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XXVI.—A revision of the Jurassic Bryozoa.—Part I. The genus *Stomatopora*

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Hab. Congo (from between Stanley Pool and Lukolele, and from Upoto). Three females.

Named in honour of the Rev. F. G. Harrison, who procured this and many other interesting and rare insects during his journeys on the Congo between the Stanley Pool and Lukolele.

XXVI.—*A Revision of the Jurassic Bryozoa.*—Part I. *The Genus Stomatopora.* By J. W. GREGORY, D.Sc., F.G.S.

I. *The Specific Characters of the Cyclostomata.*

The diagnosis of species of Cyclostomatous Bryozoa has always been regarded as a difficult and unsatisfactory task. The Cheilostomata offer nine useful characters, some of which appear to be very reliable. In this group the form of the zoarium, the shape of the orifices and of the zoecia, the structure of the front wall, the characters of the oecia or gonocia, the arrangement of the avicularia and vibracula, the distribution of the spines and maculae, and the superficial ornamentation give a combination of characters which enables species to be defined with considerable precision. Unfortunately in the typical Cyclostomata only the least trustworthy of these characters are available. We have to rely only on the form of the zoarium, the length of the zoecia, the size and position of the mouth, the shape of the oecia (when present), and the ornamentation of the wall. The zoecia in the Cyclostomata are, however, so very simple in structure that their characters are far less reliable than in the more specialized subclass, the Cheilostomata. It seems therefore at first sight almost impossible to diagnose species while even the genera appear to vary to a hopeless extent.

Two opposite methods of treatment have therefore been adopted for the Cyclostomata. On the one hand, numerous species have been founded on insignificant and individual variations; on the other, many authors have thought that this subclass affords an illustration of the theory of the "persistence of type," that was once applied, but has been discontinued in the case of many other groups. They have therefore abandoned the effort to separate species of different ages; they have lumped together the forms of such different geological horizons that, if their example be followed, the study of the group becomes valueless.

To find a mean between these extremes is not easy. The

general facies of the Cyclostomatous faunas of the various geological systems is, however, strikingly different; this can at once be seen by a comparison of lists of the genera. If the genera vary it is almost certain that the species must do so likewise. The specific characters are variable and slight. But if we examine good series of specimens, and compare the normal types of the zoëcia and equivalent zoëcia in the two zoaria, then certain fairly constant differences appear. Thus, if we take a Jurassic specimen in which the zoarium contains, say, two hundred zoëcia, and compare it with one of a closely allied recent species with as many zoëcia, it is not improbable that one zoëcium in each may be found to be identical. But that does not seem sufficient reason for ignoring the constant differences between the majority of the zoëcia in each. The embryos and young forms of different species of Mollusca are often indistinguishable; but that does not lead malacologists to merge the species when there are definite differences in the adults. The variations in the zoëcia of a zoarium of a bryozoon is an analogous case to this; some zoëcia are young and immature, others are cramped and malformed. To draw up a diagnosis which shall accurately describe each zoëcium in a colony, and shall at the same time be sufficiently definite to characterize the species, is impossible. Nevertheless, if we take the normal adult zoëcia and compare equivalent ones in different species, there seems sufficient reason for supporting the practical validity of species in this group.

II. *Revision of the Species.*

The genus *Stomatopora* affords a very convenient illustration of the difficulties, but yet of the possibilities, of the diagnosis of the Cyclostomata. It is, moreover, the first genus represented in the Jurassic that comes under consideration in the preparation of a catalogue of the Jurassic Bryozoa. It may be useful to publish a synopsis of each of the leading genera as they are finished.

Family Tubuliporidæ.

Genus STOMATOPORA, Bronn, 1825.

Alecto, Lamouroux, 1821.

Aulopora, pars, Goldfuss, &c.

Diagnosis.—Tubuliporidæ with the zoëcia forming flat adnate zoaria, composed of uniserial lines. These branch

dichotomously or irregularly, and sometimes anastomose into a reticular web. The peristome is flush or slightly raised. Zoecia tubular or subpyriform.

Type species : *S. dichotoma* (Lamouroux).

1. *Stomatopora dichotoma* (Lamx.).

Alecto dichotoma, Lamouroux, 1821, Exp. méth. Polyp. p. 84, pl. lxxxi. figs. 12-14.

Stomatopora dichotoma, Bronn, 1825, Pflanzenth. pp. 27, 43, pl. vii. fig. 3.

Aulopora dichotoma, Goldfuss, 1831, Petref. Germ. Bd. i. p. 218, pl. lxxv. fig. 2 (? non 2 a).

Stomatopora antiqua, Haime, 1854, Mém. Soc. géol. France, sér. 2, t. v. p. 162, pl. vi. fig. 7.

Stomatopora Haimeï, Terq. & Piette, 1865, ibid. sér. 2, t. viii. p. 124, pl. xiv. figs. 29, 30.

Stomatopora dilatans montivaltiformis, Vine, 1883, Rep. Brit. Assoc. 1882, p. 251.

Stomatopora Terquemi, Haime, 1854, op. cit. p. 164, pl. vi. fig. 4.

Stomatopora Waltoni (non Haime), Vine, 1884, Quart. Journ. Geol. Soc. vol. xl. p. 787.

Stomatopora spirata, Walford, 1889, ibid. vol. xlv. p. 564, pl. xviii. fig. 6.

Stomatopora porrecta, Walford, 1889, ibid. vol. xlv. p. 565, pl. xviii. figs. 7, 8.

Diagnosis.—*Zoarium* typically forming a loose irregular network; the lines radiate from the centre and repeatedly branch dichotomously. Eight or ten zoecia may occur between two points of bifurcation. Such series are often curved (var. *spirata*, Walf.). Young forms consist of a single line, which may at first branch very sparingly (var. *porrecta*, Walf.). Crowded growths occur.

Zoecia regularly cylindrical.

Peristomes well raised, varying in height from half to one and a half times the diameter of the zoecia. Surface punctulate and transversely wrinkled. The wrinkling is best seen in young zoecia. The normal zoecia vary in length from one and a half to three times the diameter.

Oæcia small; appear as small hemispherical tubercles; diameter about half that of the zoecia; punctulate.

Distribution. — England: Lower Lias to Cornbrash. Foreign: Sinemurian to Kimeridgian; France and Germany.

2. *Stomatopora dichotomoides* (d'Orb.).

Alecto dichotomoides, d'Orbigny, 1849, Prod. Pal. t. i. p. 288.

Stomatopora dichotomoides, d'Orbigny, 1852, Pal. Franç., Terr. Crét. t. v. p. 834.

Stomatopora Bouchardi, Haime, 1854, Mém. Soc. géol. France, sér. 2, t. v. p. 164, pl. vi. fig. 6.

Stomatopora jurensis, Étallon, 1861, Mém. Soc. Émul. Doubs, sér. 3, t. vi. p. 211.

Stomatopora corallina (? d'Orb.), id. 1861, *ibid.* p. 210.

Stomatopora Waltoni (pars.), Vine, 1884, Quart. Journ. Geol. Soc. vol. xl. p. 787, fig. 2 *b* (non 2 *a*).

Diagnosis.—*Zoarium* of uniserial zoecia branching dichotomously or irregularly. Typically it is very loose. Long unbranched series occur. Crowded varieties with tufted ends to the branches also occur.

Zoecia at first regularly cylindrical, but soon becoming pyriform or subpyriform; obscurely transversely ridged; surface punctulate.

Peristomes slightly raised, usually not on the median line.

Oecia unknown.

Distribution.—England: Inferior Oolite to Corallian. Foreign: Bajocian to Corallian; France, Germany, and Austria.

3. *Stomatopora Waltoni*, Haime.

Stomatopora Waltoni, Haime, 1854, Mém. Soc. géol. France, sér. 2, t. vi. p. 162, pl. vi. figs. 3 *a* and *b*.

Alecto bajocensis, d'Orbigny, 1849, Prod. Pal. t. i. p. 288.

Diagnosis.—*Zoarium* of uniserial zoecia forming delicate, radiating, and very divergent lines; these branch repeatedly, occasionally interlace, and end in loose tufts.

Zoecia long, cylindrical, and very thin; transversely ridged.

Peristomes have thickened rims, but are not reflexed.

Distribution.—England: Fuller's Earth to Cornbrash. Foreign: Bajocian, France.

4. *Stomatopora Smithi* (Phillips).

Cellaria Smithi, Phillips, 1829, Geol. Yorks. pt. i. p. 143, pl. vii. fig. 8.

Hippothoa Smithi, Morris, 1843, Cat. Brit. Foss. p. 39.

Alecto Smithi, d'Orbigny, 1849, Prod. Pal. t. i. p. 317.

Diagnosis.—*Zoarium* hippothoiform, uniserial; branches crowded and irregular; entirely adherent.

Zoecia pyriform; long slender proximal ends; front wall well raised, rounded, and punctate; orifice small, circular, surrounded by a low rim.

Peristomes slightly raised. Flat regular rims surround each of the zoecia.

Distribution.—Adherent to *Cardium citrinoidum*. Cornbrash, near Scarborough. Only the type specimen known.

5. *Stomatopora intermedia* (Münst.).

Aulopora intermedia, Münster, 1831, in Goldfuss, Petref. Germ. Bd. i. p. 218, pl. lxx. fig. 1.

Stomatopora intermedia, Bronn, 1849, Ind. Pal. p. 1202.

Alecto intermedia, d'Orbigny, 1850, Prod. Pal. t. ii. p. 25.

Diagnosis.—*Zoarium* forming a crowded network.

Zoecia cylindrical, very short.

Peristomes raised and much thickened.

Distribution.—Corallian, France and Germany.

Synopsis of Species.

- I. *Zoecia* regularly tubular.
 Peristomes well raised ; *zoecia* short *dichotoma*.
 Peristomes slightly raised ; *zoecia* long *Waltoni*.
 Peristomes thickened *intermedia*.
 II. *Zoecia* pyriform *dichotomoides*.
 III. *Zoecia* hippothoiform *Smithi*.

III. *Relations of the Jurassic Species.*

The four main characters used in the diagnosis of these species are as follows :—The elevation of the peristome (*p*) ; the shape of the *zoecia* (*c*) ; the size, and especially the length, of the *zoecia* (*l*) ; and, last and least, the arrangement of the *zoarium* (*r*). In order to show the relations of these Jurassic species to those of later periods formulæ are very convenient. Each of the characters may be represented by a letter, and numbers adopted for the principal variations.

Thus, let *p* stand for peristome ; if it is flush it may be indicated by 0, if well raised by 2, and if slightly so by 1.

In the subjoined formulæ the signs denote as follows :—

	Peristome.	Shape of Zoecia.	Length of Zoecia.	Zoarium.
	<i>p.</i>	<i>c.</i>	<i>l.</i>	<i>r.</i>
0	Flush.	Cylindrical.	Short.	Uniserial ; long thin series.
1	Slightly raised.	Fusiform.	Median.	Uniserial ; branches tufted at ends.
2	Well raised.	Pyriform.	Long.	Uniserial ; branches tend to become double at ends.
3	Highly raised.	Hippothoiform.	Very long.	Multiserial.

Intermediate variations may be indicated by the use of dashes beside the figures.

Thus we may represent the different series as follows:—

S. dichotoma series.

	<i>p.</i>	<i>c.</i>	<i>l.</i>	<i>r.</i>	
<i>S. dichotoma</i> (Lamx.)	2	0	1	1	Jurassic.
<i>S. granulata</i> , M.-Edw. (non auct.)	2'	0'	1	1	Cretaceous.
<i>S. divaricata</i> , Reuss	2'	0'	1'	0''	Miocene.
<i>S. trahens</i> , Couch (<i>S. granulata</i> , Johnst.)	2''	0''	1	2	Recent.

S. dichotomoides series.

	<i>p.</i>	<i>c.</i>	<i>l.</i>	<i>r.</i>	
<i>S. dichotomoides</i> (d'Orb.)	1	2	1	0	Jurassic.
<i>S. plicata</i> , d'Orb.	1	2'	1	0	Cretaceous. (Or- namentation differs.)
<i>S. vesiculosa</i> (Mich.)	1	2''	1	0	Miocene.

S. Waltoni series.

	<i>p.</i>	<i>c.</i>	<i>l.</i>	<i>r.</i>	
<i>S. Waltoni</i> , Haime	1	0	2	0	Jurassic.
<i>S. longiscata</i> , d'Orb.	1''	0	2	0	Cretaceous.
<i>S. Reussi</i> , n. nom.*	2	0	2	0	Miocene.

Each of these three sets of formulæ shows a gradual increase in the degree of development of the distinguishing characters. This fact is clearly brought out by the formulæ. In some species the later types, however, are simpler than their Cretaceous representatives, for the genus attained its maximum in the Mesozoic, and has been on the wane throughout the Cainozoic. The different stages may be called either species or varieties. It probably does not matter which name is adopted, so long as the differences between them are marked and the forms grouped together in series round the best-known type.

XXVII.—*Descriptions of Two new Species of Pieridæ captured by Captains Cayley Webster and Cotton in New Georgia, Solomon Islands.* By H. GROSE SMITH.

Delias georgiana.

Male.—*Upperside*. Anterior wings white, with the costal margin, costal and subcostal nervures black; the third sub-

* *Aulopora divaricata*, Reuss (non Roemer), Foss. Polyp. Wien. Tert. 1847, p. 53, pl. vii. fig. 18.