

- Fig. 17. *Spongodes boletiformis*, n. sp. Portion of head (spirit). Nat. size.
 18. The same. Lobule. $\times 6$ diam.
 19. The same. Projecting spicule. $\times 55$ diam.
 20. *Spongodes aurora*, n. sp. Portion of head (spirit). Nat. size.
 21. The same. Small portion of head. $\times 6$ diam.
 22. The same. Large spicule of cortex of head. $\times 85$ diam.
 23. The same. Projecting spicule. $\times 85$ diam.
 24. The same. Spicules of stem. $\times 250$ diam.

PLATE XVIII.

- Fig. 1. *Plexaura indica*, n. sp. Small specimen in spirit. Nat. size.
 2. The same. Portion of larger (dry) specimen. $\times 2$ diam.
 3. The same. Foliate spicules of cortex. $\times 250$ diam.
 4. The same. Radiate spicule of verrucæ. $\times 250$ diam.
 5. The same. Fusiform cortical spicule (No. 2 of description). $\times 250$ diam.
 6. *Mopsella planiloca*, n. sp. Foliate spicule. $\times 300$ diam.
 7. *Gorgonia oppositipinna*, n. sp. Portion of type specimen (spirit). Nat. size.
 8. The same. Portion of branch. $\times 4$ diam.
 9 & 10. The same. Larger scaphoid spicule. $\times 250$ diam.
 11. The same. Smaller scaphoid spicule. $\times 250$ diam.

On two Species of Actiniæ from the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. By Professor ALFRED C. HADDON, M.A., M.R.I.A. (Communicated by Dr. JOHN ANDERSON, F.R.S., F.L.S.)

[Read 16th June, 1887.]

(PLATES XIX. & XX.)

Two species of Actiniæ from the Mergui Archipelago were submitted to me by Dr. John Anderson, both of which have proved to be undescribed.

The more interesting form, which is the type of a new genus, was unfortunately in such a bad state of preservation that most of the epithelial tissues had entirely disappeared. Although this specimen was partially dissected and a portion removed for microscopic examination, care was taken not to destroy its value as a Museum specimen.

The other species was represented by three specimens, one
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of which was devoted to the microtome, the other two are uninjured.

Except where otherwise stated, the following descriptions apply to the specimens as they appear after preservation in alcohol, and in a very contracted condition. In my definitions I have largely followed the method of procedure advocated by Professor R. Hertwig.

MYRIACTIS*, n. gen.

Hexactiniæ [as defined by R. Hertwig] with slightly developed endodermal muscles in the upper portion of the body-wall, and strong mesenteric retractor muscles; a large number of moderately long, slightly contractile, subequal, polycyclic tentacles, the marginal row being papilliform; numerous complete mesenteries ["septa" of Hertwig]; reproductive organs present on all the mesenteries; wall, smooth below, provided with suckers above.

MYRIACTIS TUBICOLA †, n. sp. (Plate XIX.)

Form. Cylindrical; base not expanded, thrown into a number of radiating ridges, with concentric rugosities, thus giving it a reticulate appearance; scapus thin-walled, with the mesenteries shining through in the less contracted portions, transversely wrinkled; the closeness of the folds in the most contracted portion of the body it gives a satin-like lustre; capitulum non-retractile, transversely folded, but not nearly to the same extent as the scapus, provided with numerous suckers; the latter are most developed above, and become less prominent below; at the region where the capitulum imperceptibly passes into the scapus the suckers are very irregular in size and disposition, and give a perforated appearance to the body-wall. Margin of disk thrown into folds. Tentacles moderately long, conical, fairly uniform in size in eight or nine rows, over four hundred in number, not counting the marginal row. Gonidial furrows prominent.

Colour. "Disk and tentacles pale green. My impression is that they were barred or spotted." [J. A., *MS.*] Uniform grey, in spirit. The green colour in the living animal is almost certainly due to the presence of zooxanthellæ, which occur in enor-

* *Mypios* innumerable, *aktis* a ray.

† So named from its habit.

mous numbers in the endoderm of the upper portion of the body, and but sparsely in the rest of the column.

Dimensions. Contracted specimen in spirit—height 40 millim.; diameter of column 22 millim. below, 25 millim. above. Length of tube (in spirit) about 260 millim.

Habitat. Deeply burrowing in mud-flats, low spring-tide, French Bay, King Island, Mergui Archipelago (February 1882). The animal inhabits a thick slimy tube formed by the threads of cast-off cnidæ and foreign matter.

I have received the following memorandum from Dr. Anderson:—

“The large Actinia I found burrowing in the extensive mud-flats exposed at spring-tides in French Bay, King Island. There was a small depression in the mud around the disk and tentacles, and as they were filled with water, the tentacles were more or less expanded, of considerable size, and prominent. The disk was large, but whether it expanded much beyond the column, or at all, I cannot say. The upper stratum of mud was so soft that I sank halfway up to my knees in it; but the burrow of the Actinia extended deep below this; and I consequently experienced considerable difficulty in digging it out. When removed from its burrow, it was very flaccid, but had contracted to about 9 inches in length.”

From the foregoing account we may conclude that the fully extended animal measures some 18 inches (460 millim.) in length. It is probable that when fully distended the disk extends beyond the diameter of the column, making it somewhat salver-shaped. As in *Cerianthus*, the tube is composed of innumerable cnidæ felted together; entangled amongst these are large numbers of unexploded nematocysts and foreign bodies, such as grains of sand, spicules of sponges and alcyonaria, diatoms, and the hyphæ of a fungus. The possession of symbiotic algæ must be very advantageous to this tubicolous actinian; and it is not surprising that they are mainly massed in the only portion of the animal which is exposed to the light.

The figures on Plate XIX. sufficiently explain themselves. It must be remembered that the greater portion of the epithelial tissues are lost by maceration. The ectoderm is entirely lost, most of the endoderm has separated from the lower portion of the body and from the mesenteries; enough, however, is present

in patches to prove that the zooxanthellæ occurred sparsely. The endoderm coating the generative region of the mesenteries (Pl. XIX. fig. 6) appears to be of a slightly different character from that of the more distal portion; in the latter granular gland-cells are very abundant; the mesenterial filaments (craspeda), as usual, contain a large number of granular unicellular glands, but I cannot discover any nematocysts.

In the capitular region of the body the endoderm is much better preserved, as will be seen from fig. 7; it is crowded with symbiotic algæ. At this region of the body the muscular folds of the endoderm, which usually remain simple, are very slightly branched (Pl. XIX. fig. 7). The mesogloea or "mesoderm" appears to be entirely fibrous, the wavy appearance being due to contraction (figs. 6 and 7).

The mesenteries are ninety-six in number, the formula being $12+12+24+48$; all of them are perfect, that is reach the œsophagus; lower down the mesenteries of different orders can be recognized by their length and relative size of the longitudinal muscles, the latter being very well developed (Pl. XIX. fig. 5). All the mesenteries bear reproductive organs. The specimen under examination possessed only ova (fig. 6).

The gonidial grooves are very well developed (Pl. XIX. fig. 4); above they have thick swollen margins, but lower down the latter are flattened bands. The œsophageal wall is thin, and can be divided into an upper folded portion and into a lower more diaphanous moiety.

The nematocysts (figs. 8 and 9) vary in size from about $\cdot 00225$ to $\cdot 0035$ of an inch, and in breadth from about $\cdot 00075$ to $\cdot 0013$ of an inch. No barbs are to be seen on the proximal portion of the thread.

There is a certain amount of external resemblance between this species and *Cereus pedunculatus* (Peun.) (*Sagartia bellis*, E. & S.), at least in such characters as the warty capitulum, smooth scapus, numerous somewhat short tentacles in several rows, of which the outermost is papilliform; but the latter is a typical member of the Sagartiæ in having acontia and in the six pairs of primary mesenteries being sterile although others reach the œsophagus. It is possible that the *Actinia paumotensis* of Couthouy is allied to our species; but H. Milne-Edwards and Andres both agree in placing that species close to the above-

mentioned Sagartid. It is now recognized that determinations of Actiniæ made from purely superficial characters are apt to be erroneous; so that a minute anatomical investigation of many of the previously described forms is now necessary before they can be confidently relegated to any group of the Actiniæ.

Dr. R. Hertwig divides the Actiniaria or Malacodermata, in his 'Challenger' Report, into six tribes. From the arrangement of its mesenteries, *Myriactis tubicola* belongs to the first tribe, the Hexactiniæ. Nine families are enumerated as belonging to this tribe. The first (Corallimorphidæ) has accessory tentacles, the last (Hyanthidæ) has a vesicular physa. The Tealidæ have a very strong endodermal circular muscle; while the Paractidæ, Liponemidæ, Sagartidæ, and Amphianthidæ have a mesodermal circular muscle. The Anthecomorphidæ are characterized by possessing a "slightly developed muscular system, long, slightly contractile tentacles, without any circular muscles (tentacles consequently non-retractile); reproductive organs present on all the septa [mesenteries]; accessory tentacles wanting." Lastly, the Antheadæ are defined as "Hexactiniæ with long marginal tentacles and slightly developed endodermal circular muscle (so that the oral disk cannot be covered at all, or only incompletely); numerous septa, reaching for the most part up to the œsophagus, distinguished only by their size, and all (?) furnished with reproductive organs."

On comparing the above descriptions with the definition of the genus *Myriactis*, it will be seen that the latter cannot be placed in any of these families unless one or more of their characters are amended. Its exact systematic position must be left until we have a more accurate knowledge of the tropical Sea-Anemones.

HORMATHIA ANDERSONI, n. sp. (Plate XX.)

Form. Base expanded; scapus leathery, with transverse furrows, terminating above in twelve fairly regular bosses, which are prolonged along the inverted capitulum as twelve prominent ridges. Tentacles moderately long, pointed, arranged in four (?) cycles, about 100 in number.

Colour. Cuticle burnt sienna, speckled with grains of sand; where the cuticle is rubbed off, the supporting tissue (mesogloea or "mesoderm") of the scapus is yellowish; terminal prominences

of scapus white. Tentacles with a row of small madder-brown spots on their oral aspect. Disk with madder pigment.

Dimensions. Specimen *a*: Diameter of base 20 millim., diameter of lower portion of scapus 15 millim., height 7 millim. Specimen *b*: Diameter of central portion of scapus 9 millim., height 8 millim.

Habitat. Sullivan Island, Mergui Archipelago; 6 fathoms. January 13, 1882.

This species is so closely allied to the "*Phellia pectinata*" of R. Hertwig, as described in his 'Challenger' Report, that there can be no doubt that they must be placed within the same genus.

The genus *Phellia* as defined by Gosse (Ann. Mag. Nat. Hist. (3) ii. 1858, p. 192, and 'Actinologia Britannica,' p. 134) and accepted by Verrill (Trans. Connect. Acad. i. 1868, p. 489) and Andres (Le Attinie, 1884, p. 117) is well characterized; the scapus may be rugose or wrinkled, but distinct nodules are absent.

While apparently agreeing in many respects with this genus, in Hertwig's form the scapus terminates "above in twelve knobs, which are prolonged on to the inverted soft-membraned section [capitulum] as twelve longitudinal combs." The new species just described also possesses twelve nodules. I am indebted to my friend Canon A. M. Norman for an Actinian which closely resembles the form depicted on Plate XX. fig. 1, which he dredged twenty years ago at Shetland, and which I am elsewhere describing (Trans. Roy. Irish Acad.). Lastly, Gosse described in 1859 a new British Sea-Anemone which he named *Hormathia Margaritæ* (Ann. Mag. Nat. Hist. (3) iii. 1859, p. 47, also Actin. Brit. p. 219, pl. viii. fig. 1), the new genus being thus diagnosed:—"Base adhereut, greatly expanded. Column pillar-like, much corrugated, surrounded by a single horizontal row of warts. Disk slightly concave, scarcely exceeding the column. Tentacles moderately long and slender, perfectly retractile. There is but a single known species, *H. Margaritæ*." This species has only once been recognized since; F. E. Schulze records it from 96 fathoms off N.E. Scotland (log. no. 79) on *Fusus antiquus* (Jahresb. d. Com. z. wiss. Untersuch. d. deutschen Meere (Exped. 1872), 1875, p. 140).

Anatomical details are wanting for the type species of both of Gosse's genera *Phellia* and *Hormathia*; but it appears pretty

evident that Hertwig should have referred his species to the former rather than to the latter of the two genera. In which case the following would constitute the recognized species of the genus *Hormathia*, viz. *H. Margaritæ*, Gosse, *H. pectinata* (R. Hert.), *H. Andersoni*, Hadd. I shall shortly in another place discuss the systematic relationships of this genus.

Of the three specimens collected by Dr. Anderson, one (*a*), Pl. XX. fig. 1, is attached to a piece of broken shell, the base being greatly expanded and partially enwrapping the fragment of shell. In the other two specimens (*b* and *c*), Pl. XX. figs. 2 & 3, the base is dome-shaped and constricted off from the upper portion of the column; possibly these were free forms, as the arrangement of the base would form an efficient sand-anchor.

As was previously mentioned, one specimen was sacrificed for anatomical purposes. First, I bisected it vertically, and then devoted one half to transverse sections; a portion of the other was utilized for vertical sections. This specimen was in a good state of preservation.

Professor Hertwig has in his 'Challenger' Report, pp. 80-83, given a good account of the genus *Hormathia*, as represented by his *P. pectinata*. Our form is so closely allied to this, that little need here be added. Fig. 3 (Pl. XX.) is a slightly diagrammatized view of a vertical section through the entire animal. The powerful mesodermal circular muscle, the folded œsophagus, and absence of gonidial grooves alone call for remark. The ectoderm is figured as extending entirely round the body; as a matter of fact in the specimen in question it only occurred in the more protected portions, as, for instance, in the slight hollow round the central boss, at the basal constriction on the pedal disk, and on all the invaginated surfaces.

Two figures of transverse sections are given: one (Pl. XX. fig. 4) is taken through the circular muscle, and shows that the sphincter forms an uninterrupted circular muscle, the apparent terminations in the section being due to the section passing out of the plane of the muscle; the second section passes through the œsophagus, and illustrates a characteristic feature of the Chondractininae, that only the primary pairs of mesenteries reach the œsophagus. This section is slightly oblique, the left-hand side being at a somewhat lower level than the right. At the latter the tips of three tentacles are cut across.

The mesenteries have no features worthy of special note.

Fig. 6 represents a section through the tertiary mesentery indicated by an asterisk (*) in fig. 5. The secondary and tertiary mesenteries alone are fertile. The total number of mesenteries is 96 ($12+12+24+48$).

The invaginated ectoderm consists of a ciliated columnar epithelium, that on the tentacles is crowded with curved nematocysts (fig. 7); granular gland-cells are common in the epithelium of the œsophagus. Where it is preserved, the ectoderm of the column is coated with an investment of grains of sand apparently imbedded in a mucous matrix often with shreds of cuticle; on the pedal disk, however, the cuticle is strongly developed between the arenaceous investment and the epithelium.

The character of the mesoglœa (mesoderm) is sufficiently indicated in fig. 10. This figure also illustrates the structure of the circular muscle in vertical section.

The concretions observed by Professor Hertwig in the superficial layer of mesoderm in his specimen are here absent; but oval foreign bodies occur in the mesoglœa mainly towards the apex of the invaginated section of the body-wall, either within or outside the circular muscle. They appear to be the ova and embryos of some parasite, possibly of a Nematode worm.

The endoderm consists of the usual histological elements. The madder-coloured pigment of the tentacles and oral disk is confined to the endoderm. In those mesenterial filaments (craspeda) which have a trilobed section, the central lobe only possesses unicellular glands which are of the granular type.

The acontia (Pl. XX. fig. 9), in addition to granular gland-cells, are crowded with nematocysts (fig. 8); these are rather longer and more slender than those of the tentacles, the former being about $\cdot 0083$ of an inch, and the latter about $\cdot 0015$ of an inch in length.

DESCRIPTION OF THE PLATES.

PLATE XIX.

Myriactis tubicola, gen. & sp. nov.

b. Craspeda (mesenteric filaments). *d.* Unicellular glands. *en.* Endoderm. *g.* Reproductive organs (gonads). *h.* Mesenteries; I.-IV. indicate the rank of the pairs of mesenteries. *i.* Oral disk. *k.* Body-wall. *l.* Pedal disk. *me.* Mesoglœa (mesoderm). *ml.* Longitudinal muscles of mesenteries. *mp.* Parietobasilar muscle. *ms.* Circular muscle. *o.* Ova. *s.* Œsophagus. *sc.* Suckers. *sr.* Œsophageal groove. *t.* Tentacles. *z.* Zooxanthellæ.

The combinations of lenses mentioned below refer to Zeiss's system.

Fig. 1. Side view of a preserved specimen. Natural size.

2. Portion of same. $\times 2$ diameters.

3. Portion of base, seen from below. $\times 2$ diameters.

4. Inner view of part of the body, showing one gonidial groove (œsophageal groove) and a secondary septum. Natural size.

5. Transverse section through one twelfth of the body below the œsophagus.

$\frac{2}{a*0}$.

6. Transverse section through a mesentery. $\frac{3}{a*10}$.

7. Portion of a longitudinal section through the capitulum, showing the endoderm crowded with zooxanthellæ, the feeble endodermal circular muscle, and the nature of the mesoglæa. $\frac{2}{A}$.

8. Portion of teased tube, with an aleyonarian and a sponge-spicule.

$\frac{2}{B}$.

9. Isolated nematocyst, partially exploded. $\frac{2}{D}$.

PLATE XX.

Hormathia Andersoni, sp. n.

a. Acontia. *b.* Mesenteric filaments (craspeda). *d.* Unicellular glands. *ek.* Ectoderm. *en.* Endoderm. *g.* Reproductive organs (gonads). *h.* Mesenteries; I-IV. indicate the rank of the pairs of mesenteries. *i.* Oral disk. *k.* Body-wall. *l.* Pedal disk. *lp.* Lip of mouth. *m.* Muscles. *mc.* Mesoglæa (mesoderm). *ml.* Longitudinal muscles of mesenteries. *mr.* Radial muscles of oral disk. *ms.* Circular muscle. *n.* Nematocysts. *rh.* Directive mesenteries. *s.* Œsophagus. *sg.* Grains of sand forming investment to the ectoderm. *t.* Tentacles; 1 primary, 2 secondary.

The combinations of lenses mentioned below refer to Zeiss's system.

Fig. 1. View from above of specimen *a.* $\times 2$ diameters.

2. Side view of specimen *b.* $\times 2$ diameters.

3. Vertical section through specimen *c.* $\times 4$ diameters.

4. Transverse section through upper portion of body-wall. $\frac{2}{a*5}$.

5. Transverse section through the œsophagus. $\frac{2}{a*5}$.

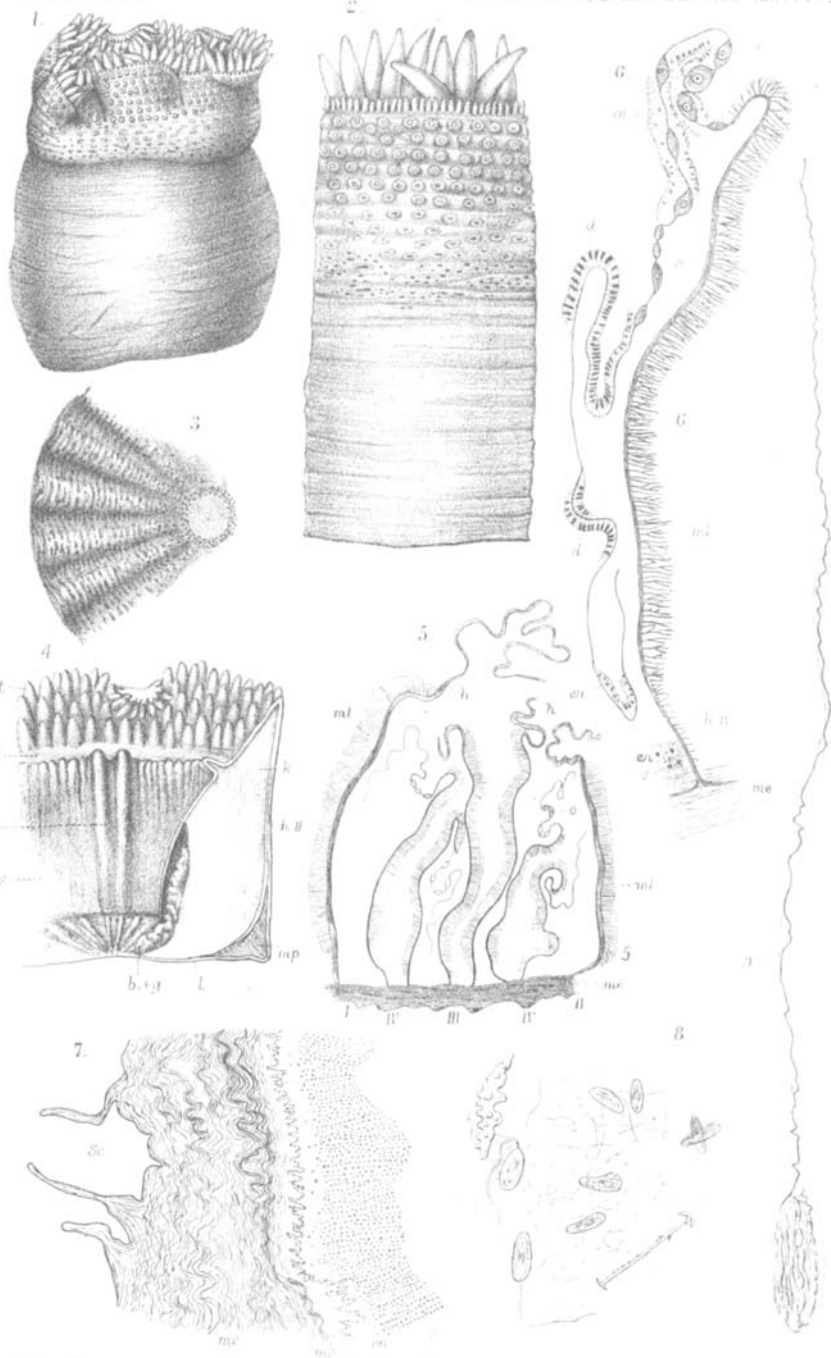
6. Horizontal section through the tertiary mesentery indicated by an asterisk (*) in fig. 5. $\frac{3}{A}$.

7. Nematocysts from a tentacle. $\frac{2}{F}$.

8. Nematocysts from an acontium. $\frac{2}{F}$.

9. Transverse section through an acontium. $\frac{2}{D}$.

10. Vertical section through horizontal portion of circular muscle. $\frac{2}{C}$.



A. C. H. del.

Reynolds & Hargreaves del.

M. J. C. 1884. 1885.

MYRIACTIS TUBICOLA, g. & sp. n.

