and descriptions have not therefore been included. On another fly-leaf is a list of the authors who have had a share in the production of the work. The number of these is no less than twenty, and among them are such familiar names as Tarleton H. Bean, John A. Ryder, and R. Edward Earll.

The work is divided into five parts: i. mammals; ii. reptiles and batrachians; iii. fishes; iv. mollusks; v. crustaceans, worms, radiates, and sponges. Of the mammals the whales and porpoises are described by G. Brown Goode; seals and walruses, by Joel A. Allen, and Henry W. Elliott, who contributes a chapter on the life-history of the fur-seal; manatees and the Arctic sea-cow, by Frederic W. True. The reptiles and batrachians are also treated by Mr. True. Mr. Brown Goode is responsible for the greater part of the portion dealing with the fishes. The part on mollusks consists of two chapters, one on mollusks in general, by Ernest Ingersoll; one on the oyster, by John A. Ryder. Part V. is the work of Richard Rathbun.

The work of Mr. Brown Goode is always lucid, systematic, and complete. In his account of the whales and porpoises he does not give technical zoological diagnoses, these being, as we have already mentioned, intentionally omitted throughout the work, but he gives the accepted name with its authorities accurately indicated. He describes fully, with references to all the literature of the subject, the distribution, habits, food, and reproduction of all the species having an economic value. Figures of nearly all the species are given; these are taken from various sources, some prepared specially for the present work, some copied from the plates of existing zoological memoirs.

A discrepancy occurs between the title of one of the figures and the description contained in the text: the porpoise sperm whale is stated to have been described by Prof. Gill, under the name *Kogia Floweri*, while the figure given is entitled *Kogia Goodei*, True, the pygmy sperm whale. Two sketches illustrating the whale fishery are reproduced in Plates 3 and 10. The account of the "right whales" is not altogether clear. It takes some time to find out that the species generally known as the "right whale" is *Balæna mysticetus*, L., which is the Arctic whale, or bowhead; while the true right whale is Eubalæna, Cope: but the assertion that *Eubalæna cisarctica*, Cope, is not remotely related to *Eubalæna biscayensis* of the Eastern Atlantic, remains a puzzle.

Mr. Allen's work on the seals is thoroughly satisfactory, and the history of the fur-seal at the Pribylov Islands, given by Mr. Elliott, contains the results of accurate personal observation, which has at last elucidated the meaning of the peculiar and long-known habits of this species. The movements of *Callorhinus ursinus* when absent from its breeding places remain for the present obscure, but the reason why it seeks its breeding places so regularly, and the facts of its reproduction—knowledge of which is necessary in order that a permanent diminution of the numbers of the animal may be avoided—are clearly set forth in this essay.

The illustrations of the account of the seals and of Mr. Elliott's essay are particularly good. Among the former are two maps of the world, showing at a glance the geographical distribution of the useful seals. Mr. Elliott's original sketches of the fur-seal at home in the Pribylov Islands are very spirited and interesting.

Mr. True gives an account of the South American manatee, and reviews lucidly the history of the extinct Rhytina of Behring's Strait.

The chapter on the reptiles and amphibians is entirely unillustrated, for what reason does not appear. The reptiles which afford products useful to man are the alligator, the turtles and tortoises, and one frog—*Rana catesbiana*, Shaw—the bull-frog. This last animal is cultivated in several localities, the eating of the hind-legs being common in most towns of the States.

The note at the commencement of Part III. on the food-fishes is a little inconsistent. "We anticipate the criticism that the book is of no use in identifying the different kinds of fish, by the statement that we expressly desire that it shall not be," is one sentence; and another is, "Most of our important species can be identified by reference to the plates." What the writer evidently means to say is that each species mentioned is accurately figured and receives its correct technical name, so that any one interested in fishes can find out the zoological name of his specimens from the plates, and can read all about range and economical uses, while for more detailed scientific treatment reference must be made to speciegraphical works in ichthyology. Various ichthyologists have contributed to this portion of the work. The fishes of the Pacific coast are the special province of David S. Jordan, while one or two species, like the Californian salmon and the carp, have been allotted to pisciculturists specially familiar with them. Many vexed questions in the biology of fishes are discussed by Mr. Brown Goode with his usual lucidity and comprehensiveness. The pages on the reproduction of the eel, for example, are very interesting reading, and this is by no means a solitary example. The food-fishes naturally take up a large portion of the whole work. They occupy more than half of the volume of text, extending to more than 500 pages. In the plates there is one feature which we have after serious efforts completely failed to understand. On nearly every plate there is a straight line below each figure, apparently intended as some standard of measurement; but the meaning of these lines is not explained.

In his chapter on the mollusks Mr. Ingersoll has not always observed the rule strictly followed in the rest of the work of giving the authority for each specific name used. He gives an account of the distribution of the numerous other species of Lamellibranchs used as food in the United States, but gives no description of oyster-beds. In Mr. Ryder's account of the life-history of the oyster there is a great deal of interesting detail about anatomy and development, and about the writer's own experiments in oyster-culture, but a general account of the distribution of *Ostrea virginica* is wanting. This is a surprising omission, and one much to be regretted.

Why Mr. Rathbun, even in a work intended for general readers, should unite together Echinoderms and Cœlenterates as Radiates is a question which it would be difficult to answer. The name Radiata would require to be considered in a history of zoology, but it is impossible to justify its use in the classification of animals for any purpose in the present state of science. But this and the other slight defects we have pointed out do not make a very great reduction in the value and completeness of the whole work. The labour spent in its preparation has been very great, and the result is a lasting monument to the industry and scientific capacity of Mr. Browne Goode and his numerous fellow workers.

REMARKS ON THE EGGS OF BRITISH MARINE FISHES[1]

THE majority of marine fishes, in regard to reproduction, readily range themselves into certain groups according to the condition of the eggs on deposition. Thus (*a*) a considerable number have delicate pelagic ova, which are generally separate, though in the frog-fish, for instance, they form gelatinous masses. (*b*) Others are characterised by the deposition of thick-walled ova, connected together in more or less firm masses, on or near the bottom, or in special nests. (*c*) A third group is distinguished by laying ova which have filamentous processes or adhesive surfaces for attachment to foreign structures; and some place them in brood-pouches of the males, in which case, however, the capsules appear to be

[1] By Prof. McIntosh, F.R.S., &c., St. Andrews Marine Laboratory.

more delicate. (*d*) A fourth series have their large eggs enveloped in dense horny capsules, which either are fixed by their twisted filaments to marine bodies or find sufficient protection on the extensive sandy flats where they are deposited. (*e*) Finally, a few produce living young, this condition ranging from the well-marked ovo-viviparous *Zoarces* to the even more complex state in the sharks.

It would seem, as far as present observations go, that in those fishes which shed their eggs on the bottom, or in brood-pouches, the ova are matured simultaneously in the ovaries, so that the act of deposition is performed rapidly. This is exemplified in the *Cotti*, in *Agonus* (*Aspidophorus*), *Cyclopterus*, *Liparis*, the herring, and others. In the case of fishes with pelagic ova, on the other hand, the ovaries mature and shed their contents at intervals, so that the process of spawning occupies a period of greater or less duration.

There is little difficulty in the case of the pelagic ova of our shores, such as those of the cod, haddock, whiting, bib, ling, rockling, gurnard, and others in artificially impregnating and hatching them, even from fishes that have been dead for some hours. The mortality, however, from excessive cold and heat is very considerable in a marine laboratory, since the limited quantities of sea-water contained in vessels a foot or even a yard or two across are much more subject to such influences than the vast body of water in the sea. It has to be borne in mind also that the sea-water usually employed in such researches is shore-water, and liable to considerable contamination from the estuaries of rivers and streams—besides other impurities. The difference, indeed, between such water and that of the open sea was illustrated in 1884 (NATURE, vol. xxxi. p. 536), when the pelagic ova of the cod could be more successfully hatched in the large glass vessels ("drop" bottles) in which they were conveyed from the fishing-ground without change, than in the ordinary water dipped from the shore and frequently renewed. In like manner eggs of plaice fertilised on the same ground this year (for which I have to thank Capt. Burn, of St. Andrews) were conveyed quite safely, even after a week's vicissitudes in a stoneware jar amongst sea-water—lightly tied over with "cheese" cloth. During the late winter ova of various kinds suffered severely, however, and the effects of such changes of temperature on the embryos were even more pronounced.

The first series of eggs of the haddock were fertilised on the 15th, and the second on the 16th of February, but the rigorous weather proved ultimately fatal to both. The earlier stages proceeded satisfactorily, but the water in the vessels by and by was frozen on the surface—softish flakes of ice forming a thick coating—on which many of the ova were elevated. No sooner was this ice broken than all or almost all the ova were observed to present the whitish patch and sink to the bottom. Some of those which had floated in mid-water or under the trickle from the supply-pipe escaped destruction, but in a few days they also succumbed after a night of unusual severity, and after the embryos had been outlined. On the other hand, a few ova carelessly thrown at the same period into a small vessel of sea-water in the window of a library escaped injury and developed quickly, though the water remained unchanged.

In the sea the danger from such extreme cold would be minimised, since these pelagic eggs in winter and spring do not float quite at the surface, but always some distance beneath it.

Under the same circumstances in the laboratory the intense frost proved fatal to many adult viviparous blennies and Montagu's suckers, though only the surface of the sea-water in the large glass vessels was coated with the softish flakes of ice. The fluid in the ovaries of the pregnant examples of the former was frozen into a solid mass, as was also the liquid in the urinary bladder, yet the animals were surrounded in all cases by sea-water.

In the Report to H.M. Trawling Commissioners in 1884 reference was made to the statement by Alex. Agassiz (*Proceed. Americ. Acad. of Arts and Sci.* xvii. p. 289, 1882) that the ova of several species of *Cottus* float. In his recent beautiful memoir along with Whitman (*Mem. Mus. Comp. Zool.* xiv. part i. 1885), he again returns to the subject—giving figures and descriptions of the ova of the so-called *Cottus grœnlandicus*, Cuv. and Val., which he found in a pelagic condition abundantly during the summer months, especially in July. The authors, indeed, appear to have met with the ova only on the surface of the sea, and do not seem to have identified them with those in the ovary of the species indicated, which in our country is supposed to be only a variety of *Cottus scorpius*, L. Unless, therefore, the *Cottus grœnlandicus*, C. and V., of Prof. Agassiz, is a form very different, there is room for doubt in regard to this interpretation of its oviposition.

The spawning of the *Cotti* in this country wholly diverges. Instead of the issue of the eggs in detachments, as in most fishes with pelagic eggs, the ovaries of the *Cotti* become distended at the breeding-season with ripe eggs of a uniform size, which are generally deposited in a mass at once—along with a transparent mucous secretion. When ejected into the water the eggs adhere together, but at first they can hardly be lifted on account of the soft and yielding nature of the connecting medium, though they do not readily separate. In a few hours the hardening of the connecting medium and the egg-capsules stiffen the outer layers of eggs, but the central region is still soft. The process of hardening is thus somewhat slow, and apparently depends on free contact with sea-water. These eggs are comparatively large and thick-walled, as well as slow in development, the embryo being ushered into the world in a much more highly organised condition than in the embryos from pelagic eggs. There is, indeed, little resemblance between Agassiz's form and the young *Cottus*, which is considerably larger, is variegated with much pigment, has rudimentary lamellæ (papillæ) on the branchial arches, complex circulatory organs, and a small yolk-sac possessing a single large oil-globule; and it shoots upward into the surrounding water like the young *Liparis* and *Cyclopterus*.

While the newly-hatched *Cottus* therefore greatly surpasses Agassiz's type in complexity, there are certain marine forms, *e.g. Anarrhichas*, which as greatly surpass *Cottus*. This will be evident when it is mentioned that the strongest embryos of the wolf-fish are much more highly developed on their escape from the egg than the salmon is for a week or two subsequently. Artificial stocking of the sea with the valuable food-fishes, such as the cod and haddock, would have been comparatively easy if their ova and embryos had been as readily handled and reared. However, since a noteworthy increase in tenacity has been observed in certain forms as soon as the yolk-sac has been absorbed, there is room in this respect for further investigation.

THE HONG KONG METEOROLOGICAL OBSERVATORY[1]

THIS first-class meteorological observatory was erected in 1883, and the regular work of observing began on January 1, 1884. Weather Reports appear monthly, and we have now before us the observations and work of Mr. Doberck and his staff for the first two years. For the first two months the work was restricted to eye-observations, but meanwhile no time was lost in erecting the barograph, thermograph, anemograph, pluviograph, and sunshine recorder, which are similar to those in use at Kew; and from April 1, 1884, the Monthly

[1] "Observations and Researches made at the Hong Kong Observatory in the Years 1884 and 1885." By W. Doberck, Government Astronomer.