

3. ON ZOANTHUS COUCHII, JOHNSTON.
 BY E. W. H. HOLDSWORTH, F.L.S., F.Z.S., ETC.
 (Radiata, Pl. X.)

The existence in our seas of a compound Zoophyte belonging to a group so essentially tropical as the *Zoanthidæ*, was first made known by Mr. R. Q. Couch, who obtained a small species from deep water near the Cornish coast. It was subsequently described and figured in Dr. Johnston's 'British Zoophytes,' and has been since eagerly sought for, but apparently without success; or if captured, its characters have not been positively recognized. There is reason, however, to believe that the original description was imperfect; and it is probable that specimens of a compound Polype, found by Mr. Barlee and others along our northern coasts, and some lately obtained by myself in Torbay, may all be referred to *Zoanthus couchii*. They are certainly identical with the animal which Dr. Johnston placed with some hesitation among the Sponges, and described under the name of *Dysidea papillosa*; and this was believed by Prof. Edward Forbes to be the same as the Cornish *Zoanthus*. As the specimens recently found differ in some important particulars from those described by Mr. Couch, I have thought it desirable to point out their characters, and to give some details of certain parts of their structure which are peculiar to the family *Zoanthidæ*, leaving their specific distinctness an open question, until we know more of the original *Zoanthus couchii*.

The living polypes now exhibited were dredged on the 12th of October last, in 10 or 12 fathoms water, at about a mile from the eastern headland of Torbay, and, although small, agree in other respects with the probably maturer examples from other parts of the coast. The special characters of the *Zoanthidæ*, which consist in their increase by budding, and their mode of distribution over the surfaces to which they are attached, are subject in this species to considerable variation. One group of six polypes on the inside of a valve of *Cardium rusticum* (fig. 4), is arranged in a linear series as in the typical forms of the restricted genus *Zoanthus*, and is the result of budding in one direction only; others are scattered over the surface of a flat stone, and have no perceptible connexion with one another, except in a few instances where two or three of them are united; the isolated polypes are perhaps the produce of separate ova, and in time may develop their compound character by the usual process of gemmation. Another form of growth is the one under which this Zoophyte has been most commonly known as *Dysidea papillosa*, and may be well seen in a remarkably fine specimen from Shetland, and now in the collection at the British Museum. In this example the polypes form a compact group (fig. 3), connected in every direction by a general expansion of the basal membrane, which is extended over the whole outer surface of a small univalve shell, and also lines the interior for a considerable distance. Mr. Alder has observed that a *Natica* is the usual support for this form of development; but in this instance the shape of the incrusting mass is more like that of a small *Buccinum*, or a *Purpura*. In these varying modes of growth, we

find a gradual transition from the linear budding of *Zoanthus* proper to the aggregation of the polypes in some species of *Palythoa*, but in the typical members of the latter genus, the Polypes are not only connected at the base, but have their bodies also severally united so as to form a solid mass; and a more decidedly compound nature exists in them than we find in any of the varieties of the present species; so that, although partaking of the characters of both genera, *Zoanthus* appears to be the one to which this is most nearly allied. An evident approach to the same intermediate form may be observed in the reticulate arrangement of the connecting bands of *Z. bertholetii* from the Red Sea.

In our British species, the body forms a cylinder from 2 to 4 lines high, by about half that in breadth, and is clothed with a dense coating of fine sand, which at the upper extremity is divided into 14 deeply-cut marginal teeth; these cover the top of the column when the animal is closed, but are turned a little outwards during expansion. The tentacula are moderate in length, slightly tapering, smooth, and not capitate; they are arranged in two rows containing 14 each, of which the inner series are rather the longer, and are placed opposite the angular prolongations of the column, those of the outer row alternating with them. Fourteen tentacles in each row appear to be a character of specific value, as I find that number constant in specimens of various sizes, and they correspond with the marginal divisions. The disk (fig. 7), which is generally concave, somewhat exceeds the diameter of the body; and the prominent mouth opens with a simple linear orifice. The general colour of the disk and tentacula is a pale transparent brown, becoming opaque white around the mouth and at the tips of the arms; and all the intermediate parts are finely speckled with the same tint. At first sight, the tentacles appear to be knobbed as in *Corynactis* and some of the Coraligenous Polypes; but their form is really quite simple, and the capitate appearance of these organs is due solely to the conspicuous colour of their extremities.

Among the external characters of this family, the serrated margin of the column is remarkable, but an examination of the animal shows that this structure is a simple provision for enabling a polype so peculiarly coated to close its disk perfectly, and in the contracted state to be completely protected by its sandy covering. Closure of the disk in the soft-bodied *Actinæ* is effected by the action of the muscles surrounding the upper extremity of the body; and as the skin is soft and yielding, contraction takes place equally on every side, and is continued until the edges of the column meet in the centre. In *Zoanthus*, the case is different; fine sand being densely impacted into the epidermis, little or no contraction can take place, and the polype would be unable to close in the usual manner if this hard covering were uniformly extended to the margin of the disk. Under the microscope, the wall of the column is seen to terminate in a number of triangular processes or teeth (fig. 6), united at the base, and covered externally with sand like the rest of the body; these prolongations are connected throughout their length by a thin membrane, which is crossed by the ordinary transverse muscles, whose contraction

brings the edges of the teeth in contact, at the same time necessarily inclining them towards the centre, and thus effectually closes the disk; the animal being then entirely covered and protected by the investing sandy coat. It will be observed that the apparently marginal teeth are in reality only parts of the wall of the column, and that intervening triangular pieces are as it were excavated from the integuments, leaving only the internal membrane and muscular bands. The nature of this adventitious covering also deserves attention, being the only character in which this polype at all resembles *Dysidea fragilis*—the sponge with which it was formerly associated. It is almost entirely composed of fine angular particles of siliceous sand, brought in contact with the body and connecting membrane of the polype by the action of the sea, and retained by, and incorporated in the cuticle; its extraneous character is evident from the occasional presence of other matters mixed with the sand, but the latter substance is in most cases the only material employed. Similar grains of sand abound in the sponge; they are not confined, however, to the exterior, but are scattered throughout the mass, and cover the inter-lacing fibres in every direction.

Independently of its different composition, this sandy coating in *Zoanthus* cannot be regarded as at all analogous to the true corallum of the Madreporæ; here it is the actual polype which is enclosed in the hard covering, and this, when tested with nitric acid, shows no trace of calcareous matter; in the Madreporæ, on the contrary, the polype is as delicate and soft-bodied as any of the Actiniæ, and when expanded, rises above and clothes the upper portion of the corallum, which is entirely secreted by the internal tissues of the animal, and is composed essentially of carbonate of lime extracted from the seawater; in fact, the hard parts constitute an external covering in the one animal, and an internal skeleton in the other.

In its explanate growth, or increase by budding from the base only, *Zoanthus* strongly resembles *Caryophyllacea*, and by some naturalists is associated with that tribe of Coralligenous Polypes; but many of its characters point to a nearer relationship to the *Actinidæ*, in which we sometimes find a similar deposition of extraneous matter on the cuticle, although in a slighter degree and less persistent: the smooth simple tentacula are also very unlike those of the Coral Polypes, in which their surface is generally studded with little wart-like prominences enclosing the thread-cells. With our present scanty knowledge of the *Actinidæ* found in different parts of the world, and the insufficient descriptions that we possess of most of the coral animals, it is difficult, if not impossible to determine, the true position of the *Zoanthidæ* among the Helianthoid Polypes. An examination of the tropical seas, in which they abound, and where they attain a size considerably exceeding that of our British species, may lead to the discovery of intermediate forms showing the true affinities of this now isolated group; but at present I am inclined to regard them as representing the budding form of growth in the Non-coralligenous Zoophytes, as the fissiparous mode of increase is exemplified in many of the true *Actiniæ*.

On the 9th of November last, Dr. Gray brought before this Society a notice of a curious form of *Zoanthus* sent to him by Mr. George Barlee from the Shetland seas, and for the reception of which he proposed the new genus *Sidisia*. He has kindly allowed me to describe this polype (fig. 8); and it is therefore with some regret that, after a careful examination of it, I must question its generic or even specific distinction from *Zoanthus couchii*, the subject of the previous part of this paper. The great peculiarity of these polypes consists in their being entirely free, no parts of the specimens at the British Museum showing any superficial trace of attachment. Another remarkable character is their irregular mode of budding, and may be briefly described as one polype growing out from another without the intervention of the usual connecting bands; this budding takes place from the base of the parent polype in an opposite direction, or at various angles with the original line of growth, the branches again sometimes throwing out buds from near their own bases. Mr. Barlee states that some of the specimens were attached, but most of them came up in the dredge free, and that they abounded on muddy ground. This situation is I think very significant, and sufficient to explain the peculiarities of the animal. As I have before mentioned, it is the habit of *Zoanthus* to be attached to some stone or shell, and the first sign of its increase is in the expansion of the basal membrane either on one or all sides of the polype; from this expansion the young bud forth at various distances from the parent, and they in time develop similar offshoots. Such is the case when the ova fall on places suited to their natural growth; but if by chance they are deposited on a muddy bottom, or where the stones are only large enough to afford attachment to a single polype, I think an irregular mode of growth may be reasonably anticipated, and a variation expected in the character which, above all others, is likely to be affected by the change of circumstances. By the motion of the sea, the position of these free polypes must be continually shifting, consequently no part of their surface can be permanently uppermost; and under these circumstances, with a natural tendency to grow upwards, regularity of budding would seem to be impossible. As might be expected, scarcely two of the specimens I have seen, are precisely alike, which adds to the probability of the suggested explanation of their irregular growth. The fact of the characters of the disk, and the number of the tentacula and marginal divisions being identical with those of the animals first described, is a strong argument also in favour of their all being only different forms of the same species.

Mr. Salmon exhibited at the Meeting a female bird of Baillon's Crake (*Crex Bailloni*) with seven eggs; they were taken by a fennan in Cambridgeshire, the bird having been ensnared during the first week in August upon the nest, which was placed upon the ground. This is the first authenticated instance of this species having bred in the British Islands. The bird and eggs belong to Mr. William Farren, of Cambridge.