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A REVISION OF THE BRITISH ACTINIÆ. PART I. BY ALFRED C. HADDON, M.A. (Cantab.), M.R.I.A., Professor of Zoology, Royal College of Science, Dublin.

(PLATES XXXI. TO XXXVII.)

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[Read JUNE 13, 1888.]

THIS is the first of what I hope will be a series of communications to the Royal Dublin Society on the Sea Anemones of the British seas. Thanks to the labours of such naturalists as Mr. George Johnston, Professor Edward Forbes, Sir John Dalyell, Mr. R. Q. Couch, and many others, but most especially to those of Mr. P. H. Gosse, we have a very complete knowledge of the appearance and habits of the Actiniæ found round our shores. In scarcely any country is the Actinian fauna so well described and figured as that in our own.

In classifying the Actiniæ external characters were alone formerly considered; but of recent years attention has been drawn to internal structure as a basis for classification. It is to the brothers Hertwig that the credit of the new departure is mainly due, and more particularly to Dr. Richard Hertwig, who, in his masterly "Report on the Actiniaria" dredged by H. M. S. "Challenger," has laid down broad lines of Actinian taxonomy, which, being based on morphology, are more strictly scientific than the systems of Prof. H. Milne Edwards, Mr. Gosse, Prof. Verrill, or Dr. Andres.

The time has now arrived when it is advisable and possible to revise the British Actiniæ. Not a few of the genera and species found around the coasts of Europe have been described from British specimens; but, apart from external characters, we are unable to assign to most of them a position in the groups proposed by Prof. R. Hertwig, on account of the absence of any knowledge of their anatomy. It is to take away this reproach that I have attempted a revision of the British Actiniæ, of which the present is a first contribution.

Considerable confusion has unnecessarily been made in the synonymy of the Actiniæ, owing to the generally recognised rules of zoological nomenclature being too often ignored. In the course of this revision I have found it necessary to

adopt several generic and specific names, which have been rarely used by zoologists, in the place of very well-known names—for example, *Tealia crassicornis* (O. F. Müll.) becomes *Urticina felina* (Linn.), and *Sagartia* (*Heliactis*) *bellis* (Ellis and Sol.) must be known as *Cereus pedunculatus* (Penn). I have done this with great reluctance, as it is not easy to remember the scientific names of animals when they are being continually changed; and, further, superfluous change in nomenclature is very objectionable from a faunistic and museum point of view; the latter, however, need hardly be considered in the present instance, as few museums possess any Actiniæ at all.

Not only has simple priority been ignored, but new names have sometimes been given, even when the introducer of the new name was aware of the pre-existing names.

In a few instances an old name has been misapplied to a species when the recorder had no knowledge that it was the same species. This error has occasionally been fallen into because the published description of the older naturalists were usually somewhat vague, so that the description might very well apply to more than one species. It is only by the recovery of the lost type and its re-description that such unavoidable errors can be rectified. But again, confusion is made when a zoologist assumes, without sufficient proof, that his specimen, possibly only known in the preserved state, is the same species as that previously described from living forms, captured, perhaps, thousands of miles distant. This action, instead of having the desired effect of simplifying classification, adds to its confusion, as it is always much easier to unite species together than to split up a species. If any doubt exists it is far better to describe the species as new, and to leave its amalgamation with previously described species to one who has a personal knowledge of that species, than to beg the question, and, by assuming an identity, to run the risk of giving false anatomical characters to an old species.

When an author has diagnosed a new genus, and named a species as its type, these names should thenceforth be inseparably connected, unless priority has been infringed. It is the ignoring of this recognised rule which has largely complicated Actinian nomenclature.

For the mere naming of specimens, a trained eye, an acquaintance with the bibliography, and an appreciation of the rules for zoological nomenclature, are alone necessary. For the classification of the genera and species it is requisite to have a fairly minute knowledge of their anatomy. Mere reliance upon outward form or external characters has led to essentially dissimilar forms being associated together. A rational scheme of classification must also take the development of the individual into account. Thus, while the name of an animal may be determined by the collector or museum curator, these must accept the classification suggested by the comparative anatomist and embryologist. Once the taxonomy is

established, the most easily ascertained characters, even if they are of trivial importance, are all that are necessary for determining purposes. The separation of the methods of systematic zoologists and those of structural zoologists has been the fruitful cause of complication in nomenclature.

In the following descriptions I have to classify the Actiniæ referred to from an anatomical standpoint; but, at the same time, external characters of both living and preserved specimens have not been ignored. Preserved Actiniæ are peculiarly difficult to determine: with increased knowledge a great deal may be done, but in many cases the task will probably always remain hopeless, unless notes on form and colour have been taken of the living animal.

In the following pages it will be seen that the species of the genera Edwardsia and Halcampa, which have already been examined, can readily be distinguished by certain anatomical details, as, for instance, the pattern of the longitudinal retractor muscles of their mesenteries. On the other hand, the three species of the genus Sagartia, *s.s.*—*S. miniata*, *S. venusta*, and *S. nivea*, cannot at present be distinguished anatomically. A possible explanation is not far to seek. From their general structure we may confidently assert that Edwardsia and Halcampa are old genera, as they retain, in their adult state, features which are transiently present in the young of the more typical Actiniæ. We may therefore assume that the existing species of this genera are well established, and have remained constant for a sufficient period for the acquisition of definite structural characters. The genus Sagartia is more specialized, and it is open to us to suppose that the species have not yet got beyond the stage of colour differentiation.

Parallel cases can be found in almost every group of animals where the species of one genus are easily defined, whereas in another genus the specific distinctions have reference to the presence or absence of a particular spot or marking.

In order to establish actinological studies on a sure foundation it will be necessary first of all to recover the types. The most satisfactory way to accomplish this is to go to the original locality and collect specimens there. Then, having recovered it, the type must be subjected to anatomical investigation. Its place in the system of Actiniæ will then be accurately known, and not till then. There has been up to the present a great deal too much of guess-work in this group.

I have found it necessary to introduce a few new terms, in order to indicate certain mesenteries and the chambers between them. In adult forms an axial line is always recognisable, but beyond that, in the majority of Actiniæ there is a radial symmetry. It has long been known that the larval forms of all Actiniæ hitherto studied are bilaterally and not radially symmetrical, and a definite orientation is possible for these, and for some adults, as I shall subsequently

show. The new terms I propose have relation to this primitive bilateral symmetry.

I have shown elsewhere (**1887**, p. 473*) that the larval Halcampa possesses a single deep œsophageal groove. I have reason to believe that the remarkable groove in Peachia occurs at the same angle of the œsophagus in that genus. The single œsophageal groove of the Zoantheæ has the same relations. I therefore take this as the more important groove, and speak of it as the "sulcus:" the less important opposite groove is the "sulculus."

The sagittal œsophageal grooves were named by Mr. Gosse the "gonidial grooves" (*canales gonidiales*) (**1860**, p. 4). He did not distinguish between them. Dr. Andres (**1884**, p. 73) adopts the terms *gonidium* and *gonidulum*. It may be considered that it is unnecessary to coin new terms with these before us; but they do not readily lend themselves to combination with others. The brothers Hertwig distinguished these grooves as "dorsal" and "ventral." This is an unfortunate application of terms which have a false significance in our group. We may speak of organs as "lateral" to a given axial line, but the words "dorsal" and "ventral" have no meaning, except a misleading one, for the Actiniæ. The sulcar directive mesenteries correspond with the "ventral" of the German authors, and the sulcular with the dorsal. Dr. Hickson (**1883**, p. 693) has introduced the term "siphonoglyphe" for the ciliated axial groove of Alcyonarians, in which group it is now universally accepted. It is, however, not conveniently applicable to the Actiniæ. The terms "axial" and "abaxial," as used by Prof. A. Milnes Marshall (**1883**, p. 125), for Pennatula, have express relation to the axis of the polypdom, as Dr. Marshall speaks of the "inner or axial," and the "outer or abaxial," surfaces. These terms are clearly unsuitable for Actiniæ.

In adult Actiniæ with two œsophageal grooves it is not possible to distinguish which is the sulcar and which is the sulcular groove; nor when only one groove is present can we in all cases determine which it is. Probably it will be found that, in every case where one groove only is present during the whole of life, it is the sulcar groove. But in the case of the genus Sagartia (Gosse, *s. s.*), one groove is as often present as two. There is no reason, as far as is known, to regard this as the sulcus. It appears to be more probable that the one-grooved condition is a secondary feature, and the groove may be either the sulcus or the sulculus. When it is impossible to determine the homology of the groove or grooves, I shall simply term them œsophageal grooves.

* In referring to the bibliography which is appended to this Revision, I have adopted the plan introduced by Dr. E. L. Mark, of Harvard, by which the reference number gives the reader the approximate date of the article.

In addition to the sagittal grooves lateral furrows may or may not be present; they are of no morphological importance.

The whole endodermal cavity has been appropriately termed the cœlenteron; it is divided radially by the mesenteries into chambers. I have adopted Mr. Fowler's (**1885**, p. 578) terms of "endocœle" for an intra-mesenterial chamber, and "exocœle" for an inter-mesenterial chamber. The endocœles of the directive mesenteries are respectively the sulcar endocœle and the sulcular endocœle. The combinations used to designate the various chambers of the ground-type are given in the last section of this communication.

The use of the term "septa" instead of "mesenteries" for the radial partitions of the cœlenteron is to be strongly deprecated, owing to the universal acceptance of that word for the radial calcareous plates of the Madreporaria.

Mr. Bourne's (**1887**, p. 311) term, "mesoglœa," bids fair to be generally adopted. It conveniently replaces the term "mesoderm," which is open to serious objection, and such cumbersome names as "supporting membrane" or the like.

A word of personal explanation is necessary. I had hoped to be able to deal with the subject in something approaching to a logical method; but two circumstances have prevented this: the first is the difficulty which exists in procuring specimens of many of the species. If completed work on available specimens was retarded in publication until other species or genera were obtained, the results attained would long lie dormant. In the second place, I am leaving Ireland for some time, and it may be a considerable period before I shall be able to conclude this series of Papers. I shall not even have the opportunity of reading the proofs of this Memoir. Thus, at present, I am only in a position to give an approximately complete account of one group of the Actiniæ—the Chondractininæ; in another section of this Paper I deal with a variety of genera, all of which, however, may be regarded as more or less representing the various stages in the evolution of the typical hexameral Actiniæ.

The family Sagartidæ was first thus defined by Mr. Gosse (**1858**, p. 415): "Sagartiadæ [this is the form of spelling adopted, and adhered to, by Mr. Gosse]. Basis adhærens. Tentacula simplicia, in cyclis continuis digesta. Cutis, pro filis retractilibus armatis emittendis, perforata." It included the genera Actinoloba (*A. dianthus*) and Sagartia, the latter being thus diagnosed: "Basis integra, cyclica. Tentacula libenter et totaliter retractilia. Cutis acetabulis instructa. Os duabis canalibus gonidialibus instructum" with the following species: *S. bellis*, *S. miniata*, *S. rosea*, *S. ornata*, *S. ichthyostoma*, *S. venusta*, *S. nivea*, *S. sphyrodeta*, *S. pallida*, *S. pellucida*, *S. coccinea*, *S. troglodytes*, *S. viduata*, *S. parasitica*. Although the title-page of the "Actinologia Britannica" bears the date of 1860, the book was issued in bi-monthly parts, of which the first (pp. 1–32) was issued, as dated, on March 1st, 1858; consequently the fuller diagnosis, in English, of the family Sagartiadæ is