

### THE SALMON FISHERIES OF ENGLAND AND WALES.<sup>1</sup>

THIS report, although the first issued by the Board of Agriculture and Fisheries, is on the same lines as the forty-three previous annual reports of the Inspectors of Fisheries of England and Wales issued by the Board of Trade. It embodies the reports of the three Inspectors of Fisheries of England and Wales, Messrs. Archer and Fryer and Dr. Masterman. Besides these reports there are twelve appendices.

It is pleasing to learn from Mr. Archer's report that the salmon and trout season of 1903 was on the whole a good one. Mr. Archer refers to the long-standing difficulty of getting accurate statistics, and has made inquiries of the various boards of conservators as to the possible methods of obtaining them. The answers from these boards are not encouraging, and it is apparent that legislation is necessary in order to compel the recording of fish caught.

As usual, the want of funds by the boards of conservators, and the impossibility of their carrying out their proper work without such funds, is discussed. The present system by which the boards derive their revenue solely from the net and rod licences granted annually is obviously inadequate, and Mr. Archer quotes a resolution adopted unanimously by the Wye Board of Conservators, which is as follows:—

"That as the present system, by which the income of Fishery Boards in England and Wales depends entirely upon the amount realised from licences paid for nets and rods, has proved inadequate for the proper protection of the Fisheries, this Board is of opinion that legislation is urgently required to enable any Fishery Board, with the consent and subject to conditions formulated by the Board of Agriculture and Fisheries, to assess the annual value of all the Fisheries in its district and to levy a rate upon each Fishery for the purpose of providing the Board with a sufficient income for the proper protection and management of the Fisheries in the district under its charge."

We quote this, not because it is new, for the suggestion that some form of assessment of fisheries was probably unavoidable was made by the Salmon Fisheries Commission in their report in 1902, but because this move on the part of the Wye Board is worthy of commendation, and seems to us to be a move in the right direction. Too often our Royal Commissions make valuable reports which are pigeon-holed, and perhaps if the various boards of conservators pass similar resolutions to that passed by the Wye Board, and thus show some common agreement in the matter, it will go some way towards making those in authority take the matter up seriously. We have heard rumours of new salmon legislation, and let us hope that the financial side of the question will have full consideration.

Mr. Archer discusses further evidence brought forward by those who believe in the advantages of artificial propagation of salmon to show the success of the experiments upon the Weser in Germany, and he shows quite clearly that "not proven" must still be the verdict on the question of their success.

We are very glad to see from Mr. Fryer's report that salmon-marking experiments, which have now been carried on for some years in Scotland and Ireland and in Norway, have been undertaken in England. The percentage of returns of marked salmon is not very high, and the more the experiment is extended the better chance there is of gathering data which will throw some light upon the migratory habits of the species.

At last steps are being taken to alter the anomalous state of the law as to the English and Scottish sides of the Solway, as recommended by the Royal Commission on Tweed and Solway Fisheries, which sent in its report eight years ago.

There is a *résumé* of the various local questions with which Mr. Fryer has had to deal, and it is in reading this that one sees the futility of our present fishery laws. While inspectors or boards of conservators are corresponding with this manufacturer or that company or corporation as to the steps to be taken to mitigate some nuisance, the seasons slip by and nothing is done, often because there is insufficient

<sup>1</sup> Board of Agriculture and Fisheries. Annual Report of Proceedings under the Salmon and Freshwater Fisheries Acts, &c., for the Year 1903.

power given under existing Acts to enforce those Acts being carried out.

Dr. Masterman, who was appointed only just before the end of the period with which the reports are required to deal, submits a short but interesting paper upon fish scales and upon the method of distinguishing the species of Salmonidæ. He refers to the work so far done upon fish scales as a means of recording the age of fishes, and in this connection we are glad to learn that the salmon scale is being studied at the present time by Mr. H. W. Johnston. The salmon scale is particularly interesting, as a number of rings—roughly about thirty—immediately surrounding the nucleus of the scale, and occupying roughly about 0.5 mm. or 0.6 mm., are much finer, and are situated much closer together, than the rings outside this area, perhaps representing the fresh-water life period of the individual.

We notice that the gross revenue returned during 1903 was 7504*l.*, as against 6606*l.* in 1902. There were more rod licences issued than in any previous years since the commencement of the statistics, although the revenue therefrom, amounting to 3294*l.*, was not equal to that realised in 1892, when it was 3386*l.* Revenue from nets was also slightly better than in 1902, being 3994*l.* as against 3905*l.*, but in 1902 these licences realised less than in any year since 1867, the first year of the statistics, when only 3851*l.* was obtained.

Trout licences produced more in 1903 than in any previous year.

The report is published at His Majesty's Stationery Office, and is obtainable from Messrs. Eyre and Spottiswoode, or through any bookseller, price 8*d.*

FRANK BALFOUR BROWNE.

### THE ANATOMY OF CORALS.<sup>1</sup>

THE classification of corals based upon the structure of the hard or skeletal parts alone, such as has been used by zoologists in general since the publication of Milne-Edwards and Haime's "Histoire Naturelle des Coralliaires" (1857-1860), is clearly not satisfactory. Some consideration in the system of the general anatomy of the soft tissues of the living coral polyps is clearly necessary if our classification is intended to indicate at all the natural grouping of the genera and species.

The startling discoveries made by Moseley during the voyage of the *Challenger*, that the coral *Heliopora* and the corals of the family Stylasteridæ do not belong even to the same order as the Madreporæ, was an important, if not the principal, stimulus to the investigations of the anatomy of these zoophytes that have been published in recent years. Moseley himself, and his pupils Bourne, Fowler, and Slater, and abroad von Heider and von Koch, contributed valuable memoirs on the anatomy of different species of Madreporaria, and slowly but without any further startling effects our knowledge grew. The result of these investigations was to confirm the belief in the close relationship of the Madreporæ to the sea anemones, and to show that in the structure of the mesenteries, tentacles, and other organs there are differences between the genera of great systematic importance. But still our knowledge remained insufficient to suggest any permanent improvement on the Edwardsian system.

Some years ago Mr. Duerden, when stationed in the island of Jamaica, commenced a series of investigations upon the living corals of Kingston harbour and its neighbourhood. He took advantage of his opportunities for observing them alive on the reef and in his aquarium; he was equipped with a profound knowledge of the structure of the Actiniaria and of the modern methods of anatomical investigation. A series of papers and notes marked the period of his residence in Jamaica; but he reserved for this magnificent memoir of 200 quarto pages a general and detailed account of his work.

To say that the memoir is brilliant is to express an opinion, but to say that it is important is but to state a fact. Zoologists who are interested in the structure of corals must refer to this memoir as a great store of first-hand

<sup>1</sup> "West Indian Madreporarian Polyps." By J. E. Duerden. *Memoirs of the National Academy of Sciences*, vol. viii. (Washington, 1902.)



facts, and whoever attempts in the future to classify the Zoantharia must base his conclusions upon many of the anatomical details which are here for the first time adequately recorded.

No less than twenty-six species of corals, distributed among twenty genera, formed the materials of Mr. Duerden's investigations, and, although the descriptions are not exhaustive, there is a very full and interesting account of the general structure of all these forms.

The brilliancy of the colours of many corals in the living state has excited the interest and admiration of the naturalists and travellers who have visited coral reefs. These colours appear to be due to a variety of causes. In many cases the cavities of the polyps and the adjacent canals bear large numbers of the symbiotic algæ called Zooxanthellæ. The colour of these cells accounts for most of the prevailing brown and yellow-brown tints. In some few instances, such as *Astrangia solitaria* and *Phyllangia americana*, the Zooxanthellæ are nearly or wholly absent, and the polyps then are remarkably transparent and almost colourless. But there are in many cases definite pigment cells, both in the ectoderm and endoderm, which may add to or give the only colour effect of the expanded polyps. A third cause of colour is to be found in the boring filamentous red and bright green algæ with which many corals are infested.

The chapter dealing with the structure and arrangement of the tentacles is one of exceptional interest. To investigators in this country the tentacles have always offered difficulties and uncertainties. However carefully the

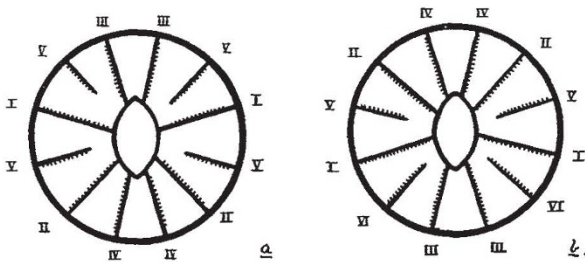


FIG. 1.—Diagrammatic figures showing the arrangement of the first six pairs of mesenteries in (a) *Madrepora*; (b) most other species of *Madreporaria*. The upper side of each is the side turned towards the axis (axial), and the lower is away from the axis (abaxial). The axial side of *Madrepora* is ventral, whereas in most other species it is dorsal. (The upper of the bilateral pairs marked v, v in a should have been vi, vi.)

material they can obtain is preserved, it is impossible to prevent a great deal of retraction and shrinkage. Mr. Duerden's careful observations, therefore, of the fully expanded tentacles of his living corals form a particularly welcome addition to our knowledge.

The most elaborate, and perhaps we may say the most important, part of the author's work deals with the number and arrangement of the mesenteries. This is not the place to relate or to criticise details which are necessarily highly technical and somewhat intricate; but it may be said that it is upon the results of this part of his investigations that the suggestions he has to offer for the classification of the order very largely depend.

If we regard the *Madreporaria* as an order, we may divide it into two suborders:—(1) the *Entocnemaria*, (2) the *Cyclocnemaria*. In the former the mesenteries always arise in bilateral pairs, and beyond the protocnemetic stage the increase takes place within one or both of the directive entocœles. In the latter the mesenteries, beyond the protocnemetic stage, arise in isocnemetic unilateral pairs within the primary exocœles. The *Entocnemaria* are represented only by the single section *Perforata*, the *Cyclocnemaria* by the two sections *Aporosa* and *Fungacea*. The arrangement of the families of the *Aporosa* into two groups, the *Gemmantes* and the *Fissiparantes*, based upon the method of asexual reproduction—by gemmation or by stomodæal fission—supported as it is by Mr. Duerden's later researches, can be regarded as only tentative and suggestive at present; but the facts upon which it is based are among the most interesting and important of his many results.

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It is a matter for regret, which many will share with the reviewer, that in the introduction to the systematic part of the memoir Mr. Duerden has not given us his views as to the relation of the *Actiniaria* to the *Madreporaria*, a difficult matter upon which no one is more competent to express an opinion.

There are some points in the terminology employed by Mr. Duerden that appear to me to be open to some objection. "By universal acceptance," he says, "Cœnenchyme is the calcareous deposit originating from the cœnosarc." This is most unfortunate. The word was introduced by Milne-Edwards and Haime to signify the common tissue which precedes the existence of the polyps and plays a considerable part in their constitution. In a similar sense Kölliker uses the expression as the tissue that gives rise to the axis of the precious coral. It was for the soft, not the hard, parts of the "common tissue" that the word was introduced. But to say that by "universal acceptance" the word is used for the calcareous deposit is not accurate, for the writers on Alcyonarians invariably use the word to signify both hard and soft parts, other than the axis, which lie between the neighbouring zooids.

Again, the use of the word "gastro-cœlom" for the general body-cavity of the Cœlenterate, suggesting as it does a compromise with the old-fashioned gastro-vascular cavity, is to be regretted. Either of the words "enterocœl" or "cœlenteron" is preferable.

On the other hand, the discussion (pp. 443-4) on the use of terms referring to the aspects of the cœlenterate body is excellent. The aspect of the body towards which the faces bearing the musculature of the two complete bilateral pairs of mesenteries, i, ii, are turned was called by Haddon the "sulcar" aspect, and the opposite the "sulcular" aspect. This terminology was adopted by Bourne in his "Anthozoa" of Lankester's "Treatise on Zoology." Marshall, in writing upon certain Alcyonarians, had previously used the terms "abaxial" and "axial" respectively, and these terms were introduced to supersede the "ventral" and "dorsal" of Moseley, Kölliker, and others. It is quite clear now from Mr. Duerden's remarks that the use of the newer sets of terms can lead to nothing but confusion. Anything that can be called a "sulcus" occurs only in Alcyonaria and a few Zoantharia; the "sulculus" is a myth.

But of more importance is the fact that, as shown by Carlgrén, the "sulcus" is dorsal in *Cerianthus* and ventral in the other forms where it occurs. The axial-abaxial relationship, moreover, is not constant. In the Alcyonaria and in the majority of Zoantharia the dorsal aspect of the polyp is turned towards the axis of the colony, and the ventral aspect away from the axis; but in *Madrepora* this arrangement is reversed. In the solitary Anthozoa the use of the terms "axial" and "abaxial" has no meaning.

The conclusion is then that, although they are open to some objections, the use of the terms "dorsal" and "ventral" for the two aspects of the bilateral anthozoom must be retained.

In conclusion, Mr. Duerden may be congratulated on the production of a really great work which marks an important step forward in the history of our knowledge of the Cœlenterata.

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#### SEISMOLOGICAL NOTES.

IN No. 10, vol. ix., of the *Boll. Soc. Sismol. Italiana*, Dr. Agamennone records the fact that his idea of taking photographs, at intervals, from fixed points, in regions suspected of bradiseismic movements, was independently suggested by F. Salmojraghi. The object is to detect slow or rapid changes of relative level in the interior of a continent, where there is no such convenient datum level as is afforded by the sea, and the paper is specially devoted to showing that the effects of refraction, being irregular, would not prevent the detection of a bradiseismic change of relative level in a regular series of photographic records.

No. 23 of the *Mittheilungen* of the Austrian Earthquake Commission is a paper by Prof. Láska on the application of earthquake observations to the investigation of the constitution of the interior of the earth. From a consideration of the observations of the Caraccas earthquake of