Corals.—*By Dr. F. Brüggemann.**

The specimens of Corals procured at Rodriguez amount to 102 and belong to 49 species. They were taken by Messrs. Slater and Gulliver evidently at moderate depths; at least no deep-sea forms, especially no *Turbinoliidæ* or *Oculinidæ*, are represented amongst them. As might have been anticipated, the Rodriguez coral fauna bears a close affinity to that of Mauritius, Madagascar, and the Seychelles Islands, and there can scarcely be any doubt that the species described as new in the present paper will prove to occur likewise in the localities mentioned as well as in others of the Indo-Pacific Region. Many of the species are common to Rodriguez and the Red Sea; a less considerable number have been recorded from the north-eastern part of the Indian Ocean; some of them extend their range into the Pacific. However, the coral fauna of these regions is hitherto comparatively but little known, and the present collection most likely contains only a small minority of the Rodriguez species; so that it would be premature to offer any further remarks on their geographical distribution.

ALCYONARIA.

Alcyoniidæ.

Alcyonium sphaerophorum.

Lobularia sphaerophora, Ehrenberg, Abhandl. Akad. Wiss. Berl. 1832, I., p. 281 (1834).

Alcyonium sphaerophora, M. Edw. Hist. Nat. Corall, I., p. 119.

Sarcophytum latum.

Alcyonium latum, Dana, U.S. Expl. Exp. Zooph. p. 623, Pl. 58, fig. 6 (1846); M. Edw. Hist. Nat. Corall. I., p. 121.

Milleporidæ.

Millepora verrucosa.

Millepora verrucosa, M. Edw. Hist. Nat. Corall. III., p. 227, Pl. F. 2, fig. 1 a, b, c (1860).

Millepora forskali.

Millepora forskali, M. Edw. Hist. Nat. Corall. III., p. 228.

Several specimens, belonging to different varieties, in one of them the terminal branches being much prolonged, stout and nearly cylindrical. This species I believe to be hardly separable from the West Indian *M. alcicornis*.

* This communication on the Corals of Rodriguez was one of the last works of the author, who died before the manuscript passed through the press. Shortly before his death he expressed a wish to make some alterations, but without specifying them. Therefore the editors have considered it best to print the manuscript as it was left by the author.

Millepora gonagra.

Millepora gonagra, M. Edw. Hist. Nat. Corall. III., p. 230, Pl. F. 3, fig. 1 a, b (1860).

ZOANTHARIA.

Actiniidæ,

Palythoa argus.

Palythoa argus, Ehrenb. Abh. Akad. Wiss. Berl. für 1833 I., p. 373 (1834); M. Edw. Hist. Nat. Corall. I., p. 305.

Palythoa violacea.

Corallum thin, explanate, spreading, incrusting coenenchyma rather rigid, coriaceous, its surface covered with numerous grains which are distant by once to twice their diameter. Polyps scattered, small, wholly immersed when contracted, their disk surrounded by six to nine short prominences, a little larger than the small verrucæ on the coenenchyma.

Height of corallum $\frac{1}{2}$ of a mm. Diameter of polyps, about 2 mm. Colour (in spirits), violet; the prominences of the coenenchyma somewhat lighter, whitish.

There is only one small specimen of this apparently new species in the collection, spreading on the surface of a fragment of *Madrepora monticulosa*. It is not well preserved, and, therefore, I am not able to give any details respecting the structure of the polyps.

Stylophoridæ.

Stylophora palmata.

Sideropora palmata, Blainville, Dict. des Scienc. Nat. LX., p. 360 (1830).
Stylophora palmata, M. Edw. & H. Hist. Nat. Corall. II., p. 137.

Astræidæ.

Galaxea laevis.

Surface of corallum slightly convex. Corallites crowded, parallel, subcylindrical, compressed, only slightly angular, united by a rather dense peritheca, the cells of which measure from $\frac{1}{2}$ to 1 mm. Walls comparatively very thick, opake, smooth, with excessively slight indications of costæ for every cycle. Calicular fossæ oblong, sub-angular, deep, Three cycles complete, a fourth one represented only by a few septa in some of the calicles. Septa smooth, unequal, the primary ones very thick, becoming suddenly thin towards the centre, much projecting, regularly truncate at the top; secondary septa a good deal smaller, less exsert; those of the third cycle very thin, narrow and hardly extending beyond the border of the calicle. Greatest diameter of calicular fossæ 8 mm.; distance between the corallites 2 to 5 mm.; height of corallites about 15 mm.

This species comes near to *G. bougainvillei*; it is readily distinguished from all its congeners by its thick smooth walls and septa.

Galaxea fascicularis.

Madrepora fascicularis, Linn. Syst. Nat. Ed. XII., p. 1278 (1767).
Galaxea fascicularis, M. Edw. & H. Hist. Nat. Corall. II., p. 227.

Galaxea laperouseana.

Sarcinula laperousiana, M. Edw. & H. Ann. Scienc. Nat. 3^{e} sér. Zool. X., p. 314, Pl. 6, fig. 5 (1848).
Galaxea laperouseana, M. Edw. & H. Hist. Nat. Corall., II., p. 231.

Mussa umbellata.

Corallites ventricoso-turbinate, arising from a common stem, united till near the summit, then suddenly isolated and much diverging, forming a sort of umbel; few of them remain associated to form short series consisting of two or three corallites. A rudimentary epitheca ascends near to the borders of the calicles. Costae distinct from the base of corallum upwards, projecting but little, smooth for the greater part of their length, then tuberculate, and near the top spinose. Fossae rather shallow, triangular or quadrangular, rounded. Columella well developed, very spongiose. Four cycles complete, a fifth one indicated only in some of the systems. Primary and secondary septa rather thick, inflated, not much projecting; their margins provided with four to six coarse teeth of moderate size, most of which are truncate at the top. Inferior septa much thinner, tapering towards the centre, with delicately dentate margins.

This species is distinguished by its mode of growth as well as by the dentition of the septa. The latter are less projecting than in most of the other members of the genus. Diameter of calicular fossæ 20 to 30 mm., their depth about 7 mm.

Leptoria tenuis.

Maeandrina tenuis, Dana, U.S. Expl. Exp. Zooph. p. 262, Pl. 14, fig. 7 (1846).
Leptoria tenuis, M. Edw. & H. Hist. Nat. Corall. II., p. 407.

Platygyra esperi.

Astroria esperi, M. Edw. & H. Ann. Scienc. Nat, 3^{e} sér. Zool. XI., p. 298 (1849).

Coeloria esperi, M. Edw. & H. Hist. Nat. Corall. II., p. 47.

The two generic names, *Cœlòria* and *Astroria* being given by Milne Edwards & Haime to the present genus in 1848 (Compt. Rend. Acad. Sc. XXVII., p. 493) ought to give way to the earlier appellation *Platygyra* of Ehrenberg (Abhandl. Berl. Akad. Wiss. für 1832, I., p. 323, 1834; type: *Madrepora labyrinthica* of Ellis and Solander).

This is a very variable species; there are specimens with short and long, mæan-

drous and straight valleys; in one nearly all the calicular fossæ are as long as broad, plenty of calicles being thus circumscribed. Walls either thin or thick, even inflated. Septa in most instances very narrow, but in one specimen (the one alluded to above) much projecting towards the centre; their edges faintly or coarsely dentate. Columella rudimentary or well developed, consisting of confluent trabecles or of vertical lamellæ, the latter being placed in the direction of the valleys, and sometimes entirely confluent, so as to render such specimens hardly distinguishable from the genus *Leptoria*. It is true that most of these differences are of what is called "specific" or even "generic" value; but I found it impossible to draw any precise lines of distinction. In the present case the beautiful series procured by the Expedition comprises every stage of transition, and what is most significant, there are frequently different forms represented in different places of the very same corallum. I have made similar observations on the true *Cœloriæ*; in one specimen of this genus taken in the Red Sea by Professor Haeckel, there are really two "species" on the same specimen, one occupying the centre of the surface, the other two opposite sides, and both passing into each other.

Hydnophora microcona.

Monticularia microconos, Lamarck, Hist. Anim. sans Vert. II., p. 251 (1816).
Hydnophora microcona, M. Edw. & H. Hist. Nat. Corall. II., p. 423.

Astræa denticulata.

Madrepora denticulata, Ell. & Sol. Hist. Zooph. p. 166, Pl. XLIX., fig. 2 (1786).
Favia denticulata, M. Edw. & H. Hist. Nat. Corall. II., p. 428.

Astræa affinis.

Parastrea affinis, M. Edw. & H. Ann. Scienc. Nat. 3^{e} Sér. Zool. XII., p. 167 (1850).
Favia affinis, M. Edw. & H. Hist. Nat. Corall. II., p. 429.

Astræa lobata.

Parastrea lobata, M. Edw. & H. Ann. Scienc. Nat. 3^{e} Sér. Zool. XII., p. 171 (1850).
Favia lobata, M. Edw. & H. Hist. Nat. Corall. II., p. 434, pl. D. 8, fig. 3.

Plesiastræa quatrefagesana.

Plesiastræa quatrefagesana, M. Edw. & H. Ann. Scienc. Nat. 3^{e} Sér. Zool. XII., p. 119 (1850); Hist. Nat. Corall. II., p. 491.
The single Rodriguez specimen may prove to belong to a new species; the

calicles are remarkably smaller than in the true *Pl. quatrefagesana*, and their borders less well defined.

Acanthastræa angulosa.

Corallum low, nearly explanate, with an even slightly undulate surface. Calicles unequal, irregularly tetragonal or pentagonal, with simple rather thin borders and shallow fossæ. Columella feebly developed, more or less papillose, parietal. Three cycles complete, a fourth one irregular; well developed in several systems of the larger calicles, rudimentary or entirely wanting in others. Septa unequal, thin, slightly granulate, narrow, hardly projecting; their edges provided with long thin spiniform teeth at the summits, and with shorter and feebler ones towards the centre. Greatest diameter of calicular fossæ, 10 to 14 mm.; their depth 4 to 6 mm.

Prionastræa rodericana.

Corallum convex, somewhat lobate. Calicles polygonal, mostly quadrangular, subequal; their fossæ of moderate depth. Walls simple, rather thin. Gemmation takes place at the very borders of the calicles. Columella pretty well developed, trabecular. Three cycles complete, a fourth one very incomplete and obsolete. Septa crowded, unequal, slightly projecting, narrow, thin, smooth, with their edges delicately and equally dentate; those of the first two cycles suddenly enlarging below and there armed with slender pointed, but not paliform, teeth. Greatest diameter of calicles averages from 7 to 8 mm.; depth of fossæ 4 to 5 mm.

Differs from the closely allied *Pr. seychellensis* in its thin walls, the regularly denticulate, smooth septa, the smaller calicles and mode of gemmation. From *Pr. melicerum*, a species I have not yet seen, it may be distinguished by the presence of a fourth cycle, and the form of the columella.

Prionastræa scabra.

Corallum explanate, somewhat convex. Calicles polygonal, slightly irregular; fossæ of medium depth. Walls simple, rather thick, roughly spinose. Columella well developed, distinctly papillose. Three cycles complete, with some additional septa of a fourth one. Septa (about 30 in number) subequal, rather thick, delicately granulate, narrow, hardly projecting; their edges with scarce, spiniform, sharp-pointed teeth. Greatest diameter of calicles, 9 to 12 mm, depth of fossæ, 6 mm.

Very similar to *Pr. tesserifera*, but the columella is crowdedly papillose instead of being spongious, the calicular fossæ are deeper, the septa thicker and their teeth stouter and more pointed, giving the whole corallum a spinose aspect.

Echinopora spinulosa.

Corallum foliaceous, explanate, slightly undulate, unifacial. Costæ indistinct, replaced by irregular series of small, acute, delicately granulate spines. Calicles

oblong, rarely circular, moderately crowded, very little prominent, with shallow fossæ. Columella well developed, delicately spongious. Four cycles complete. Septa crowded, altogether thin, spinulous on their surfaces, the primary, secondary, and tertiary ones nearly equal, projecting, unevenly truncate and toothed at the summit, irregularly denticulate and deeply emarginate on the inner edge; those of fourth cycle much thinner, smaller and not prominent. Under surface of corallum faintly striate. Greatest diameter of calicles, 5 to 6 mm.

This species should be placed next to *E. gemmacea* with which it agrees in having the fourth cycle complete and in being partly fissiparous. It differs from this as well as from the other species by the condition of the costæ and by the very slight prominence of the corallites. It bears a general resemblance to *E. ehrenbergi* in which, however, the fourth cycle is entirely wanting, the costæ being well marked and the calicles more projecting. With the coarsely spinose *E. hemprichi* it cannot be confounded; from *E. helli* it is distinguished by the absence of paliform lobes, and by the number and description of the septa.

Fungidæ.

Fungia haimei.

Fungia "discus," M. Edw. Hist. Nat. Corall. III., p. 9.
Fungia haimei, Verill, Bull. Mus. Comp. Zool. I., p. 51 (1864).

Lobactis dentigera.

Fungia dentigera, Leuckart, Zooph. corall. spec. gen. Fung. p. 48, Pl. III. fig. 1, 2 (1841); M. Edw. Hist. Nat. Corall. III., p. 17.

Pavonia cristata.

Madrepora cristata, Ell. & Sol. Hist. Zool. p. 158, Pl. XXXI., fig. 3,4 (1786.)
Lophoseris cristata, M. Edw. Hist. Nat. Corall. III., p. 66.

Eupsammiidæ.

Dendrophyllia ehrenbergiana.

Coenopsammia ehrenbergiana, M. Edw. & H. Ann. Scienc. Nat. 3^{e} sér. Zool. X., p. 109, Pl. 1, fig. 12 (1848); Hist. Nat. Corall. III., p. 127.

Madreporidæ.

Madrepora pharaonis.

Madrepora pharaonis, M. Edw. Hist. Nat. Corall. III., p. 143 (1860).

Madrepora pustulosa.

Madrepora pustulosa, M. Edw. Hist. Nat. Corall. III., p. 144 (1860).

30. *Madrepora plantaginea.*

Madrepora plantaginia, Lamarck. Hist. Anim. s. Vertebr. II., p. 279 (1816); M. Edw. Hist. Nat. Corall. III., p. 149.

Madrepora acervata, Dana, U. S. Expl. Exp Zooph. p. 460, pl. 34, fig. 4 (1846), M. Edw. Hist. Nat. Corall. III., p. 154.

In two examples the corallum consists of a thin spreading base, covered with numerous low, mammilliform branches. This may be either a younger state or a variety.

Madrepora haimei.

Madrepora haimei, M. Edw. Hist. Nat. Corall. III., p. 151 (1860).

Madrepora gonagra.

Madrepora gonagra, M. Edw. Hist. Nat. Corall. III., p. 151 (1860); Brüggem. Abh. Ver. Brem. V., p. 398.

In the Mauritius specimen mentioned in my paper, the corallum shows a small compact base from which half a dozen of simple, straight, sub-cylindrical branches arise. One of the Rodriguez specimens nearly agrees with it, only the branches are more irregular and partly ramified. The second is apparently very old, the base of the corallum being entirely worn, the branches altogether confluent, and their summits coalescing, forming a nearly continuous plane and bearing the general aspect of the top of a cauliflower. This condition is evidently due to some immediate outer influence; most probably the corallum had approached too near the surface of the water.

Madrepora seriata.

Heteropora seriata, Ehrenb. Abh. Berl. Akad. 1832, I., p. 337 (1834).

Madrepora seriata, M. Edw. Hist. Nat. Coral. III., p. 152.

A low, slender branched variety, in which the seriate disposition of the calicles is not well pronounced.

Madrepora corymbosa.

Madrepora corymbosa, Lamarck, Hist. Anim. sans vert. II., p. 279 (1816); M. Edw. Hist. Nat. Corall. III., p. 154.

In the Rodriguez specimens, the stems and branches show an extreme tendency to coalesce and form bulky masses.

Madrepora flabelliformis.

Madrepora flabelliformis, M. Edw. Hist. Nat. Corall. III., p. 156 (1860).

Madrepora microcladus.

Heteropora microclados, Ehrenb. Abh. Berl. Akad. 1832, I., p. 333 (1834).

Madrepora surculosa, Dana, U.S. Expl. Exp. Zooph. p. 445, Pl. 32, fig. 4 (1846); M. Edw. Hist. Corall. III., p. 158.

Dana considers Ehrenberg's species to be closely allied to, or identical with, *M. spicifera*; Milne Edwards who seems to have examined the type specimen places it near to the *M. millepora*. In my opinion, it should be united to the *M. surculosa*, the descriptions agreeing well with each other.

Madrepora monticulosa.

Corallum solid, explanate, spreading. Surface nearly even, covered for the greater part of its extent with large, stout, rounded, subconical prominences. Coenenchyma faintly developed, spongious. Calicles much crowded, short, sublabellate or nearly tubiform, equal on the cones, intermixed with smaller or immersed ones on the plain parts of the corallum. Walls rather thin, reticulate, slightly echinulate. Septa nearly entirely wanting. Apical calicles always indicated, but not very conspicuous, with thicker walls and more distinct septa, the latter being generally six to eight in number.

Height of corallum, from under surface of base to the summits of largest cones, 60 mm.; greatest height of cones, 30 mm.; greatest diameter at base, 20 mm. Diameter of ordinary calicles 2 mm.; their length the same. Diameter of apical calicles, 3 mm.; height, $1\frac{1}{2}$ to 2 mm.; width of their apertures, 1 mm.

This well-marked species is, in its general aspect, similar to *M. conigera*, but it seems to be always spreading, and therefore, unifacial. Besides, it is distinguished by its lower and everywhere rounded cones, by its much shorter subequal calicles, by the absence of the septa, etc.

Madrepora alces.

Mandrepora alces, Dana, U.S. Expl. Exp. Zooph. p. 437, Pl. 31, fig. 12 (1846); M. Edw. Hist. Nat. Corall. III., p. 160.

One of the specimens is provided with long, erect, cylindrical branches rising at nearly a right angle from the palmato-digitate main stem. There are similar examples in the collection of the British Museum, one of which is stated to be from the Louisiade Archipelago.

Turbinaria mesenterina.

Explanaria mesenterina, Lamarck, Hist. Anim. s. Vert. II., p. 255 (1816).

Turbinaria mesenterina, M. Edw. Hist. Nat. Corall. III., p. 166, pl. E. 1, fig. 1 a, b.

Poritidæ.

Porites lutea.

Porites lutea, M. Edw. & H. Ann. Scienc. Nat. 3^{e} sér. Zool. XVI., p. 28 (1851); M. Edw. Hist. Nat. Corall. III., p. 180.

Milne Edwards quotes as a synonym, the *Porites conglomerata* var. *lutea*, from the "Voyage de l'Astrolabe." Quoy and Gaimard, indeed, mention a variety of *P. conglomerata*, but without naming it.

Porites arenosa.

Madrepora arenosa, Linn. Syst. Nat. Ed. XII., p. 1276, sp. 17 (1767).
Porites arenosa, M. Edw. Hist. Nat. Corall. III., 180.

Montiporidæ.

Montipora divaricata.

Corallum ramose, subarborescent. Branches diverging, more or less angular, enlarged towards the summit; branchlets compressed, obtuse. Calicles immersed, distant by about twice the diameter, subequal, hardly larger on the prominent parts of the corallum. Coenenchyma moderately spongious, with even, delicately echinulate surface. Two cycles; septa subequal, very narrow, rather stout. Diameter of calicular apertures, nearly three quarters of a millimeter.

Allied to *M. rus* and *M. monasteriata;* differing by its mode of growth, and by the absence of the prominent verrucae.

Montipora foliosa.

Madrepora foliosa, Pallas, Elench. Zooph. p. 333 (1766).
Montipora foliosa, M. Edw. Hist. Nat. Corall. III., p. 212.

Montipora incrustans.

Montipora incrustans, Brüggemann, Abhandl. Ver. Brem. V., p. 398 (1877).

This species was established for a specimen from Mauritius. The condition of the coenenchyma and the excessively small calicles render it easily recognizable.

Montipora explanata.

Montipora n. sp., Brüggemann, Abh. Ver. Brem. V., p. 399.

Corallum explanate, spreading, incrusting. Surface uneven, in some places slightly tuberculate. Coenenchyma rather dense, consisting of confluent trabecles covered with small spinulous grains. Calicles immersed, equal, distant by about twice the diameter. Twelve septa, but little developed, thin and narrow, one of the primaries always stouter and larger; the secondary ones sometimes rudimentary.

Height of corallum averages 7 mm.; diameter of calicular apertures, three-quarters of a mm.

Rodriguez (*Slater*); Mauritius (*Brit. Mus., Jena Mus.*).

Distinguished from the preceding by its much larger calicular apertures, by the coarser coenenchymal tissue and less delicately spinulous surface; closely allied to *M. scabricula*, but the latter is a more massive species, with uniformly tuberculate surface. *M. lichen*, with which I was formerly inclined to unite it, has prominent calicles, a character totally absent in *M. explanata*.

Montipora lichen.

Manopora lichen, Dana, U.S. Expl. Exp. Zooph. p. 492 (1846).

Montipora lichen, M. Edw. Hist. Nat. Corall. III., p. 218.

There are several fragments in the collection which seem to belong to the above species. The corallum is explanate, foliaceous, partly bifacial, partly incrusting. Surface more or less even; margin in one fragment reflexed, in another straight and somewhat tumid. Coenenchyma spongious, with most delicately echinulate surface, the minute spines being generally united to small packets. Calicles very small, unequally distant on the upper surface, crowded below, nearly everywhere encircled by a coenenchymal ring, which is either continuous or separated into six rounded papillæ. Primary septa well-developed, thin; secondary ones rudimentary.

Pocilliporidæ.

Pocillipora brevicornis.

Pocillipora brevicornis, Lamarck, Hist. Anim. s. Vert. II., p. 275 (1816); M. Edw. Hist. Nat. Corall. III., p. 304.

The present collection contains the true *P. brevicornis*, as well as a singular variety, which may be termed *P. brevicornis* var. *cerebrum*. The corallum is hemispherical, brain-like. The principal branches are much enlarged and compressed, confluent, mæandrous, subsimple, with nearly smooth summits and obtusely verrucose lateral surfaces. This form would, according to the classification of Milne-Edwards, be placed in quite another section of the genus, viz. close to *P. mæandrina*, etc., and I should never have ventured to regard it as a variety of the *P. brevicornis*, but for the complete series of transitional examples in the collection.

Pocillipora favosa.

Pocillipora favosa, Ehrenb. Abh. Berl. Akad. Wiss. 1832, I., p. 351 (1834); M. Edw. Hist. Nat. Corall. III., p. 305.

Pocillipora grandis.

Pocillopora grandis, Dana, U.S. Expl. Exp. Zooph. p. 533, pl. 51, fig. 2 (1846); M. Edwd. Hist. Nat. Corall. III., p. 307.

The principal branches are, as a rule, more elongate, and their summits more mæandrous than in the specimen figured by Dana. The lateral verrucæ are very variable: either crowded or more remote, or (on the outer surface of lateral branches in some of the coralla) even totally wanting; either appressed, or more horizontal; generally pointed and angular, but in one example obtuse and rounded. One specimen approaches the *P. verrucosa* in having the summits of minor branches covered with verrucæ.

Perhaps the Rodriguez coral is a distinct species; but since I have no specimens of the Pacific *P. grandis* for comparison, I abstain from characterising it under a new specific name. In my opinion, moreover, the species of *Pocillipora* have already been far too much multiplied.