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## XLIII.—Studies on fossil sponges.—II. Lithistidæ

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tionably substantiated to distinguish the Jurassic and Silurian genus *Eryon* from the recent *Polycheles* is that in the latter, but not in the former, the inner antennæ are furnished with a scale on the inner margin. This is a point to which attention has not been previously directed; but I think it affords sufficient ground for keeping the genera distinct.

With respect to the chelation (as in *Pentacheles*) of the last pereopods in *Eryon*, Dr. Woodward writes to me:—"The hind foot seems to be simple, not chelate—as far as the specimens before me enable me to form an opinion, certainly. I thought I detected an indication of the last foot being chelate (*minutely so*) in a Solenhofen *Eryon*; but it might be due to fossilization."

# XLIII.—*Studies on Fossil Sponges*.—II. *Lithistidæ*.

By KARL ALFRED ZITTEL.

[Continued from p. 341.]

## *Rhizomorina* (*continued*).

POMELIA, Zitt.

(*Recent*.) Sponge from clavate to cylindrical, short-stalked, attached by a broad base. Vertex convex, with a pit-like depression, in which there are several small circular apertures of vertical tubes which traverse the sponge-body. Isolated pits of the same kind with tubular canals on the sides. Surface very regularly furnished with fine pores. Skeleton formed of short, curved, rather thick, branched corpuscles, covered all over with processes, arranged in trains, the forked ends of the branches being closely interwoven. Corpuscles at the surface of the same form as those of the interior, but no true surface-structures present in the specimen.

The genus, which is named after M. Pomel, is very nearly related in external appearance to various sponges from Oran referred by Pomel to *Jerea*, *Polyjerea*, *Marisca*, and *Jereopsis*, some of which probably approach this genus more nearly than the Cretaceous forms of *Jerea* and *Jereica*. The sponge described is from Florida, and was received from Prof. O. Schmidt under the name of *Corallistes? polydiscus*.

JEREICA, Zitt.

*Jerea* p. p., auct.; *Polyjerea* p. p., auct.

*Spumsporgia* p. p., Quenst.

Sponge simple or compound, cylindrical, top-shaped, clavate,  
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pyriform, or obconical, shortly stalked, attached by a broad disciform foot. Vertex truncate or with a shallow pit, in which are the apertures of several round efferent tubes which vertically traverse the whole sponge-body. Surface uniformly covered with pores, from which capillary radial canals penetrate to the centre of the sponge. Skeleton composed of fine, radiform, irregularly branched or simple siliceous corpuscles, elegantly filigreed by numerous longer and shorter side branches; they lie close together, and are united into radial trains by their processes. In some species (*J. punctata*) the radial canals are in vertical rows; the walls of these are formed by the interlaced branched ends of the corpuscles, the main stems of which form pillars uniting two neighbouring lamellæ.

This genus closely resembles *Jerea* outwardly; but the microstructure is quite different. In *Jerea* the skeletal elements are more or less regular quadriradiates of considerable size, which form a loose meshed texture. Externally *Jereica* differs from *Jerea* by the finer and more uniform pores of the surface, the absence of a branched base, and the very numerous radial canals.

The typical species are:—

\*1. *Jerea polystoma*, Röm. Spong. xii. 5. Senonian, Ahlten.

\*2. *Jerea tuberculata*, Röm. ib. xiii. 3. Senonian, Ahlten.

3. *Jerea punctata*, Goldf. lxxv. 13. Senonian, Sütnerberg.

*Spumispongia punctata*, Quenst. Petr. cxxxiv. 10–12.

4. *Jerea sexplicata*, Röm. Spong. xii. 4. Senonian.

5. *Spumispongia alveare*, Quenst. Petr. cxxxiv. 20. Senonian, Ilsenburg.

Also probably *Jerea ocellata*, *oligostoma*, *tessellata*, and *mamillosa*, Röm., from the Cretaceous of Ilsenburg.

Very likely many of the sponges from the Miocene of Oran described by Pomel under the genera *Jerea*, *Jereopsis*, *Ischadia*, *Polyjerea*, and *Dichojerea* belong to *Jereica*.

#### CÆLOCORYPHA, Zitt.

*Scyphia* p. p., *Siphonia* p. p., *Eudea* p. p., and *Siphonocælia* p. p., F. A. Röm.

*Spumispongia* p. p., Quenst.

Sponge simple or compound, with a broad base, or cylindrical. Vertex convex, with a tubular stomachal cavity, which is sometimes shallow, sometimes more or less deep. Frequently radiating, branched, superficial furrows run from its upper margin. Sides uniformly covered with numerous pores, opening into fine radial canals. Skeleton composed of small

irregularly branched corpuscles, covered with verruciform or spiny processes. Sometimes a part of the surface has an apparently smooth covering-layer, formed of young, densely interwoven skeletal corpuscles.

The genus differs from *Scytalia* by its narrower and shallower central cavity, its stouter gnarled corpuscles, and the absence of large radial canals. No isolated spicules observed.

a. Simple forms :—

1. *Siphonocælia nidulifera*, Röm. Spong. xi. 3. Senonian.
- \*2. *Eudea crassa*, Röm. ib. x. 4. Senonian.
3. *Cælocorypha subglobosa*, Zitt. Senonian.  
*Spumispongia punctata* p. p., Quenst. Petr. cxxxiv. 9, 13-15.
4. *Chaetetes cretaceus*, Trautsch. Bull. Mosc. 1877, vi. 5. Senonian.
5. *Scyphia acuta*, Röm. Spong. ii. 4. Senonian, Sutmerberg.

b. Compound forms :—

6. *Polycælia familiaris*, Röm. Spong. xi. 10. Senonian, Sutmerberg.
- \*7. *Siphonia socialis*, Röm. Kr. ii. 5. Senonian, Sutmerberg.

SCYTALIA, Zitt.

*Scyphia* p. p., *Siphonocælia* p. p., *Jerea* p. p., *Eudea* p. p., auct.

*Tubulospongia* p. p., Court.

?*Cladocalpia*, *Calpia* p. p., Pom.

Sponge elongate, cylindrical, rarely clavate, simple or branched, with a round, tubular central cavity, usually reaching nearly to the base, into which open numerous radial canals, becoming thinner outwards, and, frequently branching, form pore-like ostia at the surface. From the lower extremity of the central cavity perpendicular canals run into the narrow base. Skeleton of curved corpuscles, with pointed processes and somewhat branched ends; among these are sometimes scattered bacillar spicules and anchors with three and six prongs.

The forms placed here constitute a genus agreeing in external form with various siliceous and calcareous sponges of quite different microstructure. Fromentel gave the name of *Siphonocælia* to all simple cylindrical fossil sponges with a round central tube; and this name has been generally accepted. But the two species cited by him in the 'Introduction à l'étude des Éponges fossiles' (*S. elegans*, Münst., and *S. compressa*, From.) do not belong to the Lithistidæ, any more than the

other species subsequently described by him. Probably some of Courtiller's *Tubulospongiae* belong to *Scytalia*.

All the species are Cretaceous.

\*1. *Jerea turbinata*, Röm. Spong. xii. 1. Senonian, Ahlten.

\*2. *Cnemidium pertusum*, Reuss, Kr. xvi. 7, 8, 11-14. Cenomanian.

3. *Spongia radiceformis*, Phill. Yorksh. i. 9. Senonian.

4. *Spongia terebrata*, Phill. ib. i. 10. Senonian.

5. *Spongia digitalis*, Röm. Spong. x. 10. Tourtia.

\*6. *Ventriculites microporus*, Röm. ib. vii. 6. Senonian.

7. *Eudea annulata*, Röm. ib. xi. 2. Turonian.

8. *Epeudea nodosa*, Röm. ib. xiv. 3. Cenomanian.

9. *Spongites cylindripes*, Quenst. Petr. cxxxiii. 21, 22. Cuvieri-Pläner.

[? *Tubulospongia insignis*, *limbata*, *elongata*, *ficoidea*, *contorta*, *dendroidea*, Court. (non *T. tuber* and *multiporella*).]

#### STACHYSPONGIA, Zitt.

*Siphonocælia* p. p., Röm.

Sponge cylindrical, much elongated, rather narrowed at both ends, very thick-walled, with a simple central cavity traversing the whole sponge. Rather large conical tubercles on the outside. Skeletal and canal-system as in *Scytalia*. Cretaceous.

1. *Siphonocælia spica*, Röm. Spong. xi. 5. Tourtia.

2. *Siphonocælia tuberculosa*, Röm. ib. xi. 4. Senonian, Sutmerberg.

#### PACHINION, Zitt.

*Jerea* p. p., Röm.

Sponge cylindrical or clavate, simple, narrowed towards the base, short-stalked. Central cavity wide, simple, deep; at its lower end with several vertical tubes continued into the base. The thick wall appears to the naked eye composed of coarse anastomosing fibres, between which are wide irregular spaces for the circulation of water. The corpuscles are of considerable size, crooked, branched at the ends, and covered with short tubercles and knobs. Covering-layer composed of small, elegant, filigreed and strongly branched corpuscles, and of innumerable forked anchors (Pl. VIII. fig. 8) stuck among these with the shaft directed inwards.

1. *Jerea scripta*, Röm. Spong. xiii. 1. *Mucronatus*-Chalk of Schwiechelt and Thadensen near Duddenstedt.

Family 2. **Megamorina.**

## MEGALITHISTA, Zitt.

*Eulespongia* p. p., Quenst.

Sponge pyriform, cylindrical, or cup-shaped, thick-walled, with rather wide, tubular central cavity. Both surfaces with round, irregularly scattered ostia of different sizes, from which large canals penetrate the wall. Corpuscles very large, smooth, curved, usually with two or three branches at each end (Pl. VIII. fig. 4), with shorter or longer axial canals. They are irregularly interwoven. Small, simple, bacillar spicules, and a few forked anchors also occur. The typical species, from the Coral Rag of Nattheim, is

1. *Megalithista foraminosa*, Zitt.

Irregularly cylindrical or elongate-ovate; surface sometimes with a few broad longitudinal folds or tubercles. Ostia of various sizes, the larger not uniformly distributed, but concentrated upon particular parts. Central cavity rather wide. Upper margin rounded.

Hitherto confounded with *Cylindrophyma milleporata*, Goldf. Possibly one of the two fragments described by Quenstedt (Petr. cxx. 7) as *Eulespongia*, from the White Jura of the Oerlinger Thal, near Ulm, belongs to this genus.

## DORYDERMA, Zitt.

*Spongia*, Phill.*Polyjerea* p. p., Röm.*Dichojerea* p. p., Pom.

Sponge simple or compound, cylindrical, pyriform, flat, or composed of cylindrical, forked branches rounded at the ends. Internally with several vertical tubes parallel to the longitudinal axis. Surface with mesh-like openings  $\frac{1}{2}$  to  $1\frac{1}{2}$  millim. in diameter, formed by a reticulate arrangement of the skeletal corpuscles. From these ostia simple radial canals penetrate the sponge-body. Skeleton composed of very large, smooth corpuscles of irregularly branched structure (Pl. VIII. fig. 3); their thick arms more or less curved, forked once or twice, never running into root-like processes at the ends. Axial canal short, simple, rarely divided into two or three short branches. The corpuscles are loosely interlocked, and form a coarse network at the surface. In well-preserved specimens the meshes are filled with a dense tuft of long-shafted forked anchors. The end of the shaft, which is directed inwards, is pointed; the opposite end thickened and furnished with

three very short prongs, which are generally forked. Smooth bacillar spicules also occur.

The skeletal corpuscles from the Greensand of Haldon, figured by Carter (Ann. & Mag. Nat. Hist. 1871, vol. vii. pl. viii.), very probably belong to this genus, as also the anchors figured by him (*l. c.* pl. x.) under the name of *Geodites haldonensis*. An example of the spicules described by Carter as *Monilites* (*l. c.* pl. ix. figs. 46, 47) has also occurred in *Doryderma*.

1. *Polyjerea dichotoma*, Röm. Spong. xvi. 1; Quenst. Petr. cxxxv. 10, 11. Senonian.

2. ? *Spongia ramosa*, Mant. Geol. Sussex, xv. 11. Senonian.

3. *Doryderma cylindrica*, Zitt.

Simple, cylindrical, narrowed above, below with a short stalk. Several scattered vertical tubes in the interior. In the *Mucronatus*-Chalk of Ahlten and Biewende.

#### LYIDIUM, O. Schmidt.

(Atlant. Spong.)

(Recent.) Sponge basin-shaped, on both surfaces with the large, round ostia of simple canals. Skeletal corpuscles smooth, crooked, branched, the branches terminating in a disciform or cup-shaped dilatation. In the sarcode of the surface numerous simple bacillar spicules of considerable size. (Species *Lyidium torquilla*, Schm. Cuba. See p. 244.)

#### CARTERELLA, Zitt.

*Jerea* p. p., Röm., Gumb.

*Eulespongia* p. p., Quenst.

Sponge cylindrical, much elongate, narrowed below; vertex rounded off, convex, with the scattered apertures of several round, quill-like vertical tubes, which traverse the whole sponge. Surface with irregular, usually elongate, ostia; below with longitudinal furrows. Numerous fine horizontal radial canals run from the surface to the centre. Corpuscles large, filiform, undulated or crooked, blunt, with long and large axial canals, sometimes with short tubercles, and sometimes slightly branched at the ends. They are grouped into thick cords parallel to the main axis, and closely interwoven. Among them in parts are small, strongly branched and tubercular corpuscles. Cretaceous.

1. *Carterella cylindrica*, Zitt.

(=*Jerea arborescens*, *cylindrica*, and *elongata*, Gümbl. Ostb. Grenzgeb. p. 761.)

Very long, cylindrical, simple, rarely dichotomous above, laterally somewhat compressed, with a long, simple, strongly furrowed root; vertex rounded. Surface coarsely reticulated, with numerous straight horizontal canals, which give the transverse section a radiate appearance. Whole sponge traversed by several vertical tubes, and composed of coarse, smooth, curved, filiform spicules, which rarely show a tendency to fork. Greensand of Kelheim and Regensburg; very abundant.

\*2. *Jerea spiculigera*, Röm. Spong. xii. 6; Quenst. Petr. cxxxv. 1, 2. *Cuvieri*-Pläner and *Mucronatus*-chalk.

?3. *Eulespongia*, sp., Quenst. ib. cxxxv. 1, 2. *Cuvieri*-Pläner.

## HETEROSTINIA, Zitt.

Cup-shaped, usually stalked, with a branched root. Both surfaces with the scattered impressed ostia of radial canals. Vertical canals in the stalk. Skeleton of two kinds of elements of different sizes. The smaller, which form the principal mass, are strongly bent, much-branched, and filigreed all over; the larger ones smooth, branched, with attenuated and pointed ends.

The only known species, *Heterostinia cyathiformis*, Zitt., is from the Senonian of Rouen. In external form it agrees perfectly with the figures of *Chenendopora subplena* and *obliqua*, Mich. Ic. xli. 1, 2; and it is probable that one of these is identical with the present species. Numerous specimens are in the Museum of Geneva.

## ISORHAPHINIA, Zitt.

*Siphonocelia* p. p., Röm.

*Eulespongia* p. p., Quenst.

Cylindrical, simple, narrowed below, stalked, truncate above; wall of moderate thickness, central cavity wide, tubular. Surface smooth, without large ostia. The whole sponge-body composed of very large, slightly curved, cylindrical spicules, thickened, but rarely dichotomous at the ends, with a wide and long axial canal. In the interior of the wall these spicules are united in bundles, their somewhat bent extremities being at regular distances interlocked so as to form knots, in each of which several radiating bundles of spicules unite



so as to reproduce on a large scale the appearance of a quadri-radiate Lithistid corpuscle. On the surface spicules of the same form and size lie irregularly, forming a covering-layer, sometimes 1-3 millim. in thickness. No free spicules of different form were observed.

1. *Siphonocælia texta*, Röm. Spong. x. 11. Very abundant in the *Cuvieri*-Pläner of Döhrnten near Salzgitter. Quenstedt gives good figures of it under the name of *Eule-spongia texta*, Petr. cxxxv. 3-7.

*Siphonocælia hirta*, Röm. Spong. xi. 6, also possibly belongs to this genus.

### Family 3. *Anomocladina*.

#### CYLINDROPHYMA, Zittl.

*Scyphia* auct.

*Siphonocælia* p. p., From.

*Hippalimus* p. p., D'Orb.

Cylindrical, somewhat narrowed below, thick-walled, with a wide tubular or funnel-shaped central cavity reaching to the base. On the wall of the stomachal cavity the round ostia of horizontal radial canals, which penetrate deeply into the walls, gradually becoming finer outwards. Surface with scattered smaller ostia connected with horizontal incurrent canals. In well-preserved specimens the lower part of the sponge-body is coated with a siliceous epidermis.

Skeleton composed of branched corpuscles, in which several smooth arms radiate from a central node; arms divided at the distal extremity into two or three short branches, running out into root-like fibres. These ends are applied to the similar ends of neighbouring corpuscles, forming cushion-like gnarled knots. As the arms often radiate from the centre at right angles, and their points of union are at nearly equal distances, the skeleton acquires a regular meshed texture, resembling the structure of certain *Hexactinellidæ*.

This genus is very abundant in the Upper Jura of Swabia and Franconia; but the specimens are usually badly preserved. In the lower beds (White Jura  $\beta$  and  $\gamma$ ) the skeleton is almost always converted into calc spar; in the Upper White Jura ( $\delta$ ,  $\epsilon$ , and  $\zeta$ ), on the contrary, the whole sponge is usually roughly silicified and ill adapted to examination. Good examples have been obtained from Gussenstadt, Sontheim, and Beuren. Only in the Upper Jura.

1. *Scyphia milleporata*, Goldf. iii. 2; Quenst. Petr. cxxi. 1-7.

2. *Scyphia milleporacea*, Goldf. xxxiii. 10.

## MELONELLA, Zitt.

*Siphonia* p. p., Goldf., Quenst.

Sponge pomiform or semiglobose, with a broad or very short-stalked base. Under surface with a wrinkled, dense siliceous membrane. Central cavity funnel-shaped, deep, but not very broad. Wall of the stomachal cavity with numerous round ostia standing in longitudinal series. The principal canals are curved parallel to the outer contour line and crossed by a second system of rather finer water-canals, which run from the base of the stomachal cavity obliquely upwards and outwards. These latter (incurrent) canals open on the surface in round ostia of moderate size. In worn specimens the concentrically curved canals appear as furrows radiating from the vertex. Skeleton as in *Cylindrophyma*, in all known specimens converted into calcite.

In external form resembling *Aulocopium* and *Siphonia*. Found only in the Upper Jura.

1. *Melonella* (*Siphonia*) *radiata*, Quenst. Jura, p. 679, Taf. lxxxii. fig. 13, and Petr. cxxvi. 60-72.

*Siphonia piriformis* p. p., Goldf. xxxv. 10 (non vi. 7).

## LECANELLA, Zitt.

From depressed funnel-shaped to basin-shaped, thin-walled, both surfaces with fine pores, with no developed canal-system; wall becoming rather thinner towards the upper margin. Skeleton consisting of irregularly branched corpuscles of considerable size, having 4-6 smooth branches spreading from a nodiform or discoidal centre, and dividing at the ends into two or three short, rounded, conical branchlets. They bear no processes. The superficial corpuscles are more regular in form, and may perhaps be regarded as greatly modified forked anchors with a short shaft. The surface is also covered with large simple bacilli and innumerable *Geodia*-like spherules.

A fragment of a very depressed funnel-shaped specimen from the White Jura  $\epsilon$  of Sontheim indicates a diameter of 150 millims. The corpuscles are loosely united and form an irregular network, reminding one of the latticed texture of the Hexactinellidæ. This texture distinguishes the sponge from *Platychonia*, which it otherwise closely resembles. This species is named *Lecanella pateræformis*. Probably Quenstedt's *Spongites flabellum* (Petr. cxxxi. 7) also belongs here.

## MASTOSIA, Zitt.

Sponge nodular, with a broad hollowed base. Upper surface with numerous large mammiform tubercles. The surface

of the tubercles and their interspaces uniformly finely porous. No oscula, and no distinct canal-system.

Corpuscles small, consisting of a thickened centre from which six to eight, smooth, straight, or slightly curved arms issue. The union of these arms, either with the nodes or arms of neighbouring corpuscles, produces a hexactinelliform lattice-work (Pl. VIII. fig. 5).

The whole of the original specimen is set with spicules and isolated siliceous corpuscles, only a portion of which probably belongs to *Mastosia*. *Geodia*-like spherules are the most abundant. There are also large and small bacillar spicules, pointed at one or both ends, small cylindrical spicules with rounded ends, simple quadri-radiates with smooth and spiny arms, spicules with a short shaft and short forked anchors.

This remarkable new genus is known only from the passage-beds of the White Jura  $\epsilon$  and  $\zeta$  at Sozenhausen, near Günzburg, where it was obtained by M. Wetzler. The largest specimens attain a diameter of nearly 2 decims. The species is named *Mastosia Wetzleri*.

[To be continued.]

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XLIV.—*Remarks upon the Porcellanidea of the West Coast of North America.* By W. N. LOCKINGTON.

THE accompanying list of Porcellanidea (which includes descriptions of nine species I believe to be new, since they are certainly distinct from any of those described or mentioned by Stimpson as found upon this coast) does not profess to be complete, but merely to give facts of distribution and other particulars respecting forms with which I am acquainted.

Stimpson, in his 'Prodr. des Anim. évert.' 1858, divides the old genus *Porcellana* into the following genera:—*Petrolisthes*, *Pisosoma*, *Raphidopus*, *Pachycheles*, *Megalobrachium*, *Porcellana*, *Minyocerus*, *Porcellanella* (White), and *Polyonyx*.

In the first two of these the first joint of the antennal base is short, not reaching the margin of the carapax; while in all the others the first joint is more or less produced, and joined to the margin of the carapax.

The more convex carapax, stouter chelipeds, and less projecting front are the characters which separate *Pisosoma* from *Petrolisthes*; but as some of my species have some of the characters of the former genus, while they are without others, I find it exceedingly difficult to discriminate. I have therefore included *Pisosoma* in *Petrolisthes*, placing the former name in brackets before the specific names of such species as, in my