occupied at seasonal intervals over a period of from 100 to 200 years in the latter half of the second millenium B.C. by a people with an Eskimo way of life.

Tyara is a stratified site on Sugluk Island off the south coast of Hudson Strait. Here almost 800 Dorset culture artifacts were recovered from three cultural layers that spanned most of the first millenium B.C. Like those who lived at Arnapik, the occupants of Tyara appear to have had an Eskimo-like culture which was adapted to an arctic environment and the hunting of sea mammals. The Tyara site also yielded fragmentary human skeletal material including a mandible bearing morphological characteristics of the Eskimo physical type.

On the basis of comparisons utilizing the materials from these two sites and other recognized Pre-Dorset and Dorset assemblages, the author convincingly demonstrates cultural continuity from one to the other. He is also able to show that not only did Dorset follow Pre-Dorset chronologically, but the two also shared similar ways of life under virtually identical environmental circumstances in the same general geographical area.

Proceeding from these major conclusions, Taylor compares his material to related data from sites throughout the arctic and subarctic regions. By so doing, he is able to demonstrate continuity between the Sarqaq (Pre-Dorset) and Dorset cultures of Disko Bay in Greenland, and to document the *in situ* development of Dorset culture in the eastern Canadian arctic. With reference to this latter conclusion, Taylor rejects the hypothesis that the Dorset culture developed as a result of migration or cultural diffusion from Archaic Indian cultures of the northeastern boreal forests.

In writing this important report, a revised doctoral dissertation, the author utilized data available up to 1960. Delay in publication made it advisable for him to add a postscript in which he summarizes relevant research through 1966. The reader is impressed to discover that more recent work has simply served to support Taylor's conclusions. Equally impressive are carbon-14 dates for the Arnapik and Tyara sites that compare favourably with estimates derived through reference to dated sites in the general area.

Taylor's monograph is thoroughly researched and clearly written. The only major weakness, in fact, is the mediocre photographs which hardly do justice to the variety of small stone artifacts characteristic of the Pre-Dorset and Dorset cultures. It is regrettable that in the past arctic archaeologists have all too frequently been forced to rely to an inordinate degree on personal communications, mimeographed circulars, and hastily written preliminary reports in order to construct their theoretical arguments. Future students of the Pre-Dorset and Dorset cultural manifestations will not labour under such a handicap. This reviewer cannot recall another study in recent years which has provided as many carefully documented and convincing answers to some of the most significant questions raised by nearly half a century of archaeological excavations in the north.

James W. VanStone

GEOGRAPHICAL VARIATION IN THE POLAR BEAR *Ursus maritimus* PHIPPS. BY T. H. MANNING. *Canadian Wildlife Service, Report Series Number 13. 1971. 8½ x 11 inches, 27 pages illustrated, tables and map. $1.00.*

It is the habit of mammal taxonomists to gather large numbers of skulls from various parts of the range of a "species", to make a series of standardized measurements on each of them, then to compare them statistically to see whether or not they vary significantly in different geographic areas. Differences may be great (at the species level) or small (at the subspecies or "population" levels). Skulls are generally used for this purpose because they tend to concentrate, and reflect in their features many of the adaptations of animals to their particular environments. In 1959 T. H. Manning began a study of this nature to see if polar bears differed enough in any part of their range to be called separate species or subspecies. In 1966 the emphasis of his work was shifted to detect population differences below the subspecies level. To do this he took 17 measurements on each of 628 skulls collected by museums, universities and other agencies from many countries, separated them according to sex, age and region, then compared them. His central conclusions are that only one species of polar bear *Ursus maritimus* exists, and that possibly one new living subspecies and another extinct ice age subspecies may be recognized. These conclusions differ from those of Knottnerus-Meyer who described four new species and one new subspecies in 1908, and from those of Birula who recognized a single species consisting of three subspecies in 1932. Further, Manning found that skull size increased from east Greenland westward to the Bering Strait and inferred that a similar trend (cline) extended eastward from Greenland towards the Bering Strait. The difficulty in confirming the exis-

tence of the latter cline arose because insufficient specimens from the Soviet Arctic were available to Manning. Fortunately, this gap has been filled to some extent by Chernyavsky's recent study in *The Polar Bear and its Conservation in the Soviet Arctic* (Edited by A. G. Bannikov, A. A. Kishchinsky and S. M. Uspensky. Leningrad 1969, pages 54-67). He concludes from work on 110 skulls that polar bears are rather homogeneous throughout the Soviet Arctic except for a possible tendency to greater size towards the Bering Strait — which seems to fit Manning's inferred cline.

As previously mentioned, Manning has discovered the possible existence of a new large-sized polar bear subspecies in southern Alaska, which he declined to name because so few specimens were available. Why should southern Alaskan bears differ from those in northern Alaska when no apparent geographical barriers prevent mixing? Manning reasons that during the last glaciation a polar bear population could have existed south of the then present Bering Isthmus, that environmental conditions would have differed greatly north and south of the isthmus, and that these changes would be shown in the bears' skulls. There may be some evidence for the former existence of denning polar bears in southern Alaska, for adult and juvenile remains of uncertain geological age were found in a cave on St. Paul Island [C. Ray, *Arctic* 24(1): 14, 1971]. Is it merely a coincidence that the largest of brown bears, the kodiaks, are known from the same region? Perhaps both types subspeciated in an extraordinarily rich coastal environment on the southern margin of the Bering Isthmus.

In addition to a possible southern Alaskan subspecies, the only other one recognized is *Ursus maritimus tyrannus* based on a massive ulna fragment from late ice age deposits at Kew Bridge near London, England. Like many other mammals which survived the last glaciation, polar bears seem to have suffered a reduction in body size.

Manning's work casts new light on another question. In 1945 a Danish biologist Alwin Pedersen proposed the superficially attractive hypothesis that polar bears — mainly drifting on pack ice — moved in a continual stream around the North Pole with the clockwise surface currents. There is no doubt that some bears are rafted great distances and that others travel far of their own volition, but to me the hypothesis is objectionable because "Pedersen's flow" would be interrupted by the attraction of pleasing local habitats and the repulsion of natural barriers. There is little reason to suppose that polar bears would not tend to remain near good hunting and denning areas; or that they would not be checked in their circumpolar migration by contrary surface currents such as those flowing through most of the Canadian Arctic, by the lack of pack ice and ringed seal prey around southern Greenland, and by the presence of too-solid pack ice (with consequently negligible ringed seal populations) in M'Clure Strait. Recently the Canadian Wildlife Service [C. Jonkel, *Arctic Circular* 21(1): 18, 1971] recovered many tagged polar bears in areas where they were originally marked, which tends to support the idea that relatively discrete populations exist. Taxonomic studies can often provide information on the degree of mixing or isolation between animal populations, and Manning states that in order to maintain the genetic difference indicated by the cline he has detected, polar bear populations must be reasonably stable and non-migratory. Certainly "Pedersen's flow" is an oversimplification of the facts.

Manning arrives at another interesting conclusion: despite marked climatic differences between the northern part of the Canada—west Greenland region and that of southern Hudson Bay, there seems to be no size difference in their polar bear populations. This might be considered as a tribute to the adaptability of the species. Of course, in talking about size, the author refers to skull size, evidently inferring that body size is proportional. Although the inference seems reasonable, I would like to see studies which would prove the point. And what effect does variation in nutrition have on the size of bear skulls and postcranial bones? In contrast to many taxonomists who use only adult skulls for comparative purposes, Manning has devoted much effort to establishing valid criteria for separating three age classes of polar bears so that they can be used in his statistical analysis. This adds to the precision and value of the study, but I cannot help wondering why teeth were not sectioned in order to get a better idea of age — presumably the technique does not apply to polar bears as well as it does to black and brown bears. Although many available specimens lacked sex data, Manning was able to include them in his study by dividing males from females using "skull characters" [presumably Kurtén's (*Acta Zoologica Fennica* 90: 9, 1955) method of sexing polar bear skulls based on differences in lower canine tooth widths was employed].

The paper is well organized, clearly written and generally free of typographical errors; however, Knottnerus-Meyer's name has been consistently misspelled, as has rostrum on

page 13. A map (Figure 1) allows the reader to see where various specimens came from but it is not a "Map of polar bear range" as it is titled. Verbal explanations of taxonomic measurements are usually subject to various interpretations, and Manning's use of skull diagrams to show how he has taken the measurements is commendable, for it enables other workers to replicate them almost exactly. The 10 statistical tables are easy to use, and Brenda Carter's vivid cover sketch of a polar bear is an attractive precursor to the text.

It is sometimes said that the best taxonomist is the most experienced one. Manning has had a great deal of experience as can be seen from his previous work on caribou, red-backed voles and other arctic mammals. Besides this experience he has a fine feeling for statistics. In this case his care in choosing appropriate tests (e.g. co-variance analysis and Duncan's multiple range tests to discern geographical differences in skull shape) and his lucid, cautious manner of interpreting the results add much to the weight of the study. A work of this kind has been long overdue, and through it, Manning has made a substantial contribution to arctic biology.

C. R. Harington

HISTORIC SETTLEMENT PATTERNS IN THE NUSHAGAK RIVER REGION, ALASKA. By James W. VanStone. *Fieldiana: Anthropology, Volume 61. Chicago: Field Museum of Natural History, 1970. 9¼ x 6⅛ inches, 149 pages. $7.00.*

This report is the fifth of a series of six in which VanStone has projected coverage of the Eskimo people of the Nushagak River region of southwestern Alaska. This particular monograph has as its stated aim the description of historic archaeological sites in the region, with a reconstruction of changing settlement patterns of the nineteenth and twentieth centuries, and the assessment of factors responsible for the change.

The introductory chapter provides the geographic, ethnic, and historical background, and includes a brief discussion of some approaches to settlement pattern studies. The refreshing aspect of the present work is that it takes concepts originally developed for the analysis of prehistoric material and makes use of them with actual historical documentation of factors thought to influence patterns of settlement. Although perhaps a minor point, I nevertheless do find myself somewhat uncomfortable as the author forces the Nushagak people into the classificatory framework devised by Richard Beardsley and others, terming the southwestern Alaskan natives "central based wandering" people, which serves to place them in a category with, for instance, nomadic horticulturalist-hunters who eke out an oftentimes precarious existence in the Amazon basin. But the Alaskans are people of a mature transhumance who at least in recent times have dispersed for a portion of the year to stable fishing and hunting camps which frequently consist of permanent dwellings, which may be owned by families and transmitted by inheritance, and to which they regularly travel by boat or dog sled transporting a very substantial kit. The Beardsley classification, which is oriented towards the evolution of agriculturally based civilizations, simply does not contain a category suitable for sedentary hunters and fishermen of the sort found in southwestern Alaska. Other frameworks — also used by the author in the present work to parallel that of Beardsley — seem much more satisfactory for his purposes. In the same chapter there is apparent confusion when the term *yupik* is used to denote a dialect of the Western Eskimo language; *yupik* is, in fact, a designator of that same language itself, of which the dialect found around Bristol Bay has been termed *yuk*.

There follow six chapters that present the descriptions of 61 sites that were located by boat and aerial survey and by interviews of native informants, during five field seasons that began in 1964. Three of these sites were excavated by the author, and an additional site was tested by Helge Larsen in 1948; the results represent all the excavated information available, with additional physical information derived from surface examination only. Historical documents referring to the area, including the vital statistics records of the Alaska Russian Church and some of the records of the Russian-American Company, were surveyed. Thus each site is described physically (commonly with the aid of a sketch map) and an attempt is made to date its occupation variously by means of such excavation data as exist, by informant contact, and by historical documentation. Population estimates are also made.

The final chapter presents summary, analysis, and conclusions. In brief, nine settlements scattered throughout the drainage system are known from documents to have been occupied before the middle of the nineteenth century. This number is concluded to have increased dramatically near the turn of the present century; in fact, no fewer than 57 sites are at least tentatively concluded to have been occupied for some portion of the period