

## Fisheries Development Task Force Formed

A Department of Commerce task force on fisheries development policy has been formed to examine problems affecting the growth of the fishing industry in the United States. The Department-wide task force is under the leadership of Frederick A. Schenck, Deputy Under Secretary of Commerce, and James P. Walsh, Deputy Administrator, National Oceanic and Atmospheric Administration. Members of the fisheries industry and Congressional staff will be included in the task force's work.

"The work of the Fisheries Development Task Force is among the most important of current Departmental activities," said Schenck. "It will mobilize our resources on behalf of an industry with considerable development potential and show how the wide variety of resources found in the Department and elsewhere can be integrated."

Walsh said that it has become increasingly clear that if the United States is to take full advantage of the resources within the 200-mile fishery conservation zone, government must work with industry in a cooperative manner. "We must develop a capability to catch the fish that are available and supplant the foreign fishing off our shores," said Walsh. "In addition, there is a real need to develop the many resources found off our coasts that are not being used by anyone."

The benefits obtainable through fisheries development are quite substantial. Scientists estimate that there are enough fish and shellfish within the conservation zone to double or triple the amounts of seafood landed in the United States.

"An increase of this size would provide

substantial benefits in terms of employment and gross national product, help to stabilize the fishing industry, decrease the rate of inflation in fishery prices, and greatly reduce the United States' present \$2.1 billion deficit in international trade of fishery products," said Schenck.

The task force will develop: 1) A proposed Executive Branch program for fisheries development; 2) a series of background papers on major concerns that must be considered in making decisions on the role of the Federal Government in fisheries development. In addition, there will be several investment analyses of selected individual fisheries that appear to have development potential. These analyses will pinpoint opportunities, specify constraints to development, and propose options to eliminate these constraints; 3) a proposal

to streamline regulations which are burdensome or of questionable value to the fishing industry; and 4) a fisheries assistance handbook that will explain the Federal resources and services presently available to the fishing industry and how they may be obtained.

In its work, the task force will study the results of the Department's nearly completed Export and Domestic Market (Wexler) Study along with the background papers and investment analyses. The Wexler study is a year-long comprehensive review of marketing opportunities for U.S. seafood products in the United States and 15 major fish and shellfish consuming nations in Western Europe, Africa, and the Far East. In addition, the study has identified the major impediments to development of those U.S. resources with significant growth potential. The results of the task force are scheduled to be available early next spring.

In addition to the Office of The Secretary and NOAA, other major agencies involved in the task force are the Economic Development Administration, Industry and Trade Administration, Office of Science and Technology, Maritime Administration, Office of Minority Business Enterprise, and four of the Department's Regional Action Planning Commissions. Co-ordination with other agencies will take place as required.

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## OCZM MERGES WITH OCEAN MANAGEMENT

The Offices of Coastal Zone Management and Ocean Management have merged, according to NOAA Administrator Richard A. Frank. The merger, anticipated for some time, became effective 1 October on an interim basis until formal documentation could be prepared and approved.

Robert Knecht, Assistant Administrator for Coastal Zone Management, becomes the Assistant Administrator for the new office, and Samuel Bleicher, Director of the Office of Ocean Management, becomes the Deputy Assistant Administrator.

Since the Office of Coastal Zone

Management is a legislatively mandated name, the new office will still be called Office of Coastal Zone Management, although a revised name is expected when the Coastal Zone Management Act is reviewed by the Congress this fiscal year.

According to Frank, the merger was partly a result of the similarity of the activities of the two offices. "As these offices perform their functions," he said, "they found that interactions between them were frequent and important."

Some programs, he said, like the marine sanctuary and estuarine sanctuary programs, were already

working closely together. Finally, Frank added, the recent passage of the Outer Continental Shelf Lands Amendments, which give NOAA new responsibilities, led many to conclude that "now is the right time to establish a closer relationship between these two programs."

## Aron Heads Marine Mammal, Endangered Species Unit

William Aron, former Director of the Office of Ecology and Environmental Conservation of the National Oceanic and Atmospheric Administration (NOAA), has become Director of the Office of Marine Mammals and Endangered Species in NOAA's National Marine Fisheries Service.

In his new post Aron has responsibility for coordinating the implementation of the Marine Mammal Protection and the Endangered Species Acts, both considered critical for the protection and conservation of animals of concern to many Americans.

Terry L. Leitzell, Assistant Administrator for Fisheries for NOAA, said Aron, who has worked for the past 7 years as NOAA's major adviser to the Administrator on conservation affairs, brings a broad biological and oceanographic background into the position.

Aron served in his previous position



William Aron

from 1971, working closely with conservation groups within and outside of government. He has served on the Scientific Committee of the International Whaling Commission on behalf of the U.S. Commissioner since 1972, and was the U.S. Commissioner to the International Whaling Commission in 1977.

Aron was Deputy Director of the Oceanography and Limnology Programs, Smithsonian Institution, from 1967 to 1971, and from 1961 to 1967

was Head of the Biological Oceanography Program for the GM Defense Research Laboratories. Between 1956 and 1961, he served as a Research Assistant Professor, Department of Oceanography, University of Washington.

Aron received his B.S. degree in Biology from Brooklyn College in 1952, his M.S. in Fisheries-Genetics in 1957, and his Ph.D. in Fisheries-Oceanography in 1960 from the University of Washington.

## Pittston Refinery Could Hurt Northeast Fishing

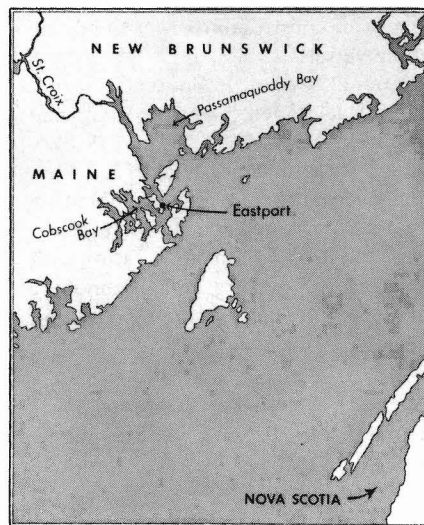
A cold, foggy estuary that spawns some of the most important food fish on the U.S. eastern seaboard should not be the site of an oil refinery and marine terminal, the National Oceanic and Atmospheric Administration (NOAA) has said in a position statement to the Environmental Protection Agency. The adverse effects of an oil spill on the valuable commercial fishery for lobster, Atlantic herring, and other fish and shellfish could endanger these fisheries in northern Maine, Nova Scotia, and New Brunswick, as well as a large recreational fishery for Atlantic salmon, NOAA said in the statement.

The Pittston Company of New York has applied to EPA for a permit to construct a 250,000-barrel-a-day oil refinery and associated marine terminal at Eastport, Me., on the St. Croix River estuary. Upon completion, it would receive crude oil transported by 80 million gallon carriers, and ship fuel oil and gasoline aboard small coastal tankers and barges.

A Canadian study of potential refinery sites along the east coast of North America terms the Passamaquoddy area "by far the least acceptable site evaluated, because of the recognized high value and vulnerability of its fisheries and aquatic bird resources, and the navigational hazards associated with tanker passage," the NOAA statement said. A U.S. inter-agency task force study, evaluating 69 sites from Maine to Florida, characterized the Eastport site as an alternative exhibiting severe and unacceptable risks to aquatic species and

to commercial fisheries resources. Together the Canadian and U.S. studies considered 38 potential sites as environmentally superior alternatives, according to NOAA.

Eastport is on an island within the Cobscook Bay/Passamaquoddy Bay complex—a large, productive estuary on the U.S.-Canadian border. Tides average 18 feet and result in strong currents within narrow, winding channels and approaches to the proposed refinery site. Wind conditions are frequently severe, and the area experiences the highest frequency of "fog days" found along the U.S. east coast. The entire northern coastline of Maine is heavily indented with numerous bays, islands, peninsulas, rocky headlands, and submerged rocks or bars.



In the event of an oil spill, Cobscook Bay, Passamaquoddy Bay, and—depending on the size of the spill—portions of the Bay of Fundy and the Gulf of Maine could be affected, according to the NOAA position statement.

The unique combination of cold, nutrient-rich waters mixing in the coastal estuaries provide an ecosystem found nowhere else on the east coast of the United States. This area also provides food for oceanic species such as the endangered humpback, right, and fin whales as well as a number of other marine mammals, the NOAA statement said.

## **Congress' New Laws Affect NOAA, NMFS**

Twenty-nine new laws of interest to NOAA and NMFS were enacted during the 95th Congress, 2nd Session (calendar year 1978), including several amendments to existing laws. Those most applicable to marine resources are outlined below. If specific information concerning a law is desired, a copy of the law should be obtained.

Merchant Marine Act Amendment (H.R. 9169), 7 April 1978, Public Law 95-257. This law amends Title XI of the Merchant Marine Act of 1936 to authorize the Secretary of Commerce to guarantee obligations up to 87 percent of the cost of constructing or reconstructing fishing vessels.

National Ocean Pollution Research and Development and Monitoring Planning Act of 1978 (S. 1617), 8 May 1978, Public Law 95-273. This established a program of ocean pollution research, development, and monitoring; designating NOAA, in consultation with the Office of Science and Technology Policy, as the lead agency for pollution research.

Central, Western, and South Pacific Fisheries Development Act Amendment (H.R. 11657), 16 June 1978, Public Law 95-295. This amends the Act to authorize the Secretary of Commerce to carry out a program for the development of the tuna and other latent fisheries resources of the

central, western, and south Pacific Ocean in conjunction with the Pacific Tuna Development Foundation or some other proposed agency or organization. NACOA Appropriation for Fiscal Year 1979 (H.R. 10823), 29 June 1978, Public Law 95-304. This amended the Act of 5 July 1977 and authorized appropriations for the fiscal year ending 20 September 1979.

Fishery Conservation Zone Transition Act Amendment (H.R. 12571), 1 July 1978, Public Law 95-314. Various requirements of the Fishery Conservation and Management Act of 1976 were waived to permit fishermen of the United States and Canada to continue fishing off the coasts of each nation during the period ending 31 December 1978.

Marine Mammal Protection Act Amendment (H.R. 10730), 10 July 1978, Public Law 95-316. This authorized appropriations for the Department of the Interior, the Department of Commerce, and the Marine Mammal Commission to carry out the Marine Mammal Protection Act of 1972.

North Pacific Fisheries Act Amendments (H.R. 21637), 28 July 1978, Public Law 95-326, and (S. 3551), 30 October 1978, Public Law 95-553. P.L. 95-326 amends the North Pacific Fisheries Act of 1954 to implement the Protocol Amending the International Convention for the High Seas Fisheries of the North Pacific Ocean (INPFC), signed 25 April 1978. P.L. 95-553 makes minor technical amendments to P.L. 95-326.

Agricultural Credit Act of 1978 (H.R. 11504), 4 August 1978, Public Law 95-334. The act, among other things, amends the Consolidated Farm and Rural Development Act to require the Secretary of Agriculture to make emergency loans to applicants where the Secretary finds the applicant's farming, ranching, or aquaculture operations have been substantially affected by a natural disaster in the United States or by a major disaster or emergency designated by the President under the Disaster Relief Act.

Fishery Conservation and Management Act Amendments/Joint Ventures (H.R. 10732), 28 August 1978, Public Law 95-354. This law authorizes \$30 million for administration of the Fishery

Conservation and Management Act of 1976 (FCMA) for fiscal year 1979. It also authorizes the Secretary of Commerce to regulate foreign processing vessels that receive fish from U.S. fishing vessels within the fishery conservation zone by limiting the issuance of permits to foreign processing vessels to those fisheries that will not be utilized by U.S. fish processors.

Outer Continental Shelf Lands Act Amendment of 1978 (S. 9), 18 September 1978, Public Law 95-372. This law requires the establishment of a policy for the management of oil and natural gas resources of the Outer Continental Shelf in order to provide for rational development of these resources of the OCS and to protect the marine and coastal environment.

Fishermen's Protective Act Amendments (H.R. 10878), 18 September 1978, Public Law 95-376. This extends the insurance program carried out pursuant to section 7 until 1 October 1981; revises the program of compensation in section 10 for American fishermen who lose or have fishing gear damaged as a result of foreign fishing activities in the U.S. fisheries zone; and provides additional protection to endangered or threatened species of fish and wildlife.

Farm Credit Act Amendment (S. 3045), 10 October 1978, Public Law 95-443. This amends the Farm Credit Act of 1971 to extend the maximum term for production credit association loans to producers or harvesters of aquatic products from 7 to 15 years.

Anadromous Fish Conservation Act Amendments (S. 415), 17 October 1978, Public Law 95-464. This broadens the scope of the conservation program authorized by the Anadromous Fish Conservation Act to include landlocked anadromous fisheries in Lake Champlain.

Port and Tanker Safety Act of 1978 (S. 682), 17 October 1978, Public Law 95-474. This amends the 1972 Ports and Waterways Safety Act to establish improved Federal standards governing navigation and vessel safety and the protection of the marine environment.

Antarctic Fauna and Flora Conservation (H.R. 7749), 28 October 1978, Public Law 95-541. This Act

directs the Director of the National Science Foundation to establish a permit and regulatory system to control: 1) The taking of animals and plants native to Antarctica; 2) the introduction of nonnative species into Antarctica; 3) the disposal of pollutants in Antarctica; and 4) the activities of the United States citizens in certain areas of Antarctica. Also, the Act amends the Fishermen's Protective Act to clarify that a vessel's documentation or certification under U.S. laws would not be affected if commanded by a person other than a citizen of the United States during any

fishing voyage beyond the U.S. fishery conservation zone. This amendment was retroactive to 1 January 1978.

Federal Water Pollution Control Act Amendments (H.R. 12140), 2 November 1978, Public Law 95-576. This Act is an authorization for appropriations for certain water pollution control programs of EPA.

Fish and Wildlife Improvement Act (H.R. 2329), 8 November 1978, Public Law 95-616. Among other things, the Act authorizes the Secretaries of Commerce and the Interior to enter into formal cooperative agreements with

states and other Federal agencies for enforcing fish and wildlife laws and to establish and conduct programs to train personnel in enforcement matters.

Endangered Species Act Amendment (S. 2899), November 1978, Public Law 95-632. This amends the Endangered Species Act by establishing a review procedure and an interagency committee to resolve conflicts between endangered and threatened species and actions of Federal agencies, and to determine mitigation and enhancement measures to conserve endangered and threatened species.

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## Fish Egg Chromosome Divisions Sensitive to Contact With Oil

After being spawned, the buoyant eggs of many valuable marine fishes float to the surface of the sea where they remain until hatching. The thin surface layer in which they are found is subject to pollution from the atmosphere, runoff from the land, and oil spills, and retains and concentrates materials and chemicals that are specifically toxic to dividing cells and that may cause deadly changes in chromosomes.

Selected fish eggs taken from Nantucket Shoals waters after the *Argo Merchant* oil spill, some dead and some dying, were found to contain arrested and abnormal chromosome divisions probably caused by pollutants. There is mounting evidence that oil is toxic to the eggs and larvae of some fish, especially in the early, fragile stages, but the absence of baseline information on normal development of fish eggs in relatively clean waters and their natural mortality does not permit a full assessment.

The normal development of cells of any species (mitosis) begins with the precise division of the combined chromosomes of the male gamete (sperm) and female gamete (egg). The embryo must have a balanced set of chromosomes for normal development to occur. Environmental influences that upset this balance may cause abnormal or arrested development as the cells multiply, and death is usually the end result. Therefore, abnormalities in the chromosome makeup during the early embryo stage are probably the most

sensitive, practical indicators of the effects of marine pollutants on reproduction in fish.

Crude and refined oils have many compounds, some of which are soluble in lipid materials (fatty substances) present in fish eggs. Benzene and polynuclear aromatic hydrocarbons (having an odor) can change the hereditary material, and cause the development of tumors and malignant growths. These compounds of oil appear to alter the surface properties of cell membranes; however, paraffin hydrocarbons do not. Dividing cells that develop into male and female reproductive cells of some fish are particularly susceptible to abnormal chromosome separation, and to mutations in the genes.

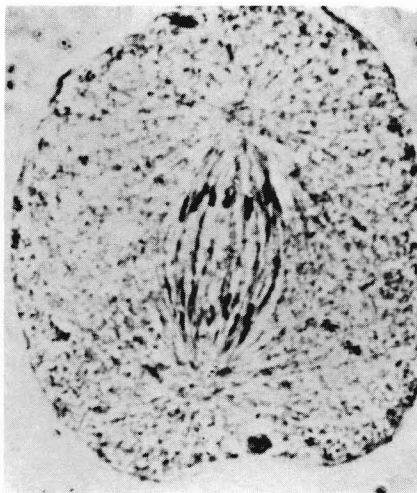
A new methodology for the study of chromosomes and their divisions in fish eggs sorted from plankton collected at sea was developed whereby the eggs of certain marine fishes are identified by species and then separated according to their developmental stages. The embryos are dissected from the eggs, their cells flattened into monolayers, and their dividing chromosomes viewed under high-resolution, high-power, light microscope optics. At their most sensitive stages, most eggs of Atlantic mackerel from the heavily polluted New York Bight did not survive (Longwell, 1976).

A. Crosby Longwell, a biologist and geneticist of the U.S. Department of Commerce, National Oceanic and

Atmospheric Administration (NOAA), working in NOAA's National Marine Fisheries Service, Northeast Center, Milford Laboratory, in Milford, Conn., and colleagues have worked together in investigating the ways petroleum hydrocarbons affected the development of fish eggs in oil-polluted waters after the *Argo Merchant* spill on Nantucket Shoals, December 1976<sup>1</sup>. Longwell concludes that there is mounting evidence that oil is toxic to fish eggs and larvae, and may be lethal to, or adversely affect, their normal cellular division. However, this researcher cautions that not enough is yet known about whether factors in clean, unpolluted marine water may also limit normal division. More baseline data are needed for meaningful and significant comparisons to be made.

Cod and pollock eggs were taken from surface waters near the *Argo Merchant* oil spill (December 1976) and examined for oil. About 80 percent of the tanker's cargo was No. 6 fuel oil, which formed "pancakes" that remained on the surface and increased in size with time. The remaining 20 percent (No. 2 oil) was a less viscous but more toxic fuel, which had concentrations of up to about 250 parts per billion (ppb). Maximum concentrations were from 1.8 to 3.6 m (5.9 to 11.8 feet) below the pancake slicks.

<sup>1</sup>Longwell, A. Crosby. 1977. A genetic look at fish eggs and oil. *Oceanus* 20(4):46-58.

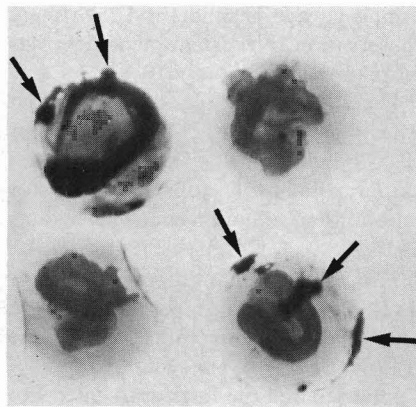


This photomicrograph shows an embryo dissected from a planktonic mackerel egg after its first division (mitosis) into two cells. It is this telophase (final stage of mitosis) that is used to appraise chromosome breakage, irregular distribution of chromosomes, and other physiological disturbances to the cell and chromosome division process.

All samples taken at a number of stations within and adjacent to the floating slicks showed some contamination. About half of all the fish eggs examined had oil droplets and tar adhering to their outer membranes (chorions). Fewer cod eggs were fouled than those of pollock.

To determine the effects of the oil and tar on the chromosomes and their divisions as they affect cell heredity of the developing embryo, the new methodology was applied to a study of the field-exposed eggs (79 cod and 162 pollock) sampled near the *Argo Merchant* oil spill. Also examined were 75 uncontaminated cod embryos from aquarium-held fish.

About 20 percent of the cod eggs and 46 percent of the pollock eggs collected at sea were dead or dying with their chromosome divisions arrested. Only 4 percent of the uncontaminated cod eggs from the laboratory aquarium were dead or dying with arrested divisions. Some pollock embryos from stations near the slicks were grossly malformed; none were malformed in samples taken at distant locations. Also, the hatched larvae of the six different species of fish sampled near

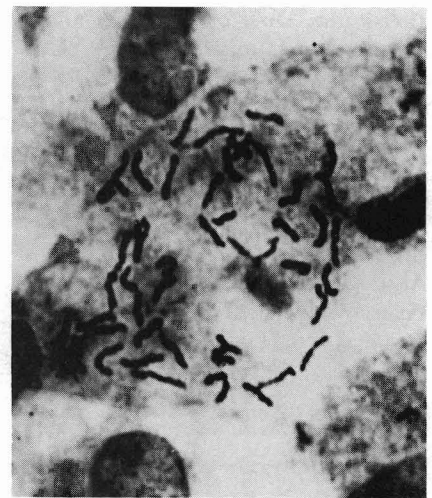


These pollock eggs, in the tail-bud and tail-free embryo stages, were sampled at the edge of the *Argo Merchant* oil slick. The eggs at upper left and lower right have outer membranes contaminated with oil (arrows). The uncontaminated egg at upper right has a malformed embryo, and that at lower left is collapsed and also has a malformed embryo.

the *Argo Merchant* spill were less prevalent within the area of the slicks than at points further removed. However, the absence of baselines for purposes of comparison makes it impossible to assess fully the significance of the cod and pollock findings from the *Argo Merchant* spill area.

In the same light, no laboratory studies have been made of the effects of oil on the chromosome divisions of developing fish embryos. However, it has been shown (Kühnhold, 1972) that cod eggs in a hatchery were most sensitive to the effects of some crude oil extracts during the first few hours after fertilization. Development was retarded and, in some instances, hatching was delayed or did not occur. Most of the hatched young were abnormally developed, swam erratically, and died after a few days.

Other researchers have shown that eggs of turbot, plaice, anchovy, scorpionfish, and sea parrot are adversely affected by concentrations of around 1 part per million or lower, of oil in water (Mironov, 1968, 1969, 1972). It was found (Struhsaker et al., 1974) that the development of abnormal embryos was the principal effect of benzene, a water-



Chromosomes of an Atlantic mackerel egg sampled from ocean surface waters.

soluble component of crude oil, on the eggs of Pacific herring.

Apparently, damage to the zygote (united reproductive cells) at the chromosome and cellular levels occurs when early stage fish eggs are exposed to oil and oil fractions. Until this study, planktonic fish eggs have not been examined with respect to their chromosomes and their division configurations.

Thus, classical genetics provides some explanations on the mortality of fish eggs, and can be a means of monitoring this most fragile link in the life cycle of fishes in their natural habitat. Yet, a fuller understanding of the natural mortality of fish eggs and larvae is needed before the effects of marine pollution on the reproductive cycles of fishes can be fully understood.

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Struhsaker, J. W., M. B. Eldridge, and T. Encheverria. 1974. Effects of benzene (a water-soluble component for crude oil) on eggs and larvae of Pacific herring and northern anchovy. In F. J. Vernberg and W. B. Vernberg (editors), *Pollution and physiology of marine organisms*. Academic Press, N.Y.

## New International Whaling Quotas Set

The International Whaling Commission agreed in late December to eliminate sperm whaling completely in one area of the southern hemisphere and also voted to reduce sperm whale quotas drastically in the north Pacific.

Calling the results of the two-day meeting in Tokyo "a significant victory," Richard A. Frank, U.S. Commissioner to the IWC and Administrator of the National Oceanic and Atmospheric Administration, stated: "We are pleased that the Commission has acted vigorously to curb whaling for sperm whales. The United States would have preferred and strongly urged a complete elimination this year of sperm whaling in the North Pacific. However, we believe that the substantial reduction voted by the Commission will mean the end of pelagic whaling in this region by Japan."

In 1978, sperm whale quotas were set at 561 for Division 5 of the southern hemisphere (an area from the equator to the Antarctic, and long. 90° E to long. 130° E), and at 6,444 in the north Pacific. The Commission's action set a moratorium on whaling in Division 5 and reduced north Pacific quota to 3,800 for 1979, a cut of more than 40 percent. The Commission further established a zero quota for female sperm whales in the north Pacific, although it did allow an accidental catch of slightly more than 400 females to be counted against the total quota.

The Commission also passed two strongly worded resolutions introduced by the United States, calling for a

prohibition of trade in whale products and implementation by the member and nonmember nations. "If fully adhered to," Frank predicted, "these resolutions will go a long way toward bringing all whaling operations under effective international regulations."

Frank expressed caution and optimism about the possibility of future conservation gain in the Whaling Commission: "The progressive reduction in quotas is encouraging. Progress in the Commission to achieve a total moratorium on whaling is not as fast as we would like, but the Commission is continuing to move in the right direction for reducing quotas, as thus providing better protection for the great whales.

## Steps Taken To Protect Sea Turtles in Florida

Emergency fishing regulations designed to protect turtles hibernating in the Port Canaveral Navigation Channel, Cape Canaveral, Fla., were published in late November by the National Oceanic and Atmospheric Administration (NOAA).

The Commerce Department agency's National Marine Fisheries Service, in the regulations, prohibited fishermen from using trawl gear in the channel waters until 19 March when the emergency regulations expire. It is believed loggerhead and Kemp's ridley sea turtles hibernate there between November and March. Public hearings were also scheduled to determine whether the regulations should be modified or extended.

The emergency regulations followed reports that last year shrimp vessels had captured large numbers of loggerhead sea turtles incidental to trawling in the channel. A survey by the NMFS in February and March 1978 confirmed the presence of the hibernating turtles, and additional surveys are now being conducted to obtain more information on them. The turtles are protected by the Endangered Species Act of 1973.

Under the regulations, trawling was prohibited in those parts of the channel known as the middle basin, east basin,

inner reach, and that part of the dredged channel beyond the outer reach to a point 1.5 nautical miles beyond buoys "R 7" and "R 8."

## Dieldrin, Endrin Levels "Very Low" in Fish off Southeast U.S. Coasts

An analytical study completed recently by the Utilization Research Division, NMFS Northwest and Alaska Fisheries Center, Seattle, Wash., showed that the dieldrin and endrin content of three species of fish, red snapper, king mackerel, and Spanish mackerel, caught off the southeastern coasts of the United States was very low. The data constitute part of a survey by the Utilization Research Division of chlorinated hydrocarbon residues in the edible tissue of fish from the Atlantic Ocean and Gulf of Mexico.

Although the three species were previously determined to have the highest DDT and PCB levels of six species analyzed, only one-third of the 46 samples of snapper mackerel contained quantifiable amounts of either dieldrin or endrin. The highest level was 0.026 ppm, less than one-tenth of the FDA tolerance of 0.3 ppm. The details are tabulated below.

Dieldrin and endrin in fish from the southeastern U.S. coast.

Species	No. <sup>1</sup>	Dieldrin (ppm)		Endrin (ppm)	
		Mean	Range	Mean	Range
Red snapper	18	n.d. <sup>2</sup>	n.d.-0.002	n.d.	n.d.-0.003
King mackerel	18	0.005	n.d.-0.026	0.004	n.d.-0.014
Spanish mackerel	10	0.007	n.d.-0.014	0.008	n.d.-0.026

<sup>1</sup>Number of composites, each consisting of 10 fish.

<sup>2</sup>n.d.=none detected

## Scientists Seek Food From Saltwater Plants

Sea Grant scientists at the University of Delaware are attempting to produce edible plants that will grow in saltwater

with the potential of becoming a food crop. The investigation—one of several supported by a \$890,000 Sea Grant from the National Oceanic and Atmospheric Administration (NOAA)—is focusing on halophytes, grass-like plants that grow naturally in salty soils. Initial efforts are pointed towards identifying which halophyte species produce large and abundant seeds, and have the potential for managed production. The Commerce Department agency grant is being supplemented by \$701,100 in non-Federal funds.

Other Sea Grant researchers at the University are testing a small, simple system to use sea wave energy in converting saltwater to fresh. Preliminary estimates suggest the cost would be only slightly greater than that most suburban U.S. homeowners pay for water.

Under NOAA grants, Delaware scientists and engineers have designed a unique, controlled mariculture system

for growing oysters and clams, and hope to grow oysters to market size in less than a year, compared with 3 years in the wild. Maricultured clams also grow to market size significantly faster than do wild clams.

## Prince William Sound Ecosystem Study Starts

National Oceanic and Atmospheric Administration (NOAA) scientists have begun an ecosystem study of Alaska's Prince William Sound to give environmental managers information needed to anticipate and ease the ecological pressures created by North Slope oil shipping and expanded commercial development in the area.

Initially funded by NOAA and the Environmental Protection Agency, the project is expected to last about 5 years. Field work deals initially with

understanding and minimizing the probable environmental impacts of oil spills in the area.

"What makes this study unique is that we're able to begin it at a stage of minimal human impact," NOAA Corps Lieutenant Christine S. Carty, acting manager of the Anchorage-based project, explained. This means there is a good chance for the Sound's beauty and vitality to be preserved, she said. Continuing development of the natural resources of Alaska and the Sound promises to build up the sparsely populated area of Alaska's south coast, although the rate of economic growth is difficult to predict, according to Carty.

The Prince William Sound effort is the third major coastal study undertaken by the Marine Ecosystems Analysis (MESA) Program, part of NOAA's Environmental Research Laboratories in Boulder, Colo. The other two focus on Puget Sound and on the ocean area off the New York-New Jersey coast.

## Marine Recreational Angling Survey Begun

The National Oceanic and Atmospheric Administration has awarded contracts totaling \$1.3 million to Human Sciences Research, Inc., McLean, Va., and Clapp and Mayne, Inc., San Juan, Puerto Rico, to collect data on the fish catch by marine recreational anglers. The survey is being conducted for the National Marine Fisheries Service.

The recreational fishery statistical survey will be done on the Atlantic and Gulf coasts, Hawaii, Guam, American Samoa, Alaska, Puerto Rico, and the Virgin Islands. The results of the survey, to be conducted between 1 November 1978, and 31 October 1979, will be available in February 1980. The Virginia firm was awarded a \$1,192,404 contract, while the San Juan company's contract was for \$117,924.

The survey will provide estimates of participation, catch, and effort by marine recreational anglers for each geographical region and State in the survey. Included will be information on finfish and selected shellfish by species,

by State or region, the number of marine anglers, number and length of fishing trips, number of days spent fishing, total catch by weight and numbers, method of fishing used and what the anglers did

with their catch. The information obtained during the survey will be used in the development of fishery management plans by the Regional Fishery Management Councils.

