

[OCTOBER, 1896.]

THE  
SCIENTIFIC TRANSACTIONS  
OF THE  
ROYAL DUBLIN SOCIETY.  
VOLUME VI.—(SERIES II.)

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VI.

ON SOME ACTINIARIA FROM AUSTRALIA AND OTHER DISTRICTS. By  
A. C. HADDON, M.A. (Cantab.), M.R.I.A., Professor of Zoology, Royal College of  
Science, Dublin; and J. E. DUERDEN, Assoc. R.C.Sc. (Lond.), Jamaica Institute,  
Kingston, Jamaica.

(PLATES VII. TO X.)

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[Read JANUARY 23, 1895.]

THIS communication is based upon a small collection of Actinaria which was entrusted to one of us for description by Professor W. Baldwin Spencer of the Melbourne University. The specimens were, as a rule, well preserved in alcohol; and they were accompanied with some cleverly executed coloured drawings, which we regret we are unable to reproduce in colours. Various circumstances delayed the completion of the undertaking; and as several other forms were forwarded to us for examination by Prof. F. Jeffrey Bell, of the Natural History Department of the British Museum, and by Prof. W. A. Herdman, of University College, Liverpool, we decided to publish the descriptions of these various specimens in one paper.

The number of genera and species is too small and unrepresentative to warrant a disquisition on the classification of the Actinaria in general.

With the exception of one or two recent papers, full references to which are given in the text, the authors referred to are so well known that we have not occupied space by giving the particulars of publication. These are given at length in Dr. Andres' Monograph, and in the "Revision of the British Actiniæ": I. Trans. Roy. Dub. Soc., 1889; II. Trans. Roy. Dub. Soc., 1891.

The following is a list of the eleven species which we now describe:—

## ZOANTHÆ.

## Brachycneminae.

- Zoanthus Shackletoni*, n. sp.; Adam's Bridge.  
*Gemmaria Canariensis*, n. sp.; Canary Islands.  
*Palythoa Gregorii*, n. sp.; East Africa.  
,, *liscia*, n. sp.; East Africa.

## Macrocneminae.

- Epizoanthus egeriæ*, n. sp.; South China Sea.

PROTACTINÆ (PROTANTHÆ.)

Corallimorphidæ.

*Corynactis Australis*, n. sp. ; Port Philip.

Aliciidæ.

*Cystiactis tuberculosa*, (Quoy et Gaim.); New South Wales.

HEXACTINÆ.

Actiniidæ (Antheadæ).

*Actinioides Spenceri*, n. sp. ; Port Philip.

SAGARTIDÆ.

Sagartininæ.

*Sagartia Carlgreni*, n. sp. ; Port Philip.

(? sub-family).

*Mitactis*, n. g.

*Mitactis Australiae*, n. sp. ; Port Philip.

„ *similis*, n. sp. ; Port Philip.

ZOANTHÆ.\*

BRACHYCNEMINÆ, (Haddon and Shackleton), 1891.

ZOANTHUS, Lamarck, 1801.

*Zoanthus Shackletoni*, n. sp.

(Pl. VII., fig. 1.)

*Form.*—Body smooth, walls thin, and in some so transparent that the gonads and mesenteries can be distinguished; club-shaped when contracted, narrowing proximally either gradually or suddenly. Polyps in clusters, buds springing from the narrow bases of the polyps and rarely from the stolon. Stolon feebly developed, occasionally forming very small flattened expansions.

In contracted spirit specimens, the following regions can be distinguished:—an uppermost region, a gonadial zone, an inferior mesenterial region, and a pedicel passing into the stolon.

*Colour.*—In spirit specimens the column exhibits various shades of buff according to the body region.

*Dimensions.*—Average length of contracted specimens, 13 mm.; average diameter, 4 mm.

\* For a definition of the Zoanthæ, and of its two sub-divisions, and the various genera, the reader is referred to the Trans. Roy. Dub. Soc., iv. (Ser. II.), 1891, pp. 626-633.

*Locality.*—Pamban, Ramesvaram Island. Adam's Bridge (between India and Ceylon), several colonies growing on nullipores, and associated with numerous small delicate sandy worm-tubes, which, along with other calcareous particles, adhere strongly to the stolons.

We have associated with this species the name of our friend and colleague Miss Alice M. Shackleton.

*Body-wall* (Pl. VIII., fig. 1).—Very thin throughout, thickening a little in the region of the proximal sphincter muscle. The wall of the column is bounded externally by a distinct brownish cuticle, with a thick deposit of brownish granular material with foreign particles, including frustules of diatoms. Beneath this cuticle, and between it and the ectoderm, is a thin layer of mesogloëal substance, "sub-cuticula,"\* connected by strands of mesogloëa through the ectoderm to the mesogloëa proper. Below the upper portion of the column the cuticle and sub-cuticula present a somewhat dendriform appearance, best seen in longitudinal sections. In some cases the brownish cuticular substance is almost entirely enclosed. This dendriform appearance may be due to the unequal contraction of the cuticle and "sub-cuticula." In the ectoderm, the cells have become so vacuolated that only nuclei and strands of protoplasm remain.

The mesogloëa is thin, and contains cell-islets. A canal system extends transversely and longitudinally; and in the lower part of the column these canals are found to communicate with the basal canals in the mesogloëa of the mesenteries. The contents of the canals stain very deeply, and zooxanthellæ occur, especially in the lower part of the column and in the stolon. The endoderm is well developed, and crowded with zooxanthellæ. The endodermal muscle is only slightly developed.

*Capitulum.*—In the capitulum, the ectoderm becomes continuous, non-vacuolated, and without the cuticle and sub-cuticula. The mesogloëa is very thin, and the endoderm crowded with zooxanthellæ.

*Sphincter muscle* (Pl. VIII., fig. 2).—The sphincter muscle is double and mesogloëal. The proximal, or lower, portion is well developed. The cavities in the mesogloëa are hollow, with only a very thin lining of muscular fibres; they are transversely elongated above, but rounded and more numerous below. The distal, or upper portion of the muscle is much smaller. In contracted specimens, there is a deep fold of the body-wall between the two parts of the sphincter.

*Tentacles, Disc, and Œsophagus.*—The ectoderm is without the cuticle and the "sub-cuticula," and is non-vacuolated. The mesogloëa is thin; the endoderm is thick, crowded with zooxanthellæ, and almost fills up the lumen of the tentacles.

\* Cf. the remarks on this structure by Prof. A. R. von Heider, "*Zoanthus chierchiaë*, n.sp.": Arbeit. Zool. Inst. Graz., v. 1895, p. 118.

*Mesenteries.*—The arrangement of the mesenteries is brachygnemic. They are straight, and, owing to their number and well developed endoderm, almost fill up the cœlenteron. The mesogloea is very thin, except parietally where it surrounds the large basal canal. These are mostly circular in transverse section (Pl. VIII., fig. 3) except in the upper part, where they become ellipsoidal. The canal is filled with a deeply staining tissue. These basal canals are in communication with the mesogloéal canals in the lower part of the column. In longitudinal sections they can be traced from near the base along the greater part of the length of the column.

The musculature is weak, the mesogloea being only slightly plaited.

*Gonads.*—Female gonads are developed in many of the specimens. They occur in the mesenteries at the upper third of the contracted column.

*Zoanthus Shackletoni* has an external resemblance to *Z. sociatus* (Ellis), which has been minutely described and figured by M<sup>c</sup>Murich (1889). This latter species is very common from the West Indies. We have communicated with our friend Prof. M<sup>c</sup>Murich, and sent him specimens of our species. He informs us that its size is only about one-third of that of *Z. sociatus*; that the sphincter muscle is entirely different in the two forms, since, in *Z. sociatus*, the proximal sphincter is relatively very much longer than in our species, and the outlines of the compartments of the lower part of these muscles is also very different. The basal canals are elongated in section in *Z. sociatus*, as shown in M<sup>c</sup>Murich's figure, but rounded in ours. As before mentioned, the remarkable appearance of the peripheral part of the body-wall may be due to unequal contraction, but this need not prevent it from forming an additional diagnostic feature, and so far as we are aware it is unique.

Our species can also be readily distinguished from other described species of *Zoanthus* (cf. Trans. R. D. S., iv., 1891, p. 629). Amongst other characters, it differs from the more recently described *Zoanthus chierchiei*, Heider, in its form, and in the character of its sphincter muscle, ectoderm, and cuticle.

#### GEMMARIA, Duchassaing & Michelotti, 1860.

Brachygnemic Zoanthææ, with a single mesogloéal sphincter muscle. Solitary, or connected by cœnosarc. The body-wall is incrustated. The ectoderm is usually discontinuous, but may be continuous. Lacunæ and cell-islets are found in the mesogloea. Dicecious.

This definition of the genus differs only from that given in the Report of the Zoanthææ from Torres Straits (1891), in the fact that the polyps may be connected by cœnosarc. M<sup>c</sup>Murich (1889) considered that, in *Gemmaria isolata*, the polyps



may be connected, but the present species is the first in which the presence of the cœnosare is undoubted.

The history of the genus will be found on page 687 of the above Report. Hitherto, only the following four species have been recognised as belonging to the genus:—*G. rusci*, Duch. & Mich., from St. Thomas (1889); *G. isolata*, M<sup>c</sup>Murr., from the Bahamas (1889a); *G. Macmurrichi*, Hadd. & Shackl., and *G. mutuki*, Hadd. & Shackl., from Torres Straits. We now add a description of a new species, *G. Canariensis*, from the Canary Islands.

**Gemmaria Canariensis, n. sp.**

(Pl. VII., fig. 2.)

*Form.*—The column is erect, rigid, and of about equal diameter throughout, except at the upper part of contracted specimens, which is swollen, and possesses about 24 radiating ridges. The ectoderm has almost entirely disappeared. Where present, it is coarse in appearance. The polyps rise from a thick, firm, continuous cœnosare.

*Colour.*—The true colour is removed by the alcohol in which the colonies are preserved. They are now of a dark purple tint, due to the pigment from an *Aplysia* placed in the same jar. This is largely removed on placing the specimens in acid.

*Dimensions.*—Height, 13 mm.; average diameter of column, 3 mm.; greatest diameter capitular region, 5 mm.

*Locality.*—Canary Islands. Two colonies, each with three or four connected polyps.

The specimens were kindly placed at our disposal by Prof. W. A. Herdman, of University College, Liverpool.

*Body-wall* (Pl. VIII., fig. 4).—In the two specimens cut for longitudinal and transverse sections, the ectoderm of the column is almost absent. Where, however, traces do occur, it is continuous, of considerable diameter, and contains numerous zooxanthellæ. A thin cuticle is present, containing frustules of diatoms.

The incrustations consist mostly of siliceous and calcareous sand-grains and sponge spicules, but they are all limited to the outermost part of the mesogloea and to the ectoderm. The incrustations give the surface of the column a roughened appearance where the ectoderm is wanting.

The mesogloea is moderately thick in the upper part of the column, and increases considerably towards the base. It is crowded with cell-islets of variable size. The larger of these are mainly limited to the central zone of the mesogloea.

The larger cell-islets contain zooxanthellæ. There is not much tendency to the formation of lacunæ. Single cells with elongated fibrils stretch across the mesogloea.

The endodermal muscular layer is well developed, but less so in the lower part of the column. The endoderm is uniformly developed, of medium height, and crowded with zooxanthellæ.

*Sphincter muscle* (Pl. VIII., fig. 5).—The sphincter muscle is single, mesogloal, and elongated. The hollow cavities are arranged in a continuous row close to the endoderm; the upper are larger and more irregular in shape.

*Disc and Tentacles*.—The ectoderm and endoderm of the disc and tentacles are both crowded with zooxanthellæ. The mesogloea of the latter is very thin, and the ectodermal muscular layer is well developed, in marked contrast to the endodermal. Cell-inclosures are found in the mesogloea of the disc. The surface of the mesogloea adjacent to the endodermal aspect is much plaited.

*Œsophagus*.—The Œsophagus is oval in section, with a well-marked rectangular œsophageal groove. The ectoderm is very deeply folded into eight ridges along each side, the mesogloea passing into each. The nuclei of the ectodermal cells form a well-defined and continuous central row. The mesogloea is very thin, except at the groove, where it becomes somewhat thickened. As in *G. isolata* and *G. rusei* the mesogloea has enclosures of granular cells placed more particularly at the insertion of the mesenteries, and at the bases of the outgrowths into the œsophageal folds.

*Mesenteries*.—The mesenteries show the brachynermic arrangement in a very clear manner. There are twelve pairs of perfect mesenteries. The mesogloea is very thin in the lower part. The musculature is relatively well shown on both perfect and imperfect mesenteries. The basal canals are large and rounded, especially in the region below the œsophagus; in the œsophageal region they become oval in section, and soon divide into two or more branches. Towards the top of the mesenteries the canals are more irregular. The mesogloea in this region becomes very much and deeply plaited, and the endoderm is crowded with zooxanthellæ.

*Cœnosarc* (Pl. VIII., fig. 6).—The ectoderm and incrustations have the same character as in the body-wall. The mesogloea is crowded with cell-islets, and contains numerous cœlenteric canals.

*Gonads*.—Both of the specimens examined contain ova.

*Gemmaria Canariensis* differs from the four previously described species of the genus in the following characters:—1. In having the capitular region swollen when contracted. 2. In the presence of a thick cœnosarc. M<sup>c</sup>Murrich (1889, p. 65) is inclined to believe that the polyps of *G. isolata* may be connected by a thin continuous cœnosarc, but owing to the fact of the polyps being buried up to the tentacles in sand, he was not able to decide this. 3. In the incrustations being limited to the ectoderm and the outermost part of the mesogloea.

It agrees with *G. mutuki* and *G. isolata*, and differs from *G. Maemurriehi* in having a continuous ectoderm, *i.e.* not broken up by strands of mesogloea. It also differs from the latter, and agrees with the other three species in the presence of zooxanthellæ. The musculature of the mesenteries is only slightly developed in *G. Maemurriehi* and *G. mutuki*, while it is fairly well developed in our species. It agrees with *G. Maemurriehi* in having only a weak tentacular ectodermal musculature.

**PALYTHOA**, Lamouroux, 1816.

***Palythoa Gregorii***, n. sp.

(Pl. VII., fig. 3.)

*Form.*—Cœnenchyme not distinguishable from the walls of the polyps; each projects above the general surface of the cœnenchyme, leaving irregular linear polygonal depressions between them. The projecting portion of each contracted polyp has the form of a flattened dome with a small central circular depression. No distinct capitular ridges and furrows.

*Colour.*—Sandy.

*Dimensions.*—Average diameter of polyps, 6 mm. The thickness of the colony is very variable, and with it the length of the polyps; greatest height, 27 mm.; least height, 10 mm.

*Locality.*—Mombassa, East Africa, collected by Dr. J. W. Gregory, of the British Museum. Only one colony incrusting an irregular base of nullipores.

The species is named after its distinguished collector.

*Body-wall.*—The ectoderm, where present, is continuous, of considerable thickness, and covered with a cuticle; large yellow oval nematocysts occur, which clearly show the internal spiral thread, as well as a large number of narrow elongated nematocysts.

The mesogloea is not very abundant, and contains numerous isolated cells; cell-islets and lacunæ of all sizes crowd the mesogloea, and contain large yellow nematocysts and zooxanthellæ. The incrustations, which extend throughout the mesogloea, consist of fairly large quartz sand grains, a few sponge spicules, somewhat more numerous in the retracted or distal portion of the polyps, and a very little calcareous matter.

The endoderm is entirely macerated away, leaving only numerous zooxanthellæ.

*Sphincter muscle* (Pl VIII., fig. 7).—The sphincter muscle is single, mesogloéal, and of a considerable length.

*Disc and Tentacles.*—The mesogloea of the disc is very thick, crowded with cell-islets and incrustations.

*Œsophagus.*—The ectoderm is folded, the foldings being partially accompanied by processes of the mesogloea. The œsophageal groove is well marked, the mesogloea being here a little thickened. The ectodermal muscle is feebly developed. In the mesogloea are numerous cells and cell-islets.

*Mesenteries.*—The whole internal structure of the polyps is very badly preserved. The endoderm is wholly macerated, leaving numerous zooxanthellæ; no musculature can be distinguished. In each of the mesenteries is a large basal canal extending the whole vertical length, and containing numerous large yellow nematocysts. Various other canals or sinuses are seen in transverse sections of the mesenteries.

*Gonads.*—No gonads present.

### ***Palythoa liscia*, n. sp.**

(Pl. VII., fig. 4.)

*Form.*—Contracted polyps not projecting, or but very slightly so, above the surface of the cœnenchyme. The upper surface of the colony is consequently very uniform, and the boundary between the individuals is not well marked; the polyps are irregularly arranged, but not crowded; each polyp has about fifteen capitular ridges and furrows. The colonies are very low and flat, the margins tending to incrust the objects upon which they grow.

*Colour.*—Sandy.

*Dimensions.*—Average diameter of contracted polyps at surface, 5 mm.; average thickness of colonies, 10 mm.

*Locality.*—Mombassa, East Africa, collected by Dr. J. W. Gregory, of the British Museum. Three colonies incrusting and almost surrounding an irregular base of nullipores.

The specific name has reference to the smooth appearance of a colony when in alcohol.

*Body-wall.*—The ectoderm covering the peripheral surface of the colonies has almost entirely disappeared. The mesogloea uniting all the polyps in the colony is rather thicker than in *P. gregorii*, but isolated cells, cell-islets, and lacunæ, of all sizes, similarly crowd the mesogloea; the islets and lacunæ contain the large yellow nematocysts and zooxanthellæ. The incrustations are of the same nature as those of the former species, principally coarse sand grains, but the distal portion of the polyps do not appear to have so many sponge spicules. The incrustations extend throughout the mesogloea.

The endoderm is very uniform and thin, and crowded with zooxanthellæ. A weak diffuse endodermal muscle can be distinguished.

*Sphincter muscle.*—The single mesogloæal sphincter muscle extends for a considerable distance.

*Disc and Tentacles.*—The ectoderm of the disc is rather thick, crowded with zooxanthellæ and pigment particles, and that of the tentacles is crowded with long narrow nematocysts; the mesogloæa is thin, with incrustations and cell-islets; the endoderm is thin and crowded with zooxanthellæ.

*Œsophagus.*—The ectoderm of the Œsophagus is folded, a well-marked groove occurs; large yellow oval nematocysts and narrow elongated ones are abundant. The mesogloæa is thin, but thickens a little at the Œsophageal groove; it does not follow the foldings of the ectoderm; cell-islets occur in it.

*Mesenteries.*—These show the brachytenemic character well. The reflected ectoderm is well developed; below the Œsophagus the mesenterial filaments or craspeda are large, and, like the ectoderm of the Œsophagus, are crowded with the two kinds of nematocysts. The mesogloæa is very thin, except where it is perforated by the large basal canal; this contains large nematocysts. Smaller canals or sinuses also occur in the mesogloæa. The endoderm has numerous zooxanthellæ, and slight parieto-basilar muscles occur, and a very slight retractor muscle.

*Gonads.*—None present in any of the polyps examined.

It is extremely difficult to define the species of this genus, as we do not yet know what variations may take place in a given species owing to difference of environment.

Turning to the forms from the Indian Ocean, we have *P. tuberculosa* (Esper) *fide* Klunz., 1877; *P. flavo-viridis* and *P. argus*, Ehr., 1834, all from the Red Sea. Klunzinger states the two latter are synonyms of the species which he describes and which he allocates to Esper's *Aleyonium tuberosum*. Esper (*Der Pflanzen-thiere*, III. Aleyonium, p. 68) gave the name of *Aleyonium tuberosum* to a *Palythoa*, from "Trankenbar" (probably Trankuebar, lat. 11° N., on the east coast of India), which he thought was the same as the *A. papillosum* of Pallas, from an unknown locality. His figure (Pl. xxiii., fig. 1) of the upper surface of the colony is not satisfactory, and does not agree with his description of the polyps growing thickly together, forming wart-like elevations of unequal size.

Hertwig investigated a specimen collected by the "Challenger," at Simon's Bay, Cape of Good Hope, and this he identified with Klunzinger's form. We speak with all caution and deference, but we venture for the present to uphold the doubt cast by one of us on this identification (*Trans. R.D.S.*, 1891, p. 631). The very close opposition of the polyps, resulting in the markedly polygonal

outlines of their contours appears to us to be very different from Klunzinger's species, and we therefore would propose the name of *P. capensis* for this form.

We have had considerable difficulty in deciding (1) whether our forms were to be regarded as belonging to one or two species, and (2) having provisionally decided in favour of the latter alternative, whether either was a new species or not. As the polyps are not distinctly polygonal in contour, we do not think either of our forms is *P. capensis*. We have carefully compared our specimens with Klunzinger's description, and find many points of resemblance and a few differences, the most important, perhaps, being that, in the latter, the polyps are less crowded. On the whole, then, we have decided to erect two new species, and so we must leave them till the group can be thoroughly investigated.

A list of the other species of this genus will be found on p. 631 of the "Revision of the British Actinaria, II. The Zoanthea." Dr. G. Müller (1889) described the following species:—*P. tuberculosa*, Klunz. (Red Sea), *P. sp.* (Phoenix Island, Pacific Ocean, about lat. 5 S., long. 175 W.); *P. calcaria*, n. sp. (Fiji "Viti"), *P. sp.* (Samoa), *P. sp.* (Rolas Island, Gulf of Guinea\*), *P. sp.* (Rolas), *P. sp.* (Rolas); unfortunately he does not give any figures.

The available information about this peculiarly difficult genus is at present too slight for us to profitably enter at length into a comparison of the various species. Judging from the figure given in the atlas (pl. xiii., figs. 13, 14), neither of our species is *P. lutea*, Q. and G. (Tongatabu), as in the latter the polyps are more scattered. They also appear to differ from *P. aggregata*, Lesson (Society Archipelago), and *P. cæsia*, Dana (Fiji). Studer (1878, p. 547), without describing or figuring a species he collected at New Ireland, recorded it as *P. tuberculosa*, Esp. s. Klunz. They differ from *P. Kochii*, Hadd. and Shackl. (Torres Straits), by the incrustations being distributed throughout the mesogloea, and not in a layer; the lacunæ and cell-islets are much more numerous; the polyps project less, and there are only 15 capitular ridges instead of 20. In *P. Howesii*, H. and S. (Torres Straits), the polyps project more on one side; their diameter is 7 mm.; the mesogloea of the œsophageal groove is thickened, and the incrustations are calcareous. They differ from *P. cæsia* (?), Dana (Torres Straits), by the smaller diameter (5 mm. instead of 9 mm.) of the polyps, their greater crowding, and, in the latter the endoderm is thrown into ridges. These three species are figured on Pl. LXI., Trans. R.D.S., iv., 1891.

It is improbable that any of the West Indian species occur in the Indian Ocean, and, on other grounds, we may dismiss those forms.

In his recently published paper ("Grundzüge der marinen Tiergeographie" Jena, 1896), Dr. A. E. Ortmann recognises the distinctiveness of the "Indo-pacific

\* We cannot identify this island.

littoral region" from the "East American littoral region" (which includes the West Indies), and also from the "Guinea sub-region" of the "West African littoral region." Dr. Ortmann allocates the littoral fauna of Cape Colony to the "Antarctic littoral region," which, in this case, separates the littoral fauna of East Africa from that of West Africa.

## MACROCNEMINÆ.

## EPIZOANTHUS, Gray, 1867.

*Epizoanthus egeriæ*, n. sp.

(Pl. VII., fig. 5.)

*Form.*—Polyps scattered. The column is short, rising very little in the contracted condition above the cœnosarc, encrusted with foraminifera, which give it a granular appearance. Upper surface of contracted column with from 12 to 18 wedge-shaped radial ridges; mouth aperture open in most.

Cœnosarc thin, incrusting, continuous, of the same nature as the wall of the column.

*Colour.*—The natural colour is removed by alcohol, leaving them a pale grayish buff.

*Dimensions*—Height, 1–2 mm. above the surface of the cœnosarc; average diameter 5 mm.

*Locality.*—Macclesfield Bank, about mid-way between Cochin China and Luzon, in the South China Sea. Depth 45 to 47 fathoms; dredged by H. M. S. "Egeria"; collected by P. W. Bassett-Smith, Surgeon, R.N.

There are two colonies, each incrusting almost the entire surface of two shells of *Murex tenuispina*. The cœnosarc also passes in and incrusts for some distance the mouth of the shells. In the larger specimen the polyps are more crowded on the oral aspect of the shell and along the varices.

Commensal with hermit-crabs.

*Body-wall.*—The ectoderm is continuous, except where interrupted by the incrustations. It is covered by a thin cuticle, upon which diatoms are very abundant. Large dark-brown oval nematocysts are numerous in some parts. Four polyps were sectionised for study, and the extent to which these dark nematocysts occur varies much in the different individuals.

The incrustations are very abundant, and consist largely of foraminifera and other calcareous material. A few siliceous sponge spicules occur. Owing to

the incrustations, the boundary between the ectoderm and mesogloea is very irregular.

The mesogloea below the œsophageal region is not much thicker than the ectoderm, but in that region it thickens considerably. It is irregular in appearance, due to the numerous incrustations. Small cell-islets occur, but not abundantly. The endodermal muscular layer is but feebly developed.

The endoderm is narrow and the cells uniform in height.

*Sphincter muscle* (Pl. VIII., fig. 8).—The sphincter muscle is mesogloéal and single. It is well developed. At its distal and thickest part, the irregular cavities extend almost across the whole diameter of the mesogloea, but lower down the spaces gradually become smaller. The muscle fibres are thin, and the cavities hollow.

*Disc and Tentacles.*—The large dark-coloured nematocysts occur in the ectoderm of the tentacles along with vast quantities of another smaller form. The ectodermal circular muscle is well developed on the plaitings of the mesogloea. The endodermal muscle is only feebly developed. The endoderm is well developed.

*Œsophagus.*—The ectoderm of the œsophagus is almost smooth, not being thrown into well-marked folds. The groove is well developed, and the mesogloea thickened in that region.

*Mesenteries.*—The arrangement of the mesenteries is macroœnemic. Owing to the fact that all the four specimens cut contain well-developed ova, this arrangement is not always easy to discern. Only in one or two instances can any trace of the imperfect mesenteries be seen.

*Gonads*—All the four individuals examined contained only ova.

It is characteristic of certain species of Epizoanthus to be commensal with hermit-crabs, and the carcinæcia which are thus formed may simply incrust the shell of the Gastropod, or they may actually replace it with their own cœnenchyme.

Our species may be readily distinguished from the others which form carcinæcia, as the polyps are numerous on the oral aspect of the Gastropod (*Murex*) shell; in other species of Epizoanthus that aspect is either bare of polyps (*E. incrustatus*, D. & K., *E. cancrisocius*, v. Mart., cf. Studer, &c.), or with one ventral polyp, and the remainder marginal (*E. paguriphilus*, Verr., *E. parasiticus*, Hertw.—probably not of Verrill, &c.).



PROTACTINIÆ (McMurrich, 1891) = PROTANTHEÆ (Carlgren, 1891).

CORALLIMORPHIDÆ (Hert., 1882). CORYNACTIDÆ (Andres, 1883).

CORYNACTIS (Allman, 1846).

*Corynactis Australis*, n. sp.

(Pl. VII., figs. 6–10.)

*Form.*—As is characteristic of other species of this genus, the form is very variable. Usually salver-shaped when fully expanded, the base may extend beyond the disc, or *vice versâ*; when the disc is not fully expanded, the column may be club-shaped or nearly cylindrical. We are unable to determine the arrangement of the tentacles either from the drawings or the specimens themselves. Those of the peripheral row are the longest, and there are three or four distinct rows decreasing in length centripetally. The small radial tentacles do not appear to have any definite arrangement. Mouth on a prominent cone.

*Colour.*—Very variable. Column pink, buff, brown, or orange, or of intermediate tints, sometimes with a greenish tinge. A green ring round the capitulum is often present; the ring may be yellow in colour, or apparently absent. Disc usually of a darker shade than the column, but may be bright green. Mouth generally greyish. Tentacles, stem usually greyish green or dark brown, occasionally translucent white or pink; knobs mostly bright orange, but may be translucent white, pink, or green.

Some of the combinations which may occur are detailed in the following list:—

	<i>Column.</i>	<i>Capitulum.</i>	<i>Disc.</i>	<i>Tentacles stem.</i>	<i>Knob.</i>
A.	Greenish.	Emerald green.	Bright green.	Pale carmine.	Pale carmine.
B.	Pink.	Emerald green.	Pinkish.	Pale green.	Pale carmine.
C.	Pale carmine.	White?	Pink.	Grey.	Orange.
D.	Pale orange buff.		Bright orange buff.	Grey.	Bright orange.
E.	Brown.	Brown.	Dark brown.	Brown.	Orange.
F.	Translucent pink.	Pale green.	Orange buff.	Brown.	Pink.
G.	Pinkish orange.	Lemon yellow.	Orange pink.	Translucent white.	Pink.

*Dimensions.*—Average height of column in living specimens, 8.5 mm.; average diameter of oral disc, 9 mm., according to Prof. Spencer's drawings.

*Locality.*—Port Philip, February 2nd, 1891; January 27th, 28th; February 3rd, 1892.

*Body-wall* (Pl. VIII., fig. 9).—The ectoderm is regular in structure. In some places it is considerably folded, but some of this is probably due to unequal contraction. The contents of the columnar cells do not stain deeply. The small nuclei appear in sections more as a band towards the inner end of the cells. The diffuse ectodermal muscle layer is clearly seen.

The mesoglœa in the upper part is thicker than the ectoderm, but it thins considerably towards the base of the column. In some cases it follows the folding of the ectoderm. It is almost homogeneous in structure, but a few small elongated cells may be observed.

The endoderm is a little thinner than the ectoderm, and is not thrown into ridges between any of the mesenteries. Highly refractive, club-shaped, glandular cells are present. A diffuse muscle is developed; towards the capitular region, it forms the endodermal sphincter muscle.

*Sphincter muscle* (Pl. VIII., fig. 10).—The mesoglœa is thrown into slight folds in the region of the diffuse endodermal sphincter, which, except for the greater development of the muscle fibres, is scarcely distinguishable from the general endodermal muscle of the body-wall.

*Tentacles*.—The ectoderm of the tentacles consists mainly of columnar cells similar to those of the body-wall, but the contents stain more deeply. A few deeply-staining, large, oval nematocysts, with a spiral thread inside, occur. Towards the distal end, long, very narrow, yellowish nematocysts are abundant, and show a spiral thread. The highly refractive glandular cells of the endoderm also occur in the more proximal parts. The ectodermal muscular layer is well developed. The mesoglœa is much folded. The endoderm is about the same thickness as that of the column, and has also numerous glandular cells; a slight endodermal muscle occurs.

*Disc*.—The disc is much like the body-wall in structure; large oval nematocysts occur, and glandular cells are present in both ectoderm and endoderm.

*Œsophagus*.—The ectoderm of the Œsophagus is much folded, and stains more deeply than that of the column; large oval nematocysts are present. The mesoglœa is thin, and follows the folds of the ectoderm. An Œsophageal groove is not distinct.

*Mesenteries*.—The mesenteries consist of numerous pairs without, however, any apparent regular arrangement. Some specimens show only one pair of directives, while another shows two pairs. The arrangement and number of the pairs of perfect and imperfect mesenteries on each side of these is irregular.

The endoderm of the mesenteries is rather thick, and is made up of large columnar cells and numerous glandular cells. The retractor muscle is well developed, and the mesoglœa is thrown into broad folds for its support. The

parieto-basilar muscles are well shown. Large oval nematocysts are abundant in some of the mesenterial filaments, but do not stain.

The mesogloea varies considerably in thickness; towards the body-wall it is quite thick (Pl. VIII., fig. 9), but afterwards thins suddenly, becoming quite linear in section.

The irregularity in the arrangement of the mesenteries will be apparent when the enumerations of the following three specimens are compared together:—

(a). D. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.

(b). D. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27.

(c). D. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, D. 11, 12, 13, 14, 15, 16, 17, 18.

The first is a young specimen in which the mesenteries are uniformly long and short. In the first two there is only one pair of directive mesenteries; whereas, in the last there are two pairs: in all cases the short mesenteries are indicated by *italic figures*.

*Gonads*.—Female gonads were present in only one specimen.

No detailed anatomical account of any member of this genus has as yet been published, but one of us has made sections of the type species *C. viridis*, Allm., and of *C. hoplites*, Hadd. and Shackl.

The new species differs from *C. viridis* in possessing a thick mesogloea in the body-wall, and in the very thick proximal portion of the mesogloea of the mesenteries. The upper portion of the sphincter of *C. viridis*\* (Pl. VIII., fig. 11) projects inwards with thin simple mesogloéal plaitings; in other words, the lower part of the sphincter is feeble and diffuse, while the upper part is a simple circumscribed endodermal sphincter muscle.

In *C. hoplites* the sphincter is much more deeply folded than in our species, but the retractor muscle of the mesenteries is feebler.

#### Family, ALICIIDÆ.

Hexactiniæ with a large, flat, contractile base. Tentacles simple, cylindrical, and entacmæous. Column with simple or complex hollow processes or vesicles over the greater part of its surface, arranged mostly in vertical rows. No cinclides.

\* Since the above has gone to press, we find that Herr Casimir R. Kwietniewski has published a paper entitled "Revision der Actinien, welche von Herrn Prof. Studer auf der Reise der Korvette Gazelle um die Erde gesammelt wurden," *Jenaische Zeitschr.* xxx., p. 583. He figures the sphincter of *Corynactis carnosa* Studer (Monats. K. Akad. Wiss. Berlin, 1878, p. 542), and it will be seen that it differs from that of our species, but very closely resembles that of *C. viridis*. This appears to us to be sufficient evidence to regard our species as distinct from Prof. Studer's.

Sphincter muscle endodermal and diffuse, variable in amount of development. Perfect mesenteries few or numerous. No acontia.

We have quoted the definition of the family as drawn up by one of us;\* it includes the genera *Alicia*, *Cystiactis*, *Thaumactis*, and probably *Bunodeopsis*.

We think that the present state of our knowledge warrants the following arrangement:—

ALICIDÆ, Duerden, 1895.

**Alicia**, Johnson 1861.

- A. mirabilis*, Johnson, 1861, Madeira.
- A. Costæ* (Panc.), 1868, Mediterranean.
- A. grandis* (Verr.), 1869, Panama.
- A. pretiosa* (Dana), 1846, Fiji.
- A. rhadina*, Hadd. & Shackl., 1893, Torres Straits.

**Cystiactis**, Milne-Edwards, 1857.

- C. Eydouxi*, M. Edw., 1857, Chili.
- C. Gaudichaudi*, M. Edw., 1857, Rio Janeiro.
- C. Reynaudi*, M. Edw., 1857, Cape of Good Hope.
- C. tuberculosa* (Quoy & Gaim.), 1833, Bass Straits.
- C. Eugenia*, Duch. & Mich., 1866, West Indies.

**Thaumactis**, Fowler, 1889.

- T. medusoides*, Fowl., 1889, Papeete.

**Bunodeopsis**, Andres, 1880.

- B. strumosa*, Andr., 1880, Bay of Naples.

**ALICIA.**

The genus *Alicia* has been re-defined as follows in the paper just referred to:—

“Tissues very delicate. Tentacles elongated, more or less retractile. Column with the distal vesicles pedunculated and much divided, the proximal vesicles simpler and more or less sessile. Sphincter muscle feebly developed. Mesenteries not very numerous; two pairs of directive mesenteries.”

**CYSTIACTIS.**

Column covered with simple vesicles. Tentacles of variable length in one, two, or three cycles. Numerous perfect mesenteries. Sphincter muscle moderately well developed.

\* J. E. Duerden, “On the Genus *Alicia* (Cladaetis), with an Anatomical Description of *A. costæ*, Panc., Ann. Mag. Nat. Hist. (6), xv. 1895, p. 213.

The genus *Cystiactis* was thus defined by its author, Milne Edwards:—"Body entirely covered with subtentaculiform tubercles, or presenting an appearance of large, very prominent vesicles." He erected the genus to include three species of Actiniaria, preserved in the Paris Museum of Natural History. These species were:—

1. *Cystiactis Eydouxi*.—Tentacles thick-set, moderately numerous, longitudinally striated by contraction; the external smaller than the internal. Body covered with large vesicles of very unequal size, very crowded and irregularly arranged. Of a uniform brown colour in alcohol. Coasts of Chili (Eydoux).

2. *Cystiactis Gaudichaudi*.—Tentacles longer and more slender than in *C. eydouxi*; vesicular tubercles of the body smaller, sub-serial, and often presenting at the summit a kind of rosette formed by blackish spots [the last character rather suggests that this species will ultimately be transferred to the genus *Alicia*]. Blackish in alcohol. Rio Janeiro (Gaudichaud).

3. *Cystiactis Reynaudi*.—Tentacles shorter than in *C. Eydouxi* and *C. Gaudichaudi*. Tubercles in the form of crowded vesicles, sub-serial, and of a medium size. Clear brown colour in alcohol. Cape of Good Hope (Reynaud).

This genus was adopted by Duchassaing and Michelotti, who described a new species, *C. Eugenia*. Mem. R. Accad. Sci. Torino, xxiii., 1866, p. 129, pl. vi., fig. 1. This has a cylindrical column, with club-shaped vesicular tubercles. Tentacles few (about 20), sub-equal, cylindrical, pointed, long, delicate, translucent. Peristome prominent. Of small size, and swimming freely or adherent to floating objects.

In his Monograph, Andres (p. 228) admits only the last as belonging unquestionably to this genus, and places the species described by Milne-Edwards amongst his "*Bunodide dubie*" (p. 236), as they are insufficiently characterised and figures are wanting. He adds:—"The form of the column reminds one of *Bunodeopsis*."

Milne-Edwards places *Cystiactis* amongst his "*Actiniæ verruqueuses*," and Andres puts them in the sub-family, Bunodidæ. When we investigated *Cystiactis tuberculosa* (Q. & G.), we found that it would have to be removed from that group; and since then one of us has examined an allied form *Alicia Coste* (Panc), and the new family Aliciide was proposed to include these two genera.

Judging from the figure (Atlas, pl. iii., fig. 19) it is possible that *A. monilifera* Dana (U. S. Expl. Exp.) may belong to this genus.

Our definition of the genus is based upon an examination of *C. tuberculosa*, and may have to be emended when the type species is rediscovered and properly described.

***Cystiactis tuberculosa* (Quoy & Gaim.)**

(Pl. VII., fig. 11.)

- Actinia tuberculosa* (*A. tuberculeuse*), QUOY & GAIMARD, "Zool. Voy. de l'Astrolabe" (Dumont d'Urville), 1833, IV., p. 159, pl. xi., figs. 3-6.
- " " BLAINVILLE, 1834, "Man. d'Act.," p. 319.
- Cereus? tuberculosus*, . . . MILNE-EDWARDS, "Hist. nat. des Coral.," 1857, I., p. 268.
- (gen. nov.?) *tuberculosa*, . . . ANDRES, 1884, "Die Actinien," p. 231.
- Cystiactis tuberculosa*, . . . DUERDEN, 1895, Ann. Mag. Nat. Hist. (6), XV., p. 213.

*Form.*—A large thin-walled Actinian, when fully expanded nearly as broad as high. Column crowded with large, delicate, oval vesicles, the cavities of which communicate with the cœlenteron. Tentacles numerous, of moderate length, in three or four rows. Oral disc apparently of not much greater diameter than the column. Mouth large, circular. Pedal disc of greater diameter than the column, somewhat inflated. The figure is reconstructed from several slight sketches made by Prof. Spencer.

*Colour.*—Upper part of pedal disc dark-grey, with light lines for the mesenteries. The pedal disc itself is of a deep chrome-yellow or orange, becoming paler or yellowish-green towards the centre, the mesenteries showing as bluish-grey lines. Vesicles either deep chrome-yellow with bluish vertical stripes, or bluish-grey with light stripes. Tentacles yellow, orange, or bluish, usually yellowish at base, then often brownish, with a yellow tip; the chrome-yellow of the tentacles has not such a red tinge as that of the vesicles; space between tentacles grey. Oral disc yellowish, passing into orange (or even dark grey) round mouth. Inside of mouth grey.

*Dimensions.*—About 6 inches (150 mm.) in height, 5 inches (125 mm.) in width, largest tentacle 1 inch (25 mm.) in length. Vesicles may be fully 1 inch (25 mm.) long, and  $\frac{1}{2}$  inch (13 mm.) wide.

*Locality.*—Coogie, New South Wales.

As our description of this species is drawn up from the sketches and coloured details sent to us by Prof. Baldwin Spencer, and from spirit specimens, we think it advisable to reprint Quoy and Gaimard's original description, which supplements our own:—

"*Actinie tuberculeuse*, *Actinia tuberculosa*, nob.—*Actinia*, turriculata, molle, subrubra, tuberculis ovalibus, striatis, ordinatis, ornata; tentaculis brevibus, subluteis; ore rubenti.

“ This species is remarkable for its straight sides, resembling a tower, although it is very soft; by the number of smooth, oval tubercles which cover it in vertical rows, which are sometimes very regular. These excrescences, which almost touch one another, vary in colour; they are reddish-brown, or golden, or of a dull crimson, or brownish, but always longitudinally marked with two or three bands of a deeper colour. But what only varies rarely is that there are six vertical rows of tubercles of a pretty bluish-grey, lined with brown. The disc, of a delicate yellow, bears three rows of short tentacles, and tinted with the same colour. The margin of the mouth is orange.

“ This Actinian is a wanderer, or adheres only very slightly to the ground, for each tide throws up millions on the shore. Those we found at King George’s Port (Port du Roi-Georges) were only about two inches in diameter; but further away, at Western, in Bass’ Straits, individuals had the size of two fists.”

*Body-wall.*—The ectoderm (which has almost entirely disappeared in the specimens) is of medium thickness, and covered with a delicate cuticle, in which is imbedded foreign colourless particles.

The mesogloea presents a granular appearance, due to the number of very small cells. Its inner border is much plaited for the endodermal muscle.

The endoderm is thick and crowded with dark granules; the dark granules which occur so numerously in the endoderm are probably the remains of Zooxanthellæ. The muscle layer is well developed and slightly dendritic in section; it is especially well marked around the apertures communicating with the vesicles. The latter have the same structure as the body-wall. The mesogloea is very thin.

*Sphincter muscle* (Pl. ix., fig. 1).—The sphincter muscle is elongated and diffuse, and extends vertically from the outermost tentacle to the uppermost vesicles. The muscle fibres are rather weak, and are disposed on mesogloéal folds, which are sometimes complex.

*Tentacles* (Pl. ix., fig. 2).—Ectoderm thick. The muscle is very strongly developed, and has become mesogloéal in position. The mesogloea is thick. The endoderm is thick and crowded with granules. The endodermal muscle is distinct.

*Disc.*—No ectoderm is preserved. The mesogloea is of medium thickness, and much plaited for the support of the endodermal muscle. Endoderm thick and crowded with granules.

*Œsophagus.*—With twenty or more folds on each side. The ectodermal folds are supported by mesogloéal extensions. Ectoderm, with elongated mesogloea, thin. Endoderm as in disc.

*Mesenteries* (Pl. ix., fig. 3).—Very numerous. They appear to be arranged in the ordinary Hexactinian manner, and to consist of 5 cycles (6 + 6 + 12 + 24 + 48). No directive mesenteries were observed.

Endoderm regular; well developed parieto-basilar muscles on each side. On the side opposite to the retractor muscle is a special outgrowth of mesogloea ("pennon") for the basal muscle of that side. Retractor muscles well developed on numerous deep plaitings of the mesogloea; those are often slightly complex. Mesogloea fairly thick in muscular region.

Mesenterial filaments well developed, with abundant narrow nematocysts. The mesenteries quite fill up the coelenteron in the contracted spirit specimens.

*Gonads.*—Testes occurred in all three specimens.

### THAUMACTIS.

Aliciidæ with irregularly scattered, complex vesicles, which when fully developed are prolonged into an elongated tubular process. Tentacles marginal; about twenty in number. Ectodermal muscle fibres in capitulum and œsophagus. Feeble, diffuse, endodermal sphincter. Two cycles of perfect mesenteries. No œsophageal groove.

We have drawn up the foregoing diagnosis, from the description by Dr. G. H. Fowler, of *Thaumactis medusoides*,\* gen. sp. n. The specimens at Dr. Fowler's disposal were very young, and strongly retracted forms. These circumstances, combined with the delicacy of the tissues and the flattening of the body, somewhat misled that investigator. Thus he has mistaken the vesiculated column for an "oral surface" bearing irregularly scattered "pseudo-tentacles." His "invaginated oral surface" is the capitulum. The mesenteries are apparently arranged on the Hexactinian plan, the irregularity noted by Dr. Fowler being probably due to immaturity. His largest specimen had paired mesenteries in three cycles; but those of the third cycle were imperfect in the sulculo-lateral exocœl. In one specimen there was only one pair of directive mesenteries, and in another none were present. We do not regard the ectodermal muscle of the capitulum and œsophagus as being of sufficient importance to warrant the creation of a new family for its occurrence; and the presence of a general ectodermal muscle enters into the diagnosis of the tribe as given by Carlgren.

From the foregoing description, it is evident that there is no need to place this form in a new tribe (Thaumactiniæ). Dr. Carlgren suggests that it might be placed as the representative of a new family (Thaumactinidæ) among his Prot-anthææ.

We have retained Dr. Fowler's genus on account of the formation of the vesicles and the ectodermal muscle. It is certainly a member of the family Aliciidæ.

\* "Two New Types of Actiniaria," Quart. Journ. Micr. Sci., xxix., 1889, p. 143.



## BUNODEOPSIS.

Until the sole representative of the genus *Bunodeopsis*, *B. strumosa*, has been anatomically investigated, we cannot be quite sure what it is. At all events it is probably very closely allied to the genus *Cystiactis*; and we may certainly adopt the opinion of Dr. Andres that it is quite distinct from *Alicia* (*Ctadactis*) *costæ*. We therefore provisionally retain it among the Aliciidae.

## HEXACTINIÆ.

ANTHEADÆ (Hertwig, 1882).

**ACTINIOIDES**, Hadd. and Shackl., 1893.

Antheadæ with more or less prominent suckers on upper portion of column; capitular margin with conical acrorhagi. Diffuse or feebly circumscribed endodermal sphincter muscle.

We have added the character of the sphincter muscle to the original definition of this genus,\* and have taken from it the statement that the acrorhagi "are provided with a well developed battery of nematocysts," as, though this is characteristic of the type species, *A. Dixoniana*, we do not find this detail sufficiently marked in our new species to warrant its being retained as a generic character.

**Actinioides Spenceri**, n. sp.

(Pl. VII., fig. 12.)

*Form.*—Column rather short and cylindrical with eighteen vertical rows of sucker-like verrucæ, of which the distal are the largest, and they gradually diminish inferiorly; capitulum with eighteen acrorhagi; tentacles short, blunt, in two cycles of eighteen in each cycle, the inner cycle being about one-half of the diameter of the disc in length, and about half as long again as the outer row. Oral disc of not much greater diameter than the column. Basal disc of not greater diameter than column.

*Colour.*—Column dull reddish-orange; the capitulum dark purplish-brown, which colour extends slightly down the lines of the verrucæ and shades off into the orange of the rest of the column; verrucæ white with a dark central spot; large inner tentacles orange with brown transverse bands (on their oral aspect);

\* Proc. Roy. Dub. Soc., VIII. (N.S.), 1893, p. 126.

outer row dark brown; disc blotched with brown; margin of mouth light-yellow; œsophagus pinkish.

*Dimensions.*—According to the coloured drawing sent to us by Professor Spencer, the diameter of the column would be about 35 mm., and its height about 25 mm.

*Locality.*—Port Philip.

The single specimen we received was in a contracted condition.

*Body-wall* (Pl. ix., figs. 4, 5).—Thin; ectoderm broader than mesogloea, regular, with numerous small nuclei; no cuticle present; weak muscle. Mesogloea thin, with small cells. Endoderm thinner than the mesogloea, regular, crowded with dark granules; muscle weak.

*Aerorhagi* (Pl. ix., fig. 4.).—Ectoderm much as in body-wall, with numerous nematocysts; mesogloea thinner than in body-wall. The aerorhagi are circumscribed externally by a distinct sphincter which projects into the cavity of the stem, and which is provided with simple mesogloéal plaitings, mainly on the inferior aspect of the projection.

*Sphincter muscle.*—The small, diffuse, endodermal muscle is situated near the base of the aerorhagi on their oral aspect; the plaitings of the mesogloea are mostly simple, though a few are very slightly complex.

*Tentacles.*—Ectoderm very thick, crowded with extremely small colourless curved nematocysts; muscle well developed on plaitings of the mesogloea. Mesogloea thin. Endoderm thick, and crowded with dark granules.

*Mesenteries* (Pl. ix., fig. 5).—Twelve pairs of perfect mesenteries, of which two pairs are directives. In the lower part of the column twelve pairs of small imperfect mesenteries alternate with these. The perfect mesenteries bear the gonads, which in this specimen were ova. The parieto-basilar muscles are well developed on simple plaitings of the mesogloea; on the side opposite to the retractor muscle is a thin pennon. The retractor muscle is strongly developed, and appears as an elongated half-oval in section; the numerous long mesogloéal plaitings are simple and slightly branched. The mesogloea is moderately thin. The mesenterial filaments are crowded with small thin nematocysts.

This species, while presenting an external similarity to *A. Dixoniana*, can be readily distinguished from that species both externally and anatomically; for example, the character of the sphincter is different in the two species, and the older species lacks the aerorhagial sphincter, while it possesses a distinct battery of nematocysts on those processes.

## SAGARTIDÆ.

This family is still in need of a thorough revision, as only a few of its members have been thoroughly examined. The best work in this family has been done by Dr. Carlgren,\* who recognises three sub-families (Sagartinae, Metridinae, and Phellinae). We admit that the accounts of the following three species is very inadequate; but our material was very limited, and most of the members of this group are so very contractile that it is, as a rule, extremely difficult to study preserved examples.

We recognise that our three forms belong to two genera, the first, *S. Carlgreni*, evidently belongs to the Sagartinae and probably to the genus *Sagartia*. The two other species, *M. Australiae* and *M. similis*, are closely allied to one another; they may belong to the Metridinae or to a new sub-family, and we think they should be placed in a new genus.

**SAGARTIA** (Gosse, 1855).***Sagartia Carlgreni***, n. sp.

(Pl. VII., fig. 13.)

*Form.*—Column, elongated and cylindrical, smooth; pedal disc large, flat, sinuous margin; oral disc of not much greater diameter than the column. Tentacles, numerous, long, thin, subulate, apparently in three cycles. Mouth large.

*Colour.*—Column, pedal and oral disc bright deep-orange; tentacles, opaque white for their proximal third, greenish-grey for their distal two-thirds.

*Dimensions.*—Judging from the coloured drawing, the height is about 20 mm., with an average diameter of about 10 mm. Tentacles about 10 mm. long. This specimen is probably not full-grown.

*Locality.*—Port Philip (January, 1892).

Two specimens were received. We give ourselves the pleasure of associating with this species the name of our distinguished Scandinavian colleague.

*Body-wall.*—The ectoderm is regular in structure, with a definite cuticle. Small oval nematocysts are very abundant in the upper part of the column. The basal muscle threads are clearly seen. The ectoderm is much folded in the contracted specimen. The mesogloea in the latter is quite thick, and presents a granular appearance owing to the abundance of uniformly small granular cells. The endoderm is regular and pretty thick, and its muscle is fairly well developed.

\* O. Carlgren, "Studien über Nordische Actinien," I. Kongl. Svenska Vet.-Akad. Hand. xxv., 1893.

*Sphincter muscle* (Pl. x., fig. 1).—The character of the mesogloæal muscle is best understood from the figure. The narrow elongated muscle-cavities are very characteristic, and give a striped appearance to the sphincter, which is more apparent in its lower half. It must be borne in mind that, at present, we are unable to say what variation in the appearance of sections of sphincter muscles may be attributed to different stages of contraction.

*Mesenteries*.—There are twelve pairs of perfect mesenteries, of which one pair are directives. The mesenterial formula is  $6 + 6 + 12 + 24$ , the fourth cycle being rudimentary. The first, second, and third cycles are fertile (ova in this case). The character of the simple retractor muscles is shown in the figure (P. x., fig. 2).

#### MITACTIS, n. g.

Sagartians with a strong mesogloæal sphincter. A variable number, probably always more than six, of perfect mesenteries. One or two pairs of directive mesenteries. Body-wall without a membranous covering. Disc of not much greater diameter than the column. Tentacles short, conical in three or four cycles.

Future investigations will show whether we are justified in erecting this new genus; at present we think it desirable to separate these forms from other Sagartians. We have named the genus from *μίτος*, a thread, in reference to the acontia.

#### Mitactis Australiæ, n. sp.

(Pl. VII., fig. 14.)

*Form*.—Short, thick column, the height of which is about equal to the diameter of the oral and pedal discs, but it is somewhat narrower than them, evidently smooth and soft, and variable in shape. Tentacles sub-equal, short, thick, pointed, apparently tri-cyclic. Mouth small, rounded.

*Colour*.—Uniform translucent buff; tentacles more of an orange colour; insertions of mesenteries show as light lines; ovaries shine through the body-wall as orange-coloured masses.

*Dimensions*.—Height of column, 10 mm.; diameter of oral disc, 12 mm.; of column, 8 mm.; length of tentacles, 2 mm. These figures are reckoned from the coloured drawing, and we cannot guarantee their absolute accuracy.

*Locality*.—Port Philip.

*Body-wall*.—Ectoderm regular, with a well-defined cuticle, a nucleated basal layer, and a fine ectodermal basal muscle. Nematocysts are very numerous, some being elongated and darkly granular. Mesogloæa variable in thickness, owing to

various degrees of contraction, thicker in upper part of column in the region of the sphincter muscle, containing minute branched cells. Endoderm generally half the thickness of the ectoderm. The basal muscle is well developed.

*Sphincter muscle* (Pl. x., fig. 3).—The sphincter muscle is well developed, and extends for a considerable distance. The cavities are not filled with muscle cells. Their character is seen in the figure.

*Tentacles*.—The ectoderm of the tentacles is crowded with small oval nematocysts, which, in some places, perhaps owing to the folding of the ectoderm, appear as if arranged in a pinnate manner. The nervous layer of the ectoderm is well marked, and the muscle is strongly developed. The endodermal muscle is extremely feebly developed.

*Disc*.—The histology of the disc resembles that of the tentacles, but the ectoderm is thinner, and the endodermal muscle is well developed.

*Œsophagus*.—Large and much folded, with appressed walls in section; ectoderm regular, not folded, with glandular cells, and long dark granular nematocysts.

*Mesenteries*.—We have found it impossible to accurately determine the arrangement of the mesenteries; but we think that the mesenteries are not in multiples of six, and that certain of the mesenteries which would correspond with the second cycle of a hexamerous form are perfect. The single pair of directives, so far as we can make out, are sterile, and the other primary mesenteries are also probably so; the second cycle appear to be fertile; the third cycle of mesenteries are imperfect and fertile; the fourth cycle are short and sterile.

The mesogloea is thin; the character of the retractor muscles will be seen on reference to Pl. x., fig. 4.

Acontia are abundant and crowded with very long nematocysts.

*Gonads*.—The specimen examined was a female.

### **Mitactis similis, n. sp.**

(Pl. vii., fig. 15.)

*Form*.—Short, thick column; oral and pedal discs somewhat wider than column; tentacles sub-equal, short, thick, blunt, in three or four cycles.

*Colour*.—Uniform deep orange, almost a terra-cotta tint; tentacles paler, a sort of flesh-colour.

*Dimensions*.—Height of column, about 16 mm.; diameter of oral disc, about 16 mm.; length of tentacles, 2 mm. These figures are only very approximate.

*Locality*.—Port Philip.

We have given this species its name from the fact that it appears to closely resemble the preceding species in its external characters.

*Body-wall.*—Ectoderm fairly thick, with a distinct cuticle; dark-coloured, granular nematocysts in upper part of the column; basal muscle weak. Mesogloea thick, with numerous, very small branched cells, which give it a rather granular appearance. Endodermal muscle rather thick, and rising into a small ridge between the bases of the mesenteries.

*Sphincter muscle* (Pl. x., fig. 5).—The single elongated mesogloéal sphincter muscle lies towards the centripetal or endodermal aspect of the mesogloea; the cavities are numerous and irregular, and their muscular lining is very thin. The muscles terminate inferiorly in very narrow, elongated spaces, which eventually merge into the muscular layer of the endoderm.

*Tentacles.*—The histology of the tentacles closely resembles that of the body-wall, but the mesogloea is not so thick. The dark-coloured nematocysts are more numerous, and the ectoderm is also crowded with small colourless ones. The ectodermal and endodermal muscles are well developed.

*Œsophagus.*—The ectoderm of the Œsophagus is thrown into deep folds, in which the mesogloea is implicated. There is no Œsophageal groove.

*Mesenteries.*—There are thirteen pairs of perfect mesenteries, two of which are directives; but these are irregularly disposed, as in the following formula:— $13 (D. 7. D. 4.) + 13 + 26 = 52$ . The mesogloea is very thick, and the plaitings of the retractor muscles are moderately complex. (Pl. x., fig. 6).

Externally this species is very like the last, at least judging from the sketches made by Professor Spencer. We think, however, that some of the anatomical details mentioned by us are sufficiently different to warrant us in regarding them as distinct species. We might recall the differences in the sphincter muscle, the more complex character of the retractor muscles of the mesenteries, and the thicker mesogloea in *M. similis* as compared with *M. Australice*.

EXPLANATION OF PLATE VII.

## PLATE VII.

### Figure

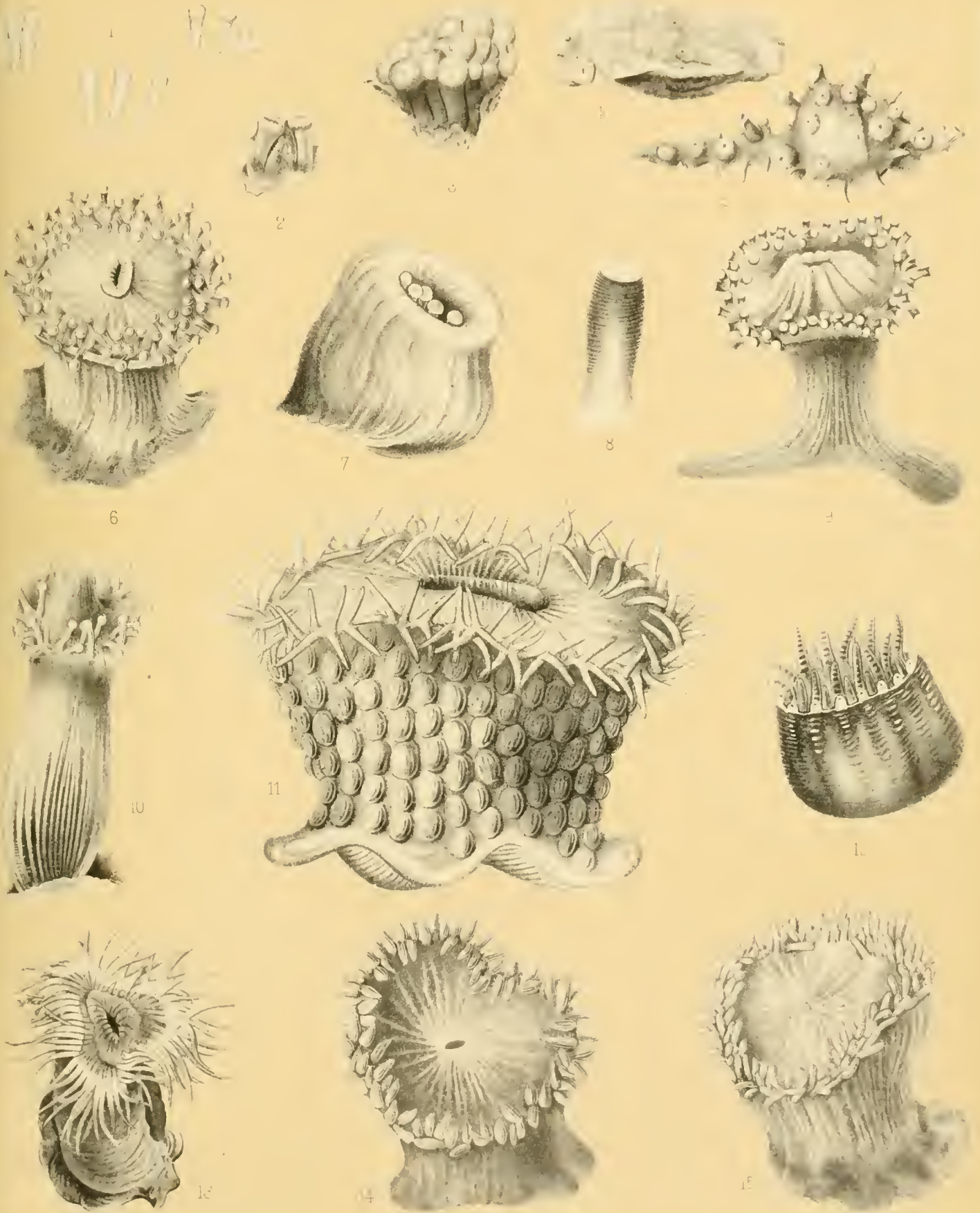
1. *Zoanthus Shackletoni*, n. sp., nat. size.
2. *Gemmaria Canariensis*, n. sp., nat. size.
3. *Palythoa Gregorii*, n. sp., nat. size.
4. *Palythoa liscia*, n. sp., nat. size.
5. *Epizoanthus egeriæ*, n. sp., nat. size.
6. *Corynactis Australis*, n. sp., × 4, specimen A.
7. „ „ „ × 4, specimen D.
8. „ „ „ fully expanded tentacle of fig. 9, greatly enlarged.
9. „ „ „ × 4, specimen F.
10. „ „ „ × 4, specimen C, fully extended.
11. *Cystiactis tuberculosa*, Q. et G.
12. *Actinioides Spenceri*, n. sp.
13. *Sagartia Carlgreni*, n. sp.
14. *Mitactis Australie*, n. sp., × 3½.
15. *Mitactis similis*, n. sp., × 2½.

Figs. 1-5 were drawn by Mr. Wilson from spirit specimens.

Figs. 6-15 are copies of coloured drawings and sketches made from the living polyps by Professor W. Baldwin Spencer.

Fig. 11 is a composite drawing made from several very rough outlines by Professor Spencer, and from some spirit specimens.







EXPLANATION OF PLATE VIII.

## PLATE VIII.

### LETTERING ON THE FIGURES.

<p><i>b. c.</i> . . . basal canal.          . . . . . canals.  <i>i.</i> . . . . . cell-islets.  <i>cæl. can.</i> . . . cœlenteric canals.  <i>cu</i> . . . . . cuticle.          . . . . . ectoderm.  <i>ect. m.</i> . . . ectodermal muscle.  <i>end.</i> . . . . . endoderm.  <i>end. m.</i> . . . endodermal muscle.</p>		<p><i>end. sph.</i> . . . endodermal sphincter muscle.  <i>gl.</i> . . . . . unicellular glands.  <i>imp. mes.</i> . . . imperfect mesentery.  <i>incr.</i> . . . . . incrustations.  <i>m.</i> . . . . . mesogloea.  <i>p. b. m.</i> . . . parieto-basilar muscle.  <i>sph.</i> . . . . . sphincter muscle.  <i>s. cu.</i> . . . . . sub-cuticula.  <i>t.</i> . . . . . tentacle.</p>
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#### *Zoanthus Shackletoni*, n. sp.

Figure

1. Longitudinal section through the body-wall, showing the contorted subcuticula, × 70.
2. Vertical section through the sphincter muscle, showing the large proximal or lower sphincter, and the small distal or upper sphincter, × 35.
3. Transverse section through the proximal portion of a perfect mesentery to show the large basal canal, × 75.

#### *Gemmaria Canariensis*, n. sp.

4. Transverse section through a portion of the body-wall just below the level of the œsophagus, × 35.
5. Vertical section through the sphincter muscle, × 24.
6. Vertical section through the cœnosarc, × 24.

#### *Palythoa Gregorii*, n. sp.

7. Semi-diagrammatic vertical section through the sphincter muscle. Only the mesogloea is represented in the figure, × 75.

#### *Epizoanthus egeriæ*, n. sp.

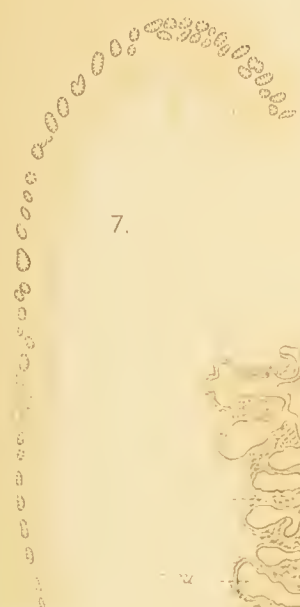
8. Vertical section through the sphincter muscle, × 24.

#### *Corynactis Australis*, n. sp.

9. Transverse section through the body-wall and the bases of two mesenteries, × 75.
10. Vertical section through the sphincter muscle, × 75.

[ *Corynactis viridis*, Allman, West of Ireland.

11. Vertical section through the sphincter muscle of an expanded polyp.]





EXPLANATION OF PLATE IX.

## PLATE IX.

### LETTERING ON THE FIGURES.

<i>acr.</i> . . .	acrorrhagia.	<i>p. m.</i> . . .	pennon muscle.
<i>ect.</i> . . .	ectoderm.	<i>sph.</i> . . .	sphincter muscle.
<i>end.</i> . . .	endoderm.	<i>t.</i> . . .	tentacle.
<i>m.</i> . . .	mesogloea.	<i>t.</i> . . .	testis in figure 3.
<i>ov.</i> . . .	ovum.	<i>v.</i> . . .	vesicle.
<i>p. b. m.</i> . . .	parieto-basilar muscle.		

### *Cystiactis tuberculosa* (Quoy et Gaim.).

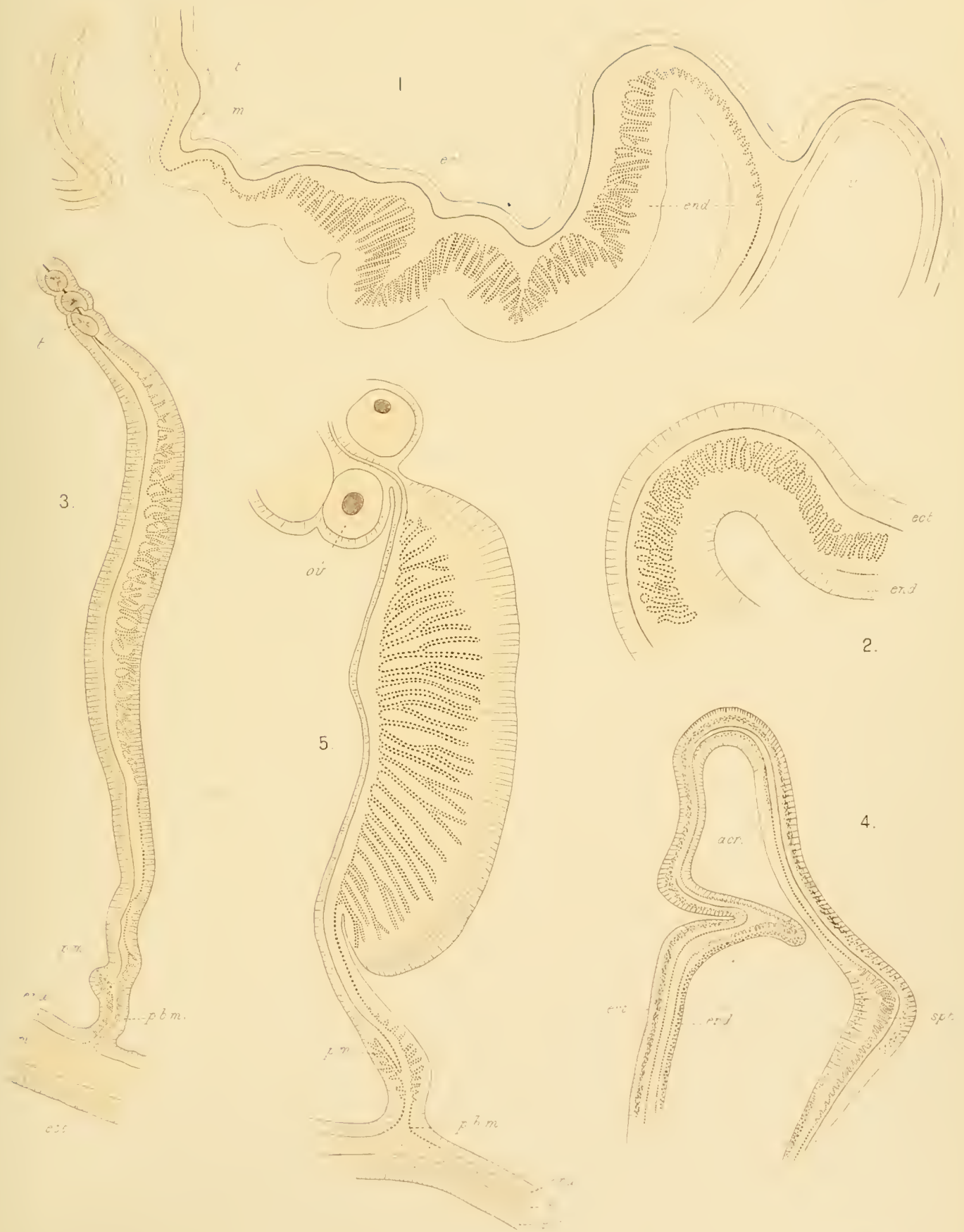
#### Figure

1. Vertical section through sphincter muscle, × 75.
2. Transverse section through part of a tentacle, showing the ordinarily ectodermal muscle become mesogloal in this species, × 75.
3. Transverse section of the proximal portion of a mesentery. Three mother cells of spermatozoa are seen, × 75.

### *Actinoides Spenceri*, n. sp.

4. Vertical section through the acrorrhagia of a contracted specimen, × 75.
5. Transverse section through the body-wall and proximal portion of a mesentery, × 75.







EXPLANATION OF PLATE X.

## PLATE X.

### LETTERING ON THE FIGURES.

*ect.* . . . ectoderm.  
*end.* . . . endoderm.

*m.* . . . mesoglœa.  
*œs.* . . . œsophagus.

#### *Sagartia Carlgreni*, n. sp.

Figure

1. Vertical section through sphincter muscle of a considerably retracted specimen, × 75.
2. Transverse section through the body-wall and a mesentery in the œsophageal region, × 75.

#### *Mitactis Australiæ*, n. sp.

3. Vertical section through sphincter muscle, × 75.
4. Transverse section through the body-wall and a mesentery in the œsophageal region, × 75.

#### *Mitactis similis*, n. sp.

5. Vertical section through sphincter muscle, × 75.
6. Transverse section through the body-wall and a mesentery in the œsophageal region, × 75.

