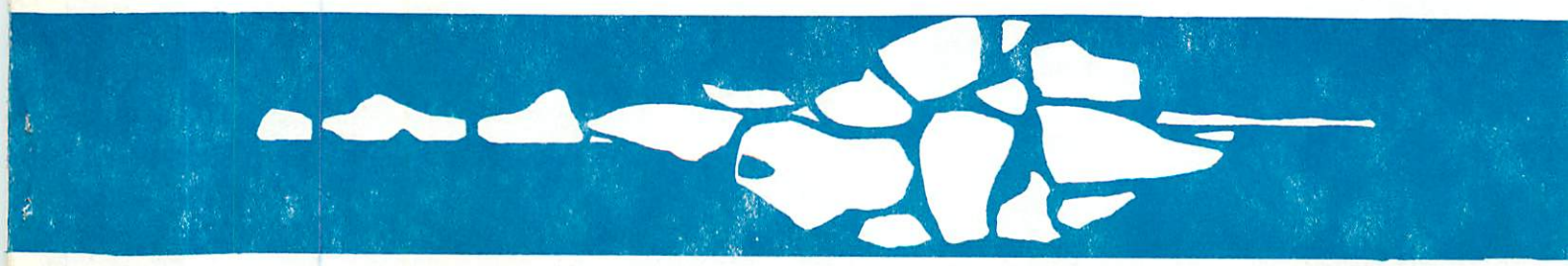
CHALLENGES IN THE ALASKAN COASTAL ZONE

A REPORT ON THE ACTIVITIES OF THE ALASKA SEA GRANT PROGRAM



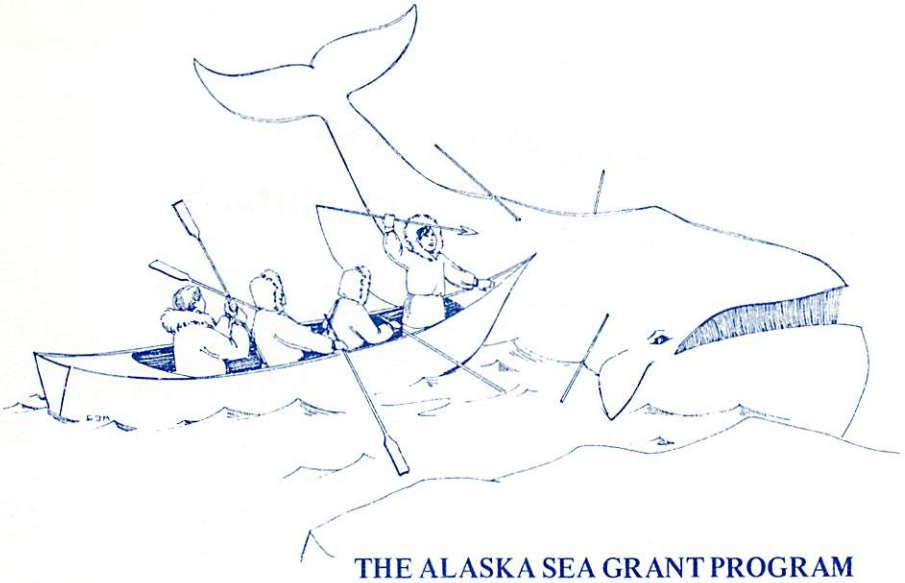
UNIVERSITY OF ALASKA 1972

Alaska Sea Grant Publication 72-1
February 1972

Bordered by two oceans and three seas, the coast of Alaska is a dominant feature of this vast northern subcontinent. Stretching for 6,640 miles, the Alaska coast represents more than half of the general coastline of the United States. Additionally, the immense continental shelves adjacent to Alaska encompass 830,000 square miles or three fourths of the total American shelf.

THE NATIONAL SEA GRANT PROGRAM

In 1966 Congress formally recognized marine resources as an important national asset and established the National Sea Grant Program to help develop the skilled manpower, facilities and equipment needed to accelerate development of these resources. The National Sea Grant Program provides monetary support to programs of education, training, research and advisory services relating to marine resource development at fifty universities and institutions throughout the country. It is administered by the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce.



THE ALASKA SEA GRANT PROGRAM

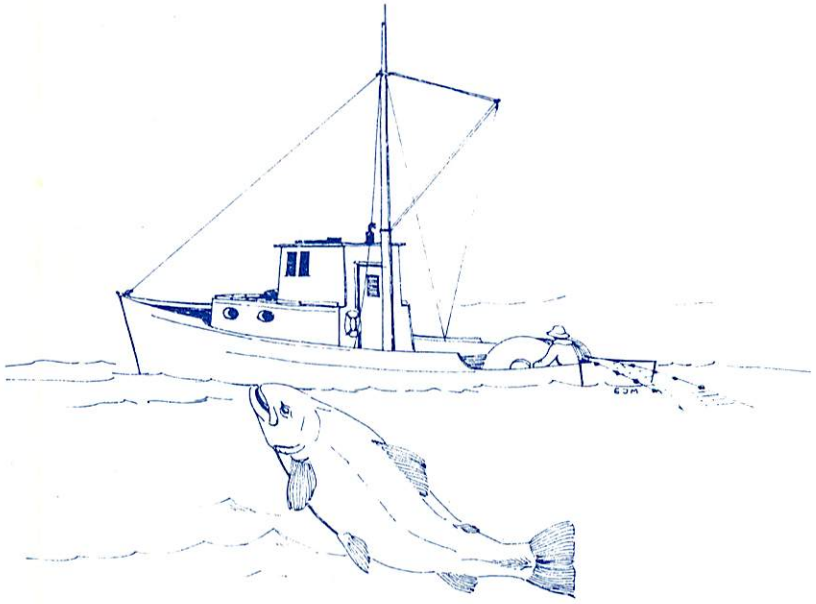
Alaska presents a position in marine affairs considerably at variance with the rest of the nation. It possesses over one half of the nation's coastline; it is adjacent to three fourths of the nation's continental shelf containing a vast storehouse of undeveloped marine resources; it exhibits a tremendous geographic and environmental diversity; and it is challenged by special problems related to the multi-cultural occupation of its coastal zone. These factors made it mandatory that Alaska participate in the National Sea Grant Program.

The Alaska Sea Grant Program began in 1970 and is now well into its second full year of participation. It is administered by the University of Alaska from the Sea Grant Coastal Resource Center located in Anchorage. The program represents an investment by the federal government of $400,000 for marine resource development in Alaska. The grant is matched by over $200,000 in state and industry funds.

Activities of the Alaska Sea Grant Program are encompassed within three broad categories: Education and Training, Research and Marine and Coastal Resource and Science Services.

Through the training of Alaskan scientists and engineers, the acquisition of new knowledge and the dissemination of information, the Sea Grant Program strives to assist government and private enterprise in their responses to the problems and challenges of developing, utilizing and managing our northern coastal zone and marine resources in proper ways.

In this effort a primary objective is to program Sea Grant activities to focus upon the current and priority needs of government, industry and Alaskan citizens using the marine resources and occupying the coastal zone of Alaska.



MARINE AND COASTAL RESOURCE AND SCIENCE SERVICES

A major emphasis of the Alaska Sea Grant Program is to provide advisory services to government agencies, industry and the general public in marine and coastal resources and related sciences and technologies. Three University activities interact in this effort: the Coastal Resource and Science Service Center, the Marine Advisory Program and the University of Alaska Museum.

Coastal Resource and Science Service Center

The Anchorage-based Coastal Resource and Science Service Center staff includes an attorney, geologist, biologist, engineer, and coastal zone planner, and strives to meet the following objectives:

- to encourage problem-oriented thinking on Alaskan marine affairs within government, industry and University groups;
- to serve as an independent source of information and analyses regarding coastal and marine resources;
- to focus the several capabilities of the University of Alaska more directly upon the needs of the State for coastal resource development.

The Center is currently engaged in a variety of activities which include:

- collecting and synthesizing scientific and technological knowledge on the resources and environments of the Alaska coastal zone;
- preparing reports on the resources, ecosystems and law of the Alaska coastal zone;
- planning for conferences on the law and management of the Alaskan coastal zone;
- providing a coastal resource and science information and dissemination service to assist with resource development, land selection, and the resolution of environmental conflicts within the Alaska coastal zone;
- preparing the first of a series of environmental atlases on the communities of Alaska's coastal zone.

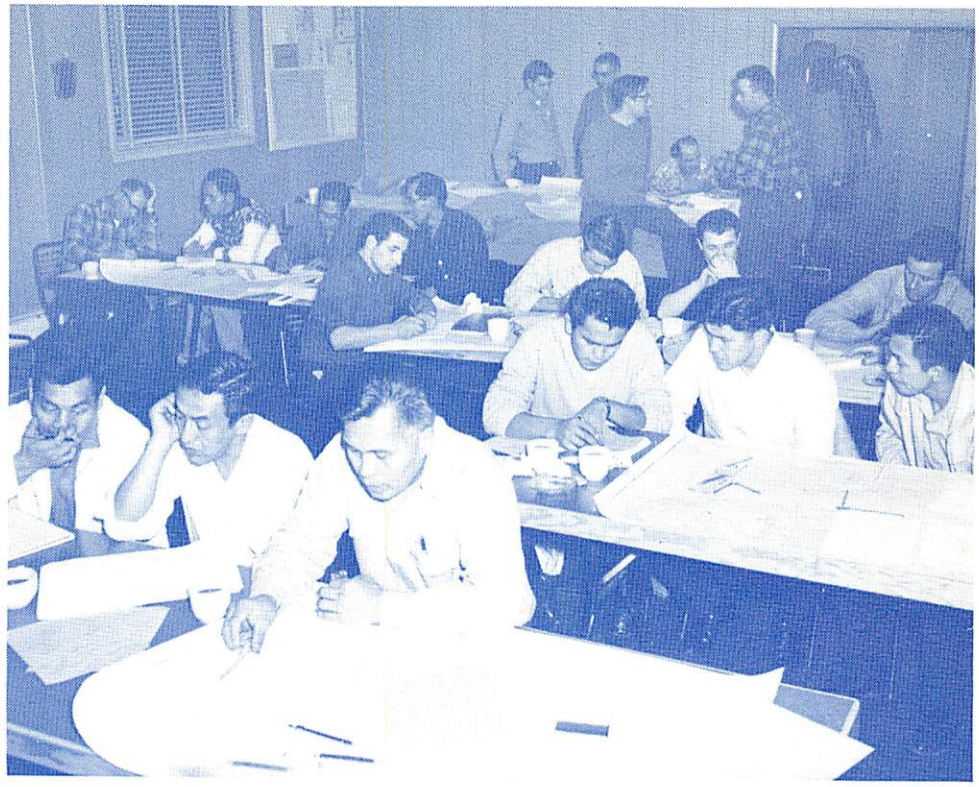
The Alaska coasts and Continental shelves are dominant features of this great subcontinental peninsula of North America.

Marine Advisory Program

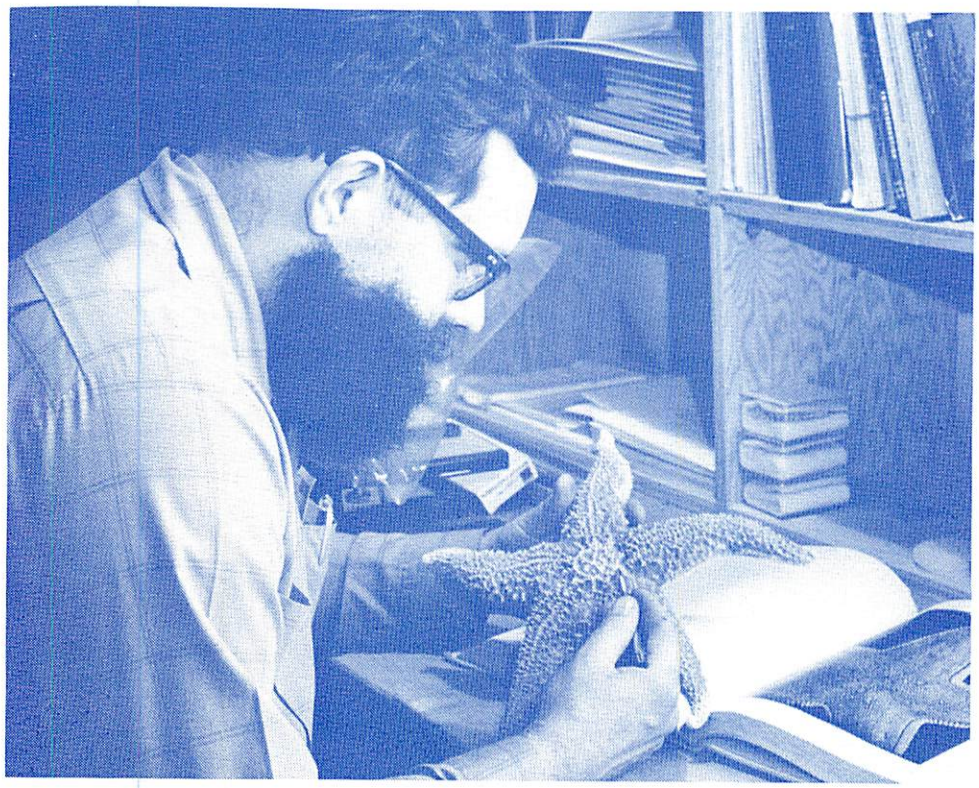
Money and manpower devoted to science and technology may be wasted if the results of such endeavors are not distributed to potential users and beneficiaries. The aim of the Marine Advisory Program is to communicate technical knowledge and other general information regarding marine affairs to developers and users of Alaska's marine resources. Workshops are conducted throughout the state by a staff of resource, technical and scientific specialists on such topics as vessel and gear usage, applied oceanography, resource harvest and marketing, fish plant sanitation and quality control, and utilization of fishery waste products. One unique aspect of this program is the development of bilingual fisheries instruction for Native communities where language and cultural barriers make communication and the acceptance of technological advancement difficult.

University of Alaska Museum

The University of Alaska Museum has a dual role in dealing with Alaska's natural history and natural resources: first, it preserves materials in a reliable repository where they are available for continued reference and study, and second, it serves as a medium of communication between the University community and the general public. The museum is presently expanding its marine natural history collection, mainly from materials collected by Sea Grant and related projects. Specimens are identified and catalogued by the museum staff and teaching and reference collections formed. Exhibits on marine natural history and resources are displayed at the museum and traveling exhibits are distributed by the Marine Advisory Program.



– marine advisory program workshops are held throughout the state.



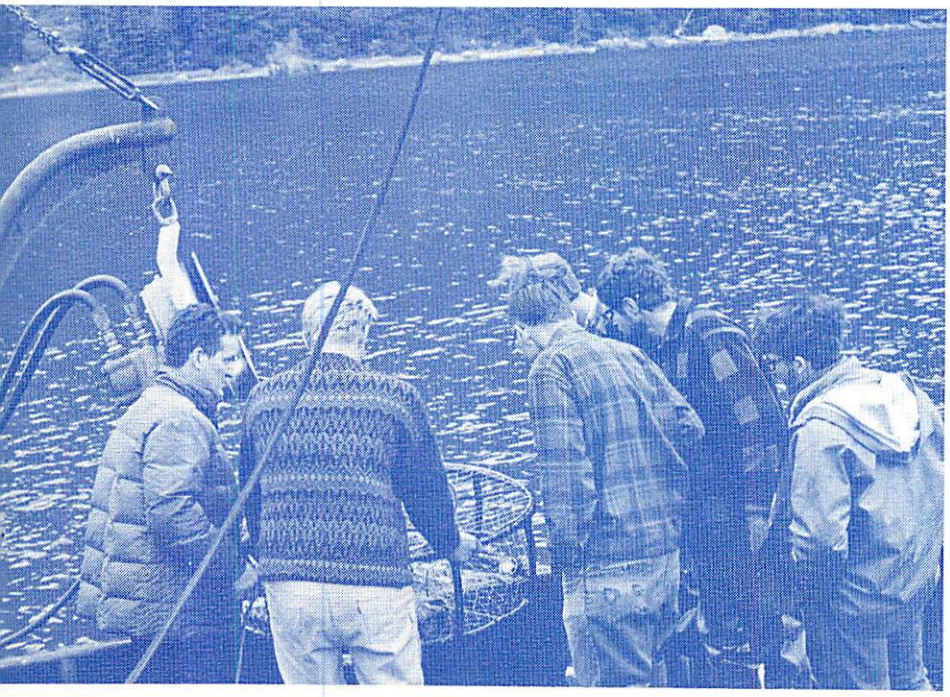
– specimens are identified and catalogued.

EDUCATION AND TRAINING

To increase the University of Alaska's teaching competence and capability in marine resource development, the Sea Grant Program is supporting three academic instruction programs in the fields of fisheries, ocean engineering and geology.

Fisheries Academic Instruction

In order for Alaska to expand its fisheries industry, many more trained fisheries personnel (technicians, scientists and managers) will be required. Presently a large proportion of the personnel working in Alaska on fisheries research and management are recruited from out of state. The objective of this project is to strengthen the fisheries program at the University of Alaska so that the state may furnish more of the necessary personnel needed by both industry and government to assess, develop and manage Alaska's vast fisheries resource. Two new faculty members already have been added to the College of Biological Sciences and Renewable Resources, and seven new fisheries courses are being offered this year. The instruction program is integrated closely with shellfishery research programs in Prince William Sound. Student involvement with field activities and research problems, as part of their academic training, is thus encouraged.



– student involvement with field activities
as part of their academic training –

Ocean Engineering Academic Instruction

Alaska has a great need for ocean engineers especially trained to deal with the unique engineering problems of the ice-stressed arctic coast. The objective of this project is to implement an academic program at the University of Alaska to train personnel in arctic ocean engineering. A new faculty position with the College of Mathematics, Physical Sciences and Engineering has been filled, and four new courses on ocean engineering are being offered this year.

Geology Academic Instruction

There has been considerable pressure by the geologic community to expand and strengthen the graduate program in the geological sciences in the Anchorage area. A new part time faculty position with the University of Alaska Geology Department based permanently in Anchorage has been filled. The duties of the new position include: first, coordinating the graduate program in the geological sciences in the Anchorage area; second, teaching graduate courses in marine geology and related fields; third, counseling prospective graduate students; and fourth, acting as liaison between the Geology Department in Fairbanks and the industrial-governmental community in Anchorage.

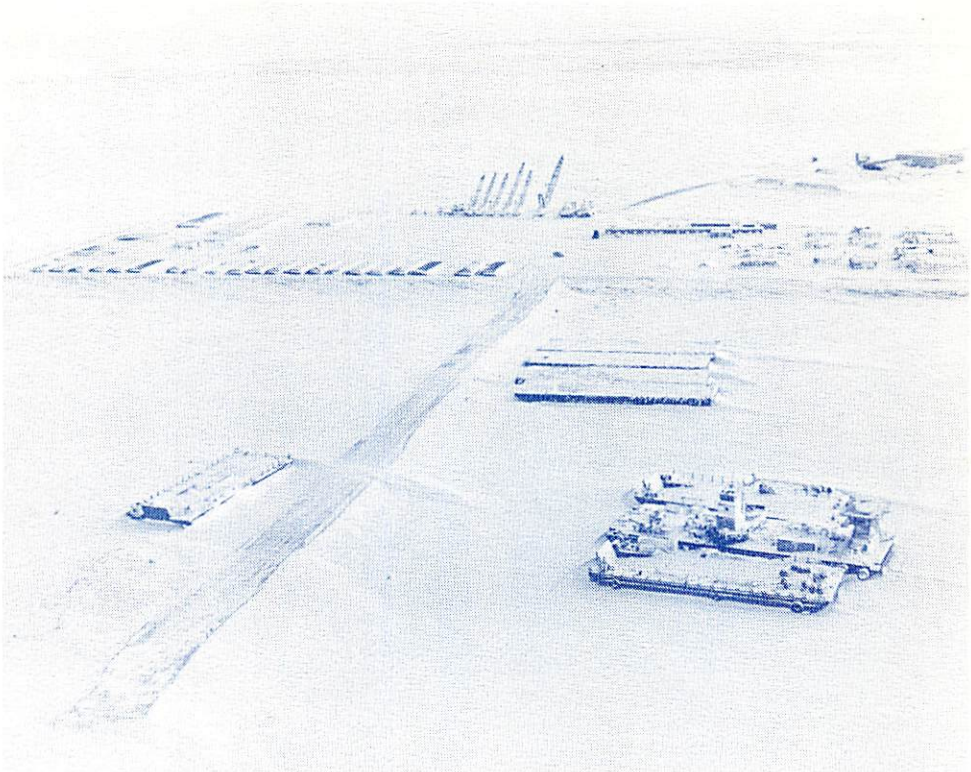
– dealing with unique engineering problems of ice stressed coasts.

RESEARCH AND DEVELOPMENT

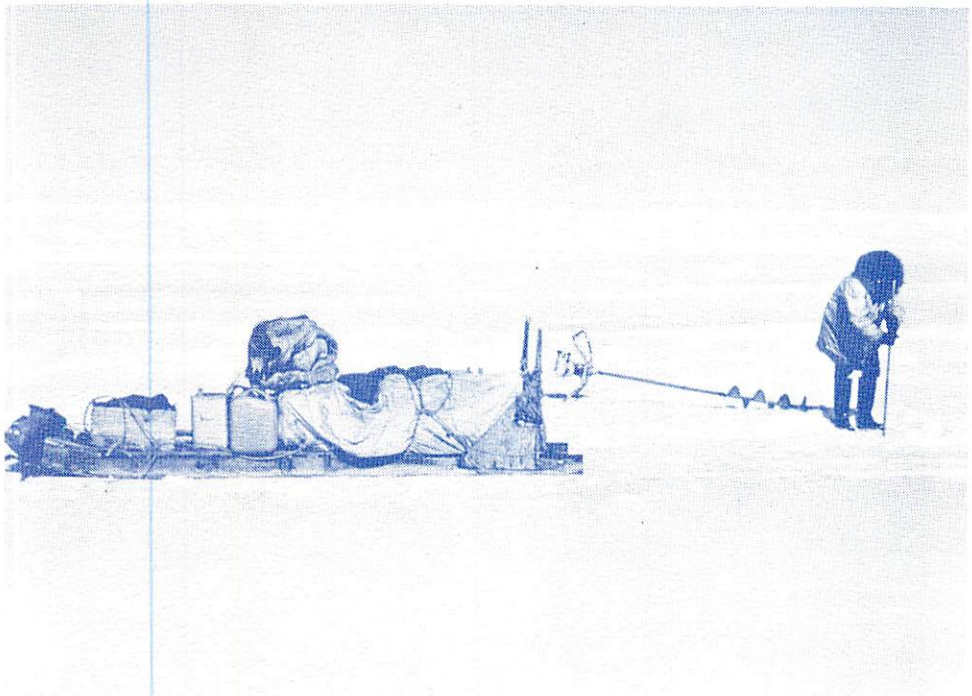
The Alaska Sea Grant Program supports a variety of research and development projects aimed at gathering baseline environmental and resource knowledge. This knowledge is needed by government, industry and the general public in order to assess marine resource potentials, to evaluate man's impact on the environment, and to provide a basis for sound coastal planning and management. A brief description of the projects follows.

Ecological Investigations of Arctic Waters

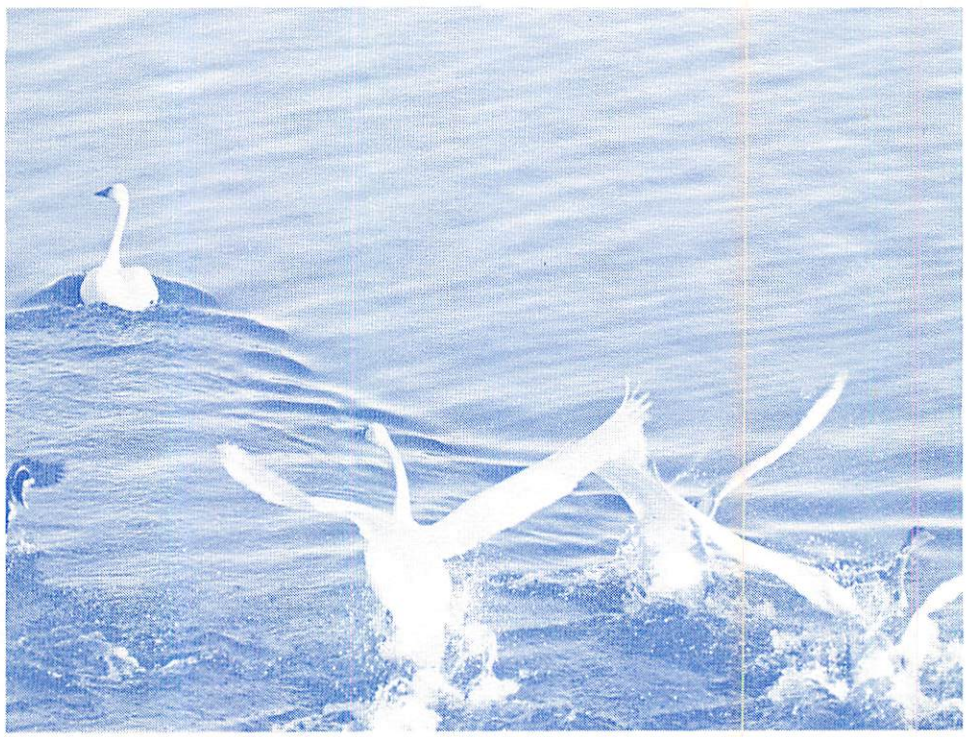
Recent petroleum developments on the Arctic Coastal Plain make it imperative that basic scientific knowledge be secured and utilized in the development and management of the resources and environments of this unique coastal zone. This project involves an ecological study of the aquatic environment in the Colville River delta - Prudhoe Bay area on the Beaufort Sea coast. The specific objectives are: to seek information essential to the support of logistics in the development of presently known resources; to identify and understand new resource opportunities; to train scientific personnel for work in the arctic; and to present and interpret arctic marine environmental knowledge in a manner so as to aid the design and execution of public policy decisions. The project is a large scale interdisciplinary study coordinated by the Institute of Marine Science and includes biologists, physical and chemical oceanographers and geologists. The biological program emphasizes studies of primary productivity, phytoplankton abundance and species composition, and the distribution and abundance of invertebrates and fishes. Investigations of physical and chemical phenomena include nutrient concentrations, trace metal occurrences, nearshore current patterns, and river and sea ice structure. Geologic data on sediment types, distributions and transport processes, geomorphology of the coast and beach dynamics are also being sought in order to more fully understand the natural processes of the region.



– arctic coastal developments such as the unloading facility at Prudhoe Bay make it imperative that basic scientific knowledge be secured and utilized.



– great braided estuaries enter the Beaufort Sea.



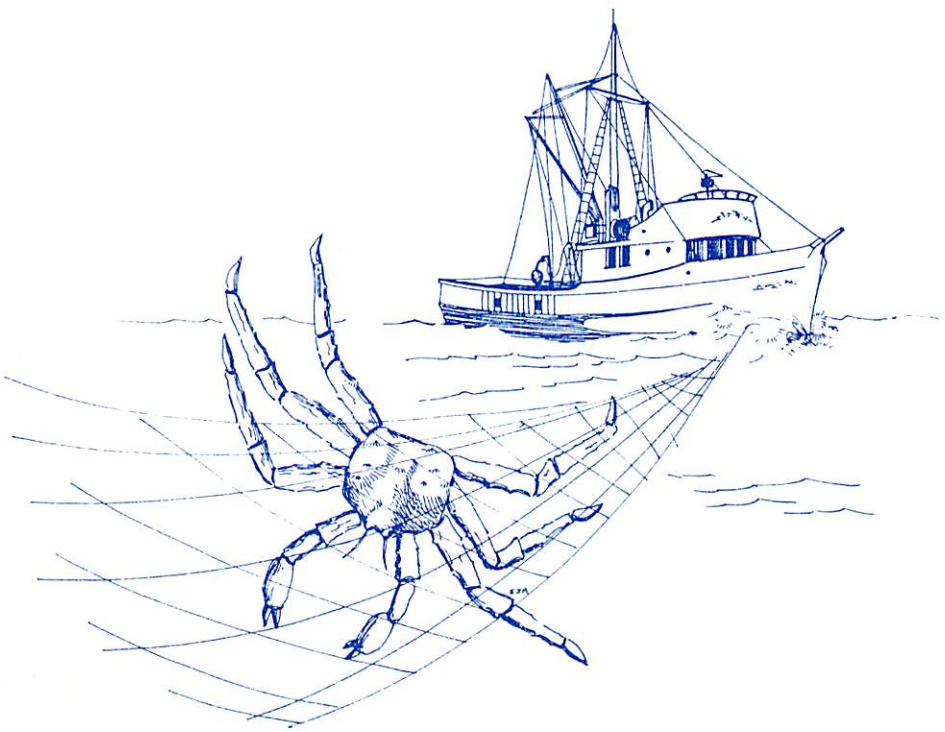
– producing waterfowl such as these Whistling Swan who winter a continent away on Chesapeake Bay.

Prince William Sound Shellfishery Assessments

Shellfish represent an important undeveloped resource potential for Alaska, but knowledge of the resource and techniques for its assessment are limited. Biologists of the College of Biological Sciences and Renewable Resources are currently investigating the shellfish stocks of Prince William Sound. Three separate shellfish groups are being studied . . . clams and oysters, shrimp and crabs. Project activities are concentrating upon techniques for the evaluation of shellfish stocks including new methods and new instruments for assessing distribution, abundance and behavior. This pilot study will provide new information for the enhanced development and utilization of the Alaska shellfishery resources.

Significantly, too, the activities of this project are being carried out in the vicinity of Port Valdez, the proposed terminus of the trans-Alaska pipeline. Knowledge acquired is assisting government and industry in the assessment of potential environmental impact in the region.

This field project also serves as an outdoor laboratory for the training of students in marine fisheries research and management.

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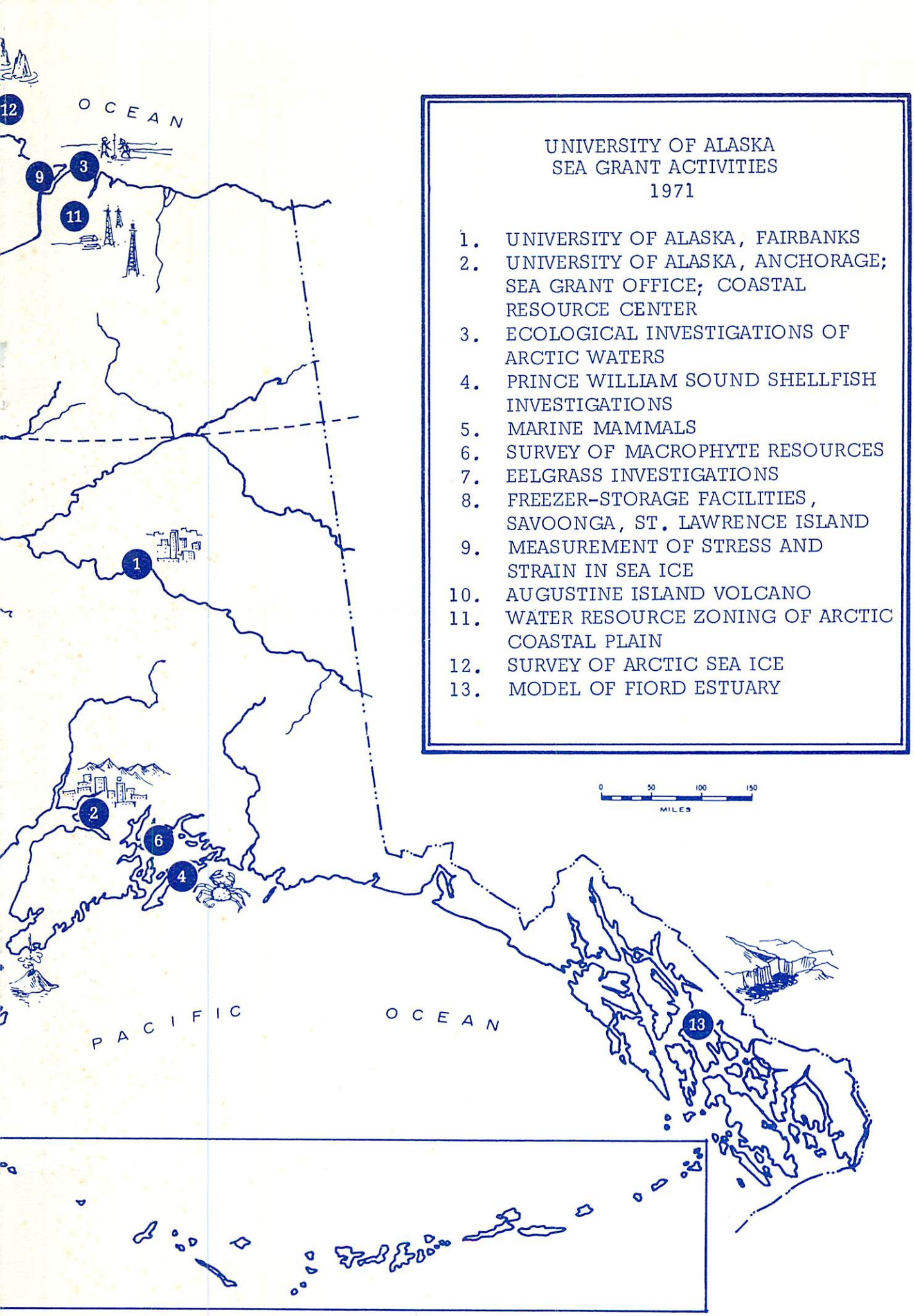
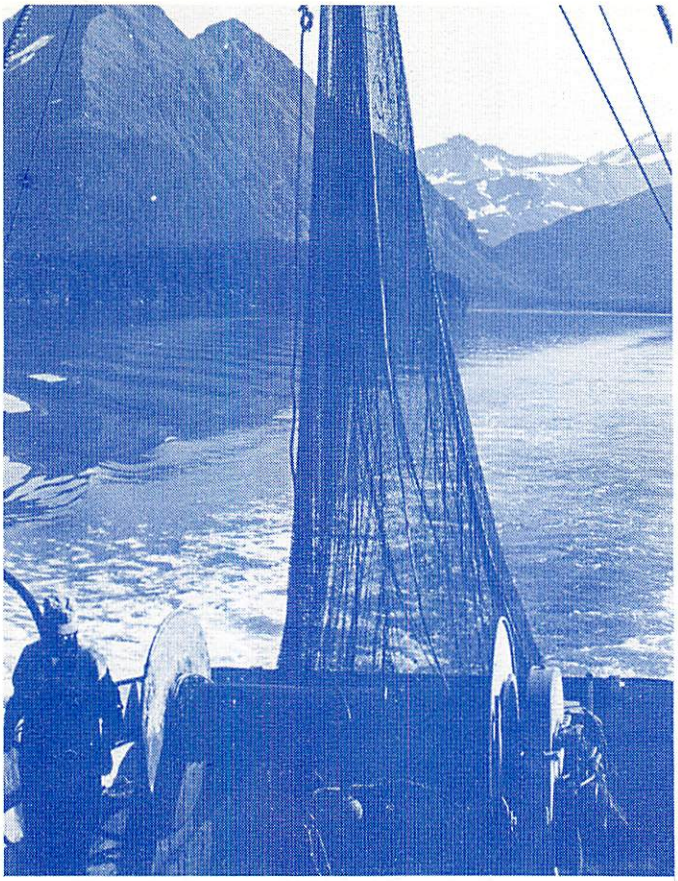


UNIVERSITY OF ALASKA
SEA GRANT ACTIVITIES
1971

1. UNIVERSITY OF ALASKA, FAIRBANKS
2. UNIVERSITY OF ALASKA, ANCHORAGE; SEA GRANT OFFICE; COASTAL RESOURCE CENTER
3. ECOLOGICAL INVESTIGATIONS OF ARCTIC WATERS
4. PRINCE WILLIAM SOUND SHELLFISH INVESTIGATIONS
5. MARINE MAMMALS
6. SURVEY OF MACROPHYTE RESOURCES
7. EELGRASS INVESTIGATIONS
8. FREEZER-STORAGE FACILITIES, SAVOONGA, ST. LAWRENCE ISLAND
9. MEASUREMENT OF STRESS AND STRAIN IN SEA ICE
10. AUGUSTINE ISLAND VOLCANO
11. WATER RESOURCE ZONING OF ARCTIC COASTAL PLAIN
12. SURVEY OF ARCTIC SEA ICE
13. MODEL OF FIORD ESTUARY



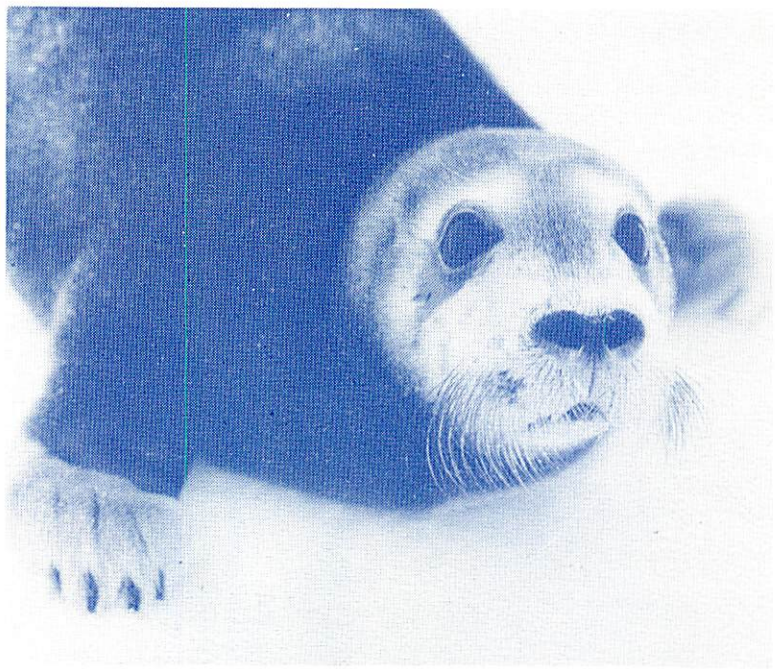
– investigations of Prince William Sound shellfish stocks – clams, crabs and shrimp – are providing information for development of Alaska's underutilized, marine resources.

Marine Mammals

Marine mammals represent a particularly important and unique Alaskan renewable resource. Management of all resident marine mammals, particularly important species of seals, is of great state concern. This program is a cooperative effort between biologists of the Alaska Department of Fish and Game and the Institute of Arctic Biology. It seeks to correlate physiological, behavioral, sensory and ecological knowledge with studies of population dynamics and productivity, information needed for marine mammal management and regulation. The project is divided into five separate but mutually complimentary aspects.

– marine mammals represent a particularly important and unique Alaskan renewable resource.

Biology of Bering Sea Harbor Seals: Harbor seals are an important species because of their wide distribution, high productivity, and utilization by man. Management information required by the State of Alaska is being collected both in the field and in the laboratory on the seal's reproductive biology, growth and development patterns, demography, physical characteristics, and ecological relationships with other organisms.



Marine Mammal Toxicology: The discovery of high mercury concentrations in Pribilof fur seals has demonstrated the potential for heavy metals and pesticides to accumulate in marine organisms. To help evaluate this problem, analyses for mercury in Alaskan marine mammals are being made, and capabilities to analyze for lead, arsenic, and various pesticides are being developed. Cooperative interest in this project is widespread between several state and federal agencies. The Alaska Department of Fish and Game cooperates with the Sea Grant Program in actively sharing costs and project management with Institute of Arctic Biology biologists.

Biochemical Analysis of Marine Mammal Species and Population: Blood samples from two different forms of harbor seals – land-breeders and ice-breeders – are being analyzed to see if they are genetically different. If so, such information could lead to population management techniques that could differentiate between the reproductive rates of the two seal forms, and thus assure improved harvest and management regulations.

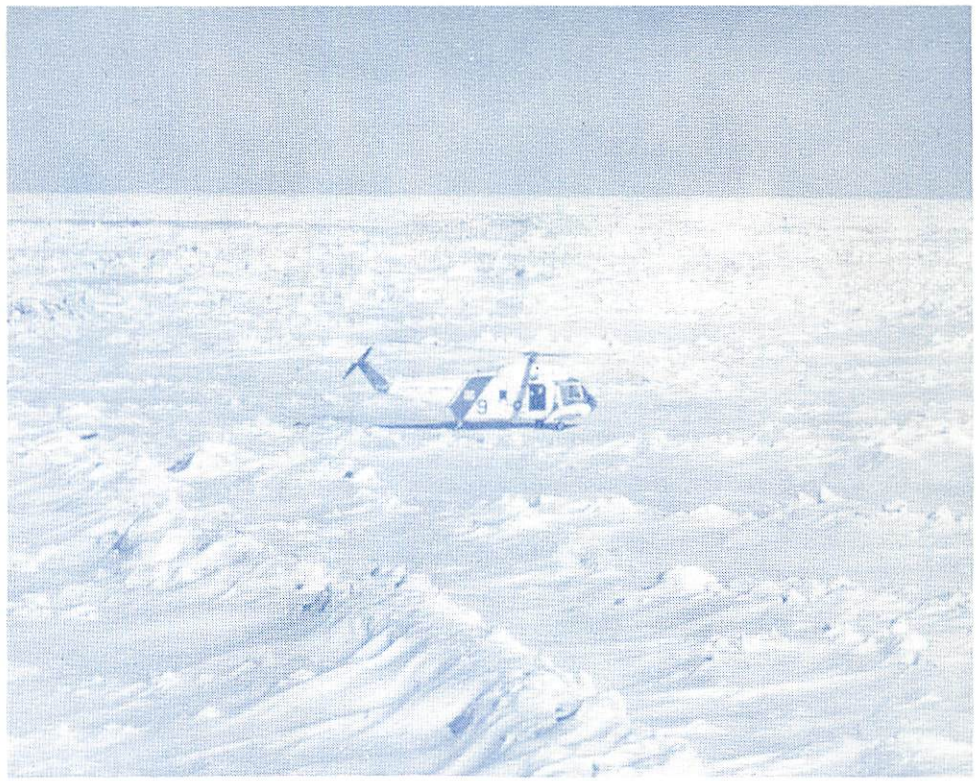
Adaptation of Marine Mammals to their Environment: This project involves two aspects. First, a study of the development of thermoregulation in newborn seals using both field and laboratory methods; and second, a study to see what adaptive changes nervous systems of marine mammals undergo to allow them to function in cold aquatic habitats. In addition to knowledge gained on the physiology of seals, this research may have far-reaching application to man's future occupation of cold regions – including areas beneath the sea and in outer space.

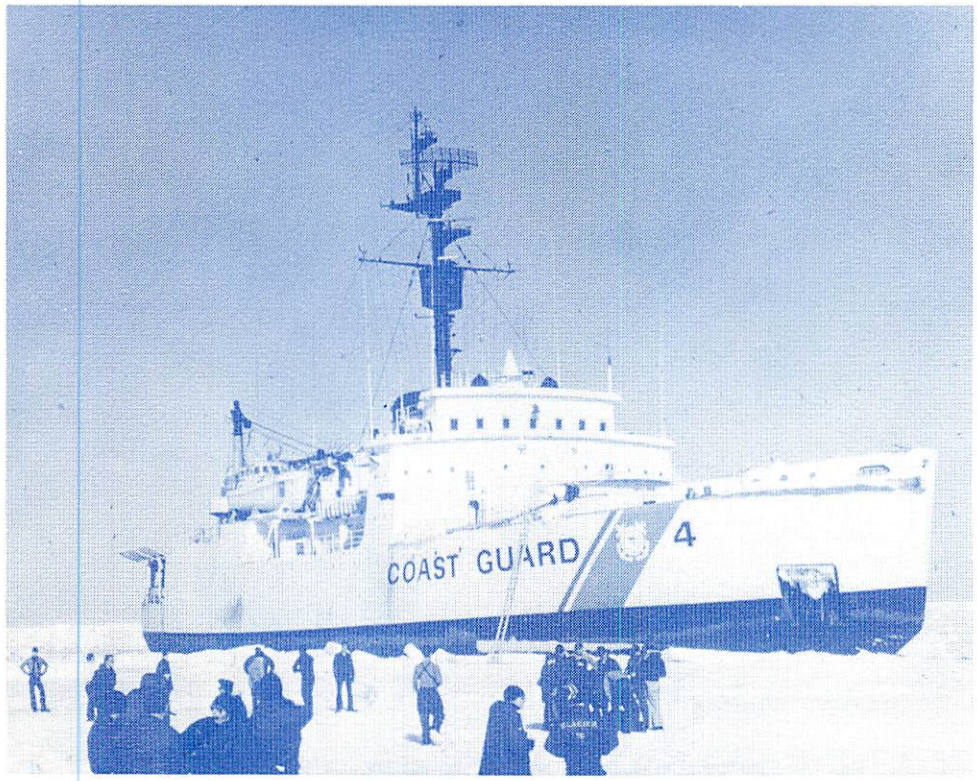
– Alaskan Natives depend upon marine mammals for life itself, and science must provide knowledge for proper state and federal management.

The Cruise of the United States Coast Guard Cutter Glacier: During March and April of 1971 twelve scientists participated in a scientific cruise on the icebreaker, USCGC Glacier. Organized under the Alaska Sea Grant Program, the cruise provided the opportunity to investigate various biological aspects of the Bering Sea environment on an integrated basis. The cruise proved the feasibility and desirability of joint research effort utilizing logistic support provided by the U.S. Coast Guard. The interests of participating scientists from the University of Alaska's Institutes of Arctic Biology and Marine Science, the Alaska Department of Fish and Game, the U.S. Arctic Health Research Center, the U.S. Fish and Wildlife Service, and John Hopkins University included five major fields of investigation. These were: 1) the ecology, biology, behavior and acoustics of Bering Sea seals, 2) the biochemistry of Bering Sea marine mammals, 3) primary productivity, benthos ecology and hydrography of the Bering Sea, 4) biochemical investigations of invertebrates in the Bering Sea, and 5) marine bird investigations in the Bering Sea.

As a result of this cruise, scientists are now better able to plan practical programs for the acquisition of new knowledge in the waters of the northern Bering Sea and Arctic Ocean. Scientific objectives have been clarified and plans for future integrated programs are currently being formulated.

– Photographs on the following pages illustrate the environmental challenges of research in arctic waters.




COAST GUARD
4

Survey of Macrophyte Resources in Alaskan Coastal Waters

Marine macrophytes, i.e., seaweeds, are increasing in value as potential sources of food and especially chemical extracts. Alaska with its relatively undeveloped coastal zone and pollution-free waters offers a good place to develop a seaweed industry. Using scuba divers and underwater television, data is being gathered on the quantities, chemical composition and commercial value of marine macrophytes in coastal waters of Alaska. In addition, a permanent herbarium of all species collected is being maintained for systematic study and reference. Preliminary results suggest there are sufficient stocks of brown seaweeds in Alaska, and there has been increasing interest in starting a new industry here. The general survey work of 1970 throughout southeast Alaska has given way to more concentrated investigations during 1971 in Prince William Sound.

Nutrient Value of Eelgrass

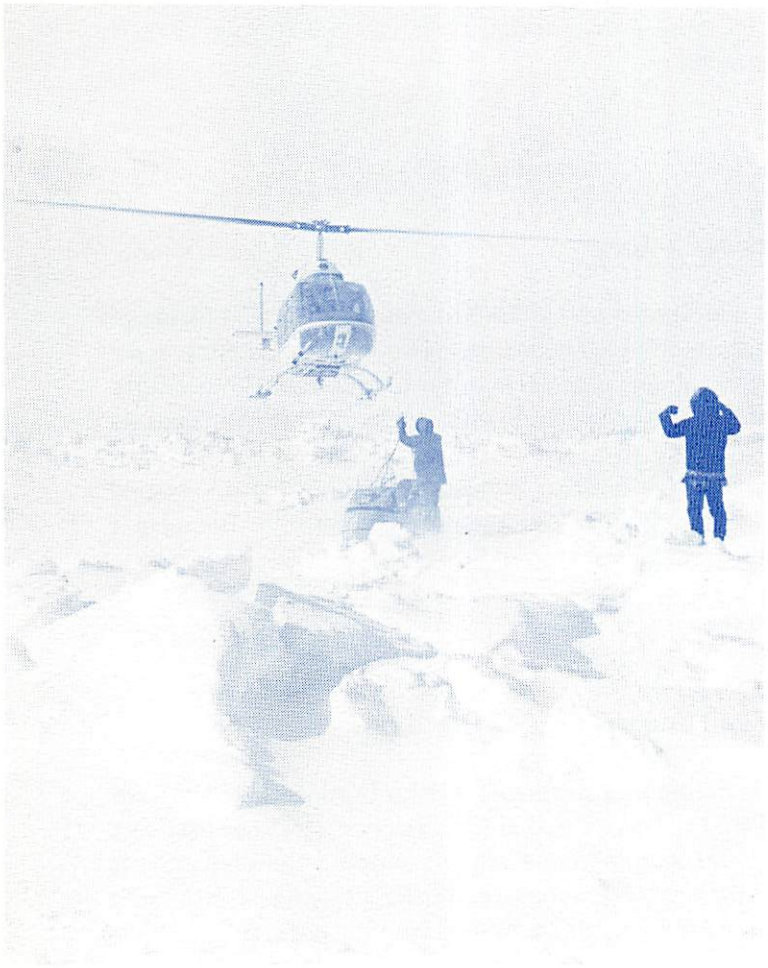
Eelgrass is a widespread and abundant marine plant that forms an important natural food for waterfowl. This project is a pilot study on the nutritive value of eelgrass in order to understand more fully environmental values associated with stocks of this plant and its value as a domestic food for waterfowl, reindeer, etc. Growth rates and energy requirements of geese and ducks fed on varying diets of eelgrass are being examined to determine the plants nutritive value.

Model of a Fiord Estuary

A hydrologic model of a southeast Alaska fiord estuary has been constructed by the Institute of Marine Science. It will be used as a preliminary tool in explaining and developing the concepts of using deep nutrient rich waters of Alaska's southeast coast as a nutrient source for aquaculture projects in tidal bays.

Measurement of Naturally Occurring Stress and Strain in Sea Ice

Knowledge of naturally occurring stresses and strains in nearshore sea ice must be available for the proper design and construction of fixed structures needed in the development of arctic coastal resources. Work is currently underway at the Institute of Arctic Environmental Engineering to develop and test equipment for making continuous, in-place measurements of the stress and strain in sea ice within the boundary nearshore region. Once developed, the equipment will be field tested in the Colville River delta and Prudhoe Bay areas and will contribute greatly to engineering knowledge of the North.



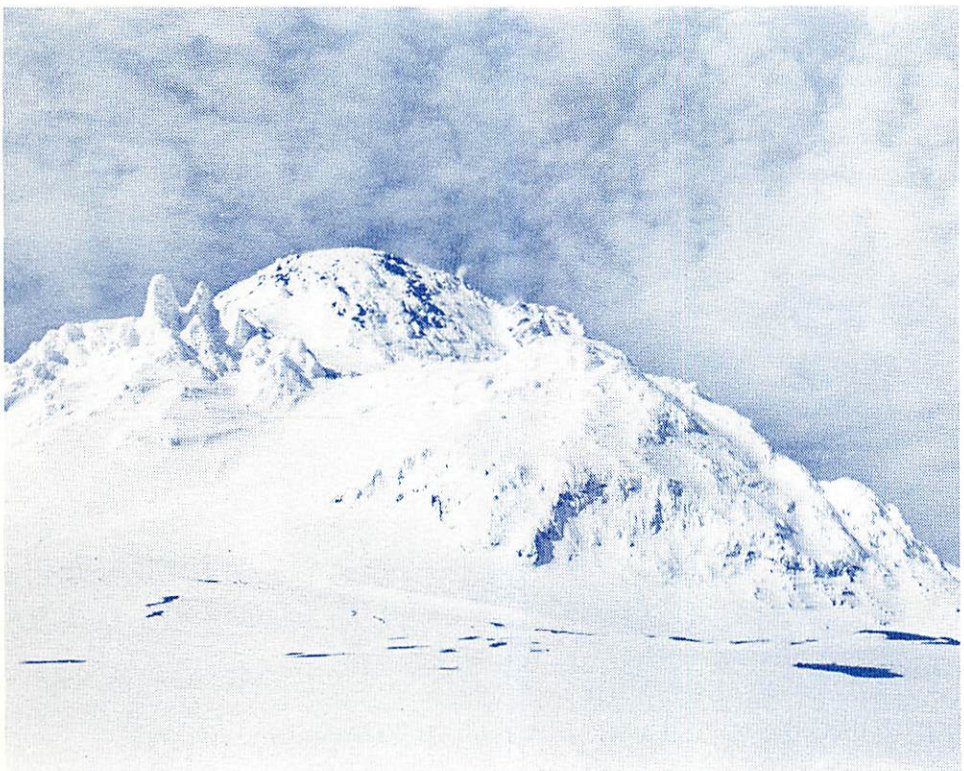
– engineering party off Prudhoe Bay, Beaufort Sea.

Volcanic Eruption Studies

Augustine Island, an explosive-type volcano located near the mouth of Cook Inlet, has erupted repeatedly during historic times. Due to its explosive nature and its location, it poses a serious threat to sea and air lanes, offshore facilities and coastal settlements in the Cook Inlet region. This project involves an extensive geophysical study of the volcano coordinated by the Geophysical Institute, primarily to develop an effective eruption detection and early warning system for the region. In addition, a computer model of Cook Inlet is being developed in an attempt to predict the effect of volcano generated sea waves, such as the one in 1883 that inundated Pt. Graham with a thirty foot high wall of water.

– geophysicists installing vertical seismometers on Mt. St. Augustine volcano.

– above: smoking Augustine volcano in 1966; below: the volcano today – with dome growth over 200 feet in the last few years, restoring its pre-eruptive contour of 1883.



Survey of Arctic Sea Ice

A survey of arctic sea ice using satellite photos is being made by scientists of the Geophysical Institute in conjunction with an overall meteorological study of Alaska's North Slope. Besides its scientific value, these methods could be used as a practical tool to aid navigation and to predict ice conditions.

– knowledge to permit ice forecasting in Arctic waters is essential to tug and barge traffic, here shown at Barter Island.

Development of Freezer-Storage Facilities at Savoonga, St. Lawrence Island

There is great need in rural communities of Alaska for low cost, efficient, large capacity food refrigeration and storage facilities to improve community subsistence and health. Inexpensive refrigeration could also lead to economic enhancement in rural villages by permitting the establishment of small, commercial fishery industries. Last winter the Sea Grant Program provided supplementary support to this project of the Institute of Arctic Environmental Engineering for the completion of an experimental prototype heat sink refrigeration system at the village of Savoonga, St. Lawrence Island. The system is now in operation providing refrigeration for subsistence Eskimo foods – walrus, seals, reindeer and birds.

Water Resource Zoning for the Arctic Coastal Plain

This study involves an evaluation of the impact of oil field development upon the water resources of the Arctic Coastal Plain. Present and future conflicts between various water uses on the North Slope have been documented and predicted. Research completed and underway in the area has been reviewed and future research needs have been prescribed. Results of the study have shown the need for a regional management group to coordinate and fund high-priority research, to plan water-related investment needs in the future, and to set and enforce operating standards for water quality control.

ALASKA SEA GRANT PROGRAM PARTICIPATION

University of Alaska:

Institute of Arctic Biology
Institute of Marine Science
Arctic Institute of Environmental Engineering
Geophysical Institute
Division of Statewide Services — Fisheries Ext.
College of Biological Sciences and Renewable Resources
College of Earth Sciences and Mineral Industry
College of Mathematics, Physical Sciences and Engineering
University Museum

State of Alaska:

Alaska Department of Fish and Game

U.S. Government:

U.S. Public Health Service — Arctic Health Research Laboratory

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The administrative office for the Alaska Sea Grant Program is located in Anchorage at 142 East Third (phone: 279-8528). Anyone desiring further information regarding the Sea Grant Program, the Coastal Resource and Science Service Center or Alaskan coastal affairs please contact this office.