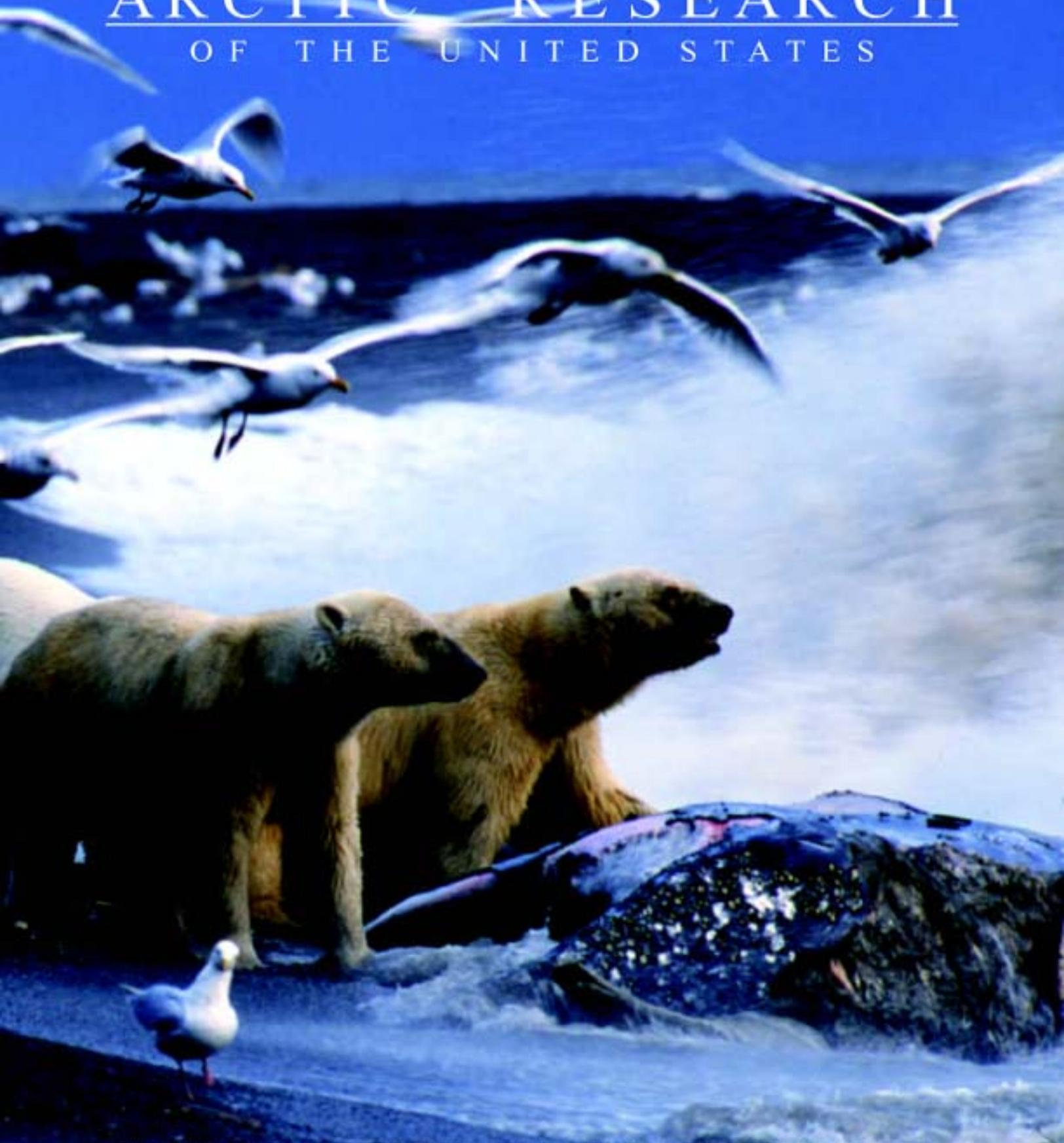


ARCTIC RESEARCH

OF THE UNITED STATES



About the Journal

The journal *Arctic Research of the United States* is for people and organizations interested in learning about U.S. Government-financed Arctic research activities. It is published semi-annually (spring and fall) by the National Science Foundation on behalf of the Interagency Arctic Research Policy Committee (IARPC) and the Arctic Research Commission (ARC). Both the Interagency Committee and the Commission were authorized under the Arctic Research and Policy Act (ARPA) of 1984 (PL 98-373) and established by Executive Order 12501 (January 28, 1985). Publication of the journal has been approved by the Office of Management and Budget.

Arctic Research contains

- Reports on current and planned U.S. Government-sponsored research in the Arctic;
- Reports of ARC and IARPC meetings; and
- Summaries of other current and planned Arctic research, including that of the State of Alaska, local governments, the private sector, and other nations.

Arctic Research is aimed at national and international audiences of government officials, scientists, engineers, educators, private and public groups, and residents of the Arctic. The emphasis is on summary and survey articles covering U.S. Government-sponsored or -funded research rather than on technical reports, and the articles are intended to be comprehensible to a nontechnical audience. Although the articles go through the

normal editorial process, manuscripts are not refereed for scientific content or merit since the journal is not intended as a means of reporting scientific research. Articles are generally invited and are reviewed by agency staffs and others as appropriate.

As indicated in the U.S. Arctic Research Plan, research is defined differently by different agencies. It may include basic and applied research, monitoring efforts, and other information-gathering activities. The definition of Arctic according to the ARPA is "all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian chain." Areas outside of the boundary are discussed in the journal when considered relevant to the broader scope of Arctic research.

Issues of the journal will report on Arctic topics and activities. Included will be reports of conferences and workshops, university-based research and activities of state and local governments and public, private and resident organizations. Unsolicited nontechnical reports on research and related activities are welcome.

Address correspondence to Editor, *Arctic Research*, Arctic Research and Policy Staff, Office of Polar Programs, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230.

Cover

A mixed group of polar bears, including an adult male, at least one adult female, and other sub-adults, yearlings, and two-year-old cubs, feed on a gray whale carcass killed perhaps a week earlier by killer whales. Glaucous gull wait their turn to feed on the carcass. In the background are the skulls of whales harvested in past years for subsistence use. The photo was taken at Point Barrow, Alaska, in September 2002.

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To Our Readers

This special issue of *Arctic Research of the United States* focuses on wildlife research in Alaska, and we offer free copies to visitors to national parks, wildlife refuges, and other Federal lands in Alaska.

Federal lands cover approximately 60% of Alaska, managed by more than a dozen Federal agencies. Much of this land is preserved as parks, wildlife refuges, and wilderness areas for the use and enjoyment of all.

Management of these lands is a major challenge. Scientific research and study provides much of the information needed to manage these Alaska lands and resources. Dedicated scientists

work to ensure that resources currently enjoyed by Alaskans and visitors to Alaska will be available for the enjoyment and use of future generations. Our objective in producing this issue of *Arctic Research of the United States* is to better inform Alaskan visitors and others of current Federal research efforts to understand and manage Alaska's wildlife and wildlife habitat.

The National Science Foundation publishes *Arctic Research of the United States* on behalf of the Interagency Arctic Research Policy Committee.

Charles E. Myers
Editor

John R. Haugh
Associate Editor



An Introduction to Stories about Alaska

This introduction was prepared by John Dennis, National Park Service.

This issue of *Arctic Research of the United States* provides a sampler of findings from the many and varied kinds of research conducted in Arctic and adjacent areas of Alaska. As you read these reports, imagine the scale of Alaska, the challenges to researchers that the scale imposes, and the usefulness of the results of these scientists' efforts. I also encourage you to think about the scientists themselves—who they are and what feats of education, logistics, and fundraising they must have experienced to be able to bring you the results of their dedicated, enthusiastic, and challenging endeavors in often spectacular wildness.

The Great Land

Alaska is large—more than 365,000,000 acres. Local travel distances are measured in hundreds, not tens, of miles. Relief runs from thousands of feet deep in the ocean to more than 20,000 feet above sea level. Salt water is cold, with tidal ranges of almost nothing in the Arctic to more than 20 feet in the Gulf of Alaska. The cold fresh water forms streams and rivers that impede travel in the thaw season but help it when frozen. Frozen water in the form of glaciers carves the land, creates new habitats for plants and animals, and provides major barriers to travel over the many mountain ranges.

The immensity and variety of Alaska's environments challenge the neophyte researcher—from thick, needle-leaved rainforest with 4-foot-diameter fallen logs lying every which way and thorn-rich devil's club plants tearing at bare skin to dense boreal forest and wide, cold rivers to sparse, low-growing, often wet tundra that offers no place to hide when the grizzly bear wanders into view. Temperatures also challenge the neophyte—the three- to four-month growing season brings the long days of summer with warmth into the 70s, 80s, and even a few 90°F days but with the chance that the next day will be in the 40s or 50s with cold rain, wind, and threat of hypothermia. The darkness of

winter comes with temperatures far below 0°F and sometimes deep snow, but it also is a crucial time for learning about the many species of animals that remain active throughout the year. The wind can be a curse—when it blows hard and long, chilling the body and toppling sheltering tents, and when it's not there, giving the biting insects of spring, summer, and fall free rein to chase after the researcher who must remain focused on science, not on avoiding bites.

The Research

The reports presented here illustrate some of the types of research that you can find underway somewhere in Alaska every year. Focused primarily on fascinating animals of Alaska, the articles will take you from the whales and sea lions of southern Alaskan waters to the muskoxen of the often-frozen north. The articles will show you some of the smaller, but no less interesting, animals found throughout the state, from the engaging sea otter of the ocean to the migratory birds and resident small mammals of the interior. The articles will also give you an overview of the ecosystems of Alaska for context and a peek at the diversity of humans who have lived and flourished in Alaska for many thousands of years. Finally, you will find that the authors of these articles are your public servants from the Fish and Wildlife Service, National Park Service, and U.S. Geological Survey.



A sea otter floating in the Gulf of Alaska. (See the article on p. 31.)

Challenges to Scientists in Alaska

To learn about Alaska, scientists must conduct their research primarily in the remoteness of the field, with perhaps some additional work in the warm, bright, and dry lab. Fieldwork in Alaska involves boats, aircraft, snowmachines, walking, and often tents. The wind and rain of growing-season storms make boats used for transportation or as research platforms the perpetrators of sea sickness, prevent aircraft from arriving in remote backcountry camps on schedule to bring provisions or take weary researchers back to home, and either make camps into cold, wet prisons or blow



Brown bear and wolf tracks in the mudflats of Tuxedni Bay, Lake Clark National Park and Preserve.

or wash them away entirely. The dense vegetation and treefall in the forest, the abundant rivers and wetlands throughout the state, and the cottongrass tussocks covering large swaths of tundra and wetland often make overland travel at any pace faster than a crawl almost impossible during the thaw season and not much easier at other times.

The need to use boats, aircraft, or snowmachines to access research sites severely limits the amount of equipment researchers can bring with them. The first priority for filling the available space and weight in the vehicle goes to the survival gear—sleeping bag, rain gear, extra clothing and food, and perhaps a tent. As a result, researchers usually do not have electricity to power devices for such activities as pulling sediment cores from lakes, collecting soil and rock cores, or hoisting large animals for taking their weights. Of all the

accommodations that researchers must make, the largest is to adjust to the sheer scale of Alaska—if they were to try to visit all of Alaska in one year, they would need to visit 1,000,000 acres a day.

Students of the Arctic find moments of aesthetic delight while existing in the wild land without the motors and other trappings of home. They can hear the clicking of the caribou feet when thousands of caribou pass through their campsite. They can hear the muffled footsteps of the grizzly

bear when it walks down the beach past their tent just as they are beginning to stir in the morning. They can enjoy dinners cooked from the salmon, trout, and greyling that swim in the rivers and lakes next to their camp and desserts concocted from the blueberries, raspberries, and other fruits the tundra produces in abundance. They can watch the early summer sun march through the northern sky without quite going below the horizon and share the excitement of the migratory birds when the shortening days at the end of summer announce the end of the field season and the time to head south.

The Value of this Research

Native peoples throughout what is now Alaska compiled a body of traditional knowledge over thousands of years that helped them survive and prosper in their forest, seacoast, or tundra homeland. Western scientists have been conducting studies in Alaska for at least the past 200 years. Both traditional knowledge and western science depend on adding new knowledge to what has been discovered in the past as the means of better understanding the present and probable future. The kinds of studies reported here meet the needs of decision-makers, resource managers, other scientists, and all people interested in knowing more about the marvels of Alaska.

Alaska's Federal, state, and private resource managers depend on scientific research for discovering resources of value to people, learning how people can utilize resources sustainably, restoring environmental components that have been disrupted by past human actions, and developing informational materials that help audiences better understand the features, opportunities, and constraints that people can find in Alaska. Learning the life histories of different populations of sea otters helps us understand why otters are abundant in some places and disappearing from others, giving us the potential to restore otters where they are disappearing. Studying migratory bird species in Alaska helps us understand, appreciate, and adjust human actions to the life histories of birds that fly the entire span of the Western Hemisphere two times each year and that experience natural and human-caused hazards along the way. Research on voles and their habitats helps us design the roads and trails that give people access to the marvels of Alaska without jeopardizing the sustainability of not only the voles but also the foxes, hawks, and other predators that depend on



Harlequin ducks nest along clear, fast-moving streams in Denali National Park and Preserve.

voles for food. Studying small marine organisms, whales, and air quality in southeast Alaska helps us improve management of tour ships to permit visitors to experience the majestic fjords, glaciers, and animals of southeast Alaska without destroying them. Studying the evidence of past human activities helps us understand when humans arrived in Alaska and what cultural changes they experienced as the climate and its associated plants and animals that surrounded them changed over time.

The types of studies represented in this issue clearly help Alaska's resource managers address and solve perplexing environmental management problems. These studies also help the scientific community around the world better understand the natural and human histories of the circumpolar world and the role of the Arctic region in broader geologic, environmental, and human history. Current global studies of human-induced Arctic haze, natural tundra fires, changes in the abundances and distributions of tundra plants, the presence of contaminants in marine mammals and in the fish that return from the oceans to the rivers and streams each year to spawn, fluctuations in behaviors and distributions of caribou and reindeer herds, or global climate change all benefit from information being developed by management-oriented studies such as those represented here.

Non-scientists, too, benefit from these studies. The information informs authors of magazine articles, books, and video presentations about the existence, status, and trends of Alaska's fascinating natural and cultural features. The readers and viewers of these compositions in turn gain the satisfaction of experiencing a greater understanding of Alaska and its environments, plants, animals, and peoples.

The Scientists Who Conduct the Research

Our ability to understand the wonders of Alaska depends on the talents of the many men and women who conduct the research. Biologists, geologists, archeologists, and anthropologists comprise an obvious group. But broad understanding also requires the involvement of many others—economists and sociologists, historians and geographers, and engineers and mathematicians. These researchers are undergraduate and graduate students, university professors, government scientists, and scientists in non-profit organizations and large and small businesses. Support for these researchers comes from Federal agencies such as the National Science Foundation, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the National Aeronautics and Space Administration. Also contributing are state agencies, such as the Alaska Department of Fish and Game and the University of Alaska. Some non-profit organizations participate using donated funds, and a number of businesses also provide funding or logistic support.

The researchers come not only from all over the United States but from around the world—for example, one of the classic scientific reports about Alaska, the 1008-page *Flora of Alaska and Neighboring Territories*, was authored by a Swedish botanist and published by Stanford University Press in 1968.

Conclusion

I hope you will find the scientific reports in this issue both informative and stimulating. As you read the reports, I encourage you to think of all the steps the scientists had to experience to be able to obtain the data on which their writings are based. They had to have the necessary education to be able to prepare research proposals to acquire the funds to support the work. They had to gain the practical experience of working in truly wild and remote conditions at the end of a thin lifeline of logistical support. They had to have a strong love of the land and the subject matter to overcome the educational, experiential, funding, and logistical hurdles that so often prevent field researchers from achieving their goals. As you read these reports, I encourage you to make this love of land and subject matter your own and, through that ownership, to increase your own enjoyment of Alaska.