool of a stream at Taloshi on the eastern watershed of the Western Ghats in April are sufficiently different from those taken at Cape Comorin and at Tanjore to be made the types of a new variety, for which I propose the name,

var. SPINOSA, nov.

The chief taxonomic peculiarity of this variety lies in the fact that its external surface is distinctly spiny. This is due to the protrusion of the radiating fibres, which, instead of becoming dissipated as they approach the surface, are prolonged upwards beyond it, often for a distance of several millimetres. The oscula also are larger than in the typical form and have no radiating furrows.

A more striking peculiarity is the occurrence of free as well as fixed gemmules; but of course this may be due to the season at which the sponge was taken or to its physiological condition rather than to any inherent character. The free gemmules are smaller

than the fixed ones; their diameter is about 0.42 mm., whereas that of the fixed gemmules is about 0.9 mm. without the external case. The free gemmules are spherical and have as a rule two apertures, each of which is provided with a short conical or cylindrical tubule. The pneumatic coat is poorly developed and there is no outer cage of megascleres. The spicules of the free gemmules are long and narrow and as a rule somewhat inflated at the ends; their measurements on an average are:—length from 0.054 to 0.063 mm., breadth about 0.0048 mm. The spicules of the fixed gemmules are, like those of the fixed gemmules of the typical form of the species, exceedingly variable and liable to all sorts of abnormalities, but those of the inner layer are, unless deformed, from 0.029 to 0.05 mm. in length and from 0.007 to 0.012 mm. in greatest breadth.

Type.—No. Z.E.V $\frac{5106}{7}$, Ind. Mus.

Locality.—Taloshi, Koyna valley, Satara district, Bombay Presidency (2,000 ft).

CORVOSPONGILLA BURMANICA (Kirkpatrick).

Spongilla loricata var. *burmanica*, Kirkpatrick, *Rec. Ind. Mus.*, ii, p. 97, pl. ix (1908).

Corvospongilla burmanica, Annandale, *Faun. Brit. Ind.*, tom. cit., p. 123.

The typical form of the species has only been found as yet in the Pegu-Sittang Canal in Lower Burma, but the Bombay race has now been taken at three different localities in that Presidency.

Subsp. BOMBAYENSIS, Annandale.

Annandale, *Rec. Ind. Mus.*, vi, p. 225 (1911).

The first specimens of this race were taken by Mr. Agharkar at Khed in the Poona district and others were found by Mr. Gravely and him at Pimpli in the Ratnagiri district. The former place is on the eastern, the latter on the western face of the Ghats. Remarkably fine examples were also obtained by Mr. C. S. Middlemiss of the Geological Survey of India in the native state of Idar, which lies between 23°6' and 24°29' N. and 72°45' and 73°39' E., considerably north of the Tapti River. About these specimens, which he mistook at first sight for a calcareous tufa, Mr. Middlemiss writes: "The locality of the specimens is Hathmati River opposite Thuravas, Idar State (Máhi Kántha); occurring as incrustations on pebbles of recent conglomerate left dry by subsidence of the water." They were taken in December, 1911, and covered considerable areas; some of them are 2.5 cm. thick.

Both the specimens from Idar and those from the Ratnagiri district contain free as well as fixed gemmules, although there are only fixed gemmules in those from the Poona district. In the Idar specimens the free gemmules are only in a few instances fully developed and many stages can be found, but in the Ratnagiri ones they are complete.

Although the free gemmules do not differ so much from the fixed ones as is the case in *C. ultima* var. *spinosa*, the differences are of the same nature. In both kinds of gemmules the shape (apart from the external case) is almost spherical and there is a single aperture with a straight foraminal tubule, but the free gemmule is slightly more flask-shaped than the other and has a longer and more tapering tubule. The diameter of both varies somewhat, but in the case of the free gemmule it is on an average about 0.5 mm. and in that of the fixed gemmule about 0.6 mm. The free gemmule has a well-developed pneumatic coat outside its proper spicules and, outside this coat, is enclosed in a hollow sphere of unusually small and often ill-formed megascleres mixed with spicules like its own and held together by a chitinous membrane. The microscleres are very little longer or more slender than is the case in the fixed gemmules.

II.—GEOGRAPHICAL.

In the introduction to my volume on the Freshwater Sponges, etc., in the *Fauna of British India* I laid great stress on the African affinities of the lower invertebrates that inhabit the streams, lakes and pools of the Western Ghats. So far as the sponges are concerned the chief foundation for this view lies in the strong representation of the genus *Corvospongilla* and the subgenus *Stratospongilla* of the genus *Spongilla*. Recent investigations have on the whole given support to my belief but have shown that the African element is more widely distributed than was at first realized. The discovery of a freshwater medusa of the genus *Limnocyclus* in the Western Ghats is evidence in favour of African affinities, and so also is the fact that three additional forms of *Corvospongilla* have now been added to the known fauna of the range, as well as a new species of *Stratospongilla*; but on the other hand two species of *Corvospongilla* have been found in India east of the Ghats and the range of *Spongilla* (*Stratospongilla*) *bombayensis*, formerly believed to be peculiar to Bombay and Natal, is now known to extend into the W. Himalayas in the north and to the Mysore plateau in the south, while there is strong evidence that *Limnocyclus indica* only occurs in those streams which run eastwards from the Ghats.

Of the genus *Corvospongilla* three species, *C. loricata* (Welter), *C. böhmi* (Hilgendorf) and *C. zambesiana* (Kirkpatrick), and possibly a fourth only recognized from isolated spicules are known to occur in Africa. The first, which is the type of the genus, is from an unknown locality in that continent, while the other three occur in Central Africa. Of the four Indian and Burmese species, one (*C. burmanica*) is very closely allied to *C. loricata*, while another (*C. lapidosa*) is perhaps no more than a local race of the African *C. zambesiana*, the gemmules of which are not known. The two sponges apparently differ only in the structure of their skeleton. All the Indian forms, with the exception of the typical

race of *C. burmanica* (the only species as yet found east of the Bay of Bengal), occur in the Western Ghats. One of them ranges eastwards and northwards in practically identical form to Lucknow, another has been found north of the Tapti River and the third occurs in one form at Cape Comorin, in Travancore and at Tanjore near the east coast of Madras, and in another on the western side of the Ghats in Bombay.

It is difficult to say what are the exact limits of distribution of *Stratospongilla*. Although I believe that this subgenus is founded on characters of sufficient weight, it is difficult to say whether it is really distinct from *Potamolepis*,¹ Marshall, the gemmules of which are unknown. Certain African species, however, namely *Spongilla sumatrana*, Weber, *S. rousseletii*, Kirkpatrick, and possibly *S. cunningtoni*, Kirkpatrick, are closely related to the three Indian species, *S. indica*, *S. gravelyi* and *S. bombayensis*, the type of the subgenus. *S. sumatrensis* was originally described from the Malay Archipelago, as its name would suggest, and it is possible that the two African forms which Weltner has ascribed to the species as varieties are specifically distinct from it, if not one from the other. In any case the three forms at present associated under the name are closely related to *S. indica*, *S. gravelyi* and less closely to *S. bombayensis*, which occurs in Natal as well as India. These sponges differ considerably from the Congo species originally ascribed to *Potamolepis* by Marshall (15) and even from *P. barroisi*, Topsent (17) from the Lake of Tiberias. They are, however, less different from the latter than they are from the former, while the species from Western China and the Philippines (*S. coggini* and *S. clementis*) that I have assigned provisionally to *Stratospongilla* (4,5) come very near to *P. barroisi*, from which it is difficult to believe that they are subgenerically distinct. It is noteworthy, moreover, that the gemmules of *S. coggini* are of a very simple nature, totally lacking microscleres, as is also the case with two of the Tanganyika species, while the gemmule-spicules of *S. clementis* are small and poorly developed. The fact that the gemmules of all known species of *Potamolepis* are wanting is, however, one of little importance. I recently examined a large collection of Spongillidae from France and Switzerland comprising all the common European species of *Spongilla* and *Ephydatia*. Only a very small proportion of the specimens, most of which had been collected in summer, contained gemmules. On the other hand I have recently found these bodies in *Veluspa bacillifera* from Lake Baikal and they are known to occur in many sponges not even remotely related to the Spongillidae.

On the whole, therefore, we can only say as regards *Stratospongilla* that the species which occur in the Malabar Zone are closely allied to African species but have, with one exception, not

¹ I cannot accept the view that *Potamolepis* is identical with the S. American genus *Uraguaya*, the gemmule-spicules of which resemble those of *Trochospongilla*. *Veluspa*, Micl. Macl. (*Lubomirskia*, auct.) is not, in my opinion, a Spongillid at all.

been found outside that zone. The exception (*S. bombayensis*), which occurs in Natal, has been found both in the W. Himalayas and on the Mysore plateau in the very centre of southern Peninsular India.

The only genus of Spongillidae that appears to be endemic in India is *Pectispongilla*, which has not been found except on the western side of the Western Ghats. It has no very close allies, so far as we know, in any other district.

The majority of the remaining sponges of the Western Ghats and the plains between them and the Arabian Sea are widely distributed forms. *Spongilla cinerea*, however, has only been found at Bombay, in the Ghats and in the W. Himalayas, its range somewhat resembling the Indian range of *Spongilla bombayensis*, but being more restricted in that it does not, apparently, extend into the main area of the Peninsula. The race *lobosa* of *Spongilla carteri* appears to be endemic in Travancore on the western side of the Ghats, while *Trochospongilla pennsylvanica* has probably, according to Miss Stephens (16), only been found in N. America and in Travancore.

It is thus clear that the sponge fauna of the Malabar Zone is abundantly distinct from that of any other part of India, although it includes many widely distributed species that occur in other districts. It appears to have distinct affinities with that of tropical Africa, and especially with that of Lake Tanganyika, but exhibits no more trace of a recent marine origin than is shown by the Spongillidae of any other country. In considering its peculiarities, however, allowance must be made for the bionomical factor. Some of the most characteristic sponges of the zone are only found in the beds of rocky streams which for part of year are raging torrents and for part a series of almost isolated pools. Few sponges have been found in similar conditions in other parts of India, the mountainous districts of which are for the most part almost unexplored so far as the aquatic fauna is concerned. It may be that many of the peculiarities or apparent peculiarities of the Spongillidae of the Western Ghats are merely characteristic of sponges that flourish in the peculiar circumstances that prevail there, and that these peculiarities will be found to be much less distinctive when other mountain ranges are as well known as the Western Ghats.

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Geographical List of Freshwater Sponges of the Malabar Zone.

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NAME.	MALABAR ZONE.		W. Himalayan Territory.	North-East Frontier Territory.	Burma Territory.	Main Peninsular Area.	Indo-Gangetic Plain.	Distribution outside India.	REMARKS.
	East.	West.							
Genus SPONGILLA ..	x	x	x	x	x	x	x	Cosmopolitan.	
Subgenus EUSPONGILLA .	x	x	x	x	x	x	x	Ditto.	
<i>S. lacustris</i> subsp. <i>reticulata</i> .	x	x	x	x	x	x	x	....	The typical form of the species is cosmopolitan.
<i>S. proliferens</i>	x	—	—	x	x	x	x	Yunnan; Java; Celebes, etc.	A purely Oriental species.
<i>S. alba</i>	—	x	—	—	—	x	x	Egypt (var. <i>cerebellata</i>) ..	The "varieties" <i>cerebellata</i> and <i>bengalensis</i> are perhaps no more than phases. Not known outside India.
<i>S. cinerea</i>	x	x	x	—	x	x	—	....
<i>S. travancorica</i> * ..	—	x	—	—	—	—	—	..	Only known from Travancore.
<i>S. crateriformis</i> ..	—	x	—	—	—	—	x	Common in N. America; probably occurs in Ireland.	Distribution apparently discontinuous.
Subgenus EUNAPIUS ..	x	x	x	x	x	x	x	Cosmopolitan.	
<i>S. carteri</i>	x	x	x	—	x	x	x	S.-E. Europe; Mauritius; Malay Archipelago.	Possibly occurs in Central Africa (<i>vide</i> Kirkpatrick). The form <i>lobosa</i> seems to be confined to Travancore, while the "varieties" <i>cava</i> and <i>mollis</i> may be mere phases.
<i>S. carteri lobosa</i> ..	—	x	—	—	—	—	—		
Subgenus STRATOSPONGILLA.	x	x	x	—	—	—	—	Central and South Africa; Sumatra; S.-W. China; the Philippines.	The Chinese and Philippine species are by no means typical.

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<i>S. gravelyi</i> * ..	x	-	-	-	-	-	-	-	Only known from Taloshi; Koyna valley in the Satara district.
<i>S. indica</i> * ..	x	x	-	-	-	-	-	-	Only known from Igatpuri and Nasik in the W. Ghats.
<i>S. bombayensis</i> ..	-	x	x	-	-	-	-	-	Natal.	
Genus PECTISPONGILLA.*	-	x	-	-	-	-	-	-	....	Only known from Travancore and Cochin.
<i>P. aurea</i> * ..	-	x	-	-	-	-	-	-	....	Only known from the western base of the W. Ghats in Travancore.
<i>P. aurea</i> var. <i>subspinosa</i> * ..	-	x	-	-	-	-	-	-	..	Only known from the coastal districts of Cochin.
Genus EPHYDATIA ..	-	x	x	-	-	-	-	x	Almost cosmopolitan ..	Apparently a scarce genus in the Oriental Region but abundant in Japan.
<i>E. meyeri</i> ..	x	x	-	-	-	-	-	x	Sumatra ..	Only known from a few widely separated localities.
Genus TROCHOSPONGILLA.	-	x	-	-	x	x	x	x	N. America; Europe ..	The headquarters are in N. America.
<i>T. pennsylvanica</i> ..	-	x	-	-	-	-	-	-	Tropical Africa.	
Genus CORVOSPONGILLA.	x	x	-	-	x	x	-	-		
<i>C. saunteri</i> ..	x	-	-	-	-	-	x	-	....	Described from Lucknow; taken by Mr. Gravely at Medha on the eastern slope of the W. Ghats.
<i>C. ultima</i> ..	-	x	-	-	-	-	x	-		
<i>C. ultima</i> var. <i>spinosa</i> * ..	-	x	-	-	-	-	-	-	....	Described from Cape Comorin; also taken at Tanjore.
<i>C. burmanica bombayensis</i> .	x	x	-	-	-	-	x	-	....	Also taken in Idar State some distance north of the W. Ghats. The typical race is from Lower Burma.
<i>G. lapidosa</i> * ..	x	x	-	-	-	-	-	-	Only known from Igatpuri and Nasik; possibly a variety of the African <i>C. zambesiana</i> , Kirkpatrick.

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