

Knauss Confirmed As Under Secretary of Commerce for Oceans and Atmosphere

The U.S. Senate on Thursday, 3 August 1989, confirmed John A. Knauss, noted oceanographer and educator, as Under Secretary of Commerce for Oceans and Atmosphere. Nominated on 20 July by President George Bush, Knauss succeeds William E. Evans. As Under Secretary, Knauss will be the sixth Administrator of the National Oceanic and Atmospheric Administration (NOAA), the nation's civil air-sea agency and, with 11,500 employees, the largest organization in the Commerce Department.

NOAA includes the National Weather Service, National Ocean Service, National Marine Fisheries Service, National Environmental Satellite, Data, and Information Service; and the Office of Oceanic and Atmospheric Research.

Since 1962, Knauss has been a professor of oceanography in the Graduate School of Oceanography at the University of Rhode Island. He also served as dean of the URI Graduate School of Oceanography from 1962 to 1987, and as the university's provost for marine affairs from 1969 to 1982.

Knauss has been a member of two presidential commissions on marine affairs: The Commission on Marine Science, Resources, and Engineering (the Stratton Commission) in 1967 to 1968 and the National Advisory Committee on Oceans and Atmosphere (NACOA), 1978-85. He served as chairman of NACOA from 1981 to 1985. He has been president of the Association of Sea Grant Program Institutions, chairman of the Ocean Science Committee of the National Academy of Sciences/National Research Council, and chairman of the Marine Division of the National Association of State Universities and Land-Grant Colleges.

Knauss has served as president of the oceanographic section American

Geophysical Union, vice president of the Marine Technology Society, vice chairman of the American Association for the Advancement of Science's Atmospheric and hydrospheric sciences section, and as council member of the American Meteorological Society. He was a cofounder of the Law of the Sea Institute and served on its governing board from 1965 to 1976 and from 1981 to 1987. He has been elected a fellow of the AAAS, the AGU, and the MTS.

Knauss has served on a number of

committees of the National Research Council, including the ocean policy committee and the earth science division, and on advisory committees to several Federal agencies including the Atomic Energy Commission, Coast and Geodetic Survey, U.S. Navy, National Science Foundation, and the State Department. He also served as chairman of the executive committee of the Joint Oceanographic Institutions Deep-Earth Sampling, and is currently a member of the executive committee of the Council for Ocean Law. He received the National Sea Grant Award in 1974. He was elected to the Rhode Island Heritage Hall of Fame in 1982 and received the Rhode Island Science and Technology Award in 1986. Knauss was graduated from Massachusetts Institute of Technology (B.S., 1946), the University of Michigan (M.S., 1949), and the University of California, Scripps Institution of Oceanography (Ph.D., 1959).

Federal 5-year Ocean Pollution Plan Told

A guide to Federal priorities in ocean pollution research programs over the next 5 years was released by the National Oceanic and Atmospheric Administration (NOAA) earlier in 1989. The Commerce Department agency report, "Federal Plan for Ocean Pollution, Research, Development, and Monitoring, Fiscal Years 1988-1992," covers marine pollution programs in the nation's coastal, estuarine, offshore, and Great Lakes areas.

The plan establishes six goals for the National Marine Pollution Program, which is a composite of all marine pollution research and development programs sponsored by the Federal government. The goals include intensive studies of toxic substances, nutrients, and biological agents entering the marine environment as a result of human activities; the loss or modification of marine habitats; conditions and trends in marine ecosystems; and the implication of

marine pollution to human health. The report provides over 40 recommendations to the President and Congress concerning future research or activities required to meet the six goals. Some major conclusions and recommendations of the report are described below.

Human Health

Human health concerns related to marine pollution center around toxic chemical substances and pathogenic microorganisms that are found in living marine resources from natural resources or as a result of human activities. It is difficult to establish with certainty the degree of hazard posed by the presence of chemical contaminants in seafood. Existing Federal and state monitoring programs provide only a limited amount of information on the concentration of contaminants in the major commercial and recreational fish species. To evaluate and manage risks to humans associated with seafood consumption, more systematic monitoring of contaminants in seafood will be needed as well as better information on seafood consumption

patterns and continued research on toxic responses in humans.

Government programs have been largely effective in protecting the public from diseases caused by shellfish-borne bacterial organisms. However, because traditionally used microbial water quality indicators do not predict reliably the occurrence of viral pathogens and certain naturally occurring pathogenic bacteria, improved indicators need to be developed.

Monitoring the Status of Marine Ecosystems

It is not possible to predict with confidence the combined effects of all human activities on the marine environment. Therefore, carefully designed long-term monitoring is needed to document status and trends in the overall condition of living and nonliving components of marine ecosystems. Additional research and development is needed to improve our understanding of the relationship between parameters that can be routinely monitored and attributes of the marine ecosystem that are of value to humans.

The report recommends that the National Ocean Pollution Policy Board establish an ad hoc working group of Federal and other scientists and program managers. Such a group would continue to assess the needs of the nation in the marine ecosystems area, determine the appropriate roles of the federal and state levels of government, and propose a systematic strategy for developing a national monitoring capability to meet these needs. The plan recommends that the strategy incorporate existing national and regional programs, make use of historical data, where possible establish guidelines for standardizing monitoring techniques, provide for information synthesis and dissemination, and help assure interagency planning and coordination.

Habitat Loss and Modification

The loss and modification of wetland habitats is a major problem threatening the living marine resources of the nation. Habitat inventory maps produced by the National Wetlands Inventory are as much as 10 years out of date. These maps should be updated more frequent-

ly to document habitat loss, especially in areas where rates of change are high.

Scientists and resource managers do not have an adequate understanding of estuarine processes and their importance to habitat functions. Because of this gap, we cannot accurately determine the effects that human activities will have on habitat quantity and quality, the significance of these effects to living marine resources, and the effectiveness of mitigation efforts in actually replacing the functional values of lost habitat.

In addition to several specific research and development studies, the report recommends that the board establish an ad hoc habitat working group. Such a group would address priority program deficiencies related to the loss or modification of habitats, such as those listed above.

The report "National Marine Pollution Program—Federal Plan for Ocean Pollution Research, Development, and Monitoring: Fiscal Years 1988-1992," was prepared by NOAA's National Ocean Pollution Program Office in cooperation with the National Ocean Pollution Policy Board, the interagency group responsible for coordinating all federal pollution research and monitoring programs. Technical support was provided by Technical Resources, Incorporated (TRI) of Rockville, Md. Copies of the report are available from NOAA's National Ocean Pollution Program Office, Room 610, Rockwall Building, 11400 Rockville Pike, Rockville, MD 20852.

U.S. Atlantic Salmon Exploited at Sea

A mathematical model of U.S. Atlantic salmon stocks suggests that as many as 70 percent of adult U.S. salmon may be captured sometime in their life by the interception fisheries in Greenland and Canada. These interceptions occur as the fish move between their at-sea feeding grounds and their homewater spawning streams. The model, based on U.S. tag-return data, assumes two possible migration routes for the fish between the fishing areas and homewaters.

Results of the model were presented by NMFS Northeast Fisheries Center scientists at a March 1989 meeting in Copenhagen, Denmark, of the International Council for the Exploration of the Sea's North Atlantic Salmon Working Group. Also presented at the meeting was a Center paper on the use of otolith (ear stone) image analysis to determine a salmon's continent of origin. These image analysis techniques are almost as accurate and certainly more cost effective than the biochemical analysis methods currently in use.

NOAA Studies of Alaska Fish Survival Continue

National Oceanic and Atmospheric Administration (NOAA) marine scientists launched another season of research cruises earlier in 1989 in the vicinity of Alaska's Shelikof Strait in an effort to understand the natural forces which influence the abundance of fisheries species there. For the past 3 years, the NOAA researchers have been studying how winds, currents, natural predators, and other factors affect the survival and growth of walleye pollock, *Theragra chalcogramma*, larvae from the rich Shelikof Strait spawning grounds.

This year the scientists—oceanographers, marine biologists, and others—are narrowing their focus to the larvae's main source of nutrition, the zooplankton in the cold waters of the strait, according to James D. Schumacher of NOAA's Pacific Marine Environmental Laboratory in Seattle. Researchers aboard the NOAA ship *Miller Freeman*, working under the direction of Schumacher and Arthur W. Kendall of the Commerce Department agency's NMFS Northwest and Alaska Fisheries Center, Seattle, Wash., will compare concentrations of zooplankton and larvae in waters under the influence of the Alaska coastal current, and waters closer to shore not affected by the current.

For the first time, through cooperation with Texas A&M University, the investigators will have almost immediate access to satellite imagery of Shelikof Strait, allowing them to locate accurate-

ly the position of the Alaska coastal current. This will aid in determining locations at which to collect larvae and zooplankton samples, as well as samples of predators that prey on the larvae. "Through examination of the biological, chemical, and physical forces we hope to determine the rates of mortality for the larvae in these two different types of waters," Schumacher said.

A long-range goal of the Fisheries Oceanography Coordinated Investigations (FOCI) program is to provide policymakers with information upon which they can base decisions on the allowable catch of a fishery species by commercial fishing fleets. The first of four FOCI cruises focussed on eggs and predators. Two more cruises were concerned with sampling and physical oceanography, and the final cruise set for late May 1989, will study late-stage larvae and their environment. Other scientists involved in the investigations come from NOAA's Atlantic Oceanographic and Meteorological Laboratory in Miami, Fla., and the Bigelow Laboratory in Boothbay Harbor, Me.

Overfishing in Antarctic Halted

Overfishing of Atlantic fish stocks, viewed only 2 years ago as a serious threat to the area's marine ecosystem, has been halted, according to the National Oceanic and Atmospheric Administration (NOAA). A new management regime, enacted by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), calls for limiting harvests, reducing the mesh size of nets, closing areas inhabited by juvenile fish, and eliminating fishing during spawning period. CCAMLR is a treaty-based organization with 21 member nations, including the United States, Soviet Union, China, Poland, Chile and Japan.

The area's krill population is estimated to be about 500,000 metric tons, about what it has been in previous years. The Commission recommended improving methods for estimating krill abundance and reporting krill catches in

heavily fished areas. The Commission's decision was grounded in large part on fish surveys carried out by NOAA scientists during the Antarctic summer (December 1987-March 1988).

NOAA scientists examined fish populations around the islands of South Georgia and krill populations around the Antarctic Peninsula, the principal fishing areas for these stocks. Krill, a small shrimp-like creature, is the keystone prey organism in the Antarctic ecosystem. It is especially important to whales. NOAA chartered the Polish fisheries research vessel *Professor Siedlecki* and worked with Polish scientists during the surveys. Although NOAA says harvesting krill poses no risk to that resource, it cautions that fish populations continue to fall. For example, NOAA scientists said, the Antarctic fish harvest fell from 400,000 metric tons in 1970 to 74,000 metric tons in 1988. The chief Antarctic fishing nations are the Soviet Union, East Germany, and Poland.

Cordell Bank Named A Marine Sanctuary

The marine waters surrounding Cordell Bank, off Point Reyes, Calif., were designated as a national marine sanctuary, placing the area under the protection and management of the National Oceanic and Atmospheric Administration (NOAA), by that agency in May 1989. The sanctuary encompasses a 397.05 n.mi.² area of waters 20 n.mi. west of Point Reyes, 50 n.mi. west-northwest of San Francisco, and just north of the existing Gulf of the Farallones National Marine Sanctuary. The regulations implementing the designation include a prohibition on oil and gas activities in the core of the sanctuary, an area of about 18.14 n.mi.².

Simultaneously with publishing these regulations, NOAA proposed a regulatory expansion of the ban on oil and gas activities to the rest of the sanctuary. NOAA is preparing a supplemental environmental impact statement on the proposal and will be soliciting public comments on the matter.

Title III of the Marine Protection, Re-

search, and Sanctuaries Act of 1972, as amended, authorizes the Secretary of Commerce to designate National Marine Sanctuaries of special national significance for the purpose of protecting and conserving special, discrete, highly productive marine areas and ensuring the continued availability of the ecological, research, educational, aesthetic, historic, and recreational resources located within the sanctuary. The designation and implementing of the area's regulations automatically take effect after the close of a review period of 45 days of continuous session of Congress unless the designation or any of its terms is disapproved by Congress through enactment of a joint resolution.

Cordell Bank, which lies on an underwater plateau 300-400 feet below the surface, consists of a series of steep-sided ridges and narrow pinnacles rising from the edge of the continental shelf to within about 115 feet of the surface. Abundant nutrients combine with high light penetration and a wide range of water depths to produce a unique biological community of subtidal and oceanic algae, invertebrates, fish, marine mammals, and seabirds. The designation brings to eight the national marine sanctuaries protected and managed by NOAA. The others are Gulf of the Farallones Islands and the Channel Islands off California, Fagatele Bay in American Samoa, Looe Key and Key Largo off Florida, Gray's Reef off South Carolina, and the site of the wreck of the Civil War ironclad Monitor, off North Carolina.

Tiny Predator Threatens Great Lakes' Food Web

A half-inch-sized predatory creature from Europe threatens to disrupt the food web in all of the Great Lakes, a National Oceanic and Atmospheric Administration (NOAA) scientist has confirmed. Henry A. Vanderploeg of NOAA's Great Lakes Environmental Research Laboratory in Ann Arbor, Mich., has demonstrated the voraciousness with which *Bythotrephes*—a European zooplankton—is consuming another type of zooplankton commonly

known as the water flea. The latter are a dietary mainstay for juvenile alewives, bloaters, and perch, which in turn are the forage of large predatory fishes such as salmon and trout.

Whether the predators will affect fishing in the Great Lakes, now largely restricted to recreation, depends upon the water depth at which the various species of fish normally feed, as well as food web relations not yet understood, Vanderploeg noted. *Bythotrephes* tend to concentrate in the upper 65 feet of the water column. *Bythotrephes* first were reported in Lake Huron in 1984, were

found in Lakes Erie and Ontario in 1986, and now have invaded all of the Lakes, Vanderploeg said. It is speculated the predators were transported from Europe in water ballast aboard empty grain freighters from the Soviet Union, and dumped into one or more of the Lakes upon arrival in the United States.

Until now, no reliable data has been available on the extent with which the predators could affect the food web. Vanderploeg used sets of paired traps to capture Great Lakes water with similar concentrations of water fleas and other

zooplankters from several sites in Lake Huron. He then introduced a number of *Bythotrephes* into one of the traps in each pair. After 24 hours during which the predators fed on the zooplankton in the trap, the NOAA scientist compared the concentrations. "The technique revealed very high feeding rates for *Bythotrephes* feeding on natural prey assemblages," he said. "These experiments confirm the concern that *Bythotrephes* could have a significant effect on the water fleas, the preferred prey of many forage fishes. It appears that all small zooplankton are vulnerable."

Awards Recognize Top NOAA Employees

NOAA Administrator's Awards and Commerce Bronze Medals were presented to outstanding employees of the National Oceanic and Atmospheric Administration at a luncheon at Ft. Myer, Va., on 23 June 1989.

NOAA Administrator's Awards went to: Eric A. Anderson, National Weather Service, for major scientific and managerial contributions in developing and implementing a new generation River Forecast System; Richard A. Severton, National Marine Fisheries Service, for outstanding leadership in planning and directing multi-agency operations involving fish and wildlife enforcement; and Marilee Bright, Office of Legislative Affairs, for exceptional skill in controlling and disseminating information allowing quick response to Congressional testimony. Also honored with the Award were: Arva Jackson, Esther Bey, Ellen Overton, and Karen Swanson-Woolf, Office of Legislative Affairs, for development and implementation of the first NOAA Product Information Catalog and retrieval system; Maureen Z. Klink, Western Administrative Support Center, for the development and highly successful implementation of On-Line Payment and Collections (OPEC) procedures; John E. Oliver, Office of the Comptroller, for outstanding achievement in designing the NOAA Coastal

Ocean Program as a major agency-wide management initiative; Carmella Davis Watkins (EEO Category Award) National Environmental Satellite, Data, and Information Service, for outstanding leadership of, and commitment to, both NESDIS and NOAA EEO activities; Thomas R. Karl, National Environmental Satellite, Data, and Information Service, for significant leadership and skill leading to NOAA's ability to document, detect, and understand climate change.

Others earning the Administrator's Award were Daniel J. Basta, National Ocean Service, for exemplary leadership of NOAA's Strategic Assessment Program; Robert E. Cheney, National Ocean Service, for outstanding achievement in using GEOSAT satellite altimeter data to obtain a new and revolutionary view of the 1986-87 El Niño; Stephen B. Fels, Office of Oceanic and Atmospheric Research, for pioneering research in atmospheric radiative transfer and its application to weather prediction and climate modeling; Bruce B. Hicks, Office of Oceanic and Atmospheric Research, for outstanding research in dry deposition monitoring in support of the U.S. national acid rain program; Donald Scavia, Office of Oceanic and Atmospheric Research, for outstanding achievement in designing the NOAA Coastal Ocean Program as a major agency-wide management initiative; and Ronald J. Morris, NMFS, Frederick H. Beaudry, NMFS, Gary K. Davis, NESDIS, Gary L. Hufford, NWS, Lt. Cdr. Terry

D. Jackson, OAR, Glenn Rutledge, NOS, and R. Adm. Sigmund R. Petersen, NOS, for outstanding efforts and accomplishments in freeing California gray whales trapped in ice near Barrow, Alaska.

Department of Commerce Bronze Medals were awarded to: Basil R. Littin, Office of Public Affairs, for outstanding cooperation with the media regarding NOAA satellite operations; Barbara Sue Kreutzer, Mountain Administrative Support Center, for unusual drive and creative ability in leading the MASC's Personal Property and Supply Branch over the past two years; Frederic M. Serchuk, National Marine Fisheries Service, for excellence in fishery resource assessments in the northeastern U.S.A.; Elizabeth F. Edwards and Pierre M. Kleiber, National Marine Fisheries Service, for designing, programming and developing a computer model capable of evaluating a wide variety of fishery assessment techniques; and Roderick A. Scofield, National Environmental Satellite, Data, and Information Service, for outstanding research and leadership in the application of NOAA's satellite data to the improvement of heavy precipitation and flash flood forecasts.

Other Commerce Department Bronze Medalists included Stephen R. Doty, Richard R. Heim, Thomas Reek, and Roger L. Winchell, National Environmental Satellite, Data, and Information Service, for the implementation of the National Climatic Data Center's Drought

Central and its ability to meet the demand for historical drought information; the Office of Satellite Operations (Organizational Award), National Environmental Satellite, Data, and Information Service, for innovation, dedication, and tenacity in prolonging the life of GOES-6; Robert W. Collins, National Weather Service, for extremely valuable contributions made to the Great Lakes marine community; Kenneth B. Mielke, National Weather Service, in recognition of leadership and creative contributions to National Weather Service operations; Andrew D. Stern, National Weather Service, for the development of forecast techniques which have led to increased understanding and use of lightning information in weather warnings; and Leon Minton, National Weather Service, for unusual initiative and creative development of a satellite imagery display capability for observing weather systems.

U.S., Soviet Scientists Investigate North Pacific Sea Lions

In a first-ever venture, Soviet and American scientists were set to carry out a joint survey off Alaska and Siberia during summer 1989 looking for causes for the 50 percent decline in the Northern Pacific sea lion population over the past 15 years. The 7-week investigation, to include areas that have not been examined in almost a century, is part of a U.S.-U.S.S.R. environmental protection agreement and will be headed for the U.S. by researchers from the National Oceanic and Atmospheric Administration (NOAA).

"American biologists have dreamed of a project like this for years," said Richard Merrick, NOAA's project scientist, "because it's in an area that has been inaccessible to us for many years and because cooperative research may be the best way to study shared environmental problems such as declines in North Pacific sea lions and fur seals."

Researchers from the Commerce Department agency's National Marine Fisheries Service and their Soviet counterparts, working from the Soviet re-

search vessel *Rubezhnoe*, expect to tag upwards of 1,000 sea lion pups to determine their movements and reproductive success. Some adult animals will be tagged with special transmitters that can be tracked by satellite. In addition, the scientists will be looking at the incidence of disease among sea lions, contamination of the sea lions by pollutants, and entangling beach debris on the Kurile Islands off Siberia. NOAA said the research team will also be talking to fishing boat crews in the Kurile Islands area and recording critical environmental data, including the location of bird colonies and sightings of other marine mammals such as sea otters.

New Marine Mammal Law and Commercial Fisheries

A new amendment to the Marine Mammal Protection Act requires some commercial fishermen to obtain an exemption from the National Oceanic and Atmospheric Administration (NOAA) to fish lawfully, according to Joseph W. Angelovic, Acting Director, Southeast Region, National Marine Fisheries Service (NOAA Fisheries). The exemption system went into effect on 21 July 1989.

All commercial fisheries are categorized based on the anticipated frequency of incidental take of marine mammals. Category I fisheries are those fisheries with "frequent" incidental takes; Category II fisheries are those with "occasional" takes; and Category III fisheries are those with a "remote likelihood or no known" incidental takes. Take means to harass, hunt, capture, collect, or kill or attempt to harass, hunt, capture, collect, or kill any marine mammal.

Beginning 21 July 1989 all vessel owners in Category I or Category II fisheries were required to register their vessels with NOAA Fisheries prior to engaging in fishing activities. They will receive a decal and an exemption certificate. The application fee is \$30.00 annually. Vessel owners must also compile information and file a report about marine mammal interactions once a year or at the end of the fishing season. Observer coverage is mandatory for Category I fisheries, if requested by NOAA

Fisheries, and voluntary for Category II fisheries. Category III fisheries are only required to report if they kill a marine mammal during fishing activities. In the Southeast Region only the tuna, shark, and swordfish longline fisheries are classified as Category II; all other fisheries in this region are in Category III.

The purpose of the exemption is to establish a 5-year period for studying the effects of interactions between marine mammals and commercial fisheries. During this period, incidental takes of marine mammals by commercial fisheries will be allowed with a few limitations, and information will be collected that can be used in devising a new long-term solution to the conflict between marine mammals and commercial fisheries. The long-term system is scheduled to be in place by 1 October 1993.

Discoverer Finds Uncharted Sea Mount

Personnel on board the NOAA ship *Discoverer* have located and mapped a previously unknown sea mount in the Pacific Ocean. The undersea mountain is approximately 8 miles long, 2 miles wide, and rises over 10,000 feet from the ocean floor—roughly the size of Mount Baker in northwestern Washington. The new geographic feature, which will be incorporated in future marine charts, is at 1 degree 52 minutes South and 139 degrees 57 minutes West.

Fish-Tag Trophy Winners Named

Winners of the 1988 Captains Trophies were announced by the NMFS SEFC Cooperative Game Fish Tagging Program. The sailfish trophy sponsored by the Sport Fishing Institute was awarded to Captain Frank "Skip" Smith of Burnet, Tex. The white marlin trophy sponsored by the Billfish Foundation was awarded to Captain Dan Timmons of Fort Lauderdale, Fla. The blue marlin trophy sponsored by the National Coalition for Marine Conservation was awarded to Captain Brad Simonds of Islamorada, Fla.

The bluefin tuna trophy sponsored by the International Game Fish Association was awarded to Captain Al Anderson of Narragansett, R.I. The yellowfin tuna trophy sponsored by AFTCO Manufacturing Company was awarded to Captain John Bayliss of Manteo, N.C. The king mackerel trophy sponsored by the Florida League of Anglers was awarded to Captain David Cibluca of Burnett, Tex. Captain Hank Halliger of Pompano Beach, Florida took the award for the commercial captain who tagged and released the most fish (117 billfish and tunas). Ed Scott, project manager of the tagging program, congratulated the winners of the 1988 trophies and everyone who participated in making the 1988 program an outstanding success.

U.S. and Japan Hold Seminar on Rockfish

Scientists from the United States, Japan, and Canada converged in Honolulu, Hawaii, during 26-30 June 1989 to talk about rockfish, the common name for members of the scorpionfish genus *Sebastes*. The rockfish seminar was sponsored by the National Science Foundation and the Japan Society for the Promotion of Science, according to George W. Boehlert, Director of the NMFS Southwest Fisheries Center's Honolulu Laboratory. Boehlert coorganized the seminar, along with Juro Yamada from the University of Hokkaido in Hakodate, Japan.

The 24 scientists attending the meeting presented papers on the reproduction, physiology, life history, and aquaculture of rockfish. Many of the papers resulted from a 4-year cooperative research program between U.S. and Japanese scientists.

With about 106 species worldwide, rockfish are found in temperate, and Arctic regions. One rockfish species, *S. capensis*, even occurs south of the equator. Rockfish give birth to live young after brooding (that is, incubating their eggs) for about 1 month. This makes their reproduction very interesting to scientists.

Some papers presented at the conference examined the feasibility of rais-

ing commercially important rockfish in hatcheries, just as salmon, trout, and other fish species are being raised for later release in the wild. Pilot studies in Japan—where raising young rockfish is much more advanced than in the United States—have raised rockfish to a viable size and then released them in the open ocean. Later, these rockfish may be captured as adults by commercial fishermen. Such hatchery releases may help prevent natural populations of rockfish from becoming depleted, but have not been proven to be effective as yet.

According to Boehlert, the meeting gave scientists an opportunity to compare the research being done by the different countries and to discuss the possibility of conducting cooperative research in the future. One interesting point made at the meeting was that, based on the published literature, the U.S. scientists tend to direct more of their research toward field ecology studies and fisheries research, whereas Japanese scientists were more likely to study reproductive physiology and aquaculture.

The papers presented at the meeting are being reviewed for publication and will be edited by Boehlert and Yamada. The meeting was held at the East-West Center Thomas Jefferson Hall on the University of Hawaii-Manoa campus.

Predators of Juvenile Hard Clams Identified

Juvenile mud crabs (family Xanthidae) and adults of two species of amphipods (small shrimp-like animals) appear to be major predators of juvenile northern quahogs (hard clams) during the quahogs' first week of settling. That's a finding from the NMFS Northeast Fisheries Center's study of causes of natural mortality in economically important species, particularly during the highly vulnerable early life stages.

The predatory potential of the juvenile crabs and adult amphipods upon the juvenile quahogs is exemplified by the situation in Barnegat Bay, N.J. (prime habitat for northern quahogs). During October 1987 in the bay, an average of 17 juvenile mud crabs was found for

every square meter of the bottom. In the lab, these crabs each consumed at least 100 juvenile quahogs a day.

Drift Gill Nets Banned for Some S.E. Mackerels

Drift gill nets may not be used in the exclusive economic zone (EEZ) to fish for king mackerel of the Gulf migratory group or Spanish mackerel of the Gulf and Atlantic migratory groups, Joseph W. Angelovic, Acting Regional Director, Southeast Region, National Marine Fisheries Service, has announced. These drift net prohibitions became effective 14 August 1989, and are contained in the final rule implementing the partially approved Amendment 3 to the Fishery Management Plan for Coastal Migratory Pelagic Resources (Mackerels) of the Gulf of Mexico and South Atlantic (FMP). Amendment 3 was prepared by the South Atlantic and Gulf of Mexico Fishery Management Councils. The prohibitions are intended to protect and rebuild the three overfished mackerel groups and to forestall early season closures that negatively impact users of traditional gears. The Councils will reconsider use of drift gill nets when stock conditions improve.

Under the new regulations, a vessel in the EEZ or having fished in the EEZ with a drift gill net aboard may not possess Spanish mackerel. Similar restrictions apply to the possession of Gulf group king mackerel within its seasonal boundaries as shown on the other side. These prohibitions do not apply to the Atlantic migratory group of king mackerel or other coastal migratory pelagic fishes (cero, cobia, dolphin, little tunny, and in the Gulf of Mexico, bluefish) managed under the FMP.

A drift gill net is defined as a gill net having a float line that is more than 1,000 yards in length. It is also defined as a gill net having a float line that is 1,000 yards or less in length, other than a run-around gill net, that, when used, drifts in the water, that is, is not anchored at both ends, whether or not it is attached to a vessel. A run-around gill net is defined as a gill net with a float line 1,000 yards or less in length that,

when used, encloses an area of water. To report violations of these drift gill net prohibitions or other provisions of the FMP contact NOAA Fisheries Enforcement at 813/893-3145 or the nearest U.S. Coast Guard Station.

Heat Emitted to Arctic by Open Water in Ice Pack

Wide open-water areas in the Arctic sea ice are sending heat and moisture high enough into the atmosphere to affect both heat and radiation there, Russell E. Schnell, a scientist with the National Oceanic and Atmospheric Administration (NOAA), reports. Ice crystals carried into the troposphere, the area extending 7-10 miles out from earth, may reflect radiation back into the lower atmosphere and form a thermal blanket retaining additional heat over the Arctic, Schnell says. The result is that the Arctic's role as a global heat sink may require reevaluation, and current climate models may require refinement, he adds.

In the British scientific journal *Nature*, Schnell reports that airborne infrared lidar has detected plumes of ice crystals rising from leads (open-water areas) as much as 6 miles wide and other open areas in the ice called polynyas. They transport heat and moisture as high as 2½ miles into the troposphere, well above the atmospheric boundary layer.

Because earlier investigations had

suggested that a temperature inversion dominating the lower Arctic troposphere in winter trapped heat and moisture in the boundary layer, it has been assumed that open-water areas in the ice had little, if any, effect on Arctic heat and radiation. This assumption is reflected in computer programs used to simulate global atmospheric warming.

"The view that turbulence from leads and polynyas affect only the boundary layer needs modifying," Schnell said. "If heat and moisture from leads can regularly reach the mid-troposphere, the role of the Arctic as a global heat sink may need reevaluating, and climate models will require more realistic values of surface-atmospheric fluxes."

Schnell, an atmospheric scientist with the Cooperative Institute for Research in Environmental Sciences, a joint NOAA-University of Colorado research organization in Boulder, Colo., has led several NOAA-sponsored expeditions to the Arctic, studying the Arctic haze and other environmental phenomena. He is based at NOAA's Environmental Research Laboratories in Boulder. The lead plumes were first seen in cloud microphysical data obtained by lidar during a 1984 Arctic flight north of Ellesmere Island toward the North Pole, and again in 1986 during flights near Thule, Greenland. Most leads in the Arctic sea ice are too small to produce sizeable plumes, Schnell said, but those that are large enough have a major role

in turbulent heat transfer to the higher Arctic atmosphere. Further research, Schnell said, will focus on developing a climatology of lead occurrence and of plume frequency and distribution in the Arctic from lidar profiles and satellite data. The study was supported by the Office of Naval Research, the National Science Foundation, and NASA.

NMFS-Tagged Shark Sets Time-at-liberty Record

A recent recapture of a tagged sandbar shark after more than 24 years at liberty has set a new time-at-liberty record for the NMFS Cooperative Shark Tagging Program and for any shark in the Atlantic Ocean. The male sandbar was tagged during summer 1965 in Delaware Bay by an NMFS scientist, and then recaptured during summer 1989 in the Gulf of Mexico by a commercial longliner.

When the fish was tagged, it was 52 inches long; when it was recaptured, it was 72 inches long. The average growth rate was less than 1 inch per year. Other tag returns have shown this species to be slow growing. The NMFS Cooperative Shark Tagging Program has established that many species of sharks have slow growth, slow maturation, and low reproductive potential (i.e., they're live bearers), all indicating that they could be easily overfished and should be carefully managed.