

# Progress of Research In Zoology through the Naval Arctic Research Laboratory

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The first station for arctic research in Barrow was established for two years of observation during the First International Polar Year in 1881-1883. In transmitting his report to General Hazen at the close of the mission, Lieutenant (Signal Corps) P. H. Ray (1885) respectfully suggested that in future expeditions it would be desirable to give the leader time in advance to become acquainted with his crew and their project. In addition to valuable geophysical records, Ray prepared a penetrating description of the ways and culture of the Eskimo people whom he saw before their habits had been much affected by white contact. He made a winter journey of reconnaissance half way to the head of Meade River. Sergeant Murdoch prepared the first comprehensive report on the birds of the arctic coast. Both reports remain interesting reading for their information and literary quality.

At about the same time, Ensign (USN) Howard left Lieut. (USN) Stoney's winter camp on the Kobuk River and, joining a genial company of mountain Eskimos in the Brooks Range, walked with them through Howard Pass to the Colville River. Travelling by boat after break-up he passed from group to group of the sociable inland Eskimos along the route of their annual migration from the mountains to trade on the arctic coast. Howard met Barrow Eskimo people near the mouth of Ikpikpuk River, having made the first traverse by a white man for over 300 miles from the interior of Alaska to the arctic coast. His narrative report (in Stoney 1900) is vivid with his pleasure at the experience in winter and spring arctic travel, and with his appreciation for the kindly and lively friendliness of his Eskimo companions.

Stefansson's (1921) major arctic exploration began with travel along the Alaskan coast east of Barrow where he made anthropological measurements of the inland Eskimos whom he met in their summer visit to the coast near the Colville delta. The survey of mammals, by his associate R. M. Anderson, first clearly brought their arctic Alaskan distribution into view. G. H. Wilkins was a most effective member of Stefansson's party. He returned to Barrow in 1928 to make with Ben Eielson the most magnificent feat of navigation in their flight from Barrow to Svalbard. For this he was knighted. Subsequently, during his busy and venturesome career, his visits at the Naval Arctic Research Laboratory were an inspiration to everyone in the camp.

A. M. Bailey (1948) extended the knowledge of bird life of the arctic coast around Barrow by travel and studies extending over several years. He travelled with and acknowledged the keen help of the Eskimo residents. In his compilation of arctic bird life he credited the eminent Charles Brower and his sons for being first to make known 63 of the then known 153 species of birds recorded from Barrow.

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During the period when Scholander and I were beginning the research at NARL, Professor August Krogh of Copenhagen asked to meet Admiral Lee, who was then Chief of Naval Research. In the course of conversation Professor Krogh alarmed me by asking the Admiral how he could justify value to the Navy in supporting the kind of biological research we were carrying out. I was relieved and still think gratefully of Admiral Lee's answer that "scientific research is as valuable to the Navy as it is good". The scope of research at the laboratory was begun and has continued under those favourable auspices.

Dr. Folk has reviewed (pp. 315-26) the progress of physiological research at NARL in which P. F. Scholander has made such distinguished contributions. I will only add that although there has been illuminating physiological research upon arctic animals there has been scarcely a bare introduction to the probably more interesting physiological processes in the life of arctic plants upon which the whole system of life depends.

In our program of physiological research (1947-49) at NARL we could see many ways in which animals and man are adaptable to the conditions of arctic life. But even now, at the start of a new era of exploitation of arctic resources, arctic conditions are still strange to most of the world's people and are as yet only vaguely understood by scientists from reports of arctic studies. Early in 1947 we realized that information obtained on the arctic coast was detached from the inland country and the world at large because biological studies in the arctic interior of Alaska were lacking. Tom Brower had remarked to me that from reports of inland Eskimos he believed that many birds migrating in spring from southern lands and coasts to the Arctic Slope and coast travelled through passes in the Brooks Range. As we learned later, these passes have long served for communication by men and animals between the forested interior and the northern tundra.

Sig Wien, who was then flying for explorations in the Petroleum Reserve, pointed to Anaktuvuk Pass as the route travelled by arctic-bound aircraft and suggested that the small band of Eskimos (Nunamiut) resident in the mountains could be effective and hospitable guides in studying the connections and communications between the life of the forested interior of Alaska and the Arctic Slope and coast. In November 1947 he introduced Scholander and me to Simon Paneak and the few Nunamiut families then living in skin tents at Chandler Lake. Through these early-established and continued services of the Nunamiut in advising and instructing scientists about their country, scientific descriptions of communications through the interior of arctic Alaska have been established and the science of the coast is no longer detached. This early association has been most usefully maintained and Simon Paneak continues to contribute Nunamiut knowledge as a member of our Institute's staff.

The annual migrations of birds bring large numbers of many species from remote wintering places in North and South America, from Pacific shores and islands and even from continental Asia to nest in arctic Alaska. There are many puzzling factors in these migrations; for instance, a warbler wintering in a circumscribed area of Venezuela migrates to nest in Alaska, with some probability that its winter resort and summer nesting place are faithfully reached within a few

miles; the journey is performed with the accuracy of an intercontinental missile. The warbler weighs only 10 grams, yet it contains the entire machinery for aerial navigation, for memory and operation in flight, and for initiating the journey. Comparison with a missile poses fascinating problems for study.

In 1948 Donald Griffin and Ray Hock surveyed nesting geese along the lower Colville River. By attaching radioactive substances to birds they hoped to trace their habits of homing to nests. Recent developments in radio signalling are now in widespread use and Folk and his colleagues have successfully applied them to monitoring behaviour and rhythmic physiological processes in arctic birds and mammals. Measurements of time, motion and activity are showing most interesting dimensions in the lives of arctic animals.

Sir Hubert Wilkins considered the annual migratory flights of eider ducks past Barrow to be one of the most impressive natural phenomena. With communicating observation points now located along the entire arctic coast there is a chance unparalleled in the world to record by sight and radar the temporal and spatial program of these migrations of birds as well as those of the massive bowhead and white whales and walrus along the arctic coast. News bulletins describing their point to point and day by day progress would be more interesting communications for arctic people than would reports on foreign sports.

Tom Brower and Simon Paneak have assessed the programs of the many birds that migrate through Anaktuvuk Pass, and Simon Paneak, John Krog and I have for 20 years observed the movements and conditions of birds in the Brooks Range to establish physiological characteristics in the process of migration to and from the Arctic. John Campbell has recorded birds in the John River Valley and at Chandler Lake. Latterly with George West and Leonard Peyton we have been defining the annual movements, associations and organization of a population of willow ptarmigan of the Brooks Range and Arctic Slope.

Tom Cade has surveyed the birds along the Colville River and particularly the habits of the numerous peregrine falcons nesting in the cliffs along the Colville. Because birds are visible, identifiable and characterized by seasonal programs in terms of motion and time they have been important in the definition of arctic life and its connection with the rest of the world. Their contribution to studies in ecology and physiology have been outlined by Pitelka (pp. 333-40) and by Folk (pp. 315-26) who, I hope, have not subordinated the view of their own importance in these researches.

Some studies on the arctic fishes have led to comprehensive and still-developing results. Vladimir Walters (1955) made a survey of Alaskan fishes, relating their present distribution to the rapid changes and development of postglacial Alaska. Norman Wilimovsky prepared a key to the fishes of Alaska that, in serving for identification, has widened knowledge of fish distribution and emphasized requirements and rewards from further studies in the very complex aquatic environment of Alaska. Wohlschlag's studies of growth, metabolism and seasonal movements of white fishes in lakes adjacent to Barrow initiated a pattern for a comprehensive view of the life histories of arctic fishes. An interesting sequel has followed in the series of studies by Wohlschlag (1960), and many others, of the metabolic character of fishes living in constantly cold ( $-1.8^{\circ}\text{C}.$ ) antarctic seas.

A comprehensive study of arctic marine fauna was begun by George MacGinitie (1955) and his wife and continued in collaboration with many colleagues after he served as second scientific director at the Arctic Research Laboratory. This great task is based upon MacGinitie's collections made from a perilously small boat under difficult arctic marine conditions. His skilful selections from his catches have been distributed among collaborating experts whose reports will continue to clarify the previously unknown marine life of the Alaskan arctic coast. The MacGinitie studies show how sustained research brings comprehensive knowledge in contrast to the isolated facts derived in occasional observations.

During the years since 1948 Robert Rausch, with a number of collaborators, has continued pioneering field studies of Alaskan mammals and their parasites. Their reports on systematics, distribution, life histories and relations with Siberia are among the illuminating classics of Alaskan studies in basic zoology and its applications to human health. We have a summary of ecological studies in Alaska by Frank Pitelka (pp. 333-40) in which he has too modestly alluded to the contributions that he and his colleagues have made to basic zoology in arctic Alaska.

J. W. Bee (Bee and Hall 1956) combined the results of his own surveys of mammals with all other records of their distribution in arctic Alaska. Harald Erikson's early measurements of metabolism in arctic ground squirrels preparing for hibernation (Erikson 1956) were followed by his studies comparing the working respiratory exchange of young Eskimo men with young naval personnel stationed at Barrow (Erikson 1957). The volumetric respirometer (invented by P. F. Scholander) employed in these latter studies was subsequently applied to the assessment of respiratory tubercular and other pathological impairment prior to thoracic surgery by Dr. Karl Semb at Oslo, resulting in major improvement in the accuracy of surgical operations and subsequent guidance of recovery.

Keith Miller and I (1962) initiated studies at Barrow on the reaction of hands of Eskimo children to cold showing that children differed from adults; this is now not surprising. These studies are being pursued on Fairbanks school children with increasing neurological refinements by Petajan and Marshall.

My inclusion of people with the other animals scientifically comprised in zoology indicates the importance of studies of Eskimo people furthered by support from the Naval Arctic Research Laboratory. It is out of my competence to discuss the interesting social studies that are basic to understanding how our Eskimo fellow citizens will be fitted into the economy of arctic Alaska that is changing so drastically through exploitation of its petroleum. Rather than emphasize the value of such studies for the indigenous arctic residents I would like to point out that even yet there are very few if any white men who are true residents of the arctic world. Eskimos are naturally adapted to arctic life and we might selfishly examine their ways to see how or even if urban white men can become serious arctic residents instead of transient exploiters.

Significant anthropological studies of Eskimo history were initiated by Ray (1885) at Barrow during the First International Polar Year. Before the Arctic Research Laboratory was established, James Ford (1959) defined by archaeology the stages in Eskimo coastal prehistory at Barrow. With aid and support through NARL, William Irving (1953) and John Campbell (1959) have traced the cul-

tures of people of the Brooks Range far back in antiquity toward the time of the last great continental glaciation. It does not surprise Eskimos that archaeologists have found records showing that their predecessors lived for 8,000 years in ancient camp sites on the arctic coast and tundra. Their instruments, the bones of their food, and associated plants show the circumstances in which the unique Eskimo people and their culture developed. During several millenia they have been a coherent arctic people in arctic lands from Siberia to Greenland over a coastline that Sir John Richardson (1852) remarked is the longest in extent of any used by a single human population.

For several years at Wainwright, Fred Milan has measured physiological efforts involved in Eskimo hunting. An elaborate and diverse program in anthropology is now in preparation as part of the International Biological Program for execution at Wainwright, led by Milan and involving a panel of numerous able anthropologists.

In referring to researches in zoology I have mentioned some that I knew to have been pursued with sufficient continuity to have produced communications that are of lasting influence in arctic science. Deliberately in some cases and inadvertently in others, I have probably omitted names and projects of important consequence. Researches at NARL stimulated the rapid growth of biological research at the University of Alaska, and in the Arctic Health Research Center. This background in arctic biology was the basis for establishing the Institute of Arctic Biology seven years ago and for the development of the Arctic Health Research Center. Exportation of the scientific knowledge obtained in Alaska has been a valuable contribution to the world's culture. Knowledge and understanding acquired in the perspective of views upon arctic life may be the most precious commodity that the arctic contributes.

I hope to have illustrated projects that have opened continuing research about the arctic and that have reflected new understanding about the world at large. I think that a major contribution of NARL is that it has provided means whereby many scientists, be they young or old, could count upon the continuity of their studies through enough years to serve as important parts of their scientific careers. Their arctic studies have greatly advanced the understanding of the participating scientists. Extended arctic studies with good support have converted arctic Alaska from a blank in knowledge to one of the well known regions of the world.

In the present period of rapid social and economic development in arctic Alaska it is fortunate that we have that solid background provided by over twenty years of research at NARL. This knowledge has immense practical value, but it has another value. Scientists in arctic Alaska have expressed the enjoyment and enlightenment derived from their experience in arctic life. The country, its conditions and the way of work and living are intensely interesting. In future years appreciation for the interest and even fascination of participation in arctic life that has been derived in arctic research may become the most valuable contribution from NARL to the newly evolving societies of arctic people. The understanding of that life will help the new residents who enter the country toward the enjoyment that comes from knowledge in the wise exploitation of arctic resources.

## ACKNOWLEDGEMENTS

It was a special pleasure and satisfaction for me at the NARL Symposium to be again associated in discussion of arctic research with four of my old contemporaries. I believe that Victor Hessler, George MacGinitie, Dallas Hanna and Ira Wiggins will not mind being referred to as my contemporaries, for I think of them as men whose lives and works have made renewed progress during mature years of devotion to research in arctic Alaska after they had already achieved scientific success in other regions.

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