

lands of the Western Canadian Arctic Archipelago. All freshwater and anadromous species known from the area are illustrated and described. Species that only occasionally enter freshwater in the area or that occupy freshwaters adjacent to the area are included in the keys. The Bulletin concludes with a section on collecting and preserving aimed at encouraging the interested layman to contribute to our knowledge of the Ichthyofauna of this little known part of the world. A bibliography is provided.

Although first impressions might lead one to suppose the scope of this publication was too limited to be of much general interest, this is not so. The outline of geological history is mainly concerned with glaciation and the pattern of retreat of the ice following the last glacial period, the Wisconsin. Of most interest here in terms of the fish fauna are changes in drainage patterns and formation of post-glacial lakes. The zoogeographical section considers the probable dispersal of fish species from three refugia: the Pacific, the Bering and the Mississippi — in which they survived the last glacial maxima. The reconstruction of dispersal routes and origins of the freshwater fish fauna of Alaska and the Western Canadian Arctic is very plausible and the authors have obviously tried very hard to be objective. Considering the nature of the evidence and the scarcity of collections from the area they are to be congratulated for their ingenuity.

The keys provided in the book are simple and well illustrated. By using the methods of identifying fish section, and the glossary, anyone with a little patience should be able to identify any species of freshwater fish from the area under discussion. Even the key to the juvenile salmonids seems to be workable and these are particularly difficult to identify.

The species accounts are well rounded and as complete as possible. They are illustrated by beautiful and accurate line drawings, almost all done by Mrs. Jean Ramsey Maher. A distribution map shows localities from which the authors have examined specimens and a small inset map shows the known natural distribution of each species. Distinguishing characters are given. A description gives taxonomic details such as counts of gill rakers, fin rays, scales, vertebrae and pyloric caecae as well as notes on colour and sexual dimorphism. The distribution is described. Taxonomic notes give information on nomenclature and synonyms. Problems that have arisen possibly as a result of speciation in different refugia and subsequent intermingling of forms are aired where appropriate. A conservative approach is taken by consid-

ering the resultant forms as complexes, e.g. *Coregonus clupeaformis* complex, and *Osmerus eperlanus* complex. Postglacial dispersal is described and an account of the biology of the species gives information on habits, age and growth, diet, fecundity and any other information about the species in the area that is available. This is generally a comment on commercial or native exploitation of the species.

I have only one regret about the publication and that is that it did not cross Hudson Bay and include northern Quebec, Labrador and the eastern arctic in its scope. It would have required very little more effort to add the Atlantic refugia and include this area.

The coloured illustrations are disappointing and do not match up to the otherwise excellent quality of the Bulletin. I hope if the Fisheries Research Board is to continue using coloured plates a better quality of reproduction can be achieved. All in all this is a good book which should find its way onto the shelves of anyone with any interest in northern freshwater fishes.

G. Power

GEOLOGIC MAPS OF ANTARCTICA. BY CAMPBELL CRADDOCK *et al.* *Antarctic Map Folio Series, Folio 12.* New York: American Geographical Society, 1969-1970. 17 x 11 inches, 23 maps. \$12.00.

The publication of "Geologic Maps of Antarctica", which coincided with the SCAR/IUGS Symposium on Antarctic Geology and Solid Earth Geophysics in Oslo last August (1970), is a welcome event for both antarctic geologists and those interested in southern hemisphere paleogeography and biogeography. The organisation is such that the basic elements of the geology are clearly displayed for the casual viewer, and yet a closer examination reveals the most detailed and extensive compilation of antarctic geological data to date. Folio 12, which was begun in 1964, was accomplished through the co-operation of 25 geologists from eight countries.

The folio includes two groups of maps. The first comprises regional geologic maps, mostly at a scale of 1:1,000,000, which cover virtually all the areas of known rock outcrop on the continent. These were compiled by invited geologists with the fullest knowledge of each region. The second group comprises four maps of Antarctica compiled by Dr. Craddock from the regional maps and other sources. They show, at a scale of 1:10,000,000, fossil localities, sampling lo-

calities for radiometric age determinations, bedrock geology, and tectonic elements and features. A fifth map showing geomorphic features was compiled by Dr. R. Nichols. The Folio concludes with a map portraying the other Gondwana continents fitted around Antarctica, and keyed by the several major tectonic boundaries that meet continental margins.

The regional sheets, with rare exceptions, include a geologic map, locality map, explanation, a narrative of between 800 and 4,000 words, an extensive bibliography and a table of radiometric ages in the region. The geology in each sheet is divided into between 7 and 12 major rock units, and is portrayed in strongly contrasting colours. Colours and rock units are consistent from sheet to sheet for the most part, though readers may be confused by the overlapping part of sheets 13 and 14, where the same outcrops are shown as different rocks and in different colours. Gondwana stratigraphers will be disappointed that the Beacon strata are not separated into the Taylor and Victoria Groups, corresponding to the Cape and Karroo Systems in South Africa, but at the time of map compilation the lithologic differences and the time break between the groups were just beginning to be appreciated by antarctic geologists. The narratives include a brief history of exploration, geomorphology and glacial geology, bedrock geology, structure and geological history, and consequently are interesting and useful to both casual reader and specialist. It is indeed regrettable that no such account accompanies the two sheets covering the Antarctic Peninsula. The area is complex geologically, and at the Oslo conference it was evident that on several topics there are strongly conflicting points of view. An explanatory narrative would have been of help to those of us east antarctic geologists who would like to understand more Peninsula geology but are not sure where to begin. The bibliographies appear to cover virtually all geological work in the areas with which the reviewer is familiar. However, few bibliographies include papers published since 1967, as most contributions had been completed by then. Several sheets include stratigraphic section columns to show details of the stratigraphy and fossiliferous intervals.

The maps of the continent as a whole will be useful to both the global and local geologist, though the antarctic geologist will notice some omissions. The bibliography of paleontology does not include several important reports^{1,2,3,4} though at least some of their localities appear on the map. The

global geologist should be wary of comparing numbers directly on the radiometric map, for the introduction states that no attempt was made to standardize the data by recalculation. Readers also will have difficulty comparing the geological or tectonic maps (scale 1: 10,000,000) with ice thickness maps (1: 13,600,000) and gravity and magnetic maps (1: 15,000,000) from other folios in the series. In the tectonic map of Antarctica Dr. Craddock updates a picture whose main outline became established about a decade ago, but no attempt has been made to accommodate the problematical trend of the Ellsworth Mountains. The map illustrates problems, rather than solutions, though even that aroused debate from Russian colleagues, who have a more stable tectonic view of the continent, at the Oslo meeting. Data on the sea floor surrounding Antarctica would have been a useful addition to the tectonic and geologic maps, though at the time of planning the folio very little was known. Reports at the 1970 Oslo meeting showed how quickly such topographic and geophysical data are coming to hand.

The folio, despite the deficiencies cited, is the most comprehensive review of antarctic geology undertaken so far. It is sure to prove an excellent planning aid for geologists contemplating new projects in Antarctica. The clear presentation will attract many with a passing interest in the continent, and the volume of information it contains will make it an essential part of every Gondwana geologist's library.

Peter J. Barrett

REFERENCES

- ¹Grindley, G. W. 1963. The geology of the Queen Alexandra Range, Beardmore Glacier, Ross Dependency, Antarctica: with notes on the correlation of Gondwana sequences. *New Zealand Journal of Geology and Geophysics*, 6 (3): 307-47.
- ²Gunn, B. W. and G. Warren. 1963. Geology of Victoria land between the Mawson and Mulock Glaciers, Ross Dependency, Antarctica. *New Zealand Geological Survey, Bulletin* n.s. 71, 157 pp.
- ³Laird, M. G. and J. B. Waterhouse. 1962. Archeocyathine limestones of Antarctica. *Nature*, 194. 861.
- ⁴Schopf, J. M. 1962. A preliminary report on plant remains and coal of the sedimentary section in the central range of the Horlick Mountains, Antarctica. *Ohio State University, Institute of Polar Studies Report* no. 2, 61 pp.