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THE CORAL *MONTIPORA MONASTERIATA* (FORSK.) IN THE FIJI ISLANDS

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During a visit to the Fiji Islands, of about three weeks in March, 1949, through the kind help of Mr. Harold Gatty at Suva I had the opportunity to make trips to various coral reefs. On one of these trips, on March 18, to the reef of Tomberua, a small island to the south east of the large island Viti Levu, I collected an extensive material of various species of the genus *Montipora*. Among this material there is one colony of *Montipora monasteriata* (Forsk.), apparently the first to be reported from the Pacific region, as Crossland (1941, p. 35) states: "It is remarkable that the species, which is not uncommon in the Red Sea, has not appeared in any collection outside this area except in Gravier's from the Gulf of Aden."

Forskål's (1775) short description of his *Madrepora monasteriata* does not give any details about the growth form of the species. Milne Edwards (1860) ranges the species in the group characterized by "polypier subden-droïde ou en forme de touffe rameuse à branches digitiformes". Probably Klunzinger (1879) was influenced by Milne Edwards's data when he identified a branched form as *Montipora monasteriata*. After examination of some of Forskål's specimens, von Marenzeller (1907) concluded that Klunzinger's *Montipora tuberculosa* belongs to *M. monasteriata* (Forsk.), whilst Klunzinger's *M. monasteriata* is another species of the genus. Crossland (1941) arrives at the same conclusion; as this author gives an elaborate account of the history concerning the species, I have noted here the most salient details only. According to Crossland the work by Bernard (1897) is not helpful and is best ignored (meaning, of course, as far as concerns the data in connexion with the specific status of *M. monasteriata*). However this may be, it must not be overlooked that Bernard (l. c., p. 137), although regarding the corallum of *M. monasteriata* (Forsk.) as unknown, emphati-

cally states that the *Montipora monasteriata* of Milne Edwards (1860) and of Klunzinger (1879) is not the same as Forskål's species. Gravier (1911), who records *M. monasteriata* from the region of the Gulf of Aden adjoining the Red Sea, remarks that the characters of his specimens correspond with those given by Klunzinger ("*M. tuberculosa*") and von Marenzeller.

The colony of *Montipora monasteriata* from Tomberua has the following dimensions: greater diameter 23 cm, lesser diameter 14 cm, height 8½ cm. It is, therefore, slightly larger than Forskål's specimens (Crossland does not give the measurements of the largest specimen, but states that a colony of 17 × 12 × 8 cm is a little smaller), but smaller than some of the colonies obtained by Gravier in the Gulf of Aden (greater diameter 30 cm). The colony from Tomberua must have started growth as an encrusting layer on coral debris, but gradually developed into a solid mass, the surface of which is divided into numerous small hillocks separated by crevices of various depths (Pl. VIII fig. 1). This growth form is more or less intermediate between those of the specimens figured by Crossland (1941, Pl. VI, upper figures). The papillae that are characteristic of the species are present almost everywhere on the surface of the corallum, they are absent in some parts of the marginal region and in the small parts of the lower surface that were alive when the colony was collected. Apparently the papillae reach their full development in parts of vigorous growth only, as a rule they are thicker and broader on the hillocks and smaller or even absent in the crevices.

For a comparison of the Tomberua specimen with the typical colonies from the Red Sea in Forskål's collection it is important to quote the following from Crossland (1941, pp. 36/37): "We may divide the papillae into the following four types (1) ridges between and around the calices rising into low blunt points here and there, (2) thin and pointed processes; the thinnest very delicate ones are round, but as soon as they thicken they flatten. Often sparse, not nearly so many as there are calices, (3) these become numerous and blunt ended, i. e. tongue shaped, but they are never lanceolate, i. e. thinner below, (4) these may fuse, forming short plates, the fusion complete to the top of the plate or extending only three quarters of the way up." In all the specimens the four types of papillae were found, in all are areas which look bare to the naked eye, presenting the conditions as (1), in all are broad plates as (4). Crossland's figure of an enlarged part of a corallum (× 8, l. c., Pl. VI, lower figure) distinctly shows the four types of the papillae side by side.

Different parts of the specimen from Tomberua are shown, 5 times enlarged, on the accompanying plates. Pl. VIII figs. 2 and 3 chiefly show the types (3) and (4), Pl. IX fig. 1 the types (2) and (3), Pl. IX figs. 2-4 the type (1).

In he part of the corallum of Pl. IX fig. 5, one of the few parts of the lower surface that was alive when the colony was taken from the reef, the surface is flat, without any ridges between and around the calices. The same holds good with regard to most parts of Pl. IX fig. 2, but here a few calices are surrounded by feebly developed ridges. The greater part of the calices of Pl. IX fig. 4 are surrounded by inconspicuous ridges, but in the upper part of the figure these become higher, and a few small roundish papillae are to be seen. The calices of Pl. IX fig. 3 are surrounded by rather high ridges which here and there rise into a papilla. Pl. IX fig. 1 shows an area with rather large cylindrical isolated papillae, surrounded by parts of the corallum with distinctly broadened papillae, often forming short plates. The parts of the corallum of Pl. VIII figs. 2 and 3 represent the general appearance of the corallum, the tops of hillocks on the upper surface, in which the papillae as a rule are distinctly broadened.

In contradistinction to Forskål's specimens (von Marenzeller, 1907, Pl. XXII fig. 76; Crossland, 1941, Pl. VI) the surface of the hillocks in the Tomberua specimen is rather uneven as the parts with the more fully developed papillae have a tendency to rise above the surface as small protuberances or ridges (Pl. VIII). But as the trabeculae surrounding the calices and the papillae with their spines correspond exactly with those of Crossland's figure (1941, Pl. VI, lower figure), there is no doubt concerning the specific identity of the Tomberua colony with the typical specimens from the Red Sea.

The parts of the Tomberua colony shown on Plate IX have a structure different from what is generally to be observed in the specimen. These parts show peculiarities that might be regarded as typical of other species of *Montipora*. The central part of Pl. IX fig. 1 with its isolated cylindrical papillae shows a striking resemblance to Hoffmeister's (1925, Pl. 6 fig. 3 b, c) figures of *Montipora tuberculosa* (Lamarck). Pl. IX fig. 2 represents a part of the corallum showing the typical characters of *Montipora venosa* (Ehrenberg), this part completely corresponds with the figure of the latter species in Hoffmeister's (l. c.) Pl. 6 fig. 2 b. The central part of Pl. IX fig. 4 in every respect is similar to that of the specimen of *Montipora ramosa* Bernard, figured by Thiel (1932, Pl. XVII figs. 2, 3). The part of the corallum on Pl. IX fig. 5, a flat region in which the calices have a distinct theca separated by a groove from the surrounding coenenchyme, corresponds with Bedot's (1907, Pl. 46 fig. 255) figure of *Montipora palmata* (Dana). A similar figure is the one in Vaughan (1918, Pl. 64 fig. 4 c), representing the lower surface of *Montipora informis* Bernard. The area of the corallum shown in Pl. IX fig. 2 is, as far as concerns the structure

of the thecae and the coenenchyme, more or less intermediate between those of figs. 4 and 5 of the same plate.

Numerous other instances could be given of parts of specimens belonging to various species showing a structure of the corallum corresponding with the parts of *Montipora monasteriata* shown on Pl. IX. Especially the structure as represented in Pl. IX fig. 5 is found on the under side of numerous species of the genus. In those parts that are excluded from direct sunlight it appears that the coenenchyme does not develop beyond a reticular mass not rising above the surface, the characteristic papillae become apparent in those areas only where there are favourable conditions. On the sides of the colony, where conditions are less favourable than in the upper parts, the development of the coenenchymal structures results into the formation of upstanding ridges between the calices (Pl. IX fig. 3), as these normally occur in well developed parts of the species *Montipora venosa*.

It is not altogether clear what Crossland means when he writes (1941, p. 37): "The thecae, though small, are remarkable in this genus for the strong development of two series of septa and an irregular, but often massive, solid columella. Bernard's numerous figures of calices show nothing at all like it and the large columella may be unique. The thecae are normally 75 μ m. in diameter, but in places, particularly in depressions, are smaller, about 30 μ m. They are always distinct to the naked eye." Crossland's statement without any doubt refers to the genus *Montipora* as a whole, as he takes Bernard's figures into consideration, and the latter author does not give a figure of *Montipora monasteriata*.

Bernard (1897, p. 10), in his general account of the genus *Montipora*, remarks: "The tips of the septal spines occasionally unite some distance down in the fossa to form a columella-like body (e. g. *M. Ellisi*), but this is certainly not typically the case, as Martin Duncan supposed." Concerning *Montipora ellisi* Bernard (l. c., p. 149) writes: "A conspicuous columella present in most of the calices on the thinner portions of the dish; not regularly developed in the calices on the excrescences." This columella is distinctly visible in the drawing of an enlarged calice of the species (l. c., Pl. XXXIV fig. 10). Generally, however, in *Montipora* the columella is poorly developed, so that Vaughan and Wells (1943, p. 108) give the following characters of the genus: "No axial corallites. Corallum submassive, foliaceous or encrusting, epithecate. Corallite walls porous. Septa rudimentary, spinose in character. Columella rare, feeble. Coenenchyme reticulate, with strong vertical trabeculae, thin horizontal connections, surface spinose, the spines often hirsute. Exo- and endotheca absent."

When dealing with the variation in the development of the septa and the

columella Crossland (1941, pp. 37/38) states that in the type specimens of *Montipora monasteriata* there may occur, though rarely, calices like nearly empty tubes, in which obviously no columella is to be found. More often there is a solid columella that may be deep down in the calice or near the top of the theca. In some calices the columella is so thick that septa above it are quite narrow. In the photograph of an enlarged part of the corallum (l. c., Pl. VI, lower figure), however, not one of the calices shows a columella, though it may have been present at the bottom, in too dark a spot to appear in the figure.

In the colony of *Montipora monasteriata* from Tomberua most of the calices do not show a trace of a columella. In the few calices in which it is to be seen it is feebly developed, then it is confined to the lower part of the calice only. It never forms a distinct massive pillar rising to some height in the calice. It is, therefore, not to be wondered that none of the calices of the enlarged parts figured on Pls. VIII and IX show a columella.

The calices of the Tomberua specimen have a complete set of 6 septa of the first cycle, of which as a rule the directives are slightly larger than the others. The septa of the second cycle are much smaller than those of the first, the second cycle is not always complete, as often only 2 or 3 septa of this cycle are present. It is a curious fact that most of the calices in the area of Pl. IX fig. 5, a part of the corallum excluded from direct light, have a fairly complete second cycle of septa.

In the Tomberua specimen the diameter of the calices generally varies from 0.6 to 0.8 mm; there are a few of larger size, up to 1 mm, and in certain parts of the colony some of the calices are smaller (diameter 0.5 mm or even less). These measurements correspond with those in the type specimens, for Crossland (1941, p. 37) obviously meant to state that the calices normally have a diameter of 0.75 mm, but may be smaller, about 0.3 mm.

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EXPLANATION OF THE PLATES

Plate VIII

Fig. 1. *Montipora monasteriata* (Forsk.), specimen from Tomberua, Fiji Islands. Upper surface, natural size.

Figs. 2 and 3. Same specimen, parts of upper surface, $\times 5$.

Plate IX

Montipora monasteriata (Forsk.), specimen from Tomberua, Fiji Islands. Various parts of the colony, $\times 5$.



