

Article XVIII.—WEST INDIAN SPONGE-INCRUSTING  
ACTINIANS.

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PLATES XLIV–XLVII.

Among collections of sponges from the West Indies will usually be found one or more specimens on the surface of which are numbers of small, white, circular discs, altogether unlike the sponge in texture. The discs are either arranged singly, in a scattered manner, or are connected in chain-like rows, forming long or short colonies. Less frequently the incrustations are orange in color, and form short linear or irregular expansions. To the casual observer the white circular discs not infrequently suggest the coiled tubes of some *Spirobis*.

Many examples of sponges having such incrustations are to be seen in the collections of the American Museum of Natural History, the United States National Museum, and the British Museum. The photographic reproductions on Plates XLIV–XLVI are from specimens in the New York institution. The real nature of the organisms was apparently first determined by the West Indian naturalists, MM. Duchassaing and Michelotti ('50, '60, '66), who, having observed them in their living expanded condition, recognized them as zoanthid polyps. Several species have been described by these authors, and referred to very diverse zoanthean genera; among these is the peculiar genus *Bergia*, the systematic position of which has long been in doubt, and which has even been made the type of a family, Bergidæ. Owing to the very few external characters available for diagnostic purposes, and to the variable nature of the colonies, the determination of certain of the species is now somewhat difficult.<sup>1</sup>

In studies on the Jamaican Actiniaria ('98, '00) I described

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<sup>1</sup> Prof. J. P. McMurrich kindly informs me that among the type collections of Duchassaing and Michelotti, now in Turin, there are no representatives of sponge-incrusting actinians.

three species of actinians commensal on sponges, and by microscopic examination proved that they are all referable to the genus *Parazoanthus* of Haddon and Shackelton ('91, p. 563). With one exception, *P. swiftii*, I hesitated in identifying the Jamaican specimens with the meagre accounts which Duchassaing and Michelotti give of their species, awaiting the possibility of obtaining more material for comparison. Specimens collected later in the West Indies, as well as examples from the same area found in various museums, have now afforded the means for instituting a better comparison of all the sponge-incrusting forms. They demonstrate that in all probability they are referable to only three species, one of which is certainly the type species of the genus *Bergia*. In their distribution they range from the northern Bermudas and Bahamas to the Lesser Antilles, whence the original types were taken. Further, the species all belong to one genus, *Parazoanthus*, and thus the systematic position of the genus *Bergia* is finally settled.

***Parazoanthus catenularis* (Duch.) Duerd.**

PLATES XLIV and XLVII.

*Alcyonium serpens* LAMARCK, Hist. Nat. des Anim. sans Vert., 2nd ed., Vol. II, p. 604

*Bergia catenularis* DUCHASSAING, 1850, p. —; DUCH. & MICHL., 1860, p. 54, pl. viii, fig. 12; DUERDEN, 1898, p. 464.

*Parazoanthus monostichus* DUERDEN, 1900, p. 202, pl. x, fig. 14, pl. xiii, fig. 9.

*Bergia via lactea* DUCH. & MICHL., 1860, p. 54.

Duchassaing's original description of this species in 1850 was very brief, and his later account ('60), in collaboration with Michelotti, did not add much. It is made the type species of the genus *Bergia*, which Duchassaing and Michelotti ('60, p. 54) characterize as including very short polyps forming a chain-like incrustation on the surface of sponges, the polyps arising from one another by stolons (propogules), not from a common membrane, and originating from the upper or cephalic part of the polyp. The commensalism and cateni-

form habit was supposed to call for a distinct place among actinian genera. Hitherto the genus has not been subjected to reëxamination.

In subdividing the Zoanthacea, in 1868, Verrill recognized the three families Zoanthidæ, Bergidæ, and Orinidæ. The separation was based entirely upon external characteristics, the Bergidæ including forms "in which the stolons arise from the sides above the base." The family included only the genus *Bergia*, and, though founded upon such a trivial character as the place of origin of the connecting stolon, was accepted by Andres ('83) and by McMurrich ('89).

The characters given in the original diagnosis, however, are only specific, and altogether insufficient for family or even generic distinction, especially in the light of recent anatomical studies on actinians, where form and habit are found to count for comparatively little. Haddon and Shackleton ('91, p. 363), in their revision of the Zoantheæ, erected the genus *Parazoanthus* to include a number of incrusting zoanths, defining it as follows: "Macrocnemic Zonatheæ, with a diffuse endodermal sphincter muscle. The body wall is incrustated. The ectoderm is continuous. Encircling sinus as well as ectodermal canals, lacunæ, and cell-islets in the mesogloea. Dioecious. Polyps connected by thin cœnenchyme, rarely distinct." The salient characters are the macrocnemic arrangement of the mesenteries, and the presence of a diffuse endodermal sphincter muscle.

An anatomical investigation of the representatives of the genus *Bergia* shows that the polyps present all the important details given above, hence the genus now becomes merged in *Parazoanthus*, which includes a number of small incrusting zoanths growing upon sponges, hydroids, shells of molluscs, etc.

The genus *Bergia* has hitherto included but two species—*B. catenularis* and *B. via lactea*, but an inspection of large numbers of specimens renders it very doubtful whether any specific separation can be maintained. The only specific characters for the first are that in the living state the polyps are a yellow brown, with 20–24 cylindrical tentacles pointed  
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at the apex, and of a clearer color than that of the disc. The figure given represents an upper view of four polyps connected by narrow stolons. Andres ('83, p. —) repeats the original description and takes the liberty of representing in a wood-cut the polyps as they may be supposed to appear if seen in side view; Delage and Hérouard ('01, p. 667) also repeat the figure of Andres. *Bergia via lactea* is distinguished by having larger polyps than the preceding, and disposed in an irregular manner; the color is also different, the disc and tentacles are violet instead of yellowish. Duchassaing and Michelotti identify *B. catenularis* with the *Alcyonium serpens* of Lamarck, though the characters given by the French author are scarcely sufficient to make certain which species was intended.

In a preliminary list of the Actiniaria of Jamaica ('98) I identified a small sponge-incrusting actinian as *B. catenularis*, but, in a fuller paper ('00), came to the conclusion that the safest course was to regard it as a distinct species, and named it *Parazoanthus monostichus*. The absence or small amount of coenenchyme connecting the individual polyps in the specimens then available seemed to suggest a different species.

The larger quantity of material now accessible proves that the species varies greatly in its habit, according to age; and on the same sponge may be two fairly distinct types of growth which appear to combine in a satisfactory manner the two species of Duchassaing and Michelotti. Where the zoanthid colony is in active growth it forms long, narrow, chain-like rows of polyps, connected by a superficial stolon-like coenenchyme; but in older colonies the rows are broken up into small groups of polyps, without much intervening coenenchyme, or the polyps may be altogether isolated. In the latter stage the individual polyps are also larger and might be mistaken for the next species—*P. parasiticus*; but the polyps of this species are larger and are rarely arranged on the sponge in long rows. The variation in habit of the present species is well shown in the photographic reproduction on Plate XLIV. The new colonies in long chain-like rows are mainly toward the margin of the zoanthid growth. In the form first described by me as *P. monostichus* only the older

type of growth was present, not the more truly cateniform stage.

Recently I have collected sponges bearing living colonies of this species, and have been able to preserve them expanded and in good condition for study. The polyps when alive were nearly colorless or yellowish brown. None showed the violet color ascribed to *Bergia via lactea*, though such variations in color are not at all infrequent in actinians. A colony of four polyps, wholly separated from the sponge, is represented on Plate XLVII, and shows the actual relationships of the polyps and cœnenchyme. Normally the whole of the latter is embedded in the sponge, being exposed only on the upper surface; the actual appearance scarcely warrants the figure which Andres gives, based on Duchassaing and Michelotti's description. The capitular ridges vary from eight to twelve; and the tentacles are double these numbers.

Details of the anatomy are represented on Plate XLVII, and will serve to supplement those given in the account of the Jamaican Actiniaria ('00, pp. 202-206). The mesenteries, as shown in Fig. 2, are macrotypic, and are in eight pairs, but may increase somewhat beyond this.

No ectodermal sphincter is present; indeed, the columnar circular muscle as a whole is of the feeblest character, and the polyps do not readily retract and overfold. The possible absence of the sphincter should be added to the diagnosis of the genus. It is merely a detail, not of kind, but of comparative significance, to be associated with the smallness of the polyps. The species is undoubtedly closely related to the next, in which the sphincter is fairly well developed ('00, pl. xiv, fig. 4); its presence or absence does not call for generic separation. The same remark will probably apply to the absence of the ciliated bands or Flimmerstreifen from the mesenterial filaments in both this and the next species; they are present in closely related species where the polyps are larger.

**Parazoanthus parasiticus** (*Duch. & Michl.*) Verr.

PLATE XLV.

*Zoanthus parasiticus* DUCH. & MICHL., 1860, p. 50, pl. viii, figs. 3, 4.

*Parazoanthus separatus* DUERDEN, 1900, p. 197, pl. x, figs. 12, 13; pl. xiii, fig. 8; pl. xiv, fig. 4.

*Parazoanthus parasiticus* VERRILL, 1900, p. 560.

This is perhaps the most common of the sponge-incrusting actinians. If the synonymy above given be correct Verrill finds it frequently parasitic on the "glove sponge" (*Tuba* or *Spinoseella vaginalis*) from the Bermudas; it is present on many specimens of the same sponge from the Bahamas now in the American Museum of Natural History; I have obtained it several times on various species of sponges around Jamaica, while Duchassaing and Michelotti secured their specimens from the Lesser Antilles.

When the account of *P. separatus* was published I had seen the species only in the retracted condition, and the walls of the polyps throughout were so thoroughly impregnated with sponge spicules that I could not see how it could possibly be identified with the *Zoanthus parasiticus* of Duchassaing and Michelotti, these authors stating that their species is a veritable *Zoanthus* with fleshy walls, not hardened by inclusions. I have since had living polyps under examination and find that when the column is fully expanded it appears practically devoid of incrustations, though a few spicules are aggregated towards the capitular margin. Duchassaing and Michelotti must have been referring to this appearance of the column in the expanded state, for when the same polyp is retracted the walls are thickly impregnated; the tissues are then firm and opaque white, due to the closeness of the inclusions, but on full expansion they are quite delicate and transparent to a degree probably not met with elsewhere among zoanthids. The specimens from the Bermudas which I have seen are certainly the same as the Jamaican forms, and I believe that Verrill's identification of them with *Zoanthus parasiticus* is correct.

A few external characters observed on the living expanded

polyp may be added to those given in previous accounts. The column can extend beyond the surface of the sponge as much as 4 mm. and is about 3 mm. in diameter; it is then clear or minutely granular according to the quantity of inclusions. The upper margin is often a dull white, the remainder a pale brown. The tentacles are short and tapering or digitiform, in two cycles, alternately large and small, about 24 in number, and are pale brown in color, containing but few Zoöxanthellæ.

Usually only the retracted column and an extremely narrow margin of coenenchyme is seen at the surface of sponges, and generally the different polyps are wholly separated from one another. On some sponges, however, the polyps are seen connected with one another in rows, but the connecting coenenchyme is embedded in the sponge and soon breaks down. This is well shown on the uppermost part of the right tube of the sponge on Plate XLV.

The retracted polyps vary a little in size, the diameter being from 2 to 3 mm., but no other characters have been found which would justify specific separation. Anatomically it differs from the previous species in having a well defined diffuse endodermal sphincter muscle ('00, pl. xiv, fig. 4).

### **Parazoanthus swiftii** (*Duch. & Michl.*) *Duerd.*

#### PLATE XLV.

*Gemmaria swiftii* DUCH. & MICHL., 1860, p. 55, pl. viii, figs. 17, 18; 1866, p. 138.

*Polythoa* (*str. s.*) *axinellæ* (pro parte) ANDRES, 1893, p. 331.

*Palythoa swiftii* ROULE, 1900.

*Parazoanthus swiftii* DUERDEN, 1898a, p. 372, pl. xviii, fig. 11; pl. xx, figs. 5, 6.

This species seems to occur less frequently in the West Indies than the other two. I have met with it only around Jamaica, while Duchassaing and Michelotti secured their types from St. Thomas.

It is an easily recognizable form, particularly in the living condition. The polyps are arranged a few in number on a

thin, narrow, linear or irregular coenenchyme, or the coenenchyme is somewhat expanded and two or three individuals may occur abreast. The colonies when alive are a bright orange yellow and stand out very conspicuously against the dark colored sponge with which they are commensal. Even at a depth of several feet in the water the color affords a great contrast, and on dried colonies kept for four or five years and now in the American Museum of Natural History it is still pronounced. Histological examination reveals that the coloration is due to an extraordinary abundance of bright yellow pigment granules throughout the ectoderm and endoderm.

The capitulum presents twelve serrations at the apex, and the tentacles are in two cycles of twelve each; the diameter of the expanded disc is 4 mm., and that of the column in retraction is 2 mm. Anatomically the sphincter muscle is well developed, and the mesenteries are in twelve pairs, macrocnemic in their arrangement. A fuller description occurs in 'Jamaican Actinaria,' Part I.

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## EXPLANATION OF PLATE XLIV.

### PARAZOANTHUS CATENULARIS (Duch.) Duerd.

Colonies incrusting sponge (sp. ?) from the Bahamas. Towards the margin of the branches of the sponge the zoanthid colonies are in a more active state of growth, and are chain-like in appearance; elsewhere the chain character has been broken up and the polyps are in isolated groups. About  $\frac{2}{3}$  natural size.



PARAZOANTHUS CATENULARIS.





## EXPLANATION OF PLATE XLV.

PARAZOANTHUS PARASITICUS (Duch. & Michl.) Verr.

Colonies incrusting the "glove sponge," *Tuba* or *Spinosella vaginalis*, from the Bahamas. The actinian appears mainly as isolated white circular discs. About  $\frac{1}{4}$  natural size.





PARAZOANTHUS PARASITICUS.





EXPLANATION OF PLATE XLVI.

PARAZOANTHUS SWIFTII (Duch. & Michl.) Duerd.

Colonies incrusting a sponge, *Hircinea* (sp. ?), from Jamaica. About  $\frac{1}{4}$  natural size.



PARAZOANTHUS SWIFTII.





## EXPLANATION OF PLATE XLVII.

### PARAZOANTHUS CATENULARIS (Duch.) Duerd.

Fig. 1. — A colony of four, partly expanded polyps. Enlarged.

Fig. 2. — Transverse section through the stomodæal region of a polyp with eight pairs of mesenteries.

Fig. 3. — Transverse section through a portion of the column wall and disc of a partly expanded polyp.



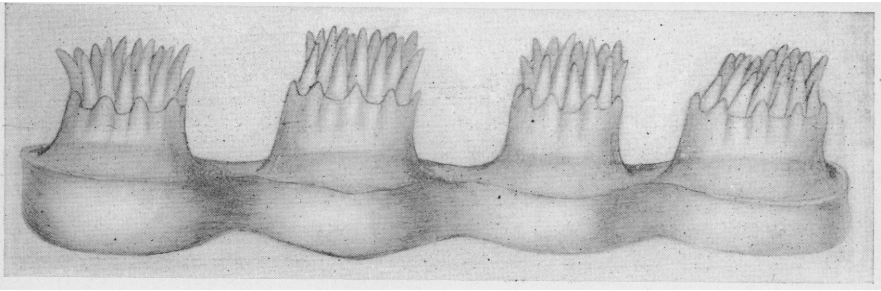


FIG. 1.

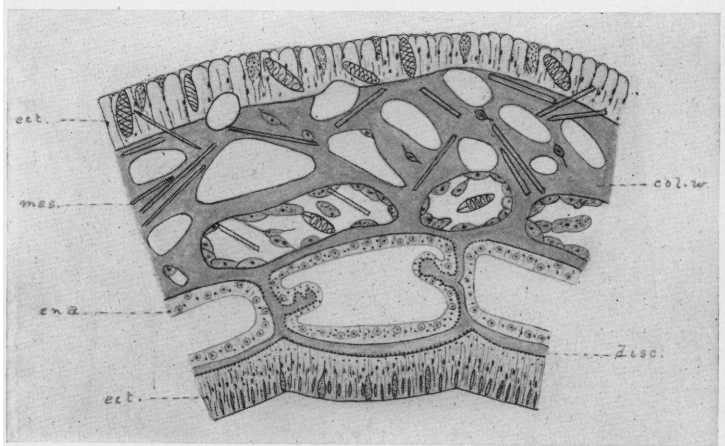


FIG. 2.

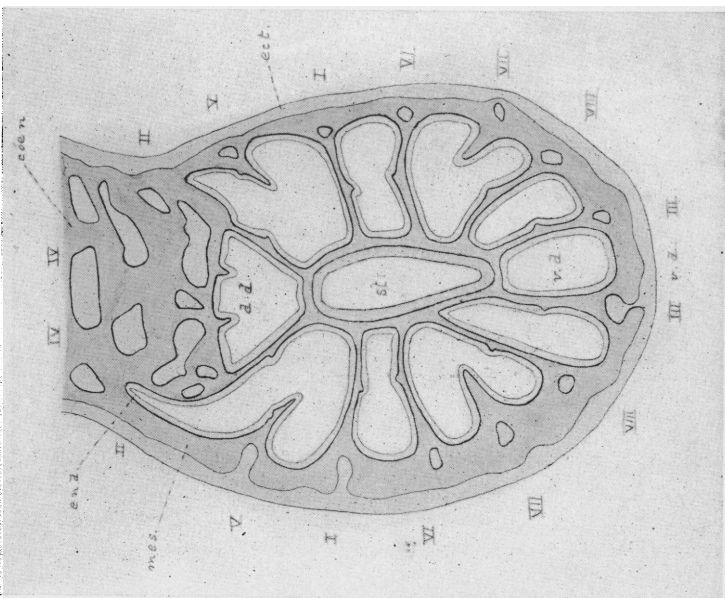


FIG. 3.

PARAZOANTHUS CATENULARIS.

