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XXI.—*Catalogue of Irish Zoophytes.* By ARTHUR HILL HASSALL, ESQ., M.R.C.S.L. With 3 Plates.

“IT is delightful to see by these miniature existences, small almost to invisibility, and by their careful organization as finely contrived as in the grandest creature, that greatness and littleness make no difference to Him in His Creation or in His Providence. They reveal to us that magnitude is nothing in His sight; that He is pleased to frame and to regard the small and weak as benignly and as attentively as the mighty and the massive. We are high and low, great and small, as to each other, but not to Him.”—*Sharon Turner's Sacred History.*

In no part of the animal kingdom is the truth of the above remarks more pleasingly or more beautifully manifested than in the present order; in no other department do we meet with, to an equal extent at least, the same diversity and elegance of form so illustrative of the fertility of invention and beauty of conception of the Divine Mind. The heart must be cold and insensate indeed, that, on beholding these interesting “minims of creation” is not tempted to exclaim with the Psalmist, “in wisdom,” beneficent, infinite wisdom, “hast thou made them all.”

The whole of the zoophytes enumerated in the following Catalogue, with two exceptions, were found in the bays of Dublin and Killiney during the winter of 1838 and spring of 1839. The extent of coast embraced by these bays is about sixteen miles, abounding more in marine productions than any other known locality of similar dimensions.

The distribution of zoophytes is often extremely local, in many cases a species being restricted to one particular spot of perhaps not more than half a mile or a mile in extent; it is, on this account, that I have given the habitat of each separately.

The law of the spiral development of similar parts, so evident in the vegetable kingdom, is here also very generally manifested both in the form of the polypes as well as in that of the polypidoms—this is particularly remarkable in *Antennularia antennina*, *Thuiaria thuja*, *Campanularia verticellata*, and *Vesicularia spinosa*; and traces of this arrangement may be detected in some part or other of the structure of the majority of zoophytes.

In this catalogue the term Zoophyte is used in the extended signification in which it was employed by Ellis, who embraced in his work the Articulated Corallines and Sponges, denying, however, the existence of polypes in the latter, and

believing in their animal nature from their structure and chemical composition.

I have here to acknowledge the obligation I am under to Dr. Johnston* of Berwick, who kindly afforded me the benefit of his experience wherever I entertained doubts as to the identity of any of the species mentioned, and from whose assistance, in this particular, I am enabled to present this Catalogue with the greater confidence.

RADIATED ZOOPHYTES.

Order I. ZOOPHYTA HYDROIDA.

TUBULARIADÆ.

TUBULARIA.

Tubularia indivisa.—Dublin bay; not common.

T. ramea. This is one of the most delicate and arborescent of the corallines, exactly resembling a miniature tree. The ultimate tubes have four or five distinct rings at their base. Polypidom about six inches in height.

On shells from deep water; rare. Blackrock, Dublin bay.

SERTULARIADÆ.

THOA.

Thoa halicina. A variety of *T. halicina* is frequently met with distinguished from the ordinary specimen by its irregular mode of branching.

Dublin bay; common.

T. Beanii. Of this extremely elegant zoophyte I have met with several specimens, averaging from four to six inches in height. There is a great resemblance between *Thoa Beanii* and the preceding, with the variety of which it may be readily confounded, particularly when deprived of its very characteristic vesicles. It may, however, be known from it by the branches passing from the main stems nearly at right angles, but at unequal intervals, and by its being *irregularly ringed*, having also a joint between each cell, in which respect it agrees with *T. halicina*.

SERTULARIA.

Sertularia polyzonias. Between this and the one following there is a manifest relation. They are both usually found upon *Flustra foliacea*, though not confined to it.

Killiney bay; not common.

S. rugosa.—Kingstown; not common.

S. rosacea. Usually found as a parasite on *S. cupressina* and *S. Tamarisca*, particularly on the former.

Dublin bay; abundant.

* I have followed the Arrangement and Nomenclature given in Dr. J.'s admirable work on British Zoophytes.

S. pumila. On *Fucus serratus*, which it thickly covers, near low water mark.

Boosterstown.—Dublin bay; not rare.

S. Tamarisca. An inhabitant of deep water, on shells; rather rare. Blackrock, Dublin bay.

S. abietina. Frequently covered with small and elegant tufts of *C. eburnea*, which give to the polypidom a very beautiful appearance; it is sometimes found a foot in height, and of a bright pink colour, which it retains on drying. All the *Sertulariæ* are occasionally found coloured in this way.

Dublin bay; very abundant.

S. Filicula.—Dublin bay; rare.

S. operculata. Of this common species a very delicate variety is occasionally met with, attaining a much greater height than the ordinary kind, and having the shoots waved or zigzag.

Dublin and Killiney bays, on shells and fuci.

S. argentea. Independently of the differences to be observed in the form of the cells and vesicles, which are generally pretty constant, between this and the following species, there are many others pertaining to their general habit and appearances. The polypidoms of this species are frequently met with growing in closely aggregated clusters, and are sometimes even branched, a condition in which I have never found the other; it is also of a darker colour and more rigid texture, and never attains the same height. The polypiers also do not end in the beautiful spire so remarkable in *S. cupressina*, but terminate much more abruptly. The branches too are usually shorter, broader, and *not arched* as in the other species.

Dublin bay; abundant.

S. cupressina. This species sometimes attains an elevation of more than two feet. The polypidom is occasionally denuded of its branches for a short distance up the stem, but this is by no means a constant occurrence, as in some others.

Dublin bay; abundant.

ANTENNULARIA.

Antennularia antennina. The stems of this coralline sometimes exceed a foot in height, and are frequently clustered together to the number of thirty or forty. The number of branchlets in each whorl varies from five to nine, and in the same specimen the number usually remains the same throughout. I have a specimen in my possession from Brighton arising by a *single trunk*, which afterwards breaks up into eight or ten branches, these again subdividing; it well deserves, from its appearance, the appellation of *ramosa*. There is also in it an *absence* of the small tubular cells placed between the larger ones met with in *A. antennina*. See Plate V. From an examination of this specimen I am inclined to think that it is what Lamarck has described under the name of *Antennularia ramosa*, and that it is really and specifically distinct from the other species. I am far, however, from considering every branched specimen of *Antennularia* as the true *A. ramosa*.

Dublin bay; common.

PLUMULARIA.

Plumularia falcata. This common species is sometimes found branched, and attains a foot in height. The vesicles appear in spring.

On stones and shells in deep water. Dublin bay; abundant.

P. cristata. On *Fucus siliquosus*; rather common. Dublin and Killiney bays.

P. pinnata.—Dublin bay; not common.

LAOMEDEA.

Laomedea dichotoma. Polypidom usually from eight to ten inches in height, but often more.

Blackrock; rather common.

L. geniculata. Parasitic on sea-weeds, particularly on *Laminaria digitata* and *F. siliquosus*. Dublin and Killiney bays; common.

L. gelatinosa.—Blackrock; not common. The stem of this species is ringed above and below the origin of each footstalk.

CAMPANULARIA.

Campanularia volubilis. This elegant microscopic species is furnished with a delicate joint or hinge, situated at the base of each little cup. This beautiful contrivance is designed, I imagine, to enable this frail zoophyte the better to elude the rude contact of the element by which it is surrounded, by permitting it to bend to a force which it cannot resist.

Dublin bay; not common.

C. Syringa. Parasitic, as in also the preceding, on other corallines, particularly on *S. abietina*. It is worthy of remark, that the more delicate species of zoophytes affix themselves either to sea-weeds or to others of a more robust nature. By so doing they receive the shock communicated by the motion of the surrounding water, as it were, second-hand—the force being first felt by, and partly expended on, the objects to which they are attached before reaching them. By this means also, a much wider range of motion is afforded them for the capture of their prey, than they could possibly enjoy were they rooted by their short pedicles to some fixed and unyielding support.

C. verticillata.—Blackrock; not very frequent.

C. ? dumosa. This is now ascertained to be the *Cornularia rugosa* of Cavolini, a figure of which is given in Dr. Johnston's 'British Zoophytes.' Vignette 27. p. 187.

Blackrock, on *P. falcata*, for which it manifests a decided preference; not common.

Order II. Z. ASTEROIDA.

ALCYONIDÆ.

ALCYONIUM.

Alcyonium digitatum.—On old shells, very common; Dublin and Killiney bays.

Order IV. Z. ASCIDIOIDA.

VESICULARIADÆ.

An undescribed zoophyte, belonging to this family, is occasionally found in Dublin bay, investing *Fucus senatus*. Dr. Johnston considers it to be new both in species and genus. As specimens of it are in Dr. Johnston's possession, I refrain from giving any detailed description; I may, however, remark, that the animal, which I succeeded in detecting in a specimen preserved in spirits, is apparently similar to that of *Flustra*, being doubled up in the cell in the same manner, and having the head encircled with about twenty tentacula.

VESICULARIA.

Vesicularia spinosa.—Dublin bay; common.

SERIALARIA.

Serialaria lendigera.—Dublin and Killiney bays; not common.

VALKERIA.

Valkeria uva.—On *Fucus siliquosus*, rare; Blackrock.

CRISIA.

Crisia cornuta.—On sponges, and various corallines; common in Dublin and Killiney bays.

C. chelata.—Blackrock; rare.

C. eburnea. Parasitic on sea-weeds and zoophytes, particularly on *S. abietina*.

Killiney and Dublin bays; common.

C. luxata.—Killiney and Dublin bays; frequent.

C. aculeata. Cells disposed in a double series, armed with a long spinous process; joints of an amber colour.—A. H.

Polypidom erect, bushy, about an inch in height, and beautifully posted; branches alternate; jointed at irregular intervals; internodes narrow at their commencement; cells subalternate, tubular, the majority being furnished with a long spine, which arises from the outer side. Vesicles much resembling a fig in shape, and dotted. See Plate VII. fig. 3, 4.

Brighton; not unfrequent.

NOTAMIA.

Notamia loriculata. The polypidom of this species sometimes attains a height of eight or nine inches.

Dublin and Killiney bays; common.

HIPPOTHOA.

Hippothoa catenularia.—Dublin bay; rare.

TUBULIPORIDÆ.

TUBULIPORA.

Tubulipora patina. The *Discopora verrucaria* of Fleming.

On shells and corallines, particularly on *N. loriculata*.

T. verrucaria. The *Tupulipora verrucaria* of Milne-Edwards has not been described as British; it is however of common occurrence in Dublin bay, adhering usually to *S. abietina*. It differs from *T. patina* in the cells not being placed in a cup, and from *T. serpens* in their not being arranged in transverse rows. The tubes are sometimes separate and sometimes united. In this latter state it bears a great resemblance to *Discopora hispida*, but may be known from it by the apertures of the tubes being plain. See Plate VI. fig. 3, 4. Is it not the small purple *Eschara* of Ellis?

T. serpens.—Not unfrequent; Dublin and Killiney bays.

DISCOPORA.

Discopora hispida.—From shells and corallines from deep water; not common; Dublin bay.

CELLEPORIDÆ.

CELLEPORA.

Cellepora pumicosa.—Dublin and Killiney bays; very common.

LEPRALIA. Johnston.

Berenicea hyalina.—Dublin bay; rare; on shells.

Lepralia variolosa.—Dublin bay; rare.

L. ciliata. Cells ovato-globose; aperture circular with a small excavation in its lower margin; spines from 5 to 7, not immediately surrounding the orifice of the cell, differing in this respect from *L. immersa*, in which the spines arise directly from the margin. By means of the indentation referred to, this species may always be distinguished from others, even in the absence of the spines.

On shells and fuci; not uncommon; Dublin and Killiney bays.

“*Lepralia 4-dentata*, Johnston's Manuscript.” Cells immersed, arranged alternately; apertures quadrangular, and furnished with four short teeth, placed near each angle.—A. H.

This species was sent to Dr. Johnston some time ago by Mr. Forbes, and subsequently by myself as a new species. See Plate VI. fig. 5.

MEMBRANIPORA.

Membranipora pilosa.—On shells, fuci, and corallines; very common; Dublin and Killiney bays.

Var. dentata. Not common.

ESCHARIDÆ.

FLUSTRA.

Flustra foliacea. The varieties of this species are very numerous. Dublin and Killiney bays; very common.

F. chartacea. This is the *F. papyracea* of Ellis, which for a long time has been lost sight of. His description, however, is inaccurate, inasmuch as he makes no mention of the spines, one of which is placed at each distal angle of every cell. It is one of the most beautiful of the *Flustræ*, growing in bushy hemispherical tufts of

about an inch and a half in height; each tuft is composed of numerous separate polypidoms, closely interwoven with each other, and dichotomously branched. The cells are of an oblong square form, slightly enlarged distally, and furnished with a globular operculum somewhat similar to that of *F. avicularis*.

F. avicularis. This species has four spines at the top of each cell. Parasitic on other corallines; rare; Dublin bay.

F. membranacea. On the frond of *Laminaria digitata*; very abundant; common.

F. Hibernica. Polypidom encrusting calcareous, white; cells hexagonal, excavated, dotted on the inside.—A. H.

The only specimens I have obtained of this are parasitic on an *Ascidia*; I have little doubt, however, of its being a new species. The *Flustra* to which it bears the closest resemblance is perhaps *F. carbacea*, but I have never met with it on this part of the Irish coast. See Plate VII. fig. 1.

CELLULARIA.

Cellularia ciliata.—Dublin bay; rare.

C. scruposa. On the roots of most corallines and old shells; abundant; Dublin and Killiney bays.

C. reptans. Everywhere very common.

C. Avicularia. This species is, I think, misplaced; it ought rather to be associated with *Flustra* than *Cellularia*.

Dublin bay; rare.

ACAMARCHIS.

Acamarchis plumosa.—Dublin bay; rare.

FARCIMIA.

Farcimia salicornia. “Articulations cylindrical; cells rhomboidal, plain.”

Farcimia sinuosa. Cells rounded above, excavated below for the reception of the head of the succeeding cell; aperture semicircular, situated in the upper third of each cell.—A. H.

I have but little hesitation in pronouncing this to be a new species*. It differs from the ordinary species in the greater size of the cylinders, in the shape of the cells (too material to be the result of any accidental circumstances), and above all, in the position of the aperture, which in this is placed in the upper part of each cell, while in *F. salicornia* it is exactly *central*. This last I consider to be the most important distinction of all. The number of the cells on each cylinder is also much greater than in the preceding species. See Plate VI. fig. 1. 2.

* Among several specimens of *salicornia*, collected by Mrs. Alder and Miss Amelia Hunter, at Blackrock, Dublin bay, I observed some of *Farcimia sinuosa*, agreeing in every particular with my own previously obtained at Menion, about two miles from the former place. The authority for this new species does not now, therefore, rest upon the examination of a single specimen.

Dr. Johnston, to whom I wrote respecting this zoophyte, refers me to a figure in which the cells are shaped as in mine, given in Ellis's work (Plate xxiii. fig. D.), and suggests the possibility of Ellis having found the two forms of cells, viz. the rhomboidal and the rounded, upon one and the same species. This communication led me to make a careful examination of numerous specimens of *F. salicornia*, the results of which has been such as I had anticipated. In no one instance have I ever detected the two forms of cells upon one and the same portion, but have always found the differences which I have pointed out to be constant between specimens. Ellis's figure proves that he had seen my species; but it is also evident that he overlooked the material points of difference between it and the ordinary kind, an unusual error for him to commit, I acknowledge; but nevertheless possible. The circumstance of his having given two separate figures of *Farcimia* is in favour of my opinion of their distinctness as species.

There is one general and undeviating principle presiding over the form and arrangement of the cells of all cellular zoophytes, and operating with such mathematical precision as to give to each species a certain type or character by which it may be distinguished from all others, each having cells of but one shape, and arranged in a uniform and determined order. To imagine, therefore, the existence of two forms of cells so distinct in their character, upon one and the same species, and constituting a part of it, is to suppose an anomaly, of which I believe the whole range of zoophytical productions does not furnish a single example. The differences between the two species are not such as can be explained by a reference to any adventitious causes, such as exposure, the mode of drying, &c.; they are not those arising from mere magnitude; in a word, they are structural.

ALCYONIDULÆ.

ALCYONIDIUM.

Alcyonidium hirsutum.—Dublin bay; not common.

A. echinatum.—Dublin and Killiney bays; common.

A. parasiticum.—Dublin and Killiney bays; frequent.

MELOBESIA.

Melobesia elegans. This beautiful microscopic object, which received its name from Mr. Bean, is not more than the sixteenth of an inch in diameter. It is composed of numerous plates of irregular form and dimensions; these plates are inserted into a raised margin or framework, and each is perforated with minute tubular apertures. Whether it is furnished with polypi or not, I believe, is not determined. See Plate VII. fig. 2.

On Fuci; Dublin bay.

HALICHONDRIA*.

Halichondria papillaris, Fleming. *Spongia ureus*, Solander. Common, encrusting fuci; Dublin and Killiney bays.

H. palmata.—Dublin bay; not common.

* For an account of this genus, see Fleming's 'British Animals.'

GRANTIA*.

Grantia compressa ! *G. foliacea* of Montagu.

Adhering to the under side of rocks above low-water mark; Monkstown.

G. Coronata.—Monkstown: same as the preceding.

MILLEPORA.

Millepora polymorpha, Linn.

Millepora informis, Lamarck.—Dublin bay; not common.

Millepora lichenoides. "This *Millepora* has slender semicircular plates which constantly grow horizontally." Lamouroux makes this a *Melobesia* under the name *Melobesia pustulosa*. It ought, I think, to be considered a *Madrephyllia*, under which head Dr. Johnston has placed it. *M. byssoides*, Lamarck.

CORALLINA.

Corallina officinalis. There are several well-marked varieties of this *Corallina cylindrica*.

"*Corallina rubens sive muscus marinus*."—Park.

"This coralline, when magnified, appears to grow in branches, always dividing into two parts, consisting of long cylindrical joints connected by small tubuli."—Ellis.

C. rubens, var. *spenophecus*.

The above four corallines are found attached to rocks at Bray Head, near Dublin.

It is only by an extensive examination of catalogues similar to the foregoing, that we shall be able to arrive at any certain conclusions regarding the geographical distribution of zoophytes, and the changes in the growth and habits occasioned by the different localities in which they are met with. On reference to the preceding list, it will appear that many species common in the North of England and Scotland are either not to be found at all on this coast, or are so sparingly; and on the other hand, many that are rare on the English coast are abundant on the Irish. Thus, *Thuiaria thuja*, common in the North of England, has never, I believe, been noticed on any part of the coast of Ireland, and certainly not on that embraced in the present catalogue.

Again, I have never met with *F. truncata* and *F. carbacea*, both very common on the coasts of Northumberland and Durham, and also occasionally found upon some parts of the Irish coast. Many species of *Plumularia*, and two or three of *Sertularia*, are wanting in these bays; and the genus *Eschara* appears to be absent not only from this part but from the coast of Ireland generally; while *Thoa Beanii*, *Discopora hispida*,

* See Grant in 2nd vol. of Edin. New Phil. Journ.

and *Alcyonidium parasiticum*, all more or less rare on the English coast, are tolerably abundant in these situations. I might enlarge upon this subject, but the data are at present too few to admit of our doing so with certainty.

Many species appear to attain a much greater height in Ireland than in England, as will be evident on a comparison of the sizes given in Dr. Johnston's elegant work and in this Catalogue: this is probably attributable to the mildness of the climate.

EXPLANATION OF THE PLATES.

PLATE V. *Fig. 1.* *Antennularia ramosa*.

Fig. 2. A portion of the same magnified.

Fig. 3. A portion of *A. antennina* magnified, showing the small tubular cells placed between the larger ones, and which are absent in *A. ramosa*.

PLATE VI. *Fig. 1.* A specimen of *Farcimia sinuosa*, of the natural size.

Fig. 2. A portion of the same magnified.

Fig. 3. and *4.* Specimens of *Tubulipora verrucaria*; in the one the tubes are separate, in the other united.

Fig. 5. *Lepralia 4-dentata*.

PLATE VII. *Fig. 1.* *Flustra Hibernica*. This is a very imperfect representation of the original, the exact appearance of which it is very difficult to represent in a drawing.

Fig. 2. *Melobesia elegans* of Mr. Bean, magnified.

Fig. 3. and *4.* *Crisia aculeata*, a new species.

XXII.—*A Synopsis of the Genera and Species of the Class Hypostoma (Asterias, Linnæus).* By JOHN EDWARD GRAY, Esq., F.R.S., Keeper of the Zoological Collection in the British Museum.

My intention in sending this paper to the press is not only to bring before the public a number of new genera and species which have been for several years in the collection of the British Museum, but also to attempt to divide what has hitherto been considered an intricate Class into natural groups, to subdivide these groups and the genera they contain into smaller sections, so as to facilitate the determination of the species, and at the same time to assist in making out the natural affinities of this much-neglected group of animals.

Hitherto very few persons have attempted to divide the Starfishes (*Asterias*, Linn.) into natural groups, and it is but recently that Nardo, and subsequently M. Agassiz, have paid any attention to the good groups pointed out by the first author of anything like a Monograph of these animals, I mean of Henry Linck, who published a separate work on the subject in folio, which he dedicated to Sir Hans Sloane and the members of the Royal Society. Nardo has done little more, as I shall presently show, than rename Linck's divisions; and M. Agassiz has followed in Nardo's footsteps, adding one or





