

## NOAA Funds Major Alaskan Marine Studies

Nearly a quarter of a million dollars in supplemental contract funds have been awarded to Western Washington State College (WWSC) in Bellingham by the National Oceanic and Atmospheric Administration (NOAA). The \$244,473 will be used to continue research on marine plant and animal life along Alaska's northern shoreline. The college had earlier received \$98,856 from NOAA, a Commerce Department agency.

### BEAUFORT AND CHUKCHI SEA HABITATS STUDIED

An overall objective of the research is to characterize the habitats and ecological relationships of predominant plant and animal species along the shorelines of the Beaufort and Chukchi seas. Continuing work begun in the summer of 1975, WWSC researchers will sample key sites from Point Barrow east to the Canadian border and southwest to Kotzebue and Cape Prince of Wales.

Results of the research will include distribution maps of Beaufort and Chukchi Sea habitat types, and quantitative estimates of predominant marine populations and their nutritional and other ecological requirements. Data from the multi-year study will help scientists estimate the potential risks incurred to resident and migratory marine life from outer continental shelf oil and gas exploration and development.

### RESEARCH CONTINUED ON OIL AND MARINE SPECIES

Another supplemental NOAA contract totaling \$247,172 has been awarded to Oregon State University (OSU) at Corvallis to continue research on the effects of oil spills on fish, shellfish, marine birds, and seafloor organisms in Alaskan Waters. Oregon State University had previously received \$300,734 from NOAA.

The OSU scientists will continue research on the acute and chronic effects of crude oil and other petroleum-associated chemicals on Dungeness crabs, fish-eating birds, shellfish, and various microorganisms in the Gulf of Alaska and the Beaufort Sea. Study-

ing the effects of potential oil spills on Dungeness crab larvae has particular economic significance for Alaska, which has harvested from 10 to 40 percent of the total catch from the Pacific coast in recent years.

The OSU and WWSC contracts are part of a major marine environmental study conducted by the Commerce Department agency's Environmental Research Laboratories (ERL) for the Interior Department's Bureau of Land Management Outer Continental Shelf Environmental Assessment Program. The studies seek to determine the probable ecological impacts of oil exploration and development activities on Alaska's outer continental shelf.

### BASELINE ECOLOGY STUDIES

Nearly \$1,000,000 in supplemental NOAA contract funds have also been awarded to the Alaska Department of Fish and Game. The \$964,063 will be used to continue research on baseline ecological studies of migratory birds, fish and shellfish, seals, and sea otters in Alaskan coastal regions. Like the OSU and WWSC contracts, this too is part of ERL's major environmental study for the Interior Department's Bureau of Land Management.

A portion of the contract funds will be used to make further studies of spawning grounds used by the Pacific herring and five species of smelt in the Bering Sea. Because Alaska coastal residents have depended upon the Pacific herring as a vital part of their subsistence catch for thousands of years, the Alaska researchers will make additional aerial and "ground truth" beach surveys for their baseline studies of the fisheries before major petroleum development activities occur. Alaska Department of Fish and Game biologists will also continue their research to define the Pacific razor clam populations in the Gulf of Alaska.

The Gulf of Alaska and the Bering, Beaufort, and Chukchi seas are all included in the state agency's studies of the various species of seals and sea otters which inhabit

these regions. The researchers will also continue their compilation of maps identifying all major bird habitats along Alaska's coastline.

By correlating important life history data of fish occupying the nearshore areas of the Beaufort Sea with knowledge of habitat needs, the biologists hope to obtain baseline information that can be used to direct the activities of people and industry in proposed petroleum lease areas there. The Alaska Department of Fish and Game had previously received \$1,182,427 for work related to NOAA's outer continental shelf environmental program.

### EFFECTS OF OIL EXPLORATION

Further supplemental ERL contract funds totaling \$1,168,613 have been awarded to the University of Alaska at Fairbanks by NOAA to continue research on the potential effects of offshore petroleum exploration and development along Alaska's coastline.

Among the research projects to be undertaken by the University of Alaska's Arctic Environmental Information and Data Center is a study and analysis of climate conditions along the entire coastline of Alaska. Results of the study will provide broad guidelines for site selection of onshore petroleum facilities and pinpoint where more detailed evaluations of climate are needed for potential site construction. To date, the University Center has completed a series of 32 annotated maps that depict the natural resource and environmental conditions for the region between the Bering Strait and Icy Cape in the Gulf of Alaska near the Yukon Territory-Alaska border.

The University's Institute of Marine Science will continue to expand its natural hydrocarbon measurements program, including the collection of floating tar samples, begun in the Gulf of Alaska during the past year. They also will study the mechanisms which influence seasonal variations of currents and large water masses in the Gulf.

Marine life is also a target of the University's research. The Institute will determine the environmental impact from oil-related industrial activity on select marine "indicator" organisms by establishing baseline levels of trace heavy metals now present in the organisms.

The Institute of Arctic Biology will make special studies of birds in Norton Sound and Kotzebue Sound. Baseline information is

needed to evaluate the impact of increased human activity associated with petroleum development on birds and their habitats.

A portion of the supplemental funds will be used by the University's Geophysical Institute to produce three sets of maps, displaying information necessary for an environmental assessment of the coasts of the Bering and Beaufort seas. When work is completed, the researchers will have produced a total of 72 maps for the Bering Sea and 30 maps for the Beaufort Sea, indicating the stability of the shoreline, the various coastal landforms, and the distribution of beach materials such as sand and gravel.

The contracts include \$692,482 to the Geophysical Institute and \$476,131 to other departments at the University of Alaska. Under two separate contracts, NOAA had previously awarded the University of Alaska \$4,796,028.

### SHELLFISH BIOECONOMICS

A \$99,995 contract has also been awarded by NOAA's National Marine Fisheries Service to the Alaska Commercial Fisheries Entry Commission for bioeconomic research of Alaskan shellfish fisheries.

One of eight similar contracts awarded for bioeconomic studies in various geographical areas, this provides for research on domestic harvesting capacity, diversification capabilities and desires of fishermen, and the extent to which overcapitalization has occurred in Alaskan shellfisheries. Study activities call for the establishment of shellfish research groups in five key geographical areas: Petersburg, Cordova, Homer, Kodiak, Alaska; and Seattle, Wash. The information obtained from the study is expected to prove helpful in the development of fishery management plans by the

North Pacific Fishery Management Council, one of eight recently formed.

Established by the Fishery Conservation and Management Act of 1976, the councils have responsibility over fisheries within the 200-mile fishery conservation zone adjacent to the states within their regions. Under this Act, the councils are charged with the development of fishery management plans consistent with certain national standards which require consideration of social and economic aspects of fisheries management. The bioeconomic studies are expected to prove useful to the councils by providing information on these.

The Alaska Commercial Fisheries Entry Commission, working in close cooperation with the Alaska Department of Fish and Game, has been responsible for monitoring the harvest of Alaskan commercial fishery resources.

## Marine Mammal Guide Published by NOAA

A field guide to help identify whales, dolphins, and porpoises in the western North Atlantic has been published by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service.

**"Whales, Dolphins, and Porpoises of the Western North Atlantic - A Guide to Their Identification"** also includes those animals found in the Caribbean Sea, Gulf of Mexico, and the eastern coastal waters of the United States and Canada.

While the 176-page volume is intended as an aid to identifying living animals at sea, it also is expected to assist in the reporting of stranded specimens, a major source of material for museums. Appendices describe how and to whom data on live or dead whales, dolphins, and porpoises should be reported.

Regardless of their scientific relationships, all the specimens covered in the main text of the Commerce Department agency's guide are divided into small, medium, and large categories.

Photographs of the animals in their natural environment, supplemented by drawings and descriptions or tables distinguishing the most similar species, form the core of the guide.

Following the summary accounts of the species are five appendices covering tags

and markings; how to record and report observations at sea; strandings and handling; forms and instructions for measurements; and institutions for information, and for reporting strandings.

Also included is a bibliography of useful references on cetaceans in general and cetaceans of this region in particular, as well as a directory of species explanations.

Funds for the preparation of the guide

were provided by a NOAA grant to Stephen Leatherwood of the Naval Undersea Center, San Diego. Co-authors of the guide are David K. Caldwell of the University of Florida, and Howard E. Winn, of the University of Rhode Island, with special assistance from William E. Schevill of the Woods Hole Oceanographic Institute, and Melba C. Caldwell, also associated with the University of Florida.

This photo of a fast-swimming blue whale is one of many illustrations from the new NOAA publication "Whales, Dolphins, and Porpoises of the Western North Atlantic—A Guide to Their Identification."



The NOAA Technical Report NMFS Circular 396, Catalog #C-55.13, is for sale at \$2.45 each by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

## **NOAA Weather Radio Aids Boaters and Fishermen**

America's fastest-growing radio network, NOAA Weather Radio, gives the Commerce Department's National Weather Service a potent, fast-moving technique for spreading storm and flood warnings. Its potential for saving lives is considered high.

NOAA Weather Radio began in a small way in the mid-1960's. Then, it was a new National Oceanic and Atmospheric Administration service to boaters and fishermen. Today, it has more than 100 stations and by 1980 it is expected to have more than 300 outlets ready to serve 90 percent of the country's population.

When a natural disaster threatens, forecasters move quickly to broadcast warnings, taped or live, accompanied by vital safety information with immediate utility. Lest the spoken word go unnoticed, forecasters can trigger "warning alarm" receivers to emit a high-pitched tone of unmistakable urgency. In some receivers, the tones activate a siren which alerts the listener to turn up the volume; in others, they automatically increase the decibels so the weather message is certain to be heard. This feature is especially useful in schools, hospitals, and other institutions.

NOAA Weather Radio broadcasts are retransmitted over cable television in some locations; some cable operators alert subscribers to urgent messages with beepers loud enough to waken sleepers. Others offer a voice override enabling local public safety officials to blank out the cable TV audio and issue weather warnings—a valuable time-saver when seconds count.

In January 1975, NOAA Weather Radio was designated by the White House as the sole Government-operated radio system to provide warnings directly into homes, not only for natural disasters but for nuclear attack.

In less dramatic times, however, the "other network" just goes on about the weather, 24 hours a day, 7 days a week. Taped in Weather Service offices, the transmissions feature the latest observations

and forecasts and a variety of specialized weather information depending upon the locality. Messages average 4 to 6 minutes, are repeated without pause, and are revised as required, ordinarily every 2 or 3 hours to provide the listener with the very latest information.

The broadcasts are heard in most locations in a radius of about 40 miles, but effective range varies with the terrain and the receiver.

Broadcasts contain a wide variety of specialized information. Along the coasts and the Great Lakes, the concentration is on information for boaters, fishermen, and others whose work or play take them to the water. Where the potential for flooding is strong and waterway navigation is important, river forecasts are emphasized.

In farm country, special information is issued for orchardists, ranchers, and others involved in agricultural operations.

To hear this unique service, one must obtain a special high-band receiver capable of picking up 162.40, 162.55, or 162.475 megahertz. They cost from \$10 to well over \$100, and performance varies widely. Some have automatic warning capability; others do not. Also on the market are numerous multi-purpose radios with the "weather band."

Quality of reception varies with the terrain and other factors. NOAA recommends that prospective buyers make final acceptance of a receiver conditional upon a test in the setting where it will be used, and that institutional users purchase high-quality commercial receivers.

As of last summer, NOAA Weather Radio operating locations were:

Alabama—Huntsville and Mobile; Alaska—Anchorage and Seward; Arizona—Phoenix; California—Coachella, Crescent City, Eureka, Los Angeles, Monterey, Point Arena, Sacramento, San Diego, San Francisco, San Luis Obispo, Santa Barbara; Colorado—Denver; Connecticut—New London; Florida—Daytona Beach, Jacksonville, Key West, Miami, Panama City, Pensacola, Tallahassee, Tampa, West Palm Beach; Georgia—Atlanta, Savannah; Hawaii—Hilo, Honolulu, Kokee, Mt. Haleakala.

Illinois—Chicago; Indiana—Evansville, Indianapolis; Iowa—Des Moines; Kansas—Wichita; Kentucky—Ashland, Bowling Green, Covington, Hazard,

Lexington, Louisville, Mayfield, Somerset; Louisiana—Baton Rouge, Lake Charles, Morgan City, New Orleans; Maine—Ellsworth, Portland; Maryland—Baltimore, Salisbury; Massachusetts—Boston, Hyannis; Michigan—Alpena, Clio, Detroit, Grand Rapids, Marquette, Sault Sainte Marie, Traverse City; Minnesota—Duluth, Minneapolis; Mississippi—Gulfport, Jackson; Missouri—Kansas City, St. Joseph, St. Louis.

New Jersey—Atlantic City; New Mexico—Albuquerque; New York—Buffalo, New York City, Rochester; North Carolina—Cape Hatteras, New Bern, Wilmington; Ohio—Akron, Cleveland, Columbus, Sandusky; Oklahoma—Tulsa; Oregon—Astoria, Coos Bay, Eugene, Newport, Portland; Pennsylvania—Erie, Philadelphia, Pittsburgh; South Carolina—Charleston, Myrtle Beach; Tennessee—Nashville; Texas—Brownsville, Corpus Christi, Dallas, Fort Worth, Galveston, Houston, Pharr; Utah—Salt Lake City; Vermont—Burlington; Virginia—Manassas, Norfolk; Washington—Neah Bay, Seattle, Yakima; Wisconsin—Green Bay, Milwaukee.

## **Office of University Affairs Opened by NOAA**

The National Oceanic and Atmospheric Administration (NOAA) has established an Office of University Affairs, Robert M. White, Administrator, announced in mid-December. The new office will be headed by Robert B. Abel, Director of the National Sea Grant Program. Abel will be succeeded in the Sea Grant post by Ned A. Ostenson, Deputy Director and Senior Oceanographer of the Ocean Science and Technology Division, Office of Naval Research.

The reorganization will bring new strength to NOAA, a major agency of the Department of Commerce, according to White. "The need for a University Affairs Office has been evolving steadily," he said. "Dr. Abel, whose distinguished career in marine science has been built upon collaboration with our major educational institutions, is an ideal choice as its Director. We are fortunate that with the Sea Grant program on a firm foundation, to a great degree through his efforts, he has accepted the challenge of this new post.

"We are equally fortunate that Dr. Ostensio has agreed to assume direction of the National Sea Grant Program, one of the most important marine efforts in the nation."

The Sea Grant program is designed to encourage and accelerate marine development through a system of grants. It operates at a level of \$27 million annually.

Commenting on the need for a University Relations Office, which will report directly to the Administrator, White said: "The successful discharge of NOAA's responsibility is dependent upon a broad range of interactions between NOAA and the university community. Traditionally, NOAA has depended upon universities to carry out certain research in support of its activities under grant or contract. The largest of these university efforts has been our Sea Grant program. However, NOAA's interactions with universities extend far beyond those involved in the Sea Grant program, and they are becoming increasingly diverse. Our support of research and development at universities has grown substantially over the past five years, to the point where today we expend over 33 million dollars annually for research and development in oceanic, atmospheric, fisheries, and earth sciences, as well as in diverse fields of public policy.

"Our interactions with the universities do not stop with direct financial support," White continued. "Our long standing policy of collocating our research laboratories on university campuses has enabled us to initiate many new forms of collaborative effort with universities. Many NOAA scientists hold professorships in the universities at which the laboratories are located. In turn our laboratories have become foci for facilitating training of students.

"We have many educational and training programs which bring us into close contact with universities. We are totally dependent upon universities for the education and training of the professionals we recruit. Because we are so dependent upon universities for the output of trained personnel for our organization, we have an obligation to see to it that these institutions are capable of continuing such training to provide the personnel that we will need in future years.

"A vital channel for our relationships with the academic world is the National Academies of Sciences and Engineering," White said. "We participate in or interact

with many committees in the Academy structure. Our interactions have become so numerous that it is necessary to systemize the way in which we conduct our affairs with the Academies.

"This diversity of relationships with the university community calls for a means whereby NOAA can effectively deal with them. We need an organizational focus to coordinate our activities where this is necessary, and to foster and stimulate further interest within our own organization in working closely with the university community. In addition," he concluded, "it has become important that we improve the means whereby universities can interact with NOAA in a more systematic fashion."

### *NOAA Scientist Models Great Lakes Phosphorus*

Efforts to halt the rampant algae growth caused by phosphorus pollution in the Great Lakes may be effective by 1985, but western Lake Erie will never be as "clean" as the other lakes.

These are among the predictions of a mathematical model developed at the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory. The model, still being refined by Steven Chapra of the Ann Arbor, Mich., laboratory (one of NOAA's Environmental Research Laboratories), is a set of equations describing the behavior of phosphorus in the Great Lakes which the scientist believes can be used to aid in planning pollution abatement programs.

Increases in the nutrient phosphorus—largely from human sources—have accelerated the natural process of eutrophication (biological productivity) in the lakes. If unchecked, this process could cause a lake to literally grow itself to death, becoming clogged with algae until decomposition of organic matter removed oxygen from the water depths and fish and other fauna could not survive.

Efforts at preserving the lakes have concentrated on limiting the amount of phosphorus entering them. Knowledge of the sources and sinks of the nutrient in the lakes would make the task easier, but the size of the lake system makes direct measurement costly and difficult. A mathematical model that simulates phosphorus budgets—a balance of the processes that add or remove

phosphorus from the lake system—would fill the need.

Chapra's model takes into account three basic sources of phosphorus: domestic, land runoff, and atmospheric. Domestic sources, he explains, include the sewered wastewater from residences, businesses, and institutions. Human waste and detergents are by far the biggest contributors of phosphorus in this category.

The amount of phosphorus that washes into the lakes from the land depends upon how the land is used—whether it is agricultural, urban, or forested land—and also on such factors as topography, precipitation, soil characteristics, vegetation, animal population, and manipulative practices such as fertilizing. Finally, dust, rainfall, and snow also drop phosphorus into the lakes. On the other side of the scale, a sizeable fraction of incoming phosphorus is removed by incorporation into lake sediments.

To test the model, the Commerce Department scientist used it to simulate phosphorus inputs and concentrations from the year 1800 to 1970 and compared the results with actual measurements. Chapra fed in the probable conditions of the lakes in 1800, when the main sources of phosphorus were the atmosphere and runoff from forested land, and the model simulated the changes that took place as the population around the lakes grew and the forests gave way to wharves, farms, and cities. In the end, the 1970 phosphorus levels predicted by the model agreed well with measured values.

The simulation also provided some new insights. It suggested, for example, that there is a physical limitation to water-quality improvement in the Great Lakes. Western Lake Erie, a small basin that collects water—and phosphorus—from a large area of land, has a calculated natural phosphorus concentration 50 percent higher than the next highest lake. "This suggests that total removal of cultural wastes would never bring western Erie to the levels possible in the other lakes," said Chapra.

Over the past 170 years, the calculations showed, the lakes have suffered two major periods of increased phosphorus loading. In the latter part of the 19th Century, the forested land was cleared for agriculture, causing phosphorus increases in all the lake basins. Then, after about 1945, population growth, a resulting increase in sewage, and the introduction of phosphate detergents



A refined mathematical model of phosphorus behavior in the Great Lakes may aid pollution abatement programs.

handling of diffuse sources and the addition of sediment-water interactions—that should enhance its usefulness. “When such modifications are made, the approach will offer a comprehensive and relatively inexpensive package for investigating man’s impact on the future water quality of the Great Lakes,” Chapra said.

## Fishing Experiments Told For NW Hawaiian Islands

The Honolulu-based research ship *Townsend Cromwell* returned to port in late November 1976 after 2 months of fishery and oceanographic surveys at selected sites along the Northwestern Hawaiian Islands. Experimental bottom trawling, fish and lobster trapping, and handling were conducted by personnel from the Honolulu Laboratory of the National Marine Fisheries Service (NMFS), according to Laboratory Director Richard S. Shomura. The *Cromwell* is one of a fleet of 25 research vessels belonging to the National Oceanic and Atmospheric Administration.

Included in the cruise was a survey of Hancock Seamount, a pinnacle rising 1,600 fathoms from the floor of the ocean just 200 miles northwest of Midway Island. There, foreign fishing vessels have been reported to harvest thousands of tons of pelagic armorhead. Chief scientist Thomas S. Hida also reported the trapping, tagging, and release of 596 spiny lobsters for population studies in waters surrounding Necker Island.

Several hundred pounds of “red tail” opelu were caught at depths of about 200 fathoms off Necker and Laysan islands. Until last year this species of scad was not recorded from the Hawaiian Archipelago. Participating in the cruise were bottom trawling gear experts from the NMFS Northwest and Alaska Fisheries Center in Seattle. Marine mammal observers from the University of Hawaii were also included in the scientific complement.

This cruise of the *Townsend Cromwell* was one of the first in a 5-year intensive survey and assessment of the inshore and inner slope resources of the little known area to the north and west of the main Hawaiian Islands. Cooperating in the undertaking are NMFS, the U.S. Fish and Wildlife Service, and the Department of Land and Natural Resources of the State of Hawaii.

made a strong impact, particularly on lakes Erie, Ontario, and Michigan. Huron and Superior were relatively less affected by the population change, hence treatment of domestic point sources of pollution would have little effect on water quality in those lakes, Chapra notes.

The experiment also demonstrated that Lake Ontario’s health is significantly affected by the health of the lake upstream, Erie, and the scientist concludes that a coordinated program of waste abatement would be necessary for those two lakes.

Chapra also used the model to try to predict the success of phosphorus abatement programs that concentrate initially on reducing domestic sources. In general, the goal of these programs is 1 mg of phosphorus in each liter of effluent by 1980.

It is estimated that every day about 150 gallons of effluent are poured into the lakes for each inhabitant of the basin. If abatement programs go according to plan, by 1980 the inflow of phosphorus into the lakes would be 0.46 pounds (209 grams) per capita per year. Under such conditions, Chapra found, all the lakes would show marked improvement by 1985. However,

Lake Erie—particularly the western basin—would require additional treatment to reach acceptable levels of productivity.

Chapra cautions that this prediction is based on the assumption that phosphorus loss to sediments is a one-way process. For most of the lakes, it is, but once again Erie is the exception. In Erie, phosphorus levels in sediments are already so high that reduction of the amount of phosphorus in the water might cause some of that trapped in sediments to leak back into the water. In addition, the western and central basins of Lake Erie are so shallow that storms can stir up sediment and mix phosphorus back into the water.

Chapra points out that his model is designed to aid management decisions, and that the computer program is structured so that political or geographic distinctions can be made. “Thus it is relatively easy to develop scenarios of future conditions which ask questions such as ‘What would happen if the State of Michigan outlawed detergents, while all other parts of the region did not?’” he said.

The NOAA researcher is planning some refinements of the model—such as better