

Agricultural Extension, Marine Advisory Services Agree on Closer Cooperation

Close working relationships between State Cooperative Extension Services and marine advisory programs will be provided under a landmark interagency agreement signed 14 November 1974.

Under the agreement, the Extension Service of the U.S. Department of Agriculture representing State Cooperative Extension Services and the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce will work together to provide extension-type services to the marine community.

"The purpose of this agreement is to speed the cooperative efforts to get the results of scientific and technical advances directly to the user," said Robert M. White, NOAA Administrator. "We are delighted that the Extension Service, with its long history of successful activity of this nature, will work closely with NOAA's Marine Advisory Service as a result of this agreement."

By the terms of the agreement, NOAA will prepare a plan for developing marine extension and advisory programs in coastal and other interested states, and advise Extension Services of programs that might pertain to cooperative extension. Upon concurrence by Extension Service, the two services will coordinate the design of educational programs for disseminating information generated by NOAA and will develop and support educational programs on national, regional, state, and local levels.

NOAA's Marine Advisory Service will also cooperate with Extension Service in preparing educational materials and will provide funding where appropriate.

In addition, Extension Service will coordinate with NOAA in developing and conducting training programs through State Cooperative Extension Services, provide information to NOAA on marine resources and environmental problems concerning agricultural and rural communities, and assist in negotiating contracts and agreements between the State Cooperative Extension Services and NOAA.

The USDA's Extension Service is responsible for disseminating to the people of the United States information on subjects relating to agriculture and home economics. NOAA's National Sea Grant Program is responsible for furthering the development, conservation and wise use of America's marine resources, and for maintaining advisory services to achieve this purpose. Institutional recipients of Sea Grants are required to conduct advisory services, and in addition numerous Sea Grant advisory service projects are separately funded.

NOAA's Marine Advisory Service is under the direction of Howard Eckles, and operates under the aegis of the National Sea Grant Program. It involves advisory activities of other NOAA components, such as those of the National Marine Fisheries Service, as well as those of Sea Grant.

Man-Made Sea Slicks May Save Lives Says NOAA Scientist

A harmless man-made sea slick being studied as a hurricane suppressor may also help save lives another way, according to a scientist with the National Oceanic and Atmospheric Administration.

Duncan Ross of NOAA's Atlantic Oceanographic and Meteorological Laboratories in Miami, part of the Commerce Department agency's Environmental Research Laboratories, believes that a slick-forming chemical, added to the dye packets of life jackets and rafts would make it easier for rescuers to spot shipwreck victims or others cast adrift at sea.

Certain chemicals form temporary sea slicks on the surface of the ocean, covering the water with a thin, polymer membrane only a few molecules thick. A small amount of one such compound—polyvinyl alcohol, lineoleic acid and derivatives of polyvinyl acetate—can produce an acre of slick in 20 minutes, with a clearly visible, stable boundary. The chemicals used have been found to be of low toxicity, and the amounts involved are too small to harm aquatic life.

In 1973, two scientists with NOAA's National Hurricane Research Laboratory and the Illinois Institute of Technology announced that such a slick could block one of the channels feeding hurricanes. Hurricanes draw their destructive force from evaporation-produced heat energy from the ocean's surface. After experiments in the Gulf Stream east of Miami, the scientists concluded that the chemical film could effectively suppress evaporation and waves, and, therefore, inhibit the development of storms.

The man-made slicks, which produce a smoother-looking patch of water, even suppress the ripples on the bow wave of a ship. This wave-suppressing property, says Ross, makes polymer sea slicks potential lifesavers. Many lifejackets and rafts carry dye packets used in an emergency to create a splotch of bright orange in the water. The dye patch, however, is soon dissipated by waves.

The ability of sea slicks to calm the seas, Ross says, would assist in prolonging the life of the dye patch. Two ounces of oleal alcohol will form a slick about 200 feet (60 meters) in diameter that lasts several hours. Ross suggests adding the substance to life-jacket dye packets. The slick, he points out, is highly visible and can be detected by airborne radar, so an all-weather search could be conducted from high altitudes, greatly improving the efficiency of search and rescue operations.

MESA Program Office Set Up, Heads Named

A program to investigate how man has affected the marine environment has been established by the National Oceanic and Atmospheric Administration at its Environmental Research Laboratories in Boulder, Colo. Charles G. Gunnerson, a sanitary engineer specializing in pollution control in the oceans and estuaries, and in disposal, reclamation, and recycling of wastes, has been appointed director of the Commerce Department agency's Marine Ecosystems Analysis (MESA) program, and Edward G. Altouney, a civil engineer-economist experienced in public works and water resources, was named deputy program director.

MESA focuses on selected coastal and offshore regions to determine what can be done to correct past mistakes that have harmed the environment, and to learn how to predict the environmental consequences of future actions. The first major project is the New York Bight study which will define the impact of a dense human population on the environment. Another MESA study will assess the probable environmental impact of oil leasing in the Gulf of Alaska.

Prior to Gunnerson's appointment as MESA program director, he was director of the Great Lakes Regional Office of the International Joint Commission, a U.S.-Canada body established by treaty in 1909 to govern the use of the Great Lakes and other boundary waters. Before setting up the Commission's Great Lakes office, he had established a San Diego office of Woodward-Environ Environmental Consultants where he planned and managed environmental impact, research, and management studies for industrial clients and government agencies. He has also served as manager of the Sanitary Engineering Laboratory of the Stanford Research Institute, directing research and development in water supply and pollution control, solid-waste management, and resources recovery. Gunnerson has also worked with the water quality section of the U.S. Public Health Service's Division of Water Supply and Pollution Control, and with the California Department of Water Resources.

A native of Storm Lake, Iowa, Gunnerson studied mining engineering at Iowa State University and civil engineering at Oregon State University. In 1947 he earned a degree in geology from the University of California at Los Angeles and later did graduate work in oceanography and marine bacteriology at the University of Southern California.

Before joining NOAA, Altouney was Senior Specialist in Engineering and Public Works for the Congressional Research Service of the Library of Congress. Previously, Altouney was staff assistant to the Assistant Secretary of the Interior for Water and Power Resources, where he supervised extensive investigations on water development programs and co-

ordinated activities with other federal agencies and with state commissions. He also developed and conducted a water resources research and training program, involving major universities and private research groups throughout the country.

Altouney was on the staff of Stanford Research Institute coordinating institute-wide water research efforts and directing the development of research contracts in water resources.

NOAA Restricts Financial Assistance to Salmon Vessels in Alaskan Waters

The National Oceanic and Atmospheric Administration will not provide financial assistance that would significantly increase the harvesting capacity of vessels in the Alaska salmon fishery until further notice.

The Commerce Department agency has declared the Alaskan salmon fishery a "conditional fishery," which is defined in Commerce Department regulations as a fishery where there are already more than enough vessels to harvest the available catch.

Robert W. Schoning, director of NOAA's National Marine Fisheries Service which administers the financial assistance programs, said that the present harvesting capacity was already so great that the use of the Service's financial assistance programs would be inconsistent with the wise use, management, conservation, and protection of the fishery. Representatives of both Alaska State Department of Fish and Game and the Alaska Limited Entry Commission agree with Schoning's view.

The restriction on financial assistance is automatic upon such a declaration. The restrictions differ for each financial assistance program and are defined in the Commerce Department regulations covering the individual program. The two financial assistance programs affected are the Fishing Vessel Obligation Guarantee Program and the Fishing Vessel Capital Construction Fund Program.

The first program provides a Federal guarantee for obligations, financing, or refinancing (for up to 15 years) 75 percent of the cost of constructing, reconstructing, or reconditioning U.S. commercial fishing vessels of at least five net tons.

Like Gunnerson, Altouney has also worked—from 1958 to 1964—in the State of California's Department of Water Resources. Born in New York City, Altouney earned a bachelor's degree in civil engineering from Ecole Supérieure d'Ingenieurs of the University of Lyons, France, and an M.S. from the Faculte des Sciences de Lyons in 1955; and, in 1963, a Ph.D. from Stanford University in Engineering-Economic Planning.

The second program is one under which Federal income taxes on fishing vessel income may be deferred in connection with constructing, reconstructing, or under certain conditions, acquiring U.S. commercial fishing vessels of at least five net tons. The programs will still be available to vessel owners already operating in the conditional fishery for approved purposes other than adding vessel capacity. The official announcement of the new policy was published in the Federal Register 23 September 1974.

Coast Guard Commissions LORAN-C Test Facility

The Coast Guard formally commissioned a LORAN-C test facility at Caribou, Maine on 22 November 1974. The Caribou facility was established to test new equipment and techniques to improve the world-wide LORAN-C Radionavigation System.

Transmitting equipment, LORAN-C monitoring equipment, communications equipment, a new LORAN-C transmitting antenna, and prototypes of all other new equipment necessary to operate the LORAN-C system are scheduled for installation at Caribou by mid-1976.

Fifteen Coast Guard military personnel, commanded by LCDR Stephen P. Plusch, operate the facility which will ultimately become a fully-operational LORAN-C transmitting station, paired with other East Coast stations to provide improved navigational services to mariners in the Gulf of Maine and neighboring areas.

Earlier last year, the Coast Guard announced plans to replace its Long Range Aid to Navigation (LORAN)

system known as LORAN-A, with the more modern LORAN-C over a five year time period. LORAN-C's primary advantages over LORAN-A are its accuracy and range. LORAN-C can provide more accurate position fixes over much wider areas for fishermen, offshore oilmen, and merchant mariners.

While LORAN-A can be used to identify a position that is accurate to from one to five nautical miles, LORAN-C can identify a position with one-quarter nautical mile accuracy or better, throughout the service area. In addition, LORAN-C signals are usable out to 1,200 to 1,500 miles from the transmitting stations, versus LORAN-A's 700- to 900-mile range. With LORAN-C's wider range, 15 "C" stations can do the work of 30 "A" stations.

Progress Seen In Lobster Culture

That cantankerous delicacy, the American lobster, is on his way to being "domesticated" for aquaculture purposes by a Sea Grant research team at the University of California's Bodega Marine Laboratory.

The interdisciplinary group headed by Robert A. Shleser is working to develop a commercially feasible system to farm lobsters and other marine animals. Within recent months they have reported success in:

- 1) Obtaining 80 percent survival of lobsters through the larval period;
- 2) Reducing cannibalism, a recurring and significant problem in lobster culture;
- 3) Developing a more cost-effective feed; and
- 4) Achieving successful matings, egg extrusion, and hatching on the west coast for the first time.

The project is sponsored by the National Oceanic and Atmospheric Administration through its National Sea Grant Program. The Commerce Department agency has mounted a substantial effort to develop commercially feasible aquaculture, both to add jobs to the economy and to provide additional sources of protein for the nation's food supply.

Using the sophisticated tools of genetics, biochemistry, and systems engineering, the Sea Grant team devised a larval rearing system that now

achieves up to 80 percent survival of lobsters through the larval period (the first 30 days of life). Survival rates in the wild are unknown, but it is estimated that less than one-tenth of one percent of lobster larvae survive this critical first month.

The genetics laboratory, Bodega Bay, Calif., has identified a rare genetic trait that can be detected chemically with the tissue from one of the small legs of the lobster. The group is now engaged in producing a stock of these lobsters for release in areas where lobsters are heavily fished, to monitor the population for survival. The results will be used to evaluate the potential for restocking areas where natural populations have been depleted.

The goal of the California Sea Grant project is to develop the technology required so that lobsters can be grown to marketable size and harvested profitably. "To grow these animals successfully, we must control every aspect of their life cycle and environment—just as modern chicken growers control the lives of their broods," said Shleser. To accomplish this, he has put together a team of specialists in water quality, nutrition, engineering, physiology, genetics, and economics.

"Only with a group such as this," he said, "can we hope to understand and ultimately control every variable that goes into lobster farming. Then we can develop the specifications and cost estimates for a lobster farm to be located at a specific place, and tell whether or not it is likely to pay off."

The Sea Grant team reduced cannibalism in tank-grown young lobsters, without separating each animal, by increasing their food ration and providing a constant algae bloom in the water. They successfully held 44 lobsters in a 28- × 41-inch tank for three months with an 87 percent survival, compared to less than 60 percent survival during a similar period in a much larger and more complex environment. The constant presence of brine shrimp provided food, and the algae—more than a million cells per cubic centimeter—may have provided the density that kept the lobsters from seeing each other, or possibly they absorbed odors that may play a role in cannibalism. For larger

animals, however, some form of physical separation still appears to be necessary.

A four-month experiment using artificial diets developed for the project showed that growth rates approximated those of lobsters fed on brine shrimp, with nearly 100 percent survival. Brine shrimp constitute the major food source for laboratory and experimental lobster research, but are too expensive for consideration in a commercial aquaculture operation.

The team has also achieved successful mating of lobsters, native to the east coast, in controlled conditions on the west coast. Several dozen lobsters have been bred, and four females have extruded eggs. Normally a 9- to 13-month interval between mating and extrusion is required, but in one instance the time was only three months. These animals are the first to perform the complete reproductive process on the west coast, and the work provides the basis for mating and selective breeding of stocks with economically important traits.

Manipulation of egg development by temperature control has been routinely achieved, based on successful work first carried out by the Massachusetts State hatchery on Martha's Vineyard. The Sea Grant group controls and predicts hatching. By planning in advance, it is possible to hatch lobsters at any time of the year. Lobsters have been hatched in most months since 1972.

Working cooperatively with this project has been another group, at San Diego State University, headed by Richard F. Ford. Ford and his associate, Jon Van Olst, are investigating the use of power plant thermal effluent as a means of reducing cost of heat for culture of lobsters and other species. This work is also part of NOAA's Sea Grant aquaculture effort. In addition, work by state fish hatcheries in Maine and Massachusetts, and by NOAA's National Marine Fisheries Service, has been drawn on by Shleser's team.

Marine Environment Curriculum Is Tested

Back in school last fall after a summer of swimming, sailing, surfing, or fishing, many a young Delaware stu-

dent began learning more about the marine environment than ever before. The reason: a Sea Grant education project of the University of Delaware became available for the first time.

Thirty Delaware schools received the university's brand new marine environment curriculum collection, and Sea Grant projects in nine other states—Rhode Island, Maine, New York, North Carolina, Maryland, Georgia, Mississippi, Alabama, and Hawaii—also purchased them. Each set consists of a collection of 65 "learning experience" folders, or packets of teaching materials. Each folder deals with a specific topic for teaching, along with reference materials. Where appropriate, such aids as discussion outlines, laboratory experiments, suggested field trips, tests, and visual aids are included.

Sponsored by the National Oceanic and Atmospheric Administration, the Marine Environment Curriculum Study is designed to relate specific problems of the marine environment to general fields of knowledge and study, in accord with the responsibility of the Commerce Department agency's National Sea Grant Program to encourage education and training related to wise use and development of marine resources.

"We have designed these lessons to be infused into a wide variety of courses," explained Robert W. Stegner, Professor of Biology and Education and director of the study. "Although a particularly marine-oriented school could use the Sea Grant collection as a nucleus for a unified course of study or for mini-courses, we think its major use will be to provide marine orientation—and awareness of the importance of our marine environment—in the standard curriculum."

Each of the 65 lesson packets is built around a single subject showing some aspect of ocean-atmosphere-land interaction. Concepts and lesson plans are keyed to subjects studied from kindergarten through twelfth grade, and encompass general science, biology, chemistry, earth science, mathematics, social studies, reading, art, language arts, and even home economics. The overall theme emphasizes that ocean-atmosphere-land relationships are critical and that im-

proved knowledge of the marine environment is required for intelligent decision-making about environmental problems.

"One purpose of the study," says Stegner, "is to interweave throughout a student's school career an awareness of how important the oceans are to life, through lessons that supplement or reorient rather than displace ongoing courses of study."

The Sea Grant packets contain extensive visual material including slides and masters for making transparencies. Examples from the Delaware region are frequently used, but the lessons can be adapted to school systems throughout the United States.

Each lesson is related to one or more of four basic propositions—that an abundance of water makes the earth unique in the solar system; that the oceans interact with the earth and its atmosphere; that marine organisms interact in complex ecosystems; and that man is part of the marine ecosystem. Among the topics covered by individual lessons are:

- 1) Seaside Nature Trail—general science, grades kindergarten through 4;
- 2) The Not-so-common Oyster—general science, grades 3 through 5;
- 3) Useful Plants of the Sea—reading, grades 4 and 5;
- 4) The Sun, Moon, and Tides—earth science and mathematics, grades 6 through 12;
- 5) The subsets of Coastal Zone—mathematics, grades 7 through 9;
- 6) The Oil Spill Problem—earth science, grades 9 and 10;
- 7) Physical Properties of Water—biology and chemistry, grades 10 through 12;

Foreign Fishery Developments

Japan's 1972-73 Fishery Exports Detailed

Japanese exports of fishery products in 1973 totaled 173,493 million yen (US\$636 million, based on exchange rate of 273:1) on a customs clearance basis. This is an increase of 20.7 percent (in terms of US dollars) over the 1972 exports¹ worth 162,178 million (\$527 million at 308:1). Canned mackerel, valued at \$96 million, was

8) Simulation Game: Superport!—social studies, grades 10 through 12.

A wide variety of readily-available reference materials are listed in the lessons, ranging from *Scientific American* to Thor Heyerdahl's books and *NOAA* quarterly. A 24-page bibliography of popular books on marine-related topics was prepared by James Schweitzer and published at the outset of the project.

The Marine Environment Curriculum Study is part of a comprehensive Population-Environment Curriculum Study, initiated by Delaware in 1968. Basic guidelines for curriculum development are incorporated in a Conceptual Scheme for Marine Environment Studies—prepared by marine biologist Maura Geens and Stegner—which also serves as a means of evaluating a marine environment education program.

Most of the teaching resource packets in the collection were prepared by Delaware teachers working with the project staff. New subjects are being developed and produced, so that teachers interested in developing awareness of the marine environment will have a more varied collection of teaching materials from which to choose. Continuous growth of the collection is planned and a means of commercial distribution is being sought.

In addition to Sea Grant Program support, the project has been aided by the Office of Environmental Education of the Department of Health, Education, and Welfare; the Delaware Department of Public Instruction; and the College of Education at the University of Delaware.

the most important product, comprising 15.1 percent of the total value of fishery exports, followed by canned tuna, \$89.5 million (14.1 percent); and frozen tuna, \$78.9 million (12.4 percent).

The United States continued to be the chief market for Japanese fishery products. Exports to the United States totaled \$226 million (35.5 percent), followed by Great Britain, \$39 million (6.1 percent), and by West Germany,

¹See also, "Japan Tells 1972-73 Fishery Product Trade," *Foreign Fishery Developments, Marine Fisheries Review*, 37:1, p. 55.