REVIEWS.

CATALOGUE OF THE MARINE INVERTEBRATA OF EASTERN CANADA. By J. W. Whiteaves, LL.D., F.G.S., F.R.S.C. Geological Survey of Canada, pp. 271. 1900.

The publication of this catalogue will be hailed with genuine delight by zoologists the world over, and especially by marine biologists on this continent. Dr. Robert Bell, the eminent head of the Geological Survey, in his introductory note, modestly expresses the hope that it may stimulate to renewed activity Canadian naturalists, who have taken up marine researches, and he very appropriately refers to the opportuneness of the appearance of this catalogue soon after a Marine Biological Station has commenced its work on our Atlantic shores.

Dr. Whiteaves would be the first to disclaim for this catalogue its title to be considered a *magnum opus*, yet such it is, and as such it will be regarded by American naturalists in the future. Hitherto reliance had to be placed on scattered and fragmentary lists and notices by Canadian workers, or to the memoirs and catalogues published in the United States, and professedly dealing less with Canadian than with United States' local faunas. Now we have a faunistic list of our own so far as marine invertebrates are concerned. Two features at once strike the appreciative reader on perusing this catalogue,—first, the extensive geographical area it covers, and the large amount of material it embraces (the species enumerated being over a thousand in number) and second, the care and accuracy revealed on every page of the publication. This latter characteristic the scientific world has long recognised in all Dr. Whiteaves' work and any one familiar with the reports, now somewhat venerable for they date back thirty years, in which Dr. Whiteaves summarised the results of his dredging expeditions in the estuary and Gulf of St. Lawrence, the Bay of Chaleurs, and the Bradelle and Orphan banks as well as parts of the coast of Cape Breton and Prince Edward Island during the years 1871, 1872 and 1873, which reports were published by the Department of Marine and Fisheries, will experience no surprise at the extent of the coastal waters covered by Dr. Whiteaves in the present catalogue. What an infinite amount of labour is represented by

the 271 pages of this work only those who have attempted faunistic lists can realise. True, it is largely drudgery : but it is pioneer work without which no future progress is possible. That a large proportion of the species of Sponges, Echinoderms, Worms, Hydroids, Mollusks, Crustaceans, Ascidians, etc., have passed through the author's own hands—a considerable proportion dredged by himself, is clear from the references : but in the preparation of so ambitious a list as that covering the invertebrate fauna of our Atlantic coast, reliance has also been placed upon the reports published by various United States workers, and many of the determinations of these workers are already undergoing revision. It seems, for instance, hardly credible that our Atlantic waters can boast at least nine distinct species of *Spirorbis*, the sedentary, almost ectoparasitic, habits of this Polychæte, when adult, favouring variations in the form and physical characteristics of its coiled tube, which may not justify the creation of so many species. As Verrill has pertinently remarked, and Dr. Whiteaves quotes the observation on p. 68, "The animals of the various species of *Spirorbis* are still very imperfectly known, and many species have been described from the tubes alone. Accurate descriptions or figures of the animals are necessary before the species can be determined satisfactorily." The Marine Biological Station founded in 1898 by the Dominion Government, freely opening its doors to all qualified scientific workers in the Dominion, will no doubt render substantial aid in confirming or in correcting current diagnoses of such species, a station of this character facilitating the study of the animals in a living or, at least, in a fresh condition, and providing the needed facilities for the accurate determination of species. It is revealing no secret to say that several marine invertebrates and vertebrates secured by the staff of the Canadian Station at St. Andrews, N.B., in 1899 and 1890, and at Canso in 1901, are not referable to any recognized Canadian species, and will of necessity be announced as additions to our marine fauna. A *Priapulus* dredged at Canso last August did not appear to resemble any known Canadian species.* But while such additions

* Dr. Whiteaves appears to be in doubt as to the identity of the specimens he secured in adjacent N. S. waters, and places a query after *Priapulus caudatus*. Lmk. (p. 89).

are to be expected for some years to come, there is every probability that many lengthy lists of species will be cut down, when the life-history of the young, and the anatomy and morphology of the adult stages, of many species have been studied in detail by Canadian zoologists.

The following enumeration gives a tabulated summary of the species set forth in Dr. Whiteaves list:

	No. of species.
PROTOZOA.	
Foraminifera, 63 species	
Radiolaria, 1	
	64
SPONGES.	
36 (exclusive of 2 Hudson Bay species.)	36
CŒLENTERATA.	
Hydromedusæ, 66 species	
Scyphomedusæ 5	
Anthozoa, 44	
Ctenophora 4	
	119
ECHINODERMATA.	
Crinoidea, 3 species	
Holothurioidea 15	
Asteroidea 29	
Ophiuroidea 21	
Echinoidea 3	
	71
MARINE WORMS.	
PLATYHELMINTHES	4
NEMERTEA	21
CHÆTOPODA	106
GEPHYREA	7
BRACHIOPODA	428
POLYZOA	3
MOLLUSCA	115
Pelecypoda, 100 species	
Scaphopoda, 5	
Gasteropoda, 164	
Cephalopoda, 13	
	282
ARTHROPODA.	
Crustacea	198
ARACHNIDA	11
CHORDATA.	
Urochordata	27
	1064

Our Atlantic waters, it cannot be doubted, abound with animal life, indeed in some localities there is a plethora which is almost incredible. Those naturalists who were privileged to pursue researches in the new marine station at St. Andrews, during the two seasons when it was located there, were familiar with the spectacle which Dr. Whiteaves describes in a passage from Dr. Stimpson on p. 44. The large reddish or blackish purple sea-cucumbers, resembling the garden vegetable in shape, but soft, slimy and elastic to the touch, were so abundant that the dredge often came up heavy and packed tight with their plump and writhing bodies. Considerable areas in the waters of Passamaquoddy Bay are indeed black with the crowded assemblages of these curious Echinoderms. The delicacy so much coveted by the Chinese called "trepang" is really the dried and prepared bodies of these interesting animals. In our utilitarian age a catalogue such as this may even stir some enterprising business man to create a "trepang" industry on the Atlantic coast. Hyrtl it was who showed a visitor a stained section of a kidney under the microscope, and the visitor straightway designed an attractive wall-paper based on the stained histological section shown to him. Dr. Whiteaves need not be alarmed if, while his valuable catalogue is of infinite worth to his brother scientists, it prove also an incentive to a new fishery enterprise! In contrast with the large fleshy *Pentacta frondosa* is the small delicate and transparent *Pentacta minuta* of Verril, a species first distinguished as *Cucumaria minuta* by Otto Fabricius in 1780, but which there is every reason to believe, now, is the small immature stage of *P. frondosa*. Dr. Martin Duncan and Mr. Sladen suggested this, as Dr. Whiteaves mentions on page 44, and the numerous specimens examined alive at St. Andrews in 1899 and 1900 support the suggestion. The curious "Sea Orange," *Lophothuria Fabricii*, Duben and Koren, a congener of the sea-cucumbers, is recorded by Dr. Whiteaves as occurring all the way from Grand Manan to Temple Bay in Labrador. Its somewhat flattened shape, (not unlike a small shoe with the opening for the foot closed up) and covered with dense overlapping scales, renders it one of the most peculiar of littoral prizes; but it is strange

that the much more familiar *Psolus phantapus* is recorded only from Grand Manan, at 40 fathoms depth, and at Eastport and in the St. Lawrence estuary. Of the Sea Urchins, three Canadian species are here placed on record, while the Starfishes embrace eight species, Dr. Whiteaves rightly concurring in the view that the huge specimens of "Five fingers," measuring 12 or 15 inches across are simply over-grown *Asterias vulgaris*, which usually measures 4 or 5 inches across. The six-rayed Starfishes, abounding below Rimouski, have been by many observers regarded as abnormal "five-fingers," but they are referable to *Asterias polaris* Müll. and Trosch, and range from the Nova Scotia banks to Cape Chidley in Labrador. Of special interest are the three species of *Antedon* occurring in Nova Scotian and southern New Brunswick waters. Future dredgings may add to this list of species, as well as extend their Canadian distribution, though the Crinoidea belong to a past epoch, and of the 1500 species existing in Palæozoic times a meagre remnant now remains in our seas. Their stalks and ovate or globular bodies abound in the rocks upon which Ottawa stands and testify to their abundance in the old-time seas.

It is impossible in a short notice like the present to refer even in the briefest way to many of the suggestive thoughts aroused by a perusal of Dr. Whiteaves' catalogue. One point, however, may be referred to as possessing a very general interest. It bears directly on the fascinating problems of animal distribution. A great proportion of species named in this list are Unistoniam, to adopt the Dominion Statisticians' uncouth yet expressive adjective (as a substitute for the misused term American), or at any rate they are regarded as peculiar to this continent. Our lobster is *Homarus americanus* not the *H. vulgaris* M. Edw., of Europe, yet the differences would be difficult to define. Prof. Knight of Kingston found that a small cephalic gland present in our lobster is absent in Scottish specimens, and Prof. Herrick states that the European lobster's stages of larval development have been abbreviated, so that it is of larger size at a corresponding age than our species. Further study will show whether the differences are essential and specific, or unimportant and varietal merely. Certainly the common whelk of our shores though called *Buccinum undatum*, L., may

ultimately justify Reeves' name *B. labradorense*, for features shown in the egg-masses, and in early stages of development exhibit differences quite marked as compared with the British form. Dr. Whiteaves' comparison of living adult specimens, however, from both sides of the Atlantic showed them to be practically undistinguishable from each other. The ten species of *Buccinum* mentioned in this catalogue would well repay renewed study, especially if the study included the ova and the embryonic stages. Curiously enough the small Dog-whelk (*Purpura lapillus*, L.) arouses such question. Its adult stage as well as its characteristic vase-shaped egg cases are identical with those of the European form, nor does the periwinkle (*Litorina literea*, L.) stir up any doubts. Indeed its identity with the East-Atlantic form has been so long recognized that Nova Scotian naturalists have for more than a quarter of a century supported its non-indigenous character. Dr. Whiteaves (p. 173) seems inclined to favour the view that it has been introduced from Europe. If so its dispersion and its local abundance everywhere are most astonishing. There are few rocky spots on our Atlantic shore where the periwinkle does not occur in countless myriads. The allied species *Litorina rudis* (Maton) is recorded only for our more northern coast extending into Hudson Bay, but no doubt it will be yet found further south.

Just as so many of our mammals, birds and fishes correspond to but are not identical with European species—our moose differing from the European elk, though not extremely so ; our whitefish, sturgeon, pike and trout unlike, yet in many respects resembling, the corresponding species in Europe, and our eastern salmon being according to the authorities not distinguishable from the British salmon (*Salmo salar*, L.), so our invertebrate forms differ in so many respects yet may in some cases be essentially undistinguishable.

A recent remark by the famous British zoologist, Professor McIntosh, to whom Dr. Whiteaves was indebted for diagnosing the Annelids, emphasizes this point and shows how much our naturalists have to do before the determination of many zoological species can be regarded as final. Dr. McIntosh says : "The exact relationships of the American Phyllodocidæ to European forms have yet to

be more rigidly determined. Further, more accurate figures of the brist'es and other parts are required." In a recent paper in the "Annals of Natural History" (London, September, 1901) Prof. McIntosh publishes some notes on at least six species of marine worms procured by Dr. Whiteaves, and though the British authority is the most eminent expert in that group of invertebrates, and has diagnosed myriads of specimens from all parts of the world and established numberless new species, yet of these specimens of Canadian Phyllodocidæ only one species is in every detail identical with a European form, viz., the ubiquitous *Phyllodoce grœnlandica*, Œrsted," taken abundantly on Bradelle Bank and 15 miles southeast of Bonaventure Island. Other specimens closely resembled *P. laminosa*, Sav., and others again differed from both. Of three species of Eteone, one, *E. spetsbergensis*, Mgrn., was unquestionable, but two other species approached either *E. lentigera*, Mgrn., or *E. cinerea*, Webs. and Bened. An appropriate means of escape from the dilemma so often presented by Canadian species is to call them *Canadensis* or to do as Professor McIntosh did in the case of the graceful Polynoid worm, *Malmgrenia whiteavesii*, or as Professor Verrill did in naming a pretty shell *Cerithiella whiteavesii*, and a unique zoophyte *Actinopsis whiteavesii*.

The author in his prefatory remarks points out that most of the invertebrates were obtained on the floor of the sea or collected in littoral regions, hence such widely scattered species as the aberrant Chætognath *Sagitta* does not occur in the catalogue, though pelagic Ctenophores like *Pleurobrachia*, *Bolina* and *Idyia* are mentioned on the authority of certain United States observers, and the interesting occurrence of the lovely sea-butterfly (*Clione limacina*, Phipps) is recorded near Belle Isle Straits on the authority of Dr. Deeks, other specimens being also referred to, from more northerly regions.

The usefulness of this catalogue, if it is permissible to make the suggestion, would be vastly increased by the addition of an index. An index would save time and would certainly facilitate reference to its pages by those not familiar with marine zoological nomenclature, and many such, it is to be hoped, will use this excellent work of reference.

Dr. Whiteaves in the early pages of his work adverts to the faunistic regions indicated by the distribution of species included in the catalogue. We know too little of the local disposition of the marine vertebrate and invertebrate life of our Atlantic waters to arrive at any satisfactory solution of this interesting problem as yet. The influence of the Gulf stream on the one hand, and of Arctic currents bearing their annual burden of icebergs, on the other, complicates the problem greatly. The occurrence of *Clio limacina* within the Gulf and the capture in the Gut of Canso of Scomberoids and other fish belonging to a southern range almost Mexican in its limits, sufficiently indicates the complexity of the conditions presented.

It is however the difficulty and complexity of the problems to be solved which stimulate scientific inquiry, and within the next decade more will he done in marine biological research in Canada than has been done for half a century. The scientists who will carry on valuable and luminous work and who will reveal to us more and more fully the marvels of life in our Canadian seas will have no basis so ample and trustworthy—none so indispensable as Dr. Whiteaves' Catalogue of the Marine Invertebrata of Eastern Canada. It is a work in Canadian Zoology worthy to mark the first year of a new century.

E. E. P.

A CHAPTER ON THE PLEISTOCENE GEOLOGY OF NORTHERN ASIA. RECENT GEOLOGICAL CHANGES IN NORTHERN AND CENTRAL ASIA. By G. Frederick Wright. Quart. Journ. Geol. Soc. London, Vol. 57, pp. 244-250. 1901.

This paper is the result of an examination of "those portions of the Asiatic continent which most nearly correspond in general superficial conditions to the glaciated portions of America." Prof. Wright has ascertained that the actual agency of wind in the deposition of the loess is evident throughout the mountainous track to the east of the border of the high plateau; further, that there were other areas of loess so large and so level that wind