

of the subquadrate crown lacks a crosspiece. Occasionally the crown is more circular. A much rarer form of table is shown in figure 2*b*, Plate LXIX. Here the disk is much reduced and the spire correspondingly elongated. This form is apparently confined to the walls of papillæ and to the center of the groups of rods, where there are commonly three or four. The rest of the calcareous deposits are in the form of small knobby rods or very incomplete buttons with knobs, the principal forms being shown in the figures. They vary in length from 0.02 to 0.038 or 0.04 mm. Rarely there is a complete button 0.05 mm. long. A characteristic feature of these deposits is their accumulation in small circular groups or in small rings. They also form large rings about the base of the ambulacral appendages. A relatively few are scattered between the groups, which are rather close together. The supporting rods of the papillæ are curved with a spinous margin; the tips being a trifle expanded, spinous, and commonly perforated. At the tip of the papillæ the rods become smaller, laterally branched, the branches sometimes joining to inclose meshes. Then the rods resemble very open plates. Very rudimentary terminal plates appear to be sometimes present. The papillæ are further strengthened by the peculiar long-spined, small-disked tables already mentioned. The pedicels (of the ventral surface) have very well developed terminal plates, and in the vicinity of these are numerous bilateral curved elliptical fenestrated supporting plates about 0.13 mm. long and with one or two tiers of holes on either side of the central shaft. The margin is often rough or toothed. The tables in the walls of the pedicels are of the ordinary shape with a smooth margin. None of the slender curved supporting rods found in the papillæ are present in the pedicels, except possibly on the transition area between pedicels and papillæ (lateral).

This species is especially characterized by the form of the tables, and the curiously knobbed, mostly incomplete buttons and rods, arranged in circular groups and rings. It is very perplexing and should probably be ranked in Théel's *Holothuria atra* group^c along with *grisea*, *inornata*, and others. The deposits, especially the knobbed buttons and rods, are entirely different from those of *atra* or any nearly related form. *Anulifera* is also related to *pervicæ*, perhaps more closely than to *atra*.

HOLOTHURIA FUSCO-OLIVACEA, new species.

Plate LXIX, figs. 3, 3*a-f*; Plate LXX, fig. 3.

General form stout; subcylindrical, blunt at both ends. Mouth directed ventrally; anus terminal. Dorsal surface well arched and covered with rather widely scattered papillæ; ventral surface well

marked from dorsal and beset with more numerous pedicels without order; pedicels not crowded. Tentacles 18, with fairly large crowns. Circumoral collar slight or not at all present; impossible to tell from condition of specimen. Body wall very tough but not remarkably thick. Color in alcohol: Dorsal surface rather dark olive brown; papillæ surrounded by a lighter ring; ventral surface dull grayish brown or light sepia, tentacles yellowish. Deposits: Tables and rough buttons. Tables of two kinds: (1) Numerous small tables with a simple annular disk bearing blunt spines on the edge and with a cruciform central hole and a perforation formed by the forked base of each spire support; or the disks may be larger with a small perforation at either side of the larger peripheral ones; spire low, made up of four rods; one crossbeam, and a circular crown bearing about 8 teeth; crown often incomplete or irregular, sometimes quadrate; (2) a few very large tables with a large perforated disk, irregular margin, and a spire ending in a single (?) point. Buttons elliptical with two to twenty-two holes, usually four or five, the edge rough, and the surface covered with very many small granular elevations. Length about 65 mm.

Locality.—Station 3834, south coast of Molokai Island, reef near Kaunakakai.

Type.—Cat. No. 21214, U.S.N.M.

In addition to somewhat larger papillæ, comparatively few in number and each in the middle of a light spot, there are scattered between them more numerous smaller ones. The larger papillæ, easily seen by the light spots, form about five very irregular rows. There are also numerous small pedicels scattered among the larger ones. The anal aperture is without special groups of papillæ. Surrounding the tentacles there is a slight ridge with pedicels and papillæ, but it apparently did not form a collar before contraction.

The calcareous ring is moderately stout and of the usual form. The interradial pieces are considerably smaller than the radial. Both are excavated on the posterior margin. Anteriorly the interradials have a single tooth, the radials being deeply incised. Madreporic canal single, free, on the right side of the mesentery. Madreporic body elongate. Polian vesicle single. Gonad small. Cuvierian organs in a large tuft. Left branch of respiratory tree not intimately connected with intestinal vessels.

The disks of the smaller tables have a very characteristic form, as shown by fig. 3, Plate LXIX. The simplest forms have only the four peripheral holes, the larger disks possessing a small perforation on either side of one or more of these. The large central hole instead of being circular is always cruciform. The disks are usually between 0.056 mm. and 0.086 mm. in diameter. The spires are low, made up of four rods and one crossbeam, and a more or less circular crown (which is frequently incomplete), bearing normally eight teeth (hori-

^cChallenger Holothurioidea, Pt. 2, p. 213.

zontal), but sometimes fewer, rarely more. The large tables are very scarce, and the tips of the few seen appeared to have been broken. The form is best shown by the figure. The disk is perforated with several tiers of holes and has no well-defined rim, being irregular from imperfectly inclosed perforations. The spire is about 0.12 mm. in height (relatively too small in drawing) and has two or three cross-beams. Apparently it ends in a single point. The buttons differ much in size. While a very few are smooth, the vast majority are irregularly beset with small protuberances, and the edge is minutely incised. Common forms are figured. The average length varies from about 0.05 to 0.09 mm., but buttons 0.135 mm. or even larger are present in the ambulacral appendages. An average button of the dorsal perisome measures 0.056 mm., but in buttons of this size the number of irregular holes varies from one to eight. Frequently asymmetry characterizes the number and position. The supporting rods of pedicels and papillæ are curved, robust, smooth, with a spiny or scalloped border. The middle is expanded and perforated on either side of the central shaft and the tips are slightly expanded also, commonly minutely perforated. In the pedicels the rods frequently have only lateral processes at the sides, with denticulate ends. These processes, by joining at the tips, form perforations. At base of pedicels and papillæ large rods or buttons of intermediate form are found, rather more sparsely knobbed than the regular buttons. They resemble the largest buttons rather more than rods. When the little protuberances begin to appear on the rods, it is at the edges. Pedicels have large terminal plates; the papillæ small rudimentary ones.

This species is apparently quite unique. At least there are no close relatives.

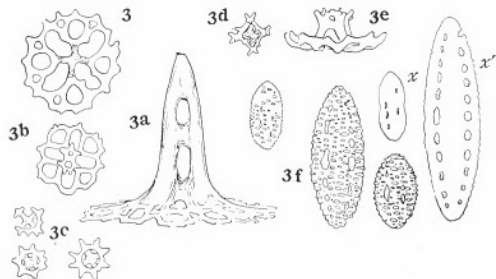
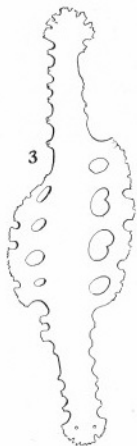


Fig. 3. *Holothuria fusco-olivacea*. Disk of commonest form of table. 3a. Very rare form of large table (tip missing). 3b. Small table. 3c, 3d. Crowns of tables. 3e. One of the commoner tables from side. 3f. Various forms of buttons; x and x' are covered with small knobs, but these have been omitted to show more clearly the perforations, $\times 200$. See also Plate LXX, fig. 3.



3. *Holothuria fusco-olivacea*. Supporting rod of pedicel, $\times 200$.