THREE NEW FUNGIÆ, WITH A DESCRIPTION OF A SPECIMEN OF FUNGIA GRANULOSA KLUNZINGER AND A NOTE ON A SPECIMEN OF FUNGIA CONCINNA VERRILL.

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In determining the species of corals belonging to the genus *Fungia* in the United States National Museum, I discovered the three forms, described as new species, a specimen of *F. granulosa* Klunzinger and one of *F. concinna* Verrill that seems worth a notice. The first considered new is a fossil species collected by Prof. Raphael Pumpelly in Toshibetzt Valley, Island of Yesso, Japan. Of the two recent forms, *F. samboangensis* and *F. madagascarensis*, the first belongs to Professor Döderlein's group of *F. repanda*; the second to his group of *F. fungites*. Without a very large series for comparison, it is not possible to assert positively that these forms are not variations of previously described species. *F. samboangensis* is closely related to *F. repanda* Dana; *F. madagascarensis* belongs in the group of *F. fungites*, but is separated principally by the character of the basal spines. I have not been able to identify these specimens by comparison with the material in the United States National Museum nor by a study of the literature, therefore I feel positive that they are undescribed forms, and think that they should be recorded, even if subsequent work should prove that they are not entitled to specific recognition.

Fossil from Japan, group of F. PATELLA (Ellis and Solander).

FUNGIA JAPONICA, new species.

Plate LXVII.

Corallum fungiform, deformed (*Diaseris* form), free, without trace of detachment scar. Base (and wall) concave upward, more or less corrugated. The deformity resembles that found in *Diaseris* and *Diafungia*.

Dimensions.	Greater diameter at base.	Lesser diameter at base.	Height.	Depth of calice.
	mm.	*mm.*	*mm.*	*mm.*
Specimen No. 1 (type)	24	22.5	17.5	About 9.
Specimen No. 2 (paratype)	20	15.5	11	About 5.5.

The base, besides possessing corrugations, has several deep sinuses, and numerous fine, not prominent, granulated costæ, which usually alternate rather regularly in size, and correspond to all septa. Toward the central portion of the base they are resolved into a great number of granulations without apparent definite arrangement. The wall over the greater portion of the base appears solid, but rather often near the periphery synapticula may be seen joining the septa together. In places the wall is clearly synapticulate. The appearance is that the wall is at first synapticulate and later becomes secondarily thickened so as to be imperforate almost throughout.

The septa are extremely numerous, thin, and very much crowded, at the edge of the corallum equal or subequal, above the edge and near the fossa unequal. In specimen No. 1 there are ten or twelve larger septa, with about twenty or more smaller intervening septa. The cycles are not distinctly differentiated, but apparently the arrangement is between six and seven cycles, with the members of the first and second cycles of the same size. Those of the third cycle are shorter; those of the fourth are shorter than those of the third. The members of the fifth cycle are shorter than those of the fourth. In places it could be seen that the two outer septa of the sixth cycle in a quarter system (that is, a septum of the sixth cycle standing next to the one of the first cycle and the one next the member of the third cycle in the same quarter system) are prolonged beyond the inner end of the included member of the fourth cycle and equal in length the member of the third cycle. The members of the sixth cycle seem always to be longer than those of the fifth. The seventh cycle is not complete; they appear to be short, but often it does not seem possible to distinguish between the members of the sixth and seventh cycles, so that sometimes an outer septum of the seventh may be prolonged and combined with one of the sixth for the inclusion of one of the fifth.

The septal margins are very finely dentate. Laterally the septa are striate, the striæ usually opposed in pairs, with granulations arranged along their courses. Each dentation on the septal margins corresponds in position to the termination of a pair of striæ. Septal perforations are numerous in the younger septa, especially near the margin; they occur between and sometimes in the courses of the septal trabeculæ, and are not perfectly regular in occurrence. The older septa, except near the margin and inner termination, are usually imperforate.

The calicular fossa is deep, extending almost to the base of the corallum, and is narrow. There is no columella. A considerable number of septa meet in the bottom of the fossa.

Locality.—Toshibetzt Valley, Yesso, Japan. R. Pumpelly, collector.

Geologic horizon.—Tertiary; nothing more definite known.

Type.—Cat. No. 154426, U.S.N.M.

RECENT SPECIES.

Group of F. REPANDA Dana.

FUNGIA SAMBOANGENSIS, new species.

Plate LXVIII and Plate LXIX, fig. 1; Plate LXXIV, fig. 1.

Corallum rather large, circular in outline, slightly arched, base gently concave. Wall perforate, numerous slits between the costæ to near the center, around which is an imperforate area about 25 mm. in diameter. Costæ rather fine, not greatly differentiated in size. Every fourth or sixth may be somewhat thicker and more prominent than those intervening. *All the costæ are spinose*, the spines smaller near the edge, where they are of only moderate size, or rather small, and in a single series. Toward the center they become larger and the distribution is not quite so regular as near the periphery. On the central imperforate area the spines are again somewhat smaller and are distributed irregularly. The shanks of the spines are smooth or with only occasional granulations; the tips are rounded, blunt, often though not always swollen, and *are granulated*.

Septa unequal, even on the periphery, where usually there are at least three different heights and three different thicknesses; all septa, even the thicker, are thin, the smallest very thin. On the upper surface they are very unequal, of three or four different heights. About eighteen septa reach the axial fossa. The inner edge of these are prominent and fall steeply to the bottom of the fossa. Between each pair of these longest septa are from one to three shorter ones of practically equal height. Then there are several lower, thinner septa, scarcely half the height of the taller, between each pair of taller ones. Septal margins serrately dentate. On the larger septa the serrations are coarser—in fact, decidedly coarse—near the periphery; become smaller and ultimately obsolete toward the fossa. Near the periphery there are five or six dentations to the centimeter; nearer the fossa, seven or eight. *There are no tentacular lobes.* The septal faces show low, broad ridges corresponding to the serrations; the whole of the septal are covered with minute granulations; near the edges are minute wavy lines running parallel to the margins. The synapticula are distinctly visible from above.

Columella distinctly developed, composed of very delicate, spongy tissue.

Dimensions.—Length, 130 mm.; width, 130 mm.; height, 44 mm.

Locality.—Samboanga, Philippine Islands. J. B. Steere, collector.

Type.—Cat. No. 21, 139, U.S.N.M.

Affinities.—This coral belongs to Professor Döderlein's "Repanda Group,"[a] and is near *F. concinna* Verrill and *F. repanda* Dana. How-

[a] Die Korallengattung Fungia, p. 105.

ever, it does not seem possible to refer it to any of the previously-described species. The nearly equal ribs separate it from both the species just mentioned. It is, in addition, separated from *F. concinna* by its very perforate wall, the wall in that species being almost solid. I thought the species that I am describing might be *F. serrulata* Verrill,[a] which Döderlein considers a variety of *F. concinna*. According to Professor Verrill's description the specimen from Samboanga can scarcely be his *F. serrulata*, which he describes as having "principal costæ" "and many other finer ones between," and "the [septal] edges irregularly dentate, with small, very acute, unequal teeth." I therefore think *Fungia samboangensis* will stand as a good species.

FUNGIA GRANULOSA Klunzinger.

Plates LXX and LXXI; Plate LXXIV, fig. 2.

1879. *Fungia granulosa* KLUNZINGER, Korallenth. Rot. Meer., III, p. 65, pl. VII, fig. 3; pl. VIII, fig. 3.

1902. *Fungia granulosa* DÖDERLEIN, Korallengat. Fungia, p. 108, pl. XI, figs. 1, 1a, 1b.

Description of a specimen in the United States National Museum:

Corallum large, low, irregularly flexed, the length greater than the width; wall with a few slits near the periphery, otherwise solid; costæ of several sizes, one set decidedly thicker and considerably more prominent than the others. These largest costæ are densely granulated, the granulations present on both the sides and the edges. In places they occur in heaps, and may be prolonged into short, comparatively thick spines. The surfaces of the spines minutely granulated. All the costæ are granulated. The smaller ones have regularly beaded edges. Toward the center of the disk all costæ become obsolete. The largest may be subobsolete, and give place to a large, densely granulate central area, in which some of the granulations may form short spines. These granulations are themselves minutely granulate.

Septa on the periphery, excepting the very smallest, subequal; those corresponding to the large costæ slightly more prominent; on the upper surface decidedly unequal, usually about 7 smaller septa between two taller and thicker ones. The courses of the septa slightly sinuous. Septal margins rather finely dentate, about 14 dentations to 1 cm., not always of equal size; on the curves of the outer edges they are finer. The tips of the dentations acute or rounded. Septal faces densely and minutely granulate, minutely wrinkled near the margin. Synapticula not visible from above except where the septa have been broken. No tentacular lobes. Columella very poorly developed, almost absent.

Dimensions.—Length, 157 mm.; breadth, 143 mm.; thickness at inner ends of large septa, 28 mm.

[a] Bull. Mus. Comp. Zool., I, 1864, p. 51.

Locality.—Unknown.

Type.—Cat. No. 110, U.S.N.M., U. S. Expl. Exped. specimen.

Note.—I have described and figured the specimen, as the species is rare and not well known. Döderlein had only two specimens.

Group of F. FUNGITES (Linnæus).

FUNGIA MADAGASCARENSIS, new species.

Plates LXXII and LXXIII; Plate LXXIV, fig. 3.

Corallum large, heavy, strongly arched, base concave, deformed, length exceeds width. Wall perforate, with numerous slits and pits. Costæ of two kinds, spined and without spines. Between each pair of spiniferous costæ are from one to three much thinner and less prominent costæ that do not bear spines. Of the spine-bearing costæ every other or every fourth is usually thicker and somewhat more prominent than the intervening ones. The larger costæ may be as much as 2.5 mm. thick. The spines are tall and thick, the larger ones as much as 2 mm. in diameter near the base and 4.5 mm. in height. Rather often they are compound and are frequently forked at the end. The shanks of the spines are smooth, glabrous, the tips secondarily spinulose. Toward the center the costæ become indistinct. The central area is covered by coarse spines similar to, but smaller than those on the costæ.

Septa, at the periphery unequal or subequal; above they are usually of about three different heights and four or five different thicknesses, the largest septa very thick, as much as 2.5 mm. The others graded in size to the youngest which are thin and closely wedged in between the older septa, they are so crowded that the faces almost touch. All of the septa coarsely dentate, on the larger septa 3 to 5 to 1 cm.; their height 3 to 4.5 mm.; they may terminate as blunt styles, or be irregularly serrate in form. Irregularly developed tentacular lobes present. The septal faces are almost glabrous—to the naked eyes they are, but with a rather high-power hand glass, very minute, low granulations can be discovered. Synapticula can not be seen from above.

Columella apparently absent.

Dimensions.—Length, 177 mm.; breadth, 145 mm.; height, 100 mm.; depth of concavity of base, 55 mm.

Locality.—Madagascar, R. W. Shufeldt, collector.

Type.—Cat. No. 21,141, U.S.N.M.

Affinities.—This species belongs in the group with *Fungia fungites*, in spite of the suggestion that it may, because of having costæ without spines, belong with *F. danai*. The costal spines, when they are not double pointed or compound, are typically like those of *F. fungites;* they are subconical with smooth sides, pointed and show a few projecting trabeculæ on the tips, but could not be called granulate. The almost smooth sides of the septa are like those of *F. fungites.*

The very thick septa recall *F. crassilamellata* M. Edwards and Haine, but the septal dentations and costal spines are entirely different. According to Döderlein's Key[a] it is nearest to *F. fungites* var. *dentata* and one would infer the same from his description. None of the specimens figured by Döderlein shows costal spines nearly so large as in the specimen here described. There are several excellent specimens of var. *dentata* in the United States National Museum, including two of Dana's specimens. They differ from the Madagascar specimen especially in the character of the spines.

FUNGIA CONCINNA Verrill.

Plate LXIX, fig. 2.

This specimen is interesting as it shows extensive budding from the mouth of the disk. Four larger and two smaller mouths have been formed.

Locality.—Papeeti, Tahiti Islands, U. S. Bureau of Fisheries steamer *Albatross*, 1900.

Explanation of the Plates.

Plate LXVII.

Fungia japonica, new species, figs. 1, 2, 3, three views, side, calicular and basal, respectively, of the same specimen. Height, 18 mm.; width, 27.5 mm.; fig. 4, face of a septum enlarged, length of septum 6.5 mm.

Plate LXVIII.

Fungia samboangensis, new species, calicular view of the type, natural size.

Plate LXIX.

Fig. 1, *Fungia samboangensis*, new species, basal view, natural size.
2, *Fungia concinna* Verrill, calicular view, natural size.

Plate LXX.

Fungia granulosa Klunzinger, calicular view, natural size.

Plate LXXI.

Fungia granulosa Klunzinger, basal view, natural size.

Plate LXXII.

Fungia madagascarensis, new species, calicular view, natural size.

Plate LXXIII.

Fungia madagascarensis, new species, basal view, natural size.

Plate LXXIV.

Septal margins enlarged twice: Fig. 1, *Fungia samboangensis;* fig. 2, *Fungia granulosa;* fig. 3, *Fungia madagascarensis.*

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[a] Die Korallengattung Fungia, p. 147.

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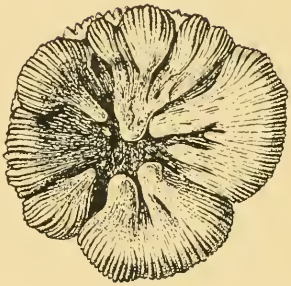

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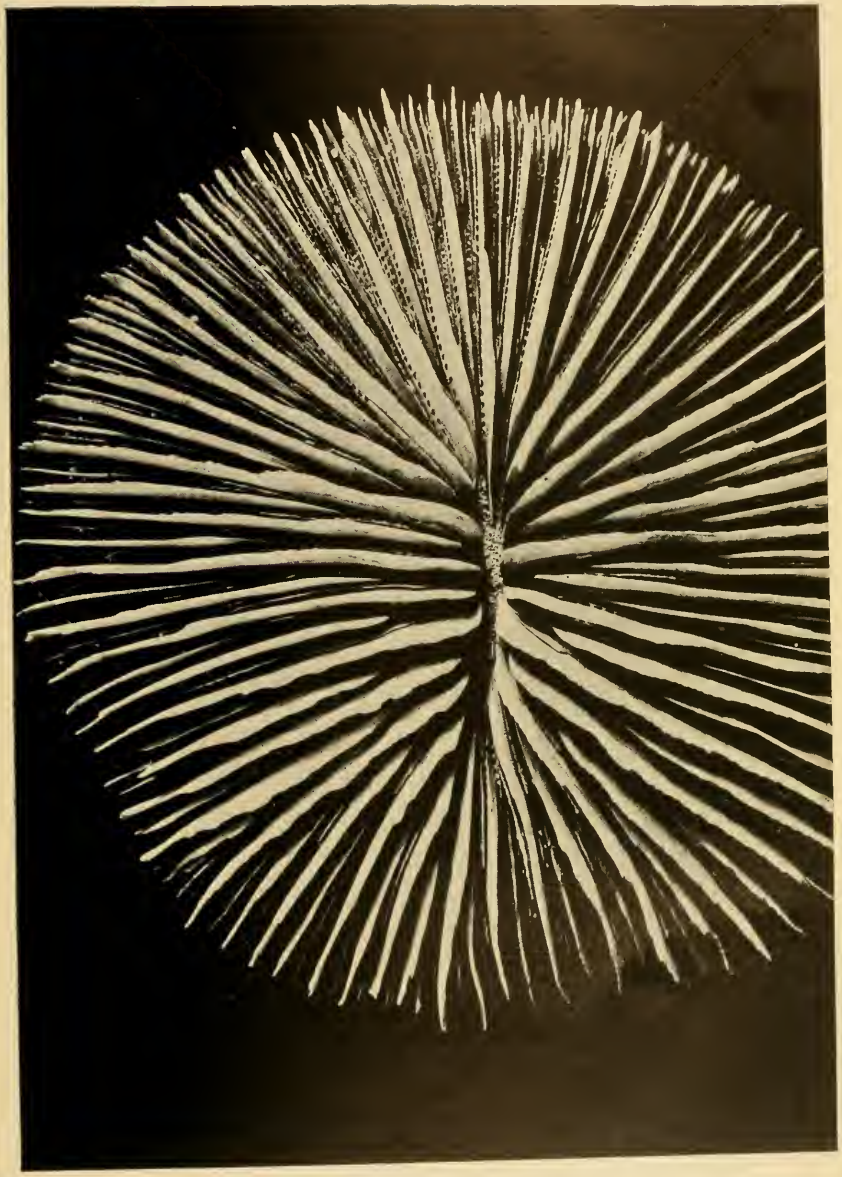
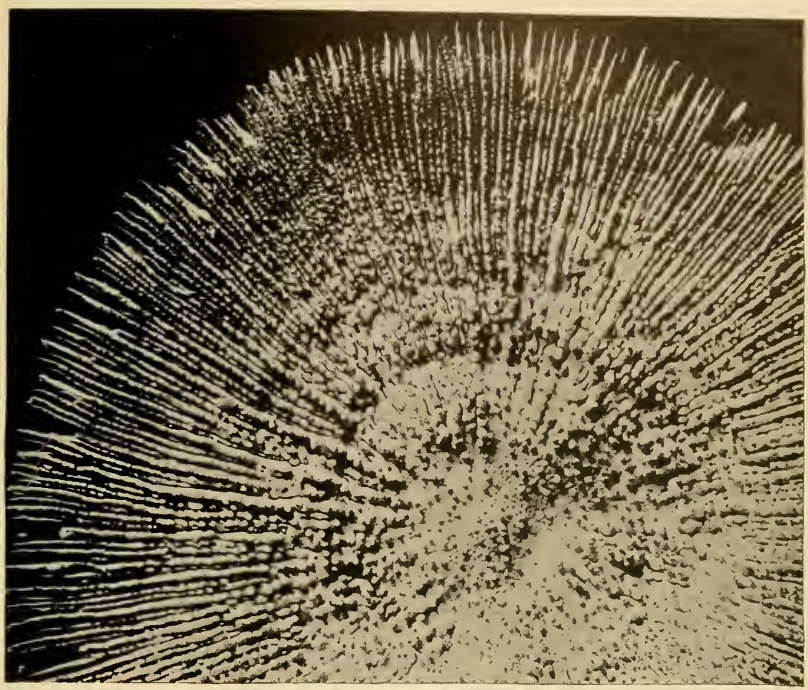
FUNGIA JAPONICA, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 832.



FUNGIA SAMBOANGENSIS, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 832.



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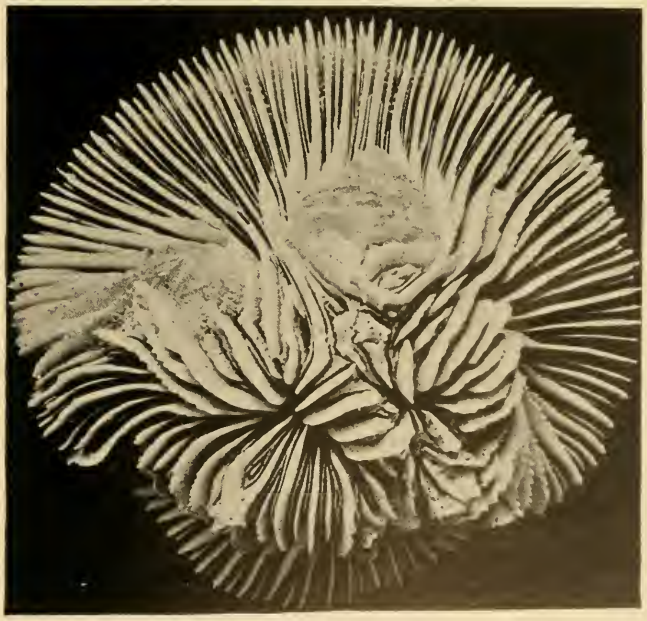

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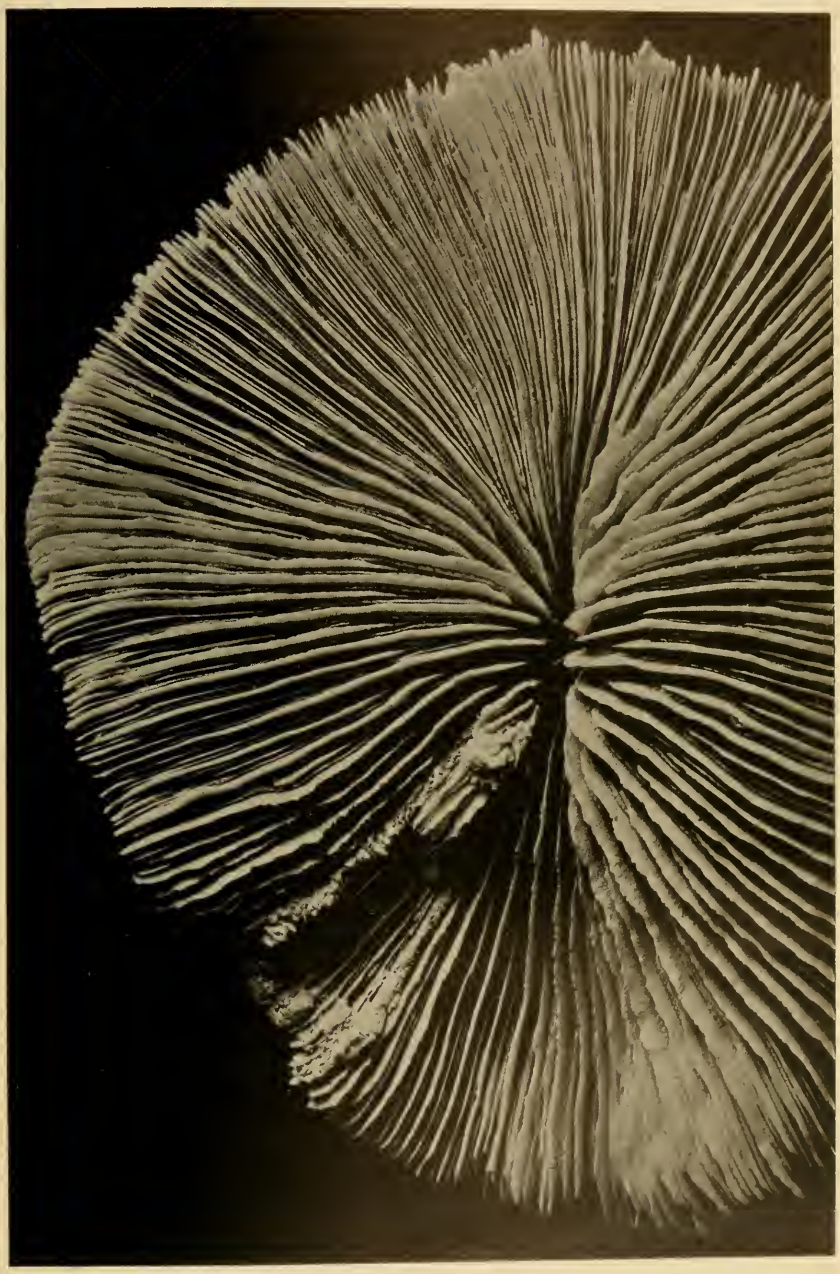
1. FUNGIA SAMBOANGENSIS. 2. FUNGIA CONCINNA.

FOR EXPLANATION OF PLATE SEE PAGE 832.



FUNGIA GRANULOSA KLUNZINGER.

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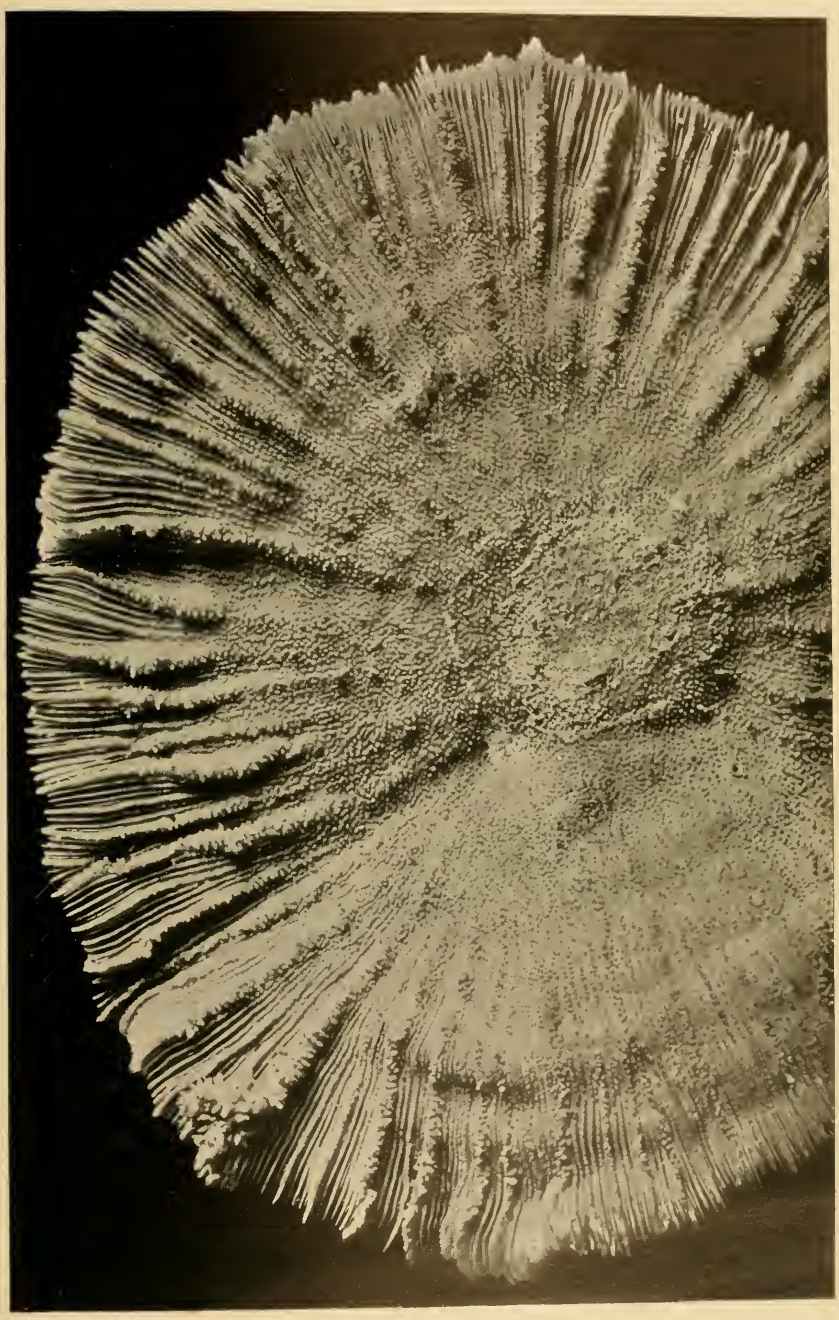

FUNGIA GRANULOSA KLUNZINGER.

FOR EXPLANATION OF PLATE SEE PAGE 832.

FUNGIA MADAGASCARENSIS, NEW SPECIES.

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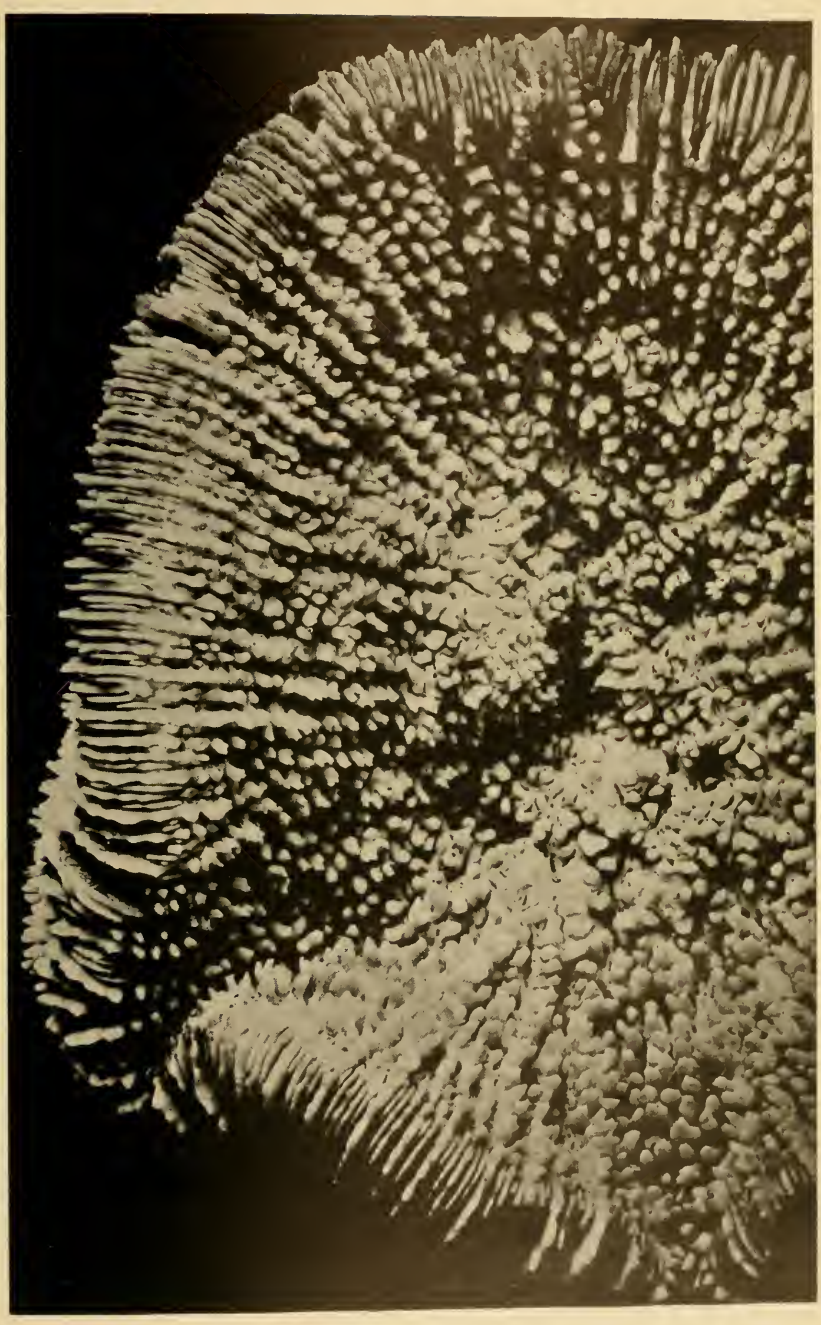

FUNGIA MADAGASCARENSIS, NEW SPECIES.

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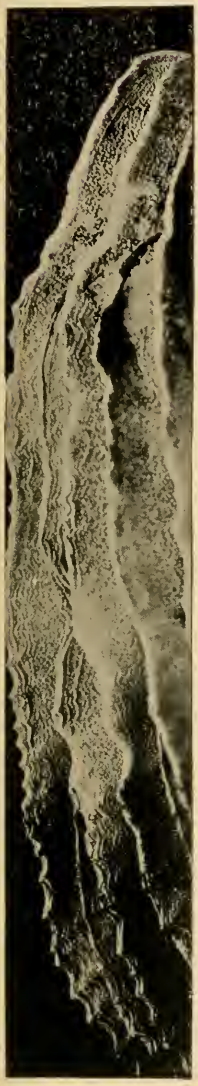

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1. FUNGIA SAMBOANGENSIS. 2. FUNGIA GRANULOSA. 3. FUNGIA MADAGASCARENSIS.

FOR EXPLANATION OF PLATE SEE PAGE 832.