

# AUSTRALIAN MUSEUM, SYDNEY.

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## MEMOIR III.

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# THE ATOLL OF FUNAFUTI, ELLICE GROUP: ITS ZOOLOGY, BOTANY, ETHNOLOGY, AND GENERAL STRUCTURE

BASED ON COLLECTIONS MADE BY  
MR. CHARLES HEDLEY,

OF THE  
*AUSTRALIAN MUSEUM,*  
SYDNEY, N.S.W.

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**THE HYDROZOA, SCYPHOZOA, ACTINOZOA,  
AND VERMES OF FUNAFUTI.**

By THOMAS WHITELEGGE.

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## ERRATA.

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Page 389, par. 3, first line—*add after "fig. 2," "and Plate xxvii., fig. 1."*

" " par. 4, third line—for "fig. 6," read "fig. 2."

" " par. 4, last line—for "fig. 7," read "fig. 1."

" 390, par. 3, second line—for "fig. 8," read "Plate xxvii., fig. 2."

" " par. 3, last line—*delete "fig. 8."*

" 392, par. 2, fourth line—for "perceptable," read "perceptible."

" 398, par. 2, fourth line—for "indicate," read "indicates."

" " par. 4, fourth line—for "have," read "has."

" 399, par. 2, fourth line—for "reject," read "rejects."

" 400, par. 1, thirteenth line—for "*I. collaris*, read "*T. collaris*."

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numerous local examples, both living and preserved, have been utilized with a view to render their identification less difficult in the future. In order to accomplish this, the pneumatophore was carefully measured, the colour noted, and the number of appendages counted. The results of an examination of thirty-four specimens are given in tabular form, from which it will be seen that the two forms are very distinct.

The class *Scyphozoa* is represented by two species—*Aurelia clausa*, Lesson; and *Phyllorhiza orithyia*, Haeckel.

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[XVI.]

## THE HYDROZOA, SCYPHOZOA, ACTINOZOA, AND VERMES OF FUNAFUTI.

By THOMAS WHITELEGGE,  
Zoologist, Australian Museum.

THE collection has provided material for much work, and the results obtained are of considerable interest; they may be summarised as follows :—There are only two *Hydroid Zoophytes* in the collection, both of which prove to be new species, i.e., *Thuiaria divergens* and *Plumularia clavicula*. The latter is of unusual interest, inasmuch as it exhibits characters of rare occurrence in the group. The apices of the branches are modified into tendrils, and the corbulæ are of a very primitive type, having a slightly modified hydrotheca at the base of each costa.

The *Hydrocorallines* are represented by four species of *Millepores*:—*Millepora squarrosa*, var. *incrassata*, Dana; *M. platyphylla*, Ehr.; *M. nodosa*, Esper.; and *M. tortuosa*, Dana.

Of the order *Siphonophora*, there is only one representative, i.e., *Physalia megalista*, Lamk., of which there are numerous examples. These have been carefully examined and compared with local material and also with specimens of *Physalia utriculus*, Eschscholtz.

Attention is called to the occurrence of secondary tentacles in the basal groups of cormidia in both species; a character which has hitherto escaped observation. The specimens from Funafuti and numerous local examples, both living and preserved, have been utilized with a view to render their identification less difficult in the future. In order to accomplish this, the pneumatophore was carefully measured, the colour noted, and the number of appendages counted. The results of an examination of thirty-four specimens are given in tabular form, from which it will be seen that the two forms are very distinct.

The class *Scyphozoa* is represented by two species—*Aurelia clausa*, Lesson; and *Phyllorhiza orithyia*, Haeckel.

Of *Actinozoa* there are six species in the collection, three of which are herein described as new, one belonging to the order

*Antipatharia* (*Antipathella brooki*), and two to the order *Actinaria* (*Zoanthus funafutiensis*, and *Gemmaria willeyi*). The remaining three are *Palythoa howesii*, Hadd. & Shack. ; *P. kochii*, Hadd. & Shack. ; and *P. cæsia*, Dana.

The *Actinaria* have been worked out in conjunction with Mr. J. P. Hill, of the Sydney University, who kindly cut the sections and examined the internal structure; he is, therefore, jointly with myself, responsible for this portion of the publication.

The *Vermes* are represented by three species of *Polychæta*, two species of *Perichæta*, and five species of *Gephyrea*. They are as follows:—*Eurythoë complanata*, Pallas; *E. pacifica*, var. *levukænsis*, McIntosh; *Phyllodoce*, sp.; *Perichæta grubei*, Rosa, *P. sp.*; *Phymosoma nigrescens*, Keferst; *P. scoleps*, Sel. & de Mann; *Aspidosiphon elegans*, Cham. & Eysenn.; *A. steenstrupii*, Diesing; and *Cleosiphon aspergillum*, Quartref.

## CLASS HYDROZOA.

### Order HYDROMEDUSÆ.

#### FAMILY SERTULARIDÆ.

##### THUIARIA DIVERGENS, sp. nov.

(Plate xxiii., figs. 1, 2, 3.)

Trophosome: Hydrocaulus simple, indistinctly and irregularly jointed, strongly fascicled below, becoming monosiphonic distally; height from 5 to 6 cm. Hydrothecæ alternate, one opposite the base of each pinna, and two on the same side, one of which is situated in the axil above and the other about 0·2 mm. below. The base of each of the caudine hydrothecæ possesses a thick chintinous process which extends across the internal cavity of the stem and becomes united with the opposite wall.

Pinnæ alternate, from 1 to 2 cm. in length and about 2 mm. apart; joints transverse, very irregular; one or two pairs of hydrothecæ to an internode, frequently two or more internodes without hydrothecæ on each pinna.

Hydrothecæ 0·7 mm. in height, 0·3 mm. in broadest diameter, diminishing to 0·2 at the apex; proximally they are opposite, distally they become subalternate, they are adnate for about one-third or one-half of their height, but not in contact with each other at the back; the free portion is abruptly bent outwards; the outline above is horizontal or slightly ascending, and evenly curved below; the terminal third exhibits numerous lines of growth. Aperture operculate, subquadrate, with four angles, one pair in a line with the axis, the other lateral.

Gonosome : Gonangia ovate, borne on the front of a pinna at the base of a hydrotheca 1·7 mm. high, 0·5 mm. broad in the middle, and 0·3 mm. at the neck, which is about as high as broad, surface with from 8 to 10 distinct annulations. Aperture square with four membranous opercular teeth.

### FAMILY PLUMULARIDÆ.

#### AGLAOPHENIA CLAVICULA, sp. nov.

(Plate xxiii., figs. 4, 5, 6.)

Trophosome : Hydrocaulus simple, monosiphonic, attaining to 3 cm. in height, the terminal 1·3 cm., consists of an undulate tubular extension indistinguishable from similar tubular growths which constitute the hydrorhiza. Hydrocladia alternate, one to each internode, arising from the front of the stem, from 2·5 to 7 mm. in length, and about 0·5 mm. apart. Hydrothecæ closely approximate, 0·25 mm. in height and about 0·14 mm. in diameter. The shape is urceolate with a slight constriction below the base of the teeth. Margin with seven erect teeth, the median one is evenly rounded at the apex, those at the sides are somewhat acute.

Intrathecal ridge distinct, extending transversely across the basal portion of the hydrotheca.

Lateral nematophores 0·1 mm. in length, 0·05 mm. in diameter, slightly projecting beyond the margin of the hydrotheca ; aperture elongate, opening upwards and inwards.

Mesial nematophore 0·2 mm. in length, 0·05 mm. in its broadest diameter, adnate to the hydrotheca to within 0·1 mm. of the summit of the central tooth. Hydrothecal internode with a short ridge or fold opposite the basal constriction of the hydrotheca.

Gonosome: Corbula closed, 2·5 to 3 mm. in length, and 1·1 mm. in diameter; the first internode bears a normal hydrotheca. There are from 8 to 12 pairs of adnate costæ ; each costa bears from 6 to 8 minute nematophores along its upper margin, and has a modified hydrotheca at its base. In a median longitudinal line on the upper surface are situated a series of from 8 to 10 elliptic or elongate apertures with broad, flat, thickened margins, similar to those figured by Allman in the *Challenger Report*.\*

These species exhibit two characters which are of great interest from a morphological point of view.

In the first place the apical portion of the stem is destitute of the usual appendages ; at a short distance above the terminal pinnules the nodes are also suppressed, and the stem becomes a

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\* Allman—"Challenger" Report—Zool., vii., pl. xx., fig. 6.

simple tubular tendril, which entwines itself around other stems or foreign objects, and thus affords the colony an additional means of attachment.

The corbula is of the closed kind, and consists of a modified branch bearing an alternating series of short stumpy branchlets, each of which carries a hydrotheca differing from those on the ordinary pinnules in being longer, more cylindrical, and in having nine instead of seven marginal teeth.

The distal branches of the corbulæ exhibit the mode of origin of the costæ and costal appendages from the mesial nematophore of the hydrotheca. The specimens at my command are very few, and their extreme transparency renders the outlines of the costal membranes difficult to trace. Three stages, however, can be distinctly discerned. In the earliest stage the mesial nematophore is seen projecting from the front and arising from the base of the hydrotheca, it assumes a fan-shaped outline, and consists of a wide membrane with an incipient micro-nematophore at its inner distal angle; in the next phase the membrane is larger and there is one fully formed micro-nematophore and another incomplete one at the inner extremity; on the next older costa there are three fully formed micro-nematophores, and the membranous part is proportionately enlarged.

Prof. Allman, in his report on the Hydroida of the Gulf Stream,\* describes two species—*A. distans* and *A. bispinosa*—in which there are modified hydrotheca at the base of each costa; both, however, are of the open corbulæ type, and the hydrothecæ appear to be more modified than in the species under notice.

## CLASS HYDROZOA.

### Sub-Order HYDROCORALLINÆ.

#### FAMILY MILLEPORIDÆ.

##### MILLEPORA SQUARROSA, Lam.

*Millepora squarrosa*, Lam., var. *incrassata*, Dana, U.S. Explor. Exped., Zoophytes, pl. liii., fig. 1; Synop. Rep. Zooph., 1859, p. 105.

A single example of this species is in the collection.

The specimen consists of a subtriangular plate 12·5 cm. in height, 18 cm. in width, from 1 to 1·5 cm. in thickness near the base, and from 1·5 to 2·3 cm. at the summit. The upper semi-circular margin is much thickened, lobate and roundly truncate; at one extremity there are two toe-like lobes 5 cm. high, 3·3 cm. broad, 1·3 cm.

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\* Mem. Mus. Comp. Zool., v., 2, pp. 44–46.

thick at their origin and 2 cm. at their apex, their outer lateral margins are thick, their inner ones thin and acute. The rest of the upper margin consists of one broad lobe with three shallow indentations. The general surface is uneven, having a few low round or ridge-like elevations, and numerous shallow depressions in which the very regular cyclosystems are situated.

The gastropores are absent from the thick apical ridge, elsewhere they are very evenly distributed ; they are on an average about 2 mm. apart and 0·25 in diameter. The dactylo pores are generally confined to a limited area around the gastropores ; they vary in number from four to six, their diameter is about 0·12 mm. and their distance from the central pore between 0·2 and 0·4 mm.

The surface is minutely porous and reticulately ridged ; the ridges are pretty regular, about 0·05 mm. apart.

#### MILLEPORA PLATYPHYLLA, Ehrenberg.

*Millepora platyphylla*, (Ehrenberg) Dana, U.S. Explor. Exped., Zoophytes, p. 548, pl. lii., fig. 5.

A small fragment from the upper portion of a colony is in the collection.

The piece consists of three or four flat lamellæ, two of which have grown out vertically and at right angles to the main frond. The lamellæ are from 1 to 2 cm. in thickness, the apical margin is somewhat thin and rounded, the lateral margins are acute.

The surface is slightly tuberculous ; the tubercles are low, rounded and longitudinally arranged.

Pores very unequally distributed, not distinctly arranged in systems. Gastropores irregularly scattered, 0·2 mm. in diameter. Dactylo pores usually about 0·1 mm. in diameter, unevenly distributed over the whole colony. Surface reticulation with very minute ridges, usually under 0·05 mm. apart.

#### MILLEPORA NODOSA, Esper.

*Millepora nodosa*, Esper, Die Pflanzenthiere, pl. ix. ; Moseley, Chall. Rep. Zool., ii., p. 18, pl. xiii., fig. 3.

There are several fine examples referable to this species ; of these three are well marked forms differing considerably in habit, but very similar in the cyclosystems and in the minute structure of the surface.

*Form A.*—The finest example possesses a large incrusting base inclosing a mass of dead material of the same species. From the upper surface there arises a series of irregular flattened lobes and

branches; the summits are usually obliquely truncated, and either acute or evenly rounded. The larger branches bear from two to three lobe-like branchlets similar to those figured by Moseley in the "Challenger" Report.\*

The specimen measures 17 cm. by 8 cm. at the base; the main branches are from 3 to 6 cm. wide at their origin, and from 1·2 to 2 cm. in their shorter diameter.

*Form B.*—The specimen consists of a compressed branched frond 19·5 cm. high, 7 cm. wide at the base, and 1·7 cm. in thickness. At a distance of 8 cm. from the base there arise two main branches; each gives off a few flat lobes at the sides and terminates in three or four subpalmate lobes.

*Form C.*—Consists of an antler-like reticulate frond, with widely divaricate and frequently coalescent branches; they are either alternate or opposite, and subdichotomous, especially near the summits. The terminal branchlets are a little compressed in the plane of branching; the rest, including the basal portions, vary from oval to subquadrate in transverse section, and measure from 1 to 2 cm. in diameter.

Another specimen is intermediate in habit between forms *B* and *C*.

The general surface in all the examples is characterised by numerous small elevations upon which the pore systems are situated; this is especially marked on the younger parts of the corallum, elsewhere they are not so conspicuous.

The gastropores are usually about 0·28 mm. in diameter, and from 1 to 2 mm. apart, they are somewhat crowded, but rather irregularly distributed. The dactylo pores are about 0·18 mm. in diameter, they are very numerous and not distinctly arranged in cycles except on the younger parts of the colony.

The surface reticulation is rather coarse as compared with other species; the ridges are on an average fully 0·1 mm. apart.

#### MILLEPORA TORTUOSA, Dana.

*Millepora tortuosa*, Dana, U.S. Explor. Exped., Zoophytes, pl. lii., figs. 3–3a.; Synop. Rep. Zoophytes, p. 105.

This species is represented by a single specimen, closely resembling Dana's figure. The main branches are, however, a little broader, varying from 5 to 12 mm. in width. The whole surface of the branches is covered with very fine slight elevations upon which the pore systems are situated. The gastropores are very

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\* Moseley—"Challenger" Report—Zool., ii., pl. xiii., fig. 3.

evenly distributed ; they are generally under 2 mm. apart and about 0·2 mm. in diameter. The dactylopoles are about 0·1 mm. in diameter, and pretty regularly arranged in cycles.

The surface ridges are about 0·1 mm. apart.

#### Order SIPHONOPHORA.

#### FAMILY PHYSALIDÆ.

##### PHYSALIA MEGALISTA, Lamk.

*Physalia megalista*, Lamk., Anim. sans Vert., ii., 1816, p. 481 ; Peron et Lesueur, Voy. de Découvertes aux terres australes, Atlas, 1807, pl. xx., fig. 1 ; Haeckel, Chall. Rep. Zool., xviii., pp. 351 – 372.

Numerous examples of this species were obtained by Mr. Hedley, who also made a coloured sketch from a living specimen ; the colours exhibited in the drawing, and by the specimens when received, agree with examples of this species from the coast of New South Wales.

During the past five or six years I have paid special attention to the *Physalidæ* occurring on our coast ; two species have been observed, i.e., *Physalia megalista* and *P. utriculus*.\* They occur nearly all the year round with favourable winds, such as N.E., E., or S.E., occasionally in company, but more frequently only one species is obtainable at a time. I have at various times closely examined hundreds of living individuals of both species, and can readily separate the two by their colour alone. There are, however, other more important characters which clearly indicate that they are specifically distinct.

In *Physalia megalista* the crest is long in proportion to the rest of the pneumatophore, whilst the anterior crestless portion is remarkably short. The ventral group of cormidia are arranged in well defined clusters, two anterior and three posterior to the main tentacle. Each cormidium consists of a short broad pedicel—more or less transverse to the axis—and a series of short branchlets from which arise the ventral appendages: siphons, tentacles, palpons, and gonodendria.

The basal group of cormidia are separated from the ventral by a very short space. They consist of five or six clusters of small palpons, siphons, and frequently from one to three tentacles in addition to that which subtends the terminal protosiphon.

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\* Chun unites all the Pacific and Indian Ocean forms under the name of *Physalia utriculus*. (See Zool. Anzieg., x., 1887, p. 558.)

The presence of accessory tentacles in the basal group of cormidia, appears to have hitherto been overlooked in the genus *Physalia*.

Prof. E. Haeckel, in the "Challenger" Report,\* remarks that "The smaller basal group, at the posterior or distal end of the trunk, produces merely a series of small siphons and palpons, placed before the protosiphon and is provided with a single tentacle only; it always remains sterile and never produces gonophores." And again, on page 344: "The primary tentacle which belongs to the protosiphon, remains either as the single tentacle of the basal cormidium, or it is afterwards lost; but I have never seen secondary tentacles developed in this distal group."

From the above remarks it seems clear that the secondary tentacles occurring in the basal group of cormidia have escaped notice. This may be due to imperfect or ill-preserved specimens from which some of the species have been described.

In living or well-preserved examples of either *Physalia utriculus* or *P. megalista*, the basal tentacles are very conspicuous and may be easily seen by the unaided eye. In badly preserved specimens, in which the tentacles are generally more or less contracted, they are not so evident; they can, however, be readily distinguished with a hand lens of moderate power.

With a view of rendering it less difficult to separate the two Pacific species, I have carefully dissected and measured a series of specimens of each. The results are embodied in the accompanying tables.

In dissecting the specimens, I began by isolating the anterior cormidia, and afterwards snipping off the entire bunch of appendages without rupturing the pneumatophore. The siphons, tentacles, and gonodendria were then separated and counted. The palpons have not been taken into account.

In the first twelve enumerated in the table, the siphons of the basal groups have not been noted. In the last six, the whole of the cormidal appendages—palpons excepted—both ventral and basal have been enumerated. The gonodendria were counted according to age; thus, in some cases, as many as four occur in one cormidium, all being in a different state of development. In the larger examples of *P. utriculus*, it often proved difficult to determine whether the last (sixth) ventral cormidium should be regarded as one cluster or two; frequently there is a clear space on each side, indicating two pedicels, but the dividing line is not continued through the centre.

\* Haeckel—"Challenger" Report—Zool. xviii., p. 341.

P. MEGALISTA (FROM FUNAFUTI).

P. MEGALISTA (FROM MAROUBRA, NEW SOUTH WALES).

**P. MEGALISTA (FROM MAROUBRA, NEW SOUTH WALES)—continued.**

P. UTRICULUS (FROM MAROUBRA, NEW SOUTH WALES).

P. UTRICULUS (FROM MAROUBRA, NEW SOUTH WALES).											
Length of specimen, 50 mm	50 mm	8									
Number of siphons .....	20	22	...	26	28	40	4	2	1	0	0
,, tentacles .....	6	5	1	6	5	10	3	3	1	0	0
,, gonodendria ...	2	2	...	3	3	1	...	...	...	...	...
Length of specimen, 50 mm	50 mm	11	...								
Number of siphons .....	18	21	...	25	34	54	4	2	1	0	1
,, tentacles .....	7	7	1	5	8	14	3	2	2	2	0
,, gonodendria ...	2	2	...	2	1	2	...	...	...	...	9
Length of specimen, 55 mm	55 mm	...									
Number of siphons .....	26	34	...	30	34	40	5	2	1	0	0
,, tentacles .....	7	5	1	5	6	8	3	2	0	0	1
,, gonodendria ...	1	3	..	2	1	...	...	...	...	...	7
Length of specimen, 60 mm	60 mm	...									
Number of siphons .....	24	28	...	23	32	40	5	3	1	0	1
,, tentacles .....	7	10	1	6	6	13	3	2	1	0	0
,, gonodendria ...	1	2	...	2	2	...	...	...	...	...	7
Length of specimen, 70 mm	70 mm	...									
Number of siphons .....	26	28	...	28	24	48	4	3	2	0	1
,, tentacles .....	7	7	1	8	7	10	4	2	2	0	1
,, gonodendria ...	1	2	...	2	2	1	...	...	...	...	8
Length of specimen, 120 mm	120 m m	...									
Number of siphons .....	54	50	...	60	51	87	19	10	12	5	0
,, tentacles .....	15	14	1	15	10	27	7	5	5	4	0
,, gonodendria ...	4	3	...	4	3	6	...	...	...	...	20

The foregoing table, although not exhaustive, exhibits a wide difference between the two species, especially in the number of ventral siphons and the secondary tentacles of the basal cormidia.

In *Physalia megalista* the lowest number of siphons is 35, the highest 78; in *P. utriculus* the lowest is 136, the highest 302, or, leaving out the large specimen, 164. The secondary basal tentacles in the former vary from 1 to 4, and in the latter from 6 to 22.

There are other important characters, which exhibit a number of differences in the length, colour, or distance of one part from another; some of these, although varying slightly in themselves within certain limits, are pretty constant in each species, and are very evident when the two species are compared. They may be enumerated as follows:—

*P. megalista.*

Crest of pneumatophore	...	...	...	long
Apical crestless portion	...	...	...	short
Distance between ventral and basal cormidia	...	...	...	short
Length occupied by basal group of cormidia	...	...	...	long
Apex of pneumatophore	...	...	...	green
Summit of crest	...	...	...	magenta
Mouths of siphons	...	...	...	yellow

*P. utriculus.*

Crest of pneumatophore	...	...	...	short
Apical crestless portion	...	...	...	long
Distance between ventral and basal cormidia	...	...	...	long
Length occupied by basal group of cormidia	...	...	...	short
Apex of pneumatophore	..	...	...	blue
Summit of crest	...	...	...	Campanula blue
Mouths of siphons	...	...	...	white

With a view of testing the pneumatophore to see if it would yield any reliable specific character, I have carefully measured a series of living, dead, and preserved specimens. I am well aware that the pneumatophore is a very variable structure; but, as in most other organisms, when at ease or in a restful condition, it has a certain definite form which may be regarded as the shape of the living object when in a healthy normal state. In the following measurements—as far as the material would allow—specimens have been selected that came nearest to what I regard as the natural shape of the pneumatophore.

## FUNAFUTI ATOLL.

	<i>P. megalista</i> From Maroubra.	<i>P. megalista</i> From Funafuti.	<i>P. utriculus</i> . From living specimens.	<i>P. utriculus</i> . Fresh dead specimens	<i>P. utriculus</i> . Large specimen preserved in formol.
Number of specimen ...	... 1 2 3 4	... 1 2 3 4	1 2 3	1 2 3 4	1 mm. 120
Length of specimen ...	... 35 45 45 50	... 39 40 45 49	mm. mm. mm. mm.	mm. mm. mm. mm.	mm. mm. mm. mm.
Number of primary chambers in crest ...	... 5 5 6 7	6 6 7 7	50 49 35 50	60 60 36 45	95 95 60 60
Length of crest ...	... 27 32 30 46	23 24 37 41	7 6 7 7	6 6 7 7	7
" anterior crestless portion ...	7 10 11 15	8 8 8 10	11 14 20	15 16 25	49
Distance from anterior end of crest to main tentacle ...	23 30 22 35	22 23 27 35	19 26 37	22 23 28	47
Distance from anterior end of crest to protosiphon ...	30 41 40 47	30 35 45 50	20 31 53	30 28 39	61
Distance from posterior end of crest to main tentacle ...	17 17 17 27	20 17 20 17	13 15 23	15 14 20	35
Distance from posterior end of crest to protosiphon ...	22 25 20 24	16 21 23 20	15 22 25	14 17 23	37
Distance from main tentacle to protosiphon	29 35 31 33	25 35 30 34	25 32 41	24 21 35	36
Distance between ventral and basal groups of cormidia ...	6 7 9 5	4 7 6 5	19 32 18	10 11 11 14	51
Length occupied by basal group of cormidia	16 17 19 15	9 19 16 15	12 16 22	10 10 11 17	20
					15

In the above measurements, certain factors must be taken into consideration. In living specimens stranded on the beach, or examples kept for some time in confinement, the anterior crestless portion of the pneumatophore is usually shorter than in healthy floating individuals. In very sick, dead, or dried examples, it generally attains to its normal proportions.

The posterior and ventral lobes usually contract a little under any circumstances, and are often much shorter in dried or preserved specimens than in life.

With a little care it is possible to preserve the pneumatophore in its natural shape. Specimens that are uninjured, and floating on the sea, may be caught in a wide-mouthed bottle, or placed in a vessel with a small quantity of sea-water. After a short time they generally assume a restful or normal condition. A 10 per cent. solution of formol will fix them without any perceptible change taking place. When fixation is completed, sufficient sea-water should be added to reduce the mixture to about one or two per cent., in which fluid they may be kept for years without much loss of form or colour.

The pneumatophore may also be dried with little or no alteration. I have succeeded in drying many specimens that have retained their natural form. My method of procedure is as follows:—The specimen is floated into a wide-mouthed bottle; when it has assumed its normal condition, it is plunged into the hot dry sand on the beach; then, as quickly as possible, the pneumatophore is rubbed with dry sand until all the surface moisture is absorbed; the appendages are then removed, and the specimen left in the sun; when thoroughly dry it is placed in fresh water to extract the salt, and afterwards again dried and placed in an air-tight bottle. Specimens dried in this manner have retained their shape for several years and exhibit no signs of deterioration except in colour.

## CLASS SCYPHOZOA.

### Order DISCOMEDUSÆ.

#### FAMILY AURELIDÆ.

##### AURELIA CLAUSA, *Lesson.*

*Aurelia clausa*, Lesson, Voy. de la Coquille, Zool., p. 119.

Four specimens of this species, were obtained in the lagoon.

#### FAMILY POLYRHIZIDÆ.

##### POLYRHIZA ORITHYIA, *Haeckel.*

*Polyrhiza orithyia*, Haeckel, System der Medusen, p. 578.

*Orithyia incolor*, Quoy & Gaimard, Voy. de l'Astrolabe, iv., p. 297, pl. xxv., figs. 6 - 10.

One example, found stranded on the beach. The specimen is not in a good condition, and is doubtfully referred to this species.

## CLASS ACTINOZOA.

### Subclass ZOANTHARIA.

### Order ANTIPATHARIA.

### FAMILY ANTIPATHIDÆ.

#### ANTIPATHELLA BROOKII, sp. nov.

The corallum is erect, pinnate and branched in a single plain ; it is 8 cm. in height and 6·5 cm. broad ; the stem (?) at the base is 1 mm. in diameter.

The specimen consists of two main fronds, having the shorter branches fused here and there at the base but free at the summits. Each frond gives off a series of alternate—rarely opposite—pinnules. The primaries arise almost at right angles, and are slightly curved upwards at a short distance from their origin. The secondaries also are at right angles to their support ; they are generally straight, simple, or with numerous short branchlets, occasionally a few are elongate and slightly curved.

The primary pinnules are from 2 to 3 cm. in length, and pretty regularly 4·3 mm. apart ; the secondaries are from 5 to 15 mm. in length and 3 mm. apart ; the tertiary pinnules vary from 1 to 7 mm. in length.

The polyps on the pinnules are situated on the anterior surface, forming a single longitudinal series ; there are six to 1 cm. ; they are about 1·1 mm. in length, and are separated from each other by short intervals varying from 0·2 to 0·4 mm.

The polyps do not commence at the bases of the branchlets ; there is generally a nude space—from 0·4 to 0·6 mm. in length—at their point of origin from the stem. The latter also usually has a similar polyp-less space above and below the base of a branchlet. On the stouter portions of the corallum a few of the polyps are radiate or subradiate, elsewhere they are elongate. There are two distal and two proximal tentacles situated in a line with the pinnule, and two placed transversely—one on each side of the mouth—which are generally smaller and inserted on the sides of the pinnule, not on the anterior surface as is the case with the other two pairs. The tentacles are about 0·25 mm. in length. The oral prominence is slightly elongate transversely, it is 0·1 mm. in height, 0·5 mm. in its longer and 0·35 mm. in its shorter diameter. The mouth is a narrow, elongate, slit-like opening, with

an irregular crenated margin. The zooids are not sufficiently well preserved to afford accurate internal structural details.

The spines near the apices of the pinnules are short and somewhat triangular; below they are elongate and subcylindrical, with smooth, acute, abruptly tapering summits. They are arranged in longitudinal rows and frequently exhibit a spiral arrangement running from right to left; five rows may be seen from one aspect, four of which are included in the spiral arrangement. Many of the spines on the stouter pinnules are given off at right angles, generally they are slightly inclined upwards, their length is about 0·3 mm., and measured from apex to apex in a spiral 0·4 mm. apart.

This species is allied to *A. tristis* and *A. atlantica*.

## SUB-CLASS ZOANTHARIA.

BY J. P. HILL, B.Sc., F.L.S., AND T. WHITELEGGE.

### FAMILY ZOANTHIDÆ.

ZOANTHUS FUNAFUTIENSIS, sp. nov.

(Plate xxiv., figs. 2, 3).

*Form.*—Body-wall smooth, translucent, surface transversely wrinkled when contracted. Cœnenchyme thin, encrusting, continuous or becoming stoloniferous at the margin. Column short, often broader than high. Capitulum slightly expanded, with from 45 to 50 ridges, confined to the upper swollen surface. Oral cone a little prominent, aperture longer than broad. Tentacles 24 to 28, similar, arranged in two cycles.

*Colour.*—The specimens were preserved in formol, and when received were of a bright grass green. The colour has now faded entirely, and the colony is greyish with slight tinge of olive.

Dimensions of colony 8·5 by 4·7 cm.; height of an average-sized polyp 5 mm., diameter of the capitulum 5 mm., of the column 3 mm.

### ANATOMY.

*Body-wall* (Plate xxv., fig. 1).—The body-wall is bounded externally by a cuticle to which stray diatoms and sponge spicules are found adherent. Between the cuticle and the ectoderm is a thin peripheral layer of mesoglœa, consisting of fine anastomosing strands, and having a thickness of 0·003 mm. The ectoderm is a thin continuous layer in which cell outlines are not recognisable. It is crossed here and there by fine strands from the mesoglœa, which unite to form the peripheral layer as described by Haddon and Shackleton in *Z. coppingeri*.\*

\* Reports on the Zoological Collections made in Torres Straits: Actiniæ, i. Zoantheæ—Sci. Trans. R. Dublin Soc. (2), iv., xiii., p. 677.

In the ectoderm there are present narrow oval nematocysts, 0·14 mm. long, but zooxanthellæ are absent. Slightly branched canals arising from the ectoderm are present in the mesoglœa, but are not at all numerous, though somewhat more abundant in the lower part of the column. In the rarity of ectodermal canals the species under consideration agrees with *Z. jukesii*, H. & S., and as in that species lacunæ are fairly numerous. Small cell-groups and isolated rounded or spindle-shaped cells, produced into radially running processes, also occur in the mesoglœa. Nematocysts are present in the ectodermal canals in small numbers. In the lacunæ there occur very definite, small, rounded or oval bodies, often in considerable numbers. In general appearance these resemble nematocysts, but are apparently quite homogeneous internally and show no trace of threads.

The entoderm is thin, and contains nematocysts and numerous zooxanthellæ. The entodermal circular musculature is weakly developed, and supported by minute mesoglœal plaitings.

*Capitulum*.—The ectoderm here is ridged and thicker than that of the column-wall. It contains nematocysts.

*Sphincter muscle*.—The double mesoglœal sphincter muscle is well developed. Its upper portion is about three times the length of the lower. The latter consists of a single row of cavities, rounded in shape and larger than those of the upper portion which are small and compressed and not arranged in a single row. In both, the muscle fibres are supported on plaitings of the mesoglœa.

*Tentacles*.—The ectoderm is thick and is crowded with enormous numbers of small sausage-shaped nematocysts, ·01 mm. in length. zooxanthellæ are absent. The ectodermal musculature, longitudinal in direction, is moderately strong and supported on small plaitings. The mesoglœa is thin, and contains only small scattered cells. The entoderm is a very thick layer. It contains numerous nematocysts similar to those of the ectoderm, and zooxanthellæ are also numerous. The circular entodermal musculature is very weak.

*Disc*.—The ectoderm of the disc is ridged. It is in general similar to the ectoderm of the tentacles, but nematocysts are here not so numerous. The mesoglœa contains isolated cells and cell-groups. In the entoderm numerous zooxanthellæ are present. The musculature of the disc is weak.

*Æsophagus* (Plate xxv., fig. 2).—The ectoderm is thrown into distinct longitudinal folds. The groove is wide and well marked. The ectoderm contains nematocysts, and here and there in the basal parts of the cells there occur groups of refractive yellow (pigment?) granules. The mesoglœa forms a uniformly thin layer. The entoderm is also thin, and contains zooxanthellæ in no great

numbers. The ectodermal musculature, longitudinal in direction, and the entodermal, circular in direction, are both weakly developed.

*Mesenteries* (Plate xxv., fig. 2).—The mesenteries are slender, and have the normal brachycnemic arrangement. The reflected ectoderm of the oesophagus forms ridges (8–11 in number) along the two faces of each perfect mesentery, and is limited to the inner half of the radial extent of each mesentery. Below, the peripheral folds of the reflected ectoderm are continued on as the mesenterial filaments. These are at first V-shaped in section, but lower down the free limbs of the V soon disappear, and the ectoderm of the filament assumes a rounded bulbous form. At the same time the entoderm becomes thickened immediately below the filament, giving rise to a second bulb-like swelling. The ectoderm of the filament contains numbers of deeply-staining gland-cells, and in its deeper part occur numerous small granules which stain slightly with eosin. Rod-shaped nematocysts also occur in the ectoderm, as well as in the thickened entoderm. The mesenterial filaments continue to near the base of the column, and are considerably folded. The mesogloea of the mesenteries is a thin layer, which, however, becomes somewhat thickened just before joining the body-wall. In this outer thickened part is situated the single basal canal of the mesentery. In the lower part of the column, the mesogloea of the mesenteries is somewhat thicker and the basal canals are larger. The entoderm of the mesenteries is a thin layer containing zooxanthellæ, which are usually much more numerous on one face of the mesentery than on the other. Nematocysts are sparingly present in the entoderm. The parietobasilar muscles are supported on mesogloal plaitings, and are well developed. The longitudinal musculature is fairly well developed, and supported on small plaitings.

*Gonads*.—Gonads were not present in any of the specimens examined by us.

This species is closely related to *Z. jukesii*, H. & S., but is to be easily distinguished by, among other points:—(1) its smaller size, (2) its green coloration, (3) the absence of nematocysts from the entoderm of the tentacles.

GEMMARIA WILLEYI, sp. nov.  
(Plate xxiv., figs. 1 and 4).

*Form*.—Body-wall opaque, encrusted with foreign matter and minutely granular. Surface even when extended, transversely wrinkled when contracted. Cœnenchyme incrusting, forming broad expansions or band-like stolons. Column often slightly swollen in the middle. The capitular region greatly expanded, with about forty very short radial ridges. Disc large, radiately ridged. Oral cone prominent, aperture oblong. Tentacles short, subequal, eighty in number, arranged in two cycles.

*Colour*.—As per coloured sketch, drawn by Mr. C. Hedley on the spot. Column pale green, capitulum pinkish, disc pale violet, tentacles brownish-orange; in formol, yellowish-grey.

*Dimensions*.—Length of largest colony, 7 cm.; breadth, 5 cm. Length of largest polyp, 1·7 cm.; diameter at base, 5 mm.; in the middle, 7 mm.; at the capitulum, 11 mm.; diameter of disc about 8 mm.; oral aperture, 3 mm. by 1·5 mm. Length of tentacles about 1·8 mm.; contracted examples are usually somewhat flattened at the summit—varying from 6 to 10 mm. in diameter—and frequently broader at the summit than long.

#### ANATOMY.

*Body-wall* (Plate xxvi., fig. 1).—The ectoderm is thick, measuring in breadth .07 mm., and forms a definitely continuous layer. It is provided externally with a thin cuticle, to which occasional diatoms adhere. A peripheral layer of mesoglœa is absent. Numerous incrustations consisting of grains of calcareous sand, foraminiferal shells etc., are present in the ectoderm and peripheral portion of the mesoglœa, forming a layer about .15 mm. thick. Owing to the presence of these incrustations, the ectoderm appears in decalcified sections considerably broken up, and is here and there separated by a space, extending over a considerable area, from the underlying mesoglœa. The ectoderm contains zooxanthellæ in considerable numbers and also numbers of large nematocysts. One of the largest of the latter observed measured 1·35 mm. in length by .06 mm. in breadth, but their average size is considerably less than this.

As is characteristic of the genus, ectodermal canals are absent from the mesoglœa. Large rounded or oval lacunæ are, however, abundant in the outer two-thirds of the layer. The lacunæ contain large nematocysts (usually one in each), similar to those of the ectoderm and also contain numbers of zooxanthellæ. Besides lacunæ small cell-islets and isolated cells produced into very distinct radial processes are present in the mesoglœa. Except in its most peripheral portion, below the ectoderm, the mesoglœa is almost completely devoid of incrustations. Occasional siliceous spicules however do occur.

The entoderm of the body-wall is thickened between the mesenteries and contains zooxanthellæ but they are here not so numerous as in the ectoderm. The circular entodermal musculature is well developed.

*Capitulum*.—The outer surface of the capitulum is ridged, the ridges alternating with the tentacles of the outer cycle. The ectoderm is thicker than that of the column and is not so densely crowded with incrustations. These are here more abundant in the outer part of the mesoglœa.

*Sphincter Muscle.*—The single mesoglœal sphincter muscle is well developed (Plate xxvii., fig. 1, *m.s.*). The muscle cavities are large and arranged in an irregular alternating fashion.

*Tentacles.*—The ectoderm of the tentacles is crowded with small slightly curved nematocysts (.010 mm. long), among which occur occasional large ones. Zooxanthellæ are also very numerous. The longitudinal ectodermal musculature is strongly developed and supported on close-set plaitings of the mesoglœa. The mesoglœa is of moderate thickness and contains only small isolated cells. The entoderm is thin. It contains numerous zooxanthellæ but no nematocysts. The circular entodermal musculature is moderately strong.

*Disc* (Plate xxvi., fig. 2).—The disc is traversed by ridges which pass one from the base of each tentacle of the inner and outer rows to the margin of the mouth. In the ridges both ectoderm and mesoglœa are somewhat thickened. The ectoderm especially on the ridges contains nematocysts similar to those in the tentacles and also zooxanthellæ. In the deeper portion of the ectoderm there occur numbers of small bright refractive (pigment?) granules. The ectoderm is devoid of incrustations.

The mesoglœa of the disc is thick, and especially noteworthy from the presence in it of numerous large ectodermal muscle cells (fig. 6, *ect. m.*) These project into the mesoglœa so obliquely that in sections they mostly appear as isolated masses which occupy the upper two-thirds of the mesoglœa, and extend from the margin of the mouth across the horizontal part of the disc and for a short distance up in its vertical part (fig. 7).

McMurrich, and Haddon and Shackleton, also describe enclosures in the disc mesoglœa of the species of *Gemmaria* examined by them. In *G. isolata*, McMurrich\* describes the mesoglœa of the disc as being "densely loaded with enclosed cavities containing cells probably ectodermal and muscular," but in his later description of *G. rusei*, D. & M., he says,† "the enclosures in the mesoglœa of the disc which I thought might possibly be muscle cells in *isolata*, are seen in *Rusei* to be comparable to the lacunæ of the column wall." Again Haddon and Shackleton in their description of *G. macmurrichi* (page 689), remark that "cell enclosures (similar to those described and figured by McMurrich) are found in the disc of *G. macmurrichi*," and they also mention the occurrence of such in *G. mutuki*. May it not be that in all these cases we have to do as in the species under description with ectodermal muscle cells, and may not the existence of such in the mesoglœa of the disc be a character diagnostic of the genus?

\* The Actiniaria of the Bahama Islands.—Jour. of Morphology, iii. p. 64.

† A contribution to the Actinology of the Bermudas.—Proc. Acad. Nat. Sci. Phil., 1889, p. 125.

The entoderm of the disc is thin and contains zooxanthellæ. The entodermal musculature is weak.

*Oesophagus*.—The groove (Plate xxvii., fig. 2 gr.) is well marked and has in one specimen examined by us, the same truncated form described by McMurrich in *G. isolata*, and Haddon & Shackleton in *G. mutuki*. The ectoderm contains large and small nematocysts and a few zooxanthellæ are also present. In the basal part of the ectoderm colourless refractive granules as well as groups of yellowish-brown granules are present. The mesogloëa is considerably thickened below the groove.

*Mesenteries*.—The mesenteries are typically brachycnemic in arrangement (fig. 8), but in one specimen examined the sulcar mesentery of the second pair on one side was perfect, thus realising the macrocnemic condition. The mesogloëa of the mesenteries is on the whole thin but is somewhat thicker in the basal part of the column. Peripherally also the mesogloëa in each perfect mesentery is thickened where it encloses the basal canal and again becomes constricted before joining the body wall. The imperfect mesenteries are short and bulbous and project little into the cœlenteron (fig. 8).

Each mesentery encloses a main basal canal appearing in section narrow and elongated in the perfect and rounded in the imperfect mesenteries. In the mesogloëa internally to the basal canals in the perfect mesenteries there occur small lacunæ. In the basal canals there are present large nematocysts similar to those in the lacunæ of the body-wall, and zooxanthellæ also occur in the canals and lacunæ, but in no great numbers. The basal canals run up into the region of the disc where they divide into several smaller canals.

The entoderm is a thin layer in which zooxanthellæ are fairly abundant, especially in the oesophageal region.

Occasional nematocysts are also present. The parieto-basilar muscles are supported on plaitings of the mesogloëa and are well developed. The longitudinal musculature is weak.

The reflected ectoderm on the two sides of each perfect mesentery give rise to numerous (up to 20) close set ridges of which the inner and outer project freely. Below, the peripheral free portions pass into the mesenterial filaments in the usual fashion. The filaments have at first in section the shape of an arrow-head, but soon the free margins disappear and the central part remains as a bulbous thickening below which the entoderm is also enlarged. Here, just as in *Z. funafutiensis*, the inner margin of the mesentery has the shape in section of a double bulb. In the ectoderm of the filament there are present occasional zooxanthellæ and large nematocysts, while gland cells are very numerous. A few large

nematocysts also occur in the thickened entoderm, and zooxanthellæ are here more numerous than in the ectoderm of the filament. The filaments are convoluted below and terminate some distance from the base of the column.

*Gonads.*—In one of the specimens examined by us ovaries were found as small whitish swellings disposed in irregular longitudinal rows along especially the lower portions of the mesenteries, in the region of the mesenteric filaments.

In *G. mutuki*, Haddon and Shackleton record finding ripe sperm cells in the coelenteron of one individual.

We have much pleasure in associating this well marked species with the name of our friend Dr. A. Willey, in appreciation of his untiring labours in the South Seas.

PALYTHOA HOWESII, *Haddon and Shackleton.*

*Palythoa howesii*, Haddon and Shackleton, Sci. Trans. R. Dublin Soc. (2), iv., 1891, p. 693, pl. lxi., fig. 13; pl. lxiii., fig. 8.

A single example is here referred to this species. Several specimens from Thursday Island are in the Museum collection, with which the Funafuti example has been compared and found to agree in all the external characters.

The specimen consists of an oblong colony 9 cm. long, 3 cm. wide and 1·4 cm. high, the basal cœnenchyme forms a projecting margin all round the colony, from 2 to 5 mm. wide, and from 1 to 3 mm. in thickness. The polyps are about 7 mm. in diameter. The capitular ridges number about 28 or 30.

PALYTHOA KOCHII, *Haddon and Shackleton.*

*Palythoa kochii*, Haddon and Shackleton, Sci. Trans. R. Dublin Soc. (2), iv., 1891, p. 694, pl. lxi., fig. 12; pl. lxiii., fig. 9.

A small specimen agreeing in its general characters with examples of this form from Thursday Island. It is a thin incrusting colony 6 cm. long, 3·5 cm. wide and having a pretty uniform thickness of 7 mm. The capitular ridges are very variable in number from 15 to 20. The polyps are however much contracted and the ridges more or less indistinct.

PALYTHOA CŒSIA, *Dana.*

*Palythoa cœsia*, Dana, U.S. Explor. Exped., Zooph., p. 40, pl. xxx., fig. 3, 3a to 3h; Haddon and Shackleton, Sci. Trans. R. Dublin Soc. (11), iv., 1891, p. 695, pl. lxi., fig. 14.

Two specimens both more or less biconvex in shape. The larger example is 3·6 cm. in diameter and 3 cm. in height. Polyps about 15 mm. high and 9 mm. in diameter. The upper surface and tentacles are of a bright reddish maroon colour. The specimens are in formol.

## Class CHÆTOPODA.

By T. WHITELEGGE.

## Order POLYCHÆTA.

## Family AMPHINOMIDÆ.

## EURYTHOE COMPLANATA, Pallas.

*Eurythoë complanata* (Pallas), Baird, Jour. Linn. Soc., Zool., x., 1870, p. 222.

A single specimen is here referred to this species. The example is 25 cm. in length, 2 cm. in width, and 1·2 cm. in thickness; there are 135 body segments. The head is too much retracted to determine the limits of the caruncle without injuring the specimen. The body is pretty uniform in width to within 2 or 3 cm. of the extremities.

The dorsal bristles consist of three forms, there are numerous elongate tapering bristles a few of which are simple, the majority however are subbifid, the shorter division being rudimentary and scarcely perceptable, the longer division is much elongated tapering and smooth. There are also numerous stout, broad serrated bristles having from 40 to 50 strong recurved teeth. The ventral bristles are stout with broad bifid and compressed apices, the longer divisions are quite smooth and about seven or eight times longer than the shorter, frequently there are one or two slender bifid bristles in which the divisions are long and cylindrical.

## EURYTHOE PACIFICA, var. LEVUKÆNSIS, McIntosh.

*Eurythoë pacifica* var. *levukænsis*, McIntosh, Chall. Report, Zool., xii. p. 29, pl. xvi., fig. 5; pl. 11a fig. 14; pl. 111a figs. 10 - 12.

There are numerous specimens referable to this species, the body is tapering, measuring from 1·5 to 5 cm. in length and consists of about 60 segments. The bristles agree very closely with the figures given by McIntosh in the Challenger Report.

## Family PHYLLODOCIDÆ.

## PHYLLODOCE sp.

This form is represented by several specimens and is closely allied to if not identical with *P. quadraticeps*, Grube; it agrees in every character except the number of bristles. Grube's species is said to have but five, whereas the Funafuti examples have six.

There are five worm tubes in the collection similar in shape and structure to those inhabited by *Eunice tibiana*, Pourt., but I failed to find any worms in them.

## Order OLIGOCHÆTA.

## Family PERICHÆTIDÆ.

## PERICHÆTA GRUBEI, Rosa.

*Perichaeta Grubei*, Rosa, Ann. d. K.K. Naturhist. Hofmus., vi. 1891, p. 395, pl. xiii., fig. 4a, 4b.

Two specimens appear to belong to this species, they are not in a good state of preservation and it is impossible to make out some of the specific characters.

#### PERICHÆTA SP.

There are two specimens of another species of *Perichæta* probably introduced into the island. The only perfect example is 7·5 cm. in length, the segments are one hundred in number, the *f* shaped setae are 0·2 mm. in length, and number about 50 per segment. The dorsal and anterior spermathecal pores if present are very small, I failed to find them with a lens. The clitellum occupies the fourteenth, fifteenth, and sixteenth segments, the female pore is situated in a line with the setae on segment fourteen. The male pores occur on the eighteenth segment, they are transversely elongate and papillose, each pore is about 1 mm. in length, and the distance between their inner margins is about the same. The median ventral line bears eight papillæ, there is one on each segment from fifteenth to twenty-first, the twenty-second being without; the remaining two are on segments twenty-three and twenty-four.

The dorsal surface is purplish-brown with green iridescent reflections, sides and under surface lighter.

### Class GEPHYREA.

#### Order SIPUNCULOIDEA.

##### Family SIPUNCULIDÆ.

###### PHYSOSOMA NIGRESCENS, Keferstein.

*Physcosoma nigrescens* (Keferstein), Selenka, in Semper's Reisen.

Arch. der Philippinen, iv., Die Sipunculiden, p. 72, pl. ix., figs. 130–136.

There are two examples of this well marked species, both are well preserved and fully extended. In the larger specimen the body is 2 cm. in length, and the proboscis is about 2·2 cm.

###### PHYSOSOMA SCOLOPS, Selenka and De Mann.

*Physcosoma scolops*, Selenka, Semper's Reisen. Arch. der Philippinen, iv., Die Sipunculiden, p. 75, pl. ii., fig. 17; pl. x., figs. 138–144.

Three examples of this species are in the collection. The largest example is 3 cm. in length, the large chitinous papillæ and the intense colour markings serve to readily distinguish this form.

###### ASPIDOSIPHON ELEGANS, Cham. and Eysenh.

*Aspidosiphon elegans* (Cham. and Eysenh.), Selenka, Semper's Reisen. Arch. der Philippinen, iv., Die Sipunculiden, p. 124, pl. i., figs. 10, 10a; pl. xiv., figs. 124–208.

One specimen, the body measures 3·5 cm., the proboscis is wholly retracted.

*ASPIDOSIPHON STEENSTRUPII, Diesing.*

*Aspidosiphon steenstrupii* (Diesing), Selenka, Semper's Reisen.  
Arch. der Philippinen iv., Die Sipunculiden, p. 116, pl. i.,  
figs. 12, 13; pl. xiii. figs. 190–192.

A single specimen is here doubtfully referred to this species. The body and proboscis are of a uniform pale brown colour, the anterior and posterior shields are darker, the latter is granular and radiately grooved, the former is slightly granular; an encircling series of about twenty small tubercles mark the line of union of the proboscis with the body.

The proboscis is clothed with a series of chitinous bodies of two kinds, those on the anterior half consist of flat curved bidentate hooks arranged in rings, each hook is about 0·05 mm. in height and 0·04 in width at the base. On the posterior half the chitinous bodies are scattered, they are elongate, three sided, slightly bent but not hooked at the summits, they are 0·04 mm. in height and 0·025 in width at the base. Numerous papillate skin glands occur between the rows of hooks, one to every four or five hooks.

The retractor muscles are 15 mm. in length, they are attached about 3 mm. from the posterior end of the body and are joined together at about 4 mm. from their point of attachment. The segmental organs are equal in length to the combined portion of the retractors, and are free from the body-wall for three fourths of their length. At the posterior third of the body there are twenty-five longitudinal muscle bands.

This form comes very near to *A. speculator*, Selenka, but the retractors are united much nearer the posterior end of the body, and the segmental organs are free for a greater distance than in Selenka's species.

*CLOEOSIPHON ASPERGILLUM, Quatrefages.*

*Cloeosiphon aspergillum* (Quatrefages), Selenka, Semper's Reisen.  
Arch. der Philippinen iv., Die Sipunculiden, p. 126, pl. ii.  
figs. 23, 24; pl. xiv. figs. 214–216.

A solitary example is somewhat doubtfully referred to this species. The specimen is 6 cm. in length, the proboscis is damaged and no hooks were available for examination. In other respects it agrees fairly well with the published description.

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# THE MOLLUSCA OF FUNAFUTI.

Part I.—Gasteropoda.

BY CHARLES HEDLEY.

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[XVII.]

THE MOLLUSCA.

Part I.—Gasteropoda.

By CHARLES HEDLEY.

Many of the introductory remarks which prefaced collections previously dealt with, apply with equal force to the Mollusca. Little was known of the Mollusca of the Ellice Group prior to our Expedition. With one exception, none of the naturalists—Dana, Whitmee, Woodford, Finsch—who have been to the archipelago, gathered any shells. The exception being Dr. Ed. Graeffe, who visited most of the atolls in the interest of the Godeffroy Museum. The land shells he procured are described by Mousson.\* A few other animals described by German authors from this group were probably also collected by him.

The poverty of the fauna of the atoll, compared with that of any continental area lying under corresponding latitudes, such as Queensland, New Guinea, or the Melanesian Plateau, again asserts itself. Whole groups, the Brachiopoda and the Polyplacophora, are missing, giving to the fauna an unsymmetrical aspect. Especially significant is the absence of Mollusca with large eggs such as *Nautilus*, *Melo*, or *Voluta* from this drifted fauna. In many cases the Funafuti shells are smaller than the usual stature of their respective species. Harper Pease has remarked that the marine Gasteropoda of the Paumotus are in general dwarfed in comparison with those of Tahiti.† Shipley mentions that specimens of Gephyrean worms from Funafuti were considerably smaller than representatives of the same species from Rotuma.‡

Poor though this fauna be, I have to apologise for the following inadequate account of it. Thorough search would probably result in multiplying the known total three or four times. My commission embraced the study of the Atoll as a whole. Although the Mollusca alone would have afforded occupation for the entire time of an investigator, yet Ethnology, and Botany, and other branches of Zoology equally claimed my attention. On my return the mass of material, molluscan and otherwise, together with the

\* Mousson--Journ. de Conch. xxi. 1873, pp. 102–109.

† Pease—Am. Journ. Conch. iv. 1868, p. 109.

‡ Shipley—Proc. Zool. Soc. 1898, p. 468.

pressure of current Museum duties has operated unfavourably on my report. Various inquiries on anatomy and other related matters have been perforce omitted. With the exception of a sketch of the geographical distribution I have unwillingly restricted myself to the mere systematic treatment of the species.

A superficial reader might seize on the fact that many new species are described as new in the following pages, and with a show of reason deduce that so great a proportion of novelties indicate a very peculiar and endemic fauna. This would however be a mistaken impression. Few realise how exceeding rich the fauna of the tropical Pacific is, or how poor our knowledge thereof. Probably, except in New Caledonia, a capable collector would obtain at least one shell new to science in a day's work on any beach in the South Pacific. Fischer's estimate that the Indo-Pacific Province contains five or six thousand marine mollusca,\* is certainly below the mark.

For the purpose of comparison the Funafuti fauna must be divided into large conspicuous, and small inconspicuous shells. The distribution already ascertained for conspicuous genera like *Cypraea* will be paralleled, as knowledge increases, for inconspicuous genera like *Caecum*. Thus I anticipate the discovery in the western continental islands of every minute species I have described as new from Funafuti. The range of all the species mentioned is given for the South Pacific as completely as opportunity permitted. A discussion of the data collected is postponed to the concluding pages of this Memoir.

The study of the mollusca of the Pacific is attended with peculiar difficulty. As a result of the superior energy of the British in exploration, commerce and missionary enterprise in the Pacific, the vast majority of the mollusca of this region have, from the time of Captain Cook to the present day, been first examined in London. The writers who have dealt with them, Adams Bros., Hinds, Reeve, the Sowerbys, Smith, Melvill, and others, have treated them uniformly on the model and method of Lamarck; it will be convenient to call this group of authors the "London School." A brilliant exception to the work of British writers is the superb Memoir by Boog Watson on the Gasteropoda collected by the Challenger Expedition.

As a consequence of the devotion of the London School to the study of the Pacific fauna, we have a great mass of involved synonymy, inadequate descriptions, poor figures or none, crude classification and total neglect of soft anatomy. The smaller portion of this fauna which has gone to Paris has generally been well figured, and a fraction which has fallen into the hands of

\* Fischer—Man. de Conch. 1887, p. 157.

American students has received scientific treatment. A higher grade of work was reached by a poor, solitary, invalid exile like Montrouzier than by men who had within their reach the unrivalled resources of the collections, the libraries and artists of London.

To descend from generalities to details, it may be pointed out that whilst the foremost British and American writers in all other branches of zoology now use English ; whilst the scientific writers of other countries, like Sars and Collett in Norway, Schepman in Holland and various Japanese authors, are adopting English as an international language, on the grounds of its wide currency, wealth and flexibility ; yet this conservative London school of Conchologists reject the advantages of their mother tongue and satisfy their humble wants with the poor and awkward medium of Latin.

By some strange unwritten law these Conchologists have invariably maintained a proportion between the size of a shell and its illustration. Thus a large shell, however simple in structure, demanded a large figure ; and a small shell, however complex its details, a small drawing. Had this school encountered Pachyderms or Foraminifera, one or both would surely have fallen beyond the focus of their vision.

Though great wealth of anatomical material was proffered them, these writers have ever cast the "nasty things" aside. The fascinating studies of structure, affinities, higher classification, or geographical distribution had no charm for them. Their measure of excellence in Conchological research being apparently the highest score of new species.

But the chief defect of this school is that it has added to the superstructure without strengthening the foundation, and has thus weakened instead of improved the fabric of our knowledge. Upon the distinction of old species depends not only generic and sub-generic classification, but even the reality of new species, which are necessarily contrasted with them. The task of rehabilitating old species, for which these writers have unique facilities, is by them neglected in favour of the easier and more showy work of describing novelties, which could be done at least as well by others.

In illustration, I will cite the following case, one instance of a multitude. Hinds, in 1843,\* thus described a new species, *Triforis collaris* :—"Testa ovata, acuminata ; anfractibus duodecim biserratim granulosis, serie inferiorie paululum maxima, margaritacea, superiore pallide fusca ; anfractu ultimo quadriseratim subaequaliter concatenato. Axis 4 lin."

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\* Hinds—Proc. Zool. Soc., 1843, p. 23.

No one will to-day affirm that so brief an account suffices for the recognition of this species. Consequently there is every probability that it has been, or will be, again named and described to the confusion of science. In so numerous and difficult a group, a description a page long and several detailed figures are barely enough to determine a species in the absence of authentic specimens. It would be supposed that this view only required to be stated for every worker to endorse it, but for sixty-five years British writers have passed over this inadequate account and neglected to repair the fault. So recently as last year, Melvill and Standen in treating of the shells of Lifu, examined and catalogued this species, yet it never occurred to them that a figure and description was more urgently needed for *I. collaris* than for any of the hundred novelties they figured and described.

Great numbers of the species of Adams, Hinds, Smith and others are inadequately represented in literature, and cannot be recognised without an inspection of the type in London. Either therefore no Conchological work should be published except by residents of London, which is an absurd proposition, or these species must be ignored by naturalists.

The local conditions under which the Funafuti mollusca occur may be briefly sketched. The distinction between the marine and terrestrial mollusca, so sharply drawn in temperate zones, fades away in the tropics. At a distance from the sea, in close association with such forms as *Stenogyra* and *Endodonta*, occur *Littorina*, *Nerita*, *Truncatella* and *Melampus*. The outer windward beach, where the surf sweeps the narrow reef platform, is only accessible at intervals when a low tide coincides with calm weather. Here the molluscan assemblage bears the mark of incessant buffeting of waves, all are characterised by powerful muscular feet which adhere to the rock like the sucker foot of the limpet, all have thick shells mostly strengthened by knobs or ridges. In the little rock pools at the foot of the shingle beach, swarm the gaily painted shells of *Engina mendicaria*, *Mitra literata*, *Conus hebraeus* and *C. ceylonensis*. Beyond, where the surf breaks more heavily, are several species of *Sistrum*, usually nestled in a rock crevice and more or less concealed by extraneous growth upon their shells. Here also are *Purpura armigera* and *P. hippocastaneum*, and on the brink of deep water is *Turbo setosus*.

It comes as a surprise to a naturalist to find the pelagic fauna scarce in this latitude. Dr. Krämer tells me that he was greatly struck by the poverty of the tropical Pacific in this respect. One Pteropod, one Heteropod, and a fragment of *Ianthina* were all of this class that came under my notice.

The quiet waters of the lagoon prove a richer field for a collector than the storm swept ledges of the ocean beach. Just at the