

DENNING HABITS OF THE POLAR BEAR (*URSUS MARITIMUS* PHIPPS). BY C. RICHARD HARINGTON. *Ottawa: Canadian Wildlife Service, Report Series No 5, 1968. 8½ x 11 inches, 30 pages, 12 figures, 9 tables. \$0.50*

The decline in numbers of the polar bear has become a matter of international concern in recent years, but the lack of detailed biological information makes impossible both an adequate appraisal of the status of the species and the definition of appropriate protective measures. In this study, Harington has made a significant contribution to knowledge of the polar bear, and provides a basis for further investigations.

His report is mainly the result of field work undertaken by means of dog sled in three regions of arctic Canada during the period 1961-1964. Although an itinerary is not included, anyone who has attempted to carry out biological investigations during the arctic winter will appreciate the rigorous and physically demanding conditions under which the author worked. His recording of 113 bear dens represents a considerable accomplishment.

The distribution of denning areas, the characteristics of dens, and the activities of bears in such areas are discussed in detail. From his work in Canada and from a survey of the literature, Harington has defined 15 areas in the Arctic where polar bears commonly den, and where, consequently, many cubs are born. Most of these "core areas" are on arctic islands, all but three above lat. 70° N., and their locations are evidently related to factors such as wind, currents, and conditions of ice. Three types of shelters and dens are distinguished, for examples of which plans and dimensions are provided. The number of dens studied was sufficiently large to permit a definition of the factors (for example, exposure and qualities of snow) which appear to influence the choice of location within the "core areas." Bears arriving late in the denning areas were not influenced by the presence nearby of other bears in dens. The temperatures inside two occupied dens were found to be 7.8° C. and 21° C. higher than that of the ambient air. The bears evidently modify the temperatures of the dens by changing the size of the ventilative hole.

Harington found that the duration of denning by individuals is variable, influenced by age, physical condition, and in the case of adult females, reproductive status. Pregnant females seem to stay in longest, while adult males frequently remain active throughout the year. Harington's data on variation in the relative lengths of the annual periods of denning and activity seem to provide an explanation for the frequent absence of distinguishable

annual layers in dental tissues of polar bears, as contrasted with the regular layering seen in such tissues of brown bears and black bears. Evidently, more complex techniques will have to be used in order to establish the age of individual polar bears.

The review of the literature was thorough, and I find only one other paper which might have been included (Parovshchikov, 1964, *Věst. Československe Spol. Zool.* 28: 167-177). The second volume of *Mlekopitaiushchie Sovetskogo Soiuzu* by Heptner *et al.* (1967), which devotes 23 pages to the polar bear, probably was not yet available when Harington's work was completed.

The report is attractively produced, the photographs are of high quality, and the line drawings and graphs are clear and well executed. Through an error presumably at the press, two graphs and a line drawing appear as negative prints; consequently, in Fig. 3, locations designated by "black dots" are shown instead by white dots. Four outstanding photographs by Fred Bruemmer, portraying bears in their natural surroundings, are reproduced in colour on the cover of the report.

Harington suggested that further studies in the "core areas" would help to develop effective measures for the preservation of polar bears. Even before such studies, the protection of the bears in all of these localities, so important for the production of cubs, would seem to be an appropriate initial action.

Robert L. Rausch

ICE EXTENT ON THE SOUTHERN OCEAN AND ITS RELATION TO WORLD CLIMATE. BY J. O. FLETCHER. *California: The Rand Corporation, 1969. 8½ x 11 inches, 108 pages.*

A great amount of information about energy budget and climatic change based on a study of the relevant literature, especially the Russian one, is presented by the author in his clear style, which makes the reading of this paper a pleasure.

It is however advisable when reading this paper to keep in mind, that it is meant as a memorandum, as stated in the preface. Accordingly, it is not a review giving opinions of different authors and weighing these as to their probability, or the influence of different possible assumptions on the conclusions. But it is the personal picture and opinions which the author obtained after a study of the relevant literature, without any attempt from the author's side to justify his choice of particular calculations or observations.

In the first part, elaborated upon in an appendix, the different energy budget components are briefly discussed for the North Polar Ocean and the southern pack ice belt, separately for an assumed full ice cover and for the same areas ice free. In addition, the same budget components are discussed for Antarctica. These discussions of the budget forms are not based on new calculations but on the results from other publications which the author chose as the most likely ones.

The author rightly points out frequently that the observational basis for the energy budget calculations leaves much to be desired and accordingly the results are highly tentative, especially over the southern pack ice belt. A further source of error, inherent in the author's approach is, that different authors used different assumptions with the consequence that their results might not be compatible. This becomes especially evident when, as in Fig. A9, the solar radiation absorbed in the atmosphere is obtained as a residual. In this instance the values seem substantially too high. The implication of this might be that, for instance, the minimum in radiation loss for the atmosphere in summer is not present. Similar doubtful points are apparent at some other places. This however, does not detract from the merit of such compilation of comparative energy budgets.

The author discusses then the implication of advances or delays in the break up period and shows convincingly, its profound effect on the energy budget even with moderate assumptions about the albedo.

For the Arctic ocean the theory is developed that higher cyclonic activity, coupled with warm air advection, advances the break up period.

The second part of the paper concentrates on the relation between pack ice extent and general circulation, and their long and short term fluctuations. For the southern hemisphere a clear seasonal relation between atmospheric heat loss — obtained from the energy budget calculations — and the zonal wind gradient is established. Further calculations with the different energy budgets give interesting numerical values of the changes in atmospheric heat loss with different annual marches of the pack ice extent. The final result given by the author is that a later melting of the pack ice increases the atmospheric cooling in winter, and hence should increase the zonal circulations. Using the empirical results by Lamb that stronger southern hemisphere circulation leads to a northward displacement of all circulation belts in both hemispheres, the author tries to explain with long term records of ice extent in the Orcadas and temperatures at far northern and

southern stations firstly the interrelation between ice cover and general circulation intensity in the south, and then opposite temperature curves in the north and south.

Some of the comparisons given by the author are strikingly good, others rather poor, for instance, if a correlation coefficient of 0.17 is quoted for the relation between ice extent in the Orcadas and a southern hemisphere general circulation index.

In many places in the paper the author points out, that a verification of the hypotheses put forward can only be obtained, once the computer models are further developed to make best calculations in the indicated directions.

To sum up, this type of constructive summarising paper, which is only too rare in present literature, is a valuable contribution. The only general criticism might be that too little is said as to why the author chose the one reference paper in preference to another, which would have given the reader more insight into the uncertainties and diversities of opinion in this field. But this is a minor shortcoming and every student of energy budget and climatic change will have to read this paper and will read it with pleasure.

E. Vowinckel

ESKIMO PREHISTORY. BY HANS-GEORG BANDI, TRANSLATED BY ANN E. KEEP. *College, Alaska: University of Alaska Press, 1969. 6 x 9 inches, 226 pages, 72 figures. \$6.50*

The present volume which appears as Number Two in the University of Alaska *Studies of Northern Peoples* series constitutes an updating of the author's earlier *Urgeschichte der Eskimo*, first published in Stuttgart in 1964. The earlier volume was designed to provide German readers with an overview of the increasingly specialized field of Eskimo prehistory. The present revision now makes Bandi's synthesis available to English readers, and has the additional virtue of including new archaeological material up to 1967, the date the manuscript was completed. This makes possible the inclusion of recent work by Ackerman, Anderson, Dumond, Hadleigh-West, Humphreys, and other northern archaeologists. Quite understandably this additional material further complicates the task of synthesis, although Bandi manages to fit these new finds into his basic *schema*. Moreover, as the author is the first to admit, the very title *Eskimo Prehistory*, is now something of a misnomer, since many finds in the North antedate the development of Eskimo culture as anthropologists now define it, and other significant sites such as the Campus and the site which John Cook and I