Space Technology Aids Fisheries Research

A team of fishermen, engineers, physicists, oceanographers, biologists, and computer specialists have "found" fish with a satellite in a unique experiment off the Louisiana coast. The project represents the culmination of a larger effort — the LANDSAT Menhaden and Thread Herring Investigation—initiated last year by the National Oceanic and Atmospheric Administration (NOAA).

Investigating the feasibility of using satellite data for assessing fisheries resources in the northern Gulf of Mexico, and thereby enhancing management of them, has been a cooperative industry-Federal Government project. Personnel from the Earth Resources Laboratory of the National Aeronautics and Space Administration and the Southeast Fisheries Center of NOAA's National Marine Fisheries Service have been working together with boats, planes, and crews from member companies of the National Fish Meal and Oil Association.

Their work has shown that there are relationships between the distribution of menhaden and water turbidity, which the LANDSAT sensor measures as water color. From the water colorations sensed by LANDSAT, scientists can infer the probable presence or absence of menhaden. The satellite cannot sense, or "see" fish directly.

Menhaden vessels, fishing under the direction of their spotter aircraft pilots, confirmed the presence of menhaden in most, though not all, of the high probability concentration areas predicted by analysis of LANDSAT data, while special navigation systems plotted the locations of the fish precisely and scientific observers on board several vessels collected water samples.

Thus, they validated a technique for locating fish concentrations from space which may lead to a greatly improved understanding of coastal fishery ecology and to better methods for resource assessment and management.

The analysis of LANDSAT data in near "realtime" began when LANDSAT I passed over the selected study area in the late morning hours of 19 July 1976, sending electromagnetic multispectral scanner data to a receiving station at the Goddard Space Flight Center in Greenbelt, Md.

At the receiving station, investigators reviewed the data prior to storing it on four large magnetic tapes. The tapes were then hand-carried to the NASA Earth Resources Laboratory in Slidell, La., where another team of scientists further processed the satellite's information, geographically referenced it, and analyzed it for high probability menhaden areas. At approximately 7:15 a.m. on 20 July, less than 21 hours after the satellite began viewing the study area, the first telephone calls were made to inform spotter pilots and vessel captains of the probable locations for menhaden so that they could compare and check their vessel findings with the scientific predictions as an experimental control. Early reports from the fishing industry indicate that the satellite did its job well.

While the test was a success, considerably more work will be required before an operational satellite system can be made available for application to fishery problems. At best it will take three to five years before such a system could become operational. Other coastal, and perhaps oceanic, species will have to be considered and additional investigations may be required. Special computer programs and facilities will have to be developed. The concept, however, has been demonstrated and that should make future efforts easier.

NOAA Researchers Track Tagged Skipjack Tuna

A cooperative undertaking between the Hawaiian fishing boat *Anela* and the NOAA research vessel *Townsend Cromwell* paid off well last summer with additional information being collected on the swimming patterns of Hawaii's large, "season" skipjack tuna. The *Cromwell* is presently assigned to the Honolulu Laboratory of NOAA's National Marine Fisheries Service, an agency of the Department of Commerce.

Laboratory Director Richard Shomura explained that the *Anela* and the *Cromwell* teamed up to catch, tag, release, and follow four large aku on what was otherwise a routine fishing trip for the *Anela*. When she fished schools of large (12 kg) skipjack to the north of Oahu just off Kahuku, a NMFS observer aboard tagged four of the fish by inducing each to swallow a small, pressure-sensitive sonic tag.

The fish were released and the *Cromwell*, using sonar equipment, followed each by following the sounds emitted by the tags, beeping sounds that varied in frequency with pressure. The deeper a tagged fish swam, the greater the pressure on its tag and the faster the beeps.

According to Shomura, this successful tagging experiment will help Laboratory fishery scientists understand the possible habitat limitations placed on the skipjack by its own ability to conserve body heat. Previous Laboratory research into the physiology of skipjack tuna showed the muscle temperature of a 13 kg (39 lb) fish to be as much as 15°C above the surrounding water temperature. Lengthy exposure to water over 20°C, it has been hypothesized, is avoided by large aku because an internal temperature of 35°C causes irreversible muscle damage.

Information gathered from this experiment can also aid the local commercial fishermen, Shomura continued. Knowing when fish are at the surface can result in adjustments in fishing strategy and in turn to more effective fishing trips, he said.

NMFS HELPS FUND SALMON HATCHERY

A grant of $225,950 to complete construction of the Humptulips Salmon Hatchery near Grays Harbor, Wash., has been awarded to the Washington Department of Fisheries by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service.

The award, funded under the Anadromous Fish Conservation Act, is

based on a State-Federal cost sharing basis of 72/28 percent. Previous Federal grants totaling $670,950 have been made during the past two years by the Department of Commerce. The State of Washington's share of the cost has been $2,309,800, for a total cost of $3,206,700 for the project.

The hatchery, started in 1973, is scheduled to be completed and in operation late this year. The project includes incubation facilities, rearing pens, a water distribution system, an intake pump station, fish ladder, and settling ponds.

Projections of returns of fish raised and released by the hatchery should add approximately $700,000 annually to the salmon fishery in the state. The hatchery will be operated by the Washington Department of Fisheries.

Cannon Named Fisheries Conservation Coordinator

Kessler R. Cannon has been named to the post of Conservation Coordinator of the National Oceanic and Atmospheric Administration's National Marine Fisheries Service, NMFS Director Robert W. Schoning announced late last summer.

Cannon, for seven years Assistant to Governor Tom McCall of Oregon for natural resource and environmental affairs, will have primary responsibility for conservation relations for the agency at the national level, working closely with the environmental community on matters of mutual concern. NOAA is an agency of the U.S. Department of Commerce.

Cannon

"I'm especially pleased to have someone with Mr. Cannon's experience to work with regional and national conservation groups," Schoning said. "His job is to ensure that the NMFS is aware of the concerns of environmentalists and conservation organizations, and that they in turn know about our efforts in the entire range of conservation of our marine resources."

Cannon, who began his new assignment 21 July, is a native of Oregon, and during the past year served as an Oregon State University professor, teaching natural resource and environmental management. He is a graduate of the University of Oregon.

Hawaiian Monk Seal Called Endangered

The Hawaiian monk seal is in danger of becoming extinct and may be placed on the endangered species list, according to a proposed ruling by Robert W. Schoning, Director of the National Marine Fisheries Service, and Lynn A. Greenwalt, Director of the U.S. Fish and Wildlife Service. The proposed rulemaking that would list and protect the Hawaiian monk seal (*Monachus schauinslandi*) as an endangered species throughout its range is issued under the authority of the Endangered Species Act of 1973.

Found throughout the Hawaiian Archipelago, the Hawaiian monk seal breeds only on the islands of the Leeward Chain, including French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll. A status review undertaken by the NMFS, a Department of Commerce agency, reflects the rarity of the species, the high mortality in pups, the relatively low reproductive rate, and indications of population decline and harrassment. The Marine Mammal Commission and its Committee of Scientific Advisors agree with the NMFS status review and recommend that the species be listed as endangered.

Research efforts since December 1975 by NMFS in cooperation with the U.S. Fish and Wildlife Service are outlined in a preliminary document released in May 1976 by the Northwest Fisheries Center, an NMFS branch. The report includes the count of recent beach and shipboard surveys of this species. NMFS believes this information clearly indicates the Hawaiian monk seal is presently in danger of extinction and supports a proposed endangered status. As a further reflection of concern over the viability of this species, the NMFS recently classified the Hawaiian monk seal as depleted under the Marine Mammal Protection Act of 1972. However, it is believed that by listing the seal as endangered, a higher level of protection may be afforded the animal and its habitat.

NOAA Buoys Set in East Pacific, Gulf of Alaska

The National Oceanic and Atmospheric Administration (NOAA) has deployed five huge deep-ocean environmental data buoys off the northwest coast of the United States and the Gulf of Alaska during the summer.

The 55-ton buoys were built by the General Dynamics Corporation, San Diego, Calif., under contract to the Commerce Department agency. Developed by NOAA's Data Buoy Office, a component of the National Ocean Survey, the buoys will serve as a prime source of data for weather prediction and storm warnings from areas where data is sparse and storms are known to develop.

The environmental buoys are the product of a five-year program to develop an operational buoy with high reliability, low life-cycle costs, a sensor system of above average accuracy, and efficient maintenance at sea. A prototype has been operating successfully 344 nautical miles southwest of Astoria, Oreg., since July 1975.

The buoys have discus-shaped hulls, 33 feet in diameter, and are capable of surviving 155-knot winds and 50-foot high waves. They are powered by air-depolarized batteries, sufficient for three years of operation.

Data from the buoys is transmitted routinely every three hours—every hour in critical storm conditions—via high frequency or satellite communications to shore collection stations in San Francisco, Calif., Miami, Fla., and Wallops Island, Va. It is then forwarded to the National Weather Service to be incorporated into marine weather reports.

Meteorological data reported will include wind speed and direction, air temperature, and barometric pressure. These measurements are made by sensors on the buoy mast, 10 meters above the sea surface. All instruments except those measuring air tempera-

ture have back-up systems for added reliability.

Oceanographic data reported will include surface seawater temperature, subsurface temperature measured at six depths from 10 to 300 meters, and one-dimensional spectral wave data.

Deployment sites range from 41° North to 56° North and from 131° West to 156° West. The buoys are moored in water depths from 9,300 to 15,500 feet.

FILM ON ESTUARIES RELEASED BY NOAA

"Estuary," a 28-minute, 16-mm color film on the estuarine areas of the United States—upon which much of our seafood is dependent—has been released by the National Oceanic and Atmospheric Administration (NOAA). Produced by NOAA and sponsored by the Environmental Protection Agency, the film depicts industrial uses of estuaries, and also shows their importance as a principal source of food, a breeding place for fish and wildlife, and a site for recreation.

Any human action taken in an estuary is likely to have a series of important reactions, the film stresses, pointing out the need for wise management. Estuarine areas depicted are Maryland's Chesapeake Bay, Florida's Tampa Bay, California's San Francisco Bay, and Oregon's Coos Bay.

Of interest to anyone concerned with the environment, "Estuary" is aimed at general audiences but is appropriate for science and ecology classes in educational institutions of all levels. The film was produced under contract, using personnel and facilities of Hal Kirn Associates of Washington, D.C., and was supervised by Elliot Macklow, Chief, NOAA Motion Picture Services. It has an original score by William Penn and is narrated by Mel Brandt.

NOAA also has two other films dealing with estuaries in distribution; "Estuarine Heritage," and "The Biologist and the Boy," which is theatrically distributed as "Crisis in the Coast." Prints are available on loan, free of charge, from NOAA Motion Picture Service, ESTUARY, 12231 Wilkins Ave., Rockville, MD 20852, telephone (301) 443-8411. A catalogue listing all NOAA films is available at the same address.

United States, Japan Research Albacore

Research by the United States and Japan on the North Pacific albacore stock—thought to be approaching its biological limits—will be continued under an informal agreement announced late last summer by the National Oceanic and Atmospheric Administration (NOAA).

In recent years the total annual harvest of North Pacific albacore has increased from 70,000 to 100,000 metric tons, primarily because of the expansion of the Japanese pole-and-line fishery, which accounted for 64 percent of the 1974 catch. Other major fisheries are the Japanese longline, 15 percent; and the U.S. troll and live-bait fisheries, 21 percent.

The agreement between the two nations emerged from a population dynamics albacore workshop held at NOAA's National Marine Fisheries Service laboratory in Honolulu, Hawaii, in December 1975, and involved the NMFS' Southwest Fisheries Center, La Jolla, Calif., and the Far Seas Fisheries Laboratory, Shimizu, Japan.

The Commerce Department agency's workshop considered preliminary stock assessments based on standard analyses of catch, effort, and size composition that put the maximum sustainable annual yield for albacore between 115,000-125,000 metric tons, only slightly above the current catch.

The on-going investigation includes participants from the California Department of Fish and Game, the Oregon Department of Fish and Wildlife, the Washington Department of Fisheries, and the Pacific Marine Fisheries Commission.

United States albacore fishermen actively support and finance government-industry research programs with the objectives of increasing the efficiency of albacore fishing and developing scientific information for albacore conservation.

Foreign Fishery Developments

New Zealand Asks Foreign Fishing Vessel Tax, 200-Mile Economic Zone Declaration

The New Zealand Government's annual budget message, released in Wellington on 29 July 1976, proposed a tax of from NZ$1,000 to NZ$5,000 on foreign fishing vessels entering New Zealand ports (NZ$1.001 = US$1.00). The exact amount of the tax will be based on the size of the vessel. In a press conference on 30 July, Prime Minister Muldoon explained that the tax is an example of his Government's determination to win access to foreign markets for New Zealand farm products and is intended to put present and potential foreign fishermen on notice that New Zealand insists on some economic benefit from the exploitation of its marine resources.

The Prime Minister also announced that draft legislation was being prepared to declare a 200-mile exclusive economic zone in the event of unsatisfactory progress at the Law of the Sea Conference, then meeting in New York. New Zealand plans to coordinate such a declaration with Australia and other independent Pacific island countries of the region. (Source: American Embassy, Wellington, New Zealand.)

According to the NMFS Office of International Fisheries, New Zealand would acquire an area of seabed totalling 1,409,500 square nautical miles if the Government extends national jurisdiction to 200 nautical miles. The superjacent waters contain tuna, squid, and other commercially valuable fish. Both Japan and the Soviet Union have engaged in fishing operations in waters near New Zealand for many years. Fishing vessels from Taiwan entered the grounds in 1974. The vessels from the Republic of Korea also fish there.

Japanese interest in marine resources in waters near New Zealand dates from the 1950's. At that time, tuna was the major target species and much effort was exploratory in nature. Growing Japanese presence in nearby waters led New Zealand to declare 12-mile fishery limits in 1967 and to