

and "Imported manufactured goods" (materials of European or American origin). Both house types and artifacts are placed into wider context in a chapter that deals with the impact that access to trade goods has on the material culture of Eskimos. Finally, Akulivikchuk is placed into a "Central-Based Wandering" settlement type on the basis of subsistence patterns which appear to have existed in the middle Nushagak region during the nineteenth century.

"Akulivikchuk" closely follows the format of "Tikchik Village" (published in 1968 as Vol. 56 No. 3 of this series) in its descriptions of houses and other structures excavated. Illustrations (houseplan drawings) are generally adequate although not very sophisticated. Plates showing the recovered artifacts fare better.

Artifacts are discussed by type, without reference to their distribution at the site. One wonders if mention of their locational distribution might not provide worthwhile additional information. Description and discussion of the various artifact types is fairly detailed so that the reader is left with a good idea of the implement under discussion.

Analysis of more than 300 pieces of non-Eskimo pottery provides VanStone with a lot of information on 19th century trade ware. Most of it was made over too long a time period to be useful in the dating of the village of Akulivikchuk, but several pieces of crockery are impressed with manufacturers' marks that were only used in the middle of the nineteenth century. Four-holed buttons (manufactured after 1860), and several rifle cartridges provide additional clues that occupation at Akulivikchuk spans a good part of the 19th century.

Akulivikchuk is not an impressive site. Excavations there yielded relatively few artifacts which appear to be deposited without any kind of stratigraphy, and suggest only that the village was occupied during and immediately after contact. But it does provide evidence that peoples living along the middle Nushagak shared in the general culture change that affected much of Southwestern Alaska shortly after contact.

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**CIRCUMPOLAR CHARACTERISTICS OF ANTARCTIC WATERS.** BY A. L. GORDON and R. D. GOLDBERG. *Antarctic Map Folio Series, Folio 13.* New York: American Geographical Society, 1970. 17 x 11 inches, 6 pages, 19 plates, 6 figures. \$6.00.

This volume, folio 13 in the 20-folio series

designed to summarize the present knowledge of Antarctica, is devoted to a description of the vertical and horizontal structure of antarctic waters. It is a colourful atlas portraying the most commonly measured physical and chemical properties of the sea from the antarctic continent to 40° S.

Data from more than 5,800 hydrographic stations occupied over the last 50 years include considerable new data from the R/V *Eltanin* as well as all available material from the National Oceanographic Data Center. They are dealt with in a short text and summarized in 19 beautifully executed colour plates. Thus this atlas affords a useful summary of the temperature, salinity and oxygen distributions.

General circulation and water masses; sources and reduction of data; and results are discussed, together with a smattering of oceanography including the location of temperature and salinity minima.

Three methods of data display are employed in the colour plates. Horizontal sections of contoured temperature (T), salinity (S), and oxygen (O) data (Plates 2 to 8) printed in 6 hues with shades and tints of each to make 18 variations, are a thing of beauty. The colours are intense and well chosen to show gradations in value of each property (T,S,O) and yet contrast with the other two variables. Less spectacular but still in three colours, the second method shows (Plates 9 to 16) the averaged temperature, salinity and oxygen data for areas within 5° latitude by 10° longitude. Plates 17 and 18 portray temperature, salinity and oxygen profiles in a N-S direction along 7 meridians. These latter are in the same beautiful colour array as are Plates 2-8.

There are 6 introductory figures within the text. A schematic representation of water masses and core layers, figure 1, aids in their visualization. Figure 2 delineates in polar projection location of the 7 vertical sections of temperature, salinity and oxygen shown in Plates 17 and 18, while figures 3 to 5 depict temperature/salinity (T/S) relationships along 3 of the profiles. The indicated depths, however, are in hundreds of metres and not in thousands as shown. The remaining figure is a polar projection of the location of minimum values of temperature (blue) and salinity (red) at the 200 m. level.

In a compilation where distribution is far from uniform, both time and space variations are inherent in the data and complicate its presentation. Most antarctic data derive from single cruises made within a circumscribed area. Since these observations are spread out over 50 years, and the use of

varying equipments under harsh working conditions frequently affects the accuracy of the data, the discussion stresses the problems involved in averaging values and in quality control. For clarity where many data are available, they have been averaged by various sized areas. Other regions suffer a paucity of data. Where there are no data at all, the blank areas in the highly-coloured patterns give the charts a moth-eaten appearance.

In the horizontal contour charts, surface conditions are omitted; the shallowest contour is for 20 m. At this level one chart is presented for summer and one for winter conditions for each of the three variables, T, S, and O. For depth levels of 200 m. and below, data for all seasons are averaged together.

The smoothed contours of horizontal sections of temperature values are in whole degrees Celsius except for the 2,000 m. and 3,000 m. levels, where they are in 0.5°C. They are vividly coloured from blue to magenta in 2°C. intervals from 0 to 8°C. These irregular contours on an orthographic polar projection generally circle the antarctic continent, with increasing values to the north.

Corresponding projections of salinity sections are contoured in 0.2, 0.1 and 0.05‰, depending on the depth of the section. They are coloured at 0.4‰ intervals in yellow-brown tones which range from bright yellow to brown red.

The third variable on each plate portrays the dissolved oxygen content of the water. Values are contoured in 0.5 ml./l. for all levels and coloured in 1.0 ml./l. intervals. Six shades and tints of green, from a light yellow green to a dark brownish green are used.

In the discussion of the contoured sections, the observed distribution of the variables is explained by eddies or gyres in the circulation, but no chart shows these circulation patterns. It would also be helpful to present some information on ice, which greatly affects the other near-surface variables.

The companion report, *Sound Channels in Antarctic Waters*, includes a brief general description of sound channels; their controlling factors; and their presence and seasonality in the Antarctic. The last plate, number 19, presents 10 graphs of the vertical sound speed structure at designated latitudes along the 19°E. meridian for most of the months. Superimposed on each monthly series of speed profiles are coloured, dashed lines connecting the axes of the sound channels.

Sound channel depths in the Antarctic are interesting in that repeated sections exhibit wide seasonal variations. In some cases a sound channel is shown at two different depths. It makes one wonder how much variability is found in the original temperature and salinity data on which the sound speed was based.

The profiles are a little confusing because the sound speed is plotted as increasing to the left, but the scale implies an increase to the right. Furthermore, the axes of some sound channels are shown to fall along the surface. This is not the common usage of the term "axis", which is rather thought of as a depth of minimum sound speed occurring at some distance below the surface, permitting a channelling of sound by refraction from above, and below. Two polar projections showing geographical distribution of the speed of sound at the depth of the sound channel axis, for winter and summer, complete the plate.

References for the two parts, 23 and 9 respectively, afford ample guidance for further exploration of the subject.

This is an informative, useful and beautiful folio. It has fulfilled well its stated aim of data display and will be enjoyed by anyone interested in the Antarctic.

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FRESHWATER FISHES OF NORTH-WESTERN CANADA AND ALASKA. By J. D. MCPHAIL and C. C. LINDSEY. *Ottawa: Fisheries Research Board of Canada, Bulletin 173*. 1970. 6½ x 9¾ inches, 381 pages. \$8.50.

As an introduction, the authors have devoted the first section of this Bulletin to background information. They provide a history of publications on northern freshwater fishes, an outline of geological history, zoogeographical patterns, summary of dispersal routes, details on classification, nomenclature, the scope of the species descriptions, and methods of identifying fishes. The second and by far the greatest part of the Bulletin consists of keys for the identification of fish families and species and accounts of 59 species found in the area under consideration. This includes drainages on the North American mainland that are tributaries either to the Bering Sea, to the Arctic Ocean from Bering Strait, to Hudson Bay or to the west side of Hudson Bay north of 60°N. Also included are St. Lawrence Island in the Bering Sea and is-