

Fish Product Inspection, Standardization Understanding Is Reached by DOC and FDA

The Department of Commerce's National Oceanic and Atmospheric Administration has announced an agreement with the Food and Drug Administration concerning the inspection and standardization of fishery products processed in the United States.

The FDA is responsible under the Food, Drug, and Cosmetic Act to insure that foods are safe and wholesome and that products are honestly labeled.

The National Oceanic and Atmospheric Administration is authorized by the Agricultural Marketing Act and the Fish and Wildlife Act to develop and implement quality grade standards for fishery products and to improve health and sanitation standards in the industry. NOAA also has the authority to conduct both plant and product inspection for fishery processors through a voluntary inspection program available to the industry.

This agreement will benefit both consumers and industry by extending fishery products inspection activities to more products and facilities. NOAA's inspection service will not diminish FDA's authority to inspect but should minimize FDA inspections in establishments under NOAA contract inspection.

In the Memorandum of Understanding between the two agencies, FDA recognizes the expertise of NOAA's National Marine Fisheries Service in the field of fishery products quality and sanitary processing. FDA also recognizes that plants under contract to NMFS' voluntary inspection program are subject to inspections which insure compliance with the Federal Food, Drug, and Cosmetic Act.

Since both agencies have certain common or related aims in carrying out their respective regulatory and service activities, the agreement defines the working arrangements which will enable each agency to administer more effectively its responsibilities relating to inspection and standardization of fishery products. Some of the areas for cooperative action identified in the agreement include joint consultation on recognized problem areas, period-

ic joint program planning, product retention and recalls, and training.

"Our agreement with FDA comes at a most appropriate time," said Joseph Slavin, Associate Director, Office of Resource Utilization, NMFS. "We have only recently expanded and modernized the inspection services that we can offer to the industry. We have developed new services, overhauled existing services to fit the needs and pocketbooks of smaller firms, and added greater flexibility to handle new business. These recent changes and our agreement with FDA makes it more attractive for a firm to use our services."

Permits Issued Under Marine Mammal Law

The Commerce Department's National Oceanic and Atmospheric Administration announced in mid-December that three general permits, which will require U.S. fishermen to take special precautions to protect marine mammals taken incidental to certain commercial fishing operations, were issued to the United Fishermen of Alaska, Juneau, Alaska, on behalf of all U.S. fishermen.

The general permits for three fishing gear categories were issued in compliance with the regulations issued under the Marine Mammal Protection Act of 1972. The Act was passed to protect, maintain, and if necessary rebuild the populations of marine mammals and, among other things, restricts the taking and importing of marine mammals and marine mammals products. The word "take" means to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal.

Because there are times when fishermen might unavoidably take marine mammals during normal fishing operations, regulations provide for the issuance of general permits and certificates of inclusion which allow fishermen to take marine mammals incidental to their commercial fishing operations.

Conditions of the general permits and the certificates of inclusion under the

permits require that U.S. commercial fishermen take special measures to avoid seriously injuring or killing marine mammals in their fishing operations. If a marine mammal is killed or seriously injured it must be reported to the National Marine Fisheries Service within a specified time. The report must contain the location, time, and date of the injury or death as well as the identity, number of marine mammals involved, and the circumstances which led up to and caused the death or serious injury.

The three general permits were issued to the United Fishermen of Alaska by the National Marine Fisheries Service under the general categories relating to: encircling gear (seine fishing other than yellowfin tuna), stationary gear, and other gear such as hook and line used in commercial fishing operations. The permits are valid until 31 December 1975, unless amended, suspended, or revoked by the Director of NMFS. The terms and conditions of the general permits and the related certificate of inclusion may be modified to conform to amendments made in the regulations.

Now that the general permit has been issued, individual commercial fishermen in these gear categories who incidentally take marine mammals in the course of fishing operations must apply for a certificate of inclusion under the general permits. Applications for the certificates of inclusion are being accepted at the National Marine Fisheries Service's Regional Offices in Seattle, Wash.; Terminal Island, Calif.; Gloucester, Mass.; St. Petersburg, Fla.; and Juneau, Alaska.

Clam Stocks Increase Off Virginia's Coast

Surf clam populations have become commercially abundant off the Delmarva Peninsula and the Virginia coast according to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service.

A surf clam survey made by the Commerce Department agency's Oxford, Md., laboratory, showed that the center of abundance of the clams has moved from the New Jersey coast to the waters off the Delmarva Peninsula. The clams are also being found more often and in greater quantities in the

Virginia-North Carolina area than was recorded in an earlier survey.

John Ropes, scientist from the Oxford laboratory and Party Chief for two cruises this past summer, states that the shift in concentration is probably the result of more favorable climatic conditions in recent years in the Delmarva, Virginia, and North Carolina areas. The fishery for the clams has increased in the area, with a corresponding decrease in the fishery off New Jersey.

NOAA Survey of Southeast Coastal Waters Completed 13 Years Ahead of Schedule

The National Oceanic and Atmospheric Administration reports that it has completed in two years a survey of a 38,000-square-nautical-mile area of coastal waters off the Carolinas, Georgia and northern Florida which has previously been programmed for completion in 1988. The survey, dubbed SCOPE (Southern Coastal Plains Expedition), will provide marine information on the coastal plain region which will aid Federal, state, local and private agencies in making decisions on environmental problems.

In compressing the 15-year survey into two years, NOAA used four ships, a hydrographic field party, land support units and an air photo mission. The ships and hydrographic party covered approximately 76,000 miles, equivalent to more than three times around the globe, in carrying out their surveys.

The SCOPE survey, which began in January 1973 and was completed this month, served as a prototype for similar concentrated surveys in other major coastal areas as funds and facilities become available.

Processing of the data has also been speeded up in order to expedite the release of information for environmental development studies, such as ecology, pollution control and marine engineering, and for nautical charts. Considerable data from last year's operation are already available and data from this year's survey will be available in about 12 months. Ordinarily, the processing of the many thousands of pieces of data in a survey of this type would take about 5 years beyond completion of the field work.

The coastal waters covered by the survey extended from Cape Hatteras,

The surf clam is the most commercially important clam in the United States, and its range of distribution is restricted to the Middle Atlantic area of the east coast. Over 82 million pounds of surf clam meats, valued at over \$9 million were landed by commercial fishermen in 1973 in the United States. They were used primarily for soups, chowders, and fried clams by large commercial users such as the restaurant chains and institutions.

N.C., to the vicinity of Cape Canaveral, Fla., and out to sea as much as 60 miles. The water depths surveyed ranged from the surf zone to 600 feet.

SCOPE was carried out by facilities of NOAA's National Ocean Survey, including the NOAA ships *Whiting*, *Mt Mitchell*, *Peirce* and *Ferrel*. The survey by the Commerce Department agency included surveys of the bottom topography, tidal currents, tide measurements and studies of the sea's physical properties—such as salt content and water temperatures—along the coast and in the Gulf Stream. Aerial photos were taken of the coastline to delineate the high and low water lines for use in the compilation of nautical charts.

The data and products that are available, or will be next year, from the survey include: Tidal current data; shoreline maps; aerial photographs; and survey sheets.

Tidal current data will be available in various forms, including magnetic tape, printouts, computer plots and data analysis forms. In due course, the data will be incorporated in the tidal current tables published by the agency. The data provide information on the speed and direction of the water that flows in and out of the estuaries, information essential to coastal planning, especially in determining the dispersion of pollutants.

Shoreline maps depict the high and low water lines as determined by aerial photography. The maps are important in determining shoreline boundaries.

Aerial photographs can be used by coastal planners for studies of the shoreline and for any type of shoreline construction. The boundaries (the high and low water lines) along the coast can

be physically seen, although it may be necessary at times to enlarge segments of the photos to achieve this.

Survey sheets provide in great detail (much more so than on nautical charts) ocean soundings along the coast. The information is important to commercial shipping, recreational craft and coastal engineering. It also provides a picture of the sea bottom, useful in almost any study of the area, whether for engineering or scientific purposes and in connection with petroleum research and the recovery of minerals on the continental shelf.

Other data gathered in the survey will be reflected later in updated nautical charts and tide and tidal current prediction tables. These data are important to ship navigation and all types of coastal engineering, including the construction of buildings and other structures, such as piers and seawalls.

Queries concerning the availability of SCOPE information and products should be addressed to the National Ocean Survey, Office of Marine Surveys and Maps (C3), Rockville, MD 20852.

NOAA Has New Jersey Inshore Water Data

The Public Service Electric and Gas Company of New Jersey has released to the Department of Commerce's National Oceanic and Atmospheric Administration environmental data collected in the inshore waters of New Jersey, north of Atlantic City (centered at lat. 39° 28'N and long. 74° 15'W).

The data, deposited in NOAA's Environmental Data Service, was collected as part of a site survey for a proposed nuclear generating station by several research groups under contract to the Public Service Company. Data sets consist of six biological reports, two geological/geophysical reports, three water quality (chemistry) reports, 13 physical oceanographic reports (currents, waves, tides, hydrography), 98 analog seismic reflection profiles, and digitized depth, temperature, salinity and current observations.

The reports contain detailed information on:

- 1) Ecological studies: life histories and migrations of some important fishes, distribution of eggs and larvae of fishes, results of seine and trawl collections, sports and commercial fisheries, invertebrates, shell fish-

eries, other marine and estuarine organisms, organisms associated with artificial reefs, problems and consequences of power plants on marine ecology.

2) Physical properties of water masses: Waves: daily wave statistics, joint distribution of significant wave heights, wave-rider data analyses, normalized wave energy spectra from wave-rider records, summary of wave records.

3) Currents: currents vs. direction, histograms, plots, profiles, computer printouts of current speed vs. direction, surface and subsurface drogue tracks, dye dispersion.

4) Tides: summary and analyses of tide recordings.

5) Hydrography: seasonal and daily

variations in water temperature as a function of depth, depth-temperature-salinity profile summaries.

6) Geology/Geophysics: bathymetry, seismic reflection profiling and sediment analysis.

The data in scientific report form and analog form are available from the Environmental Data Service on loan or microfilm copy. Automated data are available as magnetic tape copy or machine listing. Write: National Oceanographic Data Center, Environmental Data Service, National Oceanic and Atmospheric Administration, 3300 Whitehaven St., Washington, DC 20235, or phone (202) 634-7441.

Porpoise Mortality Rate Reduction of 50 Percent Picked by Commerce Department

The Commerce Department has set a 1975 goal of a 50 percent reduction below the 1974 level in the rate of porpoises killed in U.S. yellowfin tuna fishing operations, and has issued regulations designed to achieve that goal, Robert W. Schoning, Director of the National Marine Fisheries Service, has announced.

Achievement of this goal will mean a reduction in porpoise mortalities from about one per ton of yellowfin tuna caught in sets on porpoises in 1974 to approximately one per two tons caught in 1975. Yellowfin tuna sometimes school under porpoises and fishermen set their seines around schools of porpoises to capture the tuna beneath them. A reduction from an estimated 117,000 porpoises killed in 1974 to approximately 58,000 in 1975 will result if U.S. tuna fleets set on porpoises at about the same rate in 1975 as they did in 1974, Schoning said. The precise number will depend upon the number of sets on porpoises and the tons of tuna taken.

"Our goal is to achieve the purposes of the Marine Mammal Protection Act of 1972, which required that the porpoise mortality and serious injury rate be reduced as closely as possible to zero within the state of science and technology," Schoning said. "The new regulations are expected to accelerate the downward trend of porpoise mortality experienced in recent years without inflicting severe economic damage on the American tuna fishermen."

He also pointed out that additional porpoises are killed by foreign tuna

fishermen who operate under no regulations that protect porpoises. "There is a need to insure that foreign fishermen, too, will make a greater effort to protect the porpoises," he said, "and our government will be taking further steps to encourage other governments to reduce porpoise mortality."

The three changes in the current regulations governing U.S. commercial yellowfin tuna purse seine fishing operations, effective 3 January 1975 are:

1) All U.S. yellowfin tuna purse seine fishermen holding certificates under a general permit must attend training sessions to ensure that they are personally aware of the provisions of the Marine Mammal Protection Act of 1972, regulations based on the Act, and methods they must use to protect porpoises;

2) The fishermen must use an additional rescue technique for porpoises, by stationing two men in a small boat close to the net and readily available to extricate and release all porpoises entangled in the net;

3) A technical revision in the wording of existing regulations concerning corkline net hangings clarifies its applicability to only a part, rather than the entire net.

The three changes in the regulations are the most recent step in the continuing effort of the National Marine Fisheries Service to reduce the porpoise mortality rate. For more than two years, the National Marine Fisheries Service has worked with conservationists, protectionists, the fishing industry, the Marine Mammal Commission and its scientific advisors to establish regulations and improve fishing

methods and gear to protect marine mammals, especially porpoises which are incidentally killed during yellowfin tuna purse seine fishing operations.

Regulations to protect porpoises during commercial yellowfin tuna fishing operations became effective on 30 September 1974. These regulations established a general permit system structured by five fishing gear categories. Under this system, fishing vessel masters or other persons in charge of fishing operations must obtain a certificate of inclusion under a general permit and comply with the terms and conditions of the regulations and the general permit.

All holders of a certificate of inclusion must, among other things, return all captured marine mammals to the water immediately and take every possible step to minimize killing and injuring the mammals. They are not permitted to set purse seine nets around porpoises when, in their judgment, wind, sea condition, visibility or the number of fish, porpoises, or both in the net would prevent proper release procedures from being used. Certificate holders are also required as a last resort to open a purse seine net already set on porpoises, if, in their judgment, this is the only way to minimize mortality. They must also maintain daily logs of all sets which include porpoises or other marine mammals, maintain their equipment in good order, and use auxiliary boats to hold the nets open so porpoises will not become trapped or entangled in the net. A violation of any of these regulations is grounds for suspending or revoking a certificate of inclusion.

The three changes in the regulations were published in the *Federal Register* on 3 January 1975. They are based on recent research conducted by the NMFS and on the results of proposals made at an informal public hearing held by the National Oceanic and Atmospheric Administration on 10 and 11 December 1974, attended by representatives of the fishing industry, conservationist and protectionist organizations, and government agencies.

"These new changes are added to the many other stringent requirements not yet thoroughly employed by the entire fleet because they were implemented toward the end of the 1974 fishing season," said NMFS Director Schoning. "There is no simple, single, right answer to the problem. We are continually

trying to improve the regulations and we welcome recommendations and suggestions that will improve the program.”

Approximately 30 suggestions or recommendations for changes in the regulations were made at the recent hearing,” said Schoning. “They ranged from minor technical word changes to proposals to stop all seining of tuna that have schooled beneath porpoises. Many of the suggestions are already in effect or being followed; others will require additional rule-making procedures. Still others are being studied for possible further action or modification. All suggestions and recommendations were studied and evaluated, and much information was obtained from the hearing that will contribute toward improvements in the program.”

Additional informal public hearings in regulations are tentatively scheduled later this year. Regulations may be changed, deleted, or added, based upon any new data. “We will monitor the progress being made in 1975 to evaluate the effectiveness of our regulations and ensure that every effort is made to meet the goal,” said the NMFS Director.

Research will continue while data are being collected on the effectiveness of the regulations. “Much is at stake,” Schoning said. “Porpoise can be given realistic protection while purse seining for yellowfin continues. But, it will require the cooperation of everyone involved.”

Russia Will Pay For Lost Lobster Gear

The Commerce Department’s National Oceanic and Atmospheric Administration has announced that the Soviet Union has agreed to pay \$11,400 to the R & G Fisheries of Tiverton, R.I. The payment will be made for loss of gear and financial hardship caused when Soviet trawlers destroyed the company’s lobster traps while trawling through a well marked area in October 1971.

The USSR agreement to pay was reached during a meeting of the U.S.-USSR Fisheries Claims Board which was established this year to hear claims submitted to it for damages caused by fishing vessels of either country. Members of the board include Carmen J. Blondin, of NOAA’s National Marine Fisheries Service; Clinton J. Maguire, U.S. Coast Guard; and

Y.A. Znamenskiy and A.G. Afanasyev of the Soviet Union.

R & G Fisheries alleged that on the morning of 9 October 1971, their fishing vessel, *Seven G’s*, found numerous Soviet trawlers towing through their lobster traps in an area marked with flags, buoys, and radar reflectors. The *Seven G’s* removed as many undamaged lobster traps as possible and returned to port. On October 27, the *Seven G’s* returned to the area and found that the rest of her gear and traps were gone. A total of 210 lobster traps and accompanying gear was lost. Owners of R & G Fisheries stated that they were forced to curtail offshore lobstering for the remainder of the season because of the incident.

The incident occurred approximately 70 miles off the northeast coast of the United States.

Surface Sediments Found Polluted in Los Angeles and Long Beach Harbors

Most of the surface sediments in the Los Angeles-Long Beach Harbor area and in the San Pedro Basin contain pollutants in varying concentrations, according to an 18-month study of the San Pedro Bay by Sea Grant scientists from the University of Southern California.

Purpose of the study was to provide baseline information on the environmental effect of alternatives for disposing of dredge spoil, such as land fill or open water dumping. The scientists concluded that carefully planned, restricted dredging of certain areas of the San Pedro Bay harbor complex would probably be beneficial, provided that the dredge spoil is properly disposed of. If dumping sites are carefully chosen, they said, minimum damage will occur.

The possibility of dredging part of the Los Angeles Harbor to create a deep-water port has been under consideration for several years by the Los Angeles Harbor Department—which contracted with USC Sea Grant Harbor Projects for the study—and the U.S. Army Corps of Engineers. The Commerce Department’s Sea Grant Program at USC provided the interdisciplinary team to undertake the analysis, and additional funding was provided by the Allan Hancock Foundation, the Corps of Engineers, and the National Oceanic and Atmospheric Administra-

tion through its Office of Sea Grant.

Headed by Dorothy Soule and Mikihiko Oguri who directed field sampling, and Kenneth Y. Chen and James C.S. Lu of USC’s Environmental Engineering Programs, who performed the chemical analyses, the Sea Grant team also included scientists from Immaculate Heart College, Occidental College, and California State University at Long Beach.

After taking hundreds of samples of harbor bottom sediments throughout the 22-square-mile area and adjacent waters to Catalina Island and analyzing them for some 35 substances, the Sea Grant scientists produced a list of contaminants that reads like a Who’s Who of Chemical Villains: heavy metals such as lead, mercury, and cadmium; organic pesticides such as DDT and aldrin; a class of toxic chemicals known as PCB’s (polychlorinated biphenyls); organic materials, and nitrates and phosphates from industrial and domestic sewage.

Chen, an Associate Professor of Environmental Engineering at USC, likened the harbor bottom to a vast chemical laboratory whose workings are not known. “The silts and muds may act as a sort of storehouse or ‘sink’ for some pollutants,” he said, “trapping them chemically and preventing their release into the environment. Under some special environmental conditions, the sediments may have the opposite effect, actually forming new compounds and thereby acting as a new source of pollution.”

In addition, he said, when a harbor bottom is dredged and the spoil is dumped offshore, the transported sediment may change its characteristics from a beneficial “sink” to a new and dynamic chemical system that may cause an unknown environmental effect by releasing the pollutants attached to the dredged material.

Because the relationships between sediment and pollutants and between pollutants and the environment are not yet well understood, Chen draws a cautious warning. “There are very few remedies available to undo the pollution of the past,” he said, “since the selective removal of pollutants from sediments is almost impossible. Emphasis must be placed on preventing these types of irreversible processes from occurring in the first place.”

The study shows that the Los Angeles County Sanitation District sewer outfall at White's Point has been the major source of trace metals and chlorinated pesticides such as DDT, while the harbor complex contributes more of the PCB's. Los Angeles Harbor is relatively contaminated in comparison to the pollution in San Pedro Bay.

The report is available from Marine Advisory Services, USC Sea Grant Program at the University of Southern California.

SALMON VACCINATED TO PREVENT DISEASE

Salmon reared in floating pens are being vaccinated to prevent disease, according to the National Oceanic and Atmospheric Administration.

National Marine Fisheries Service scientists at the Northwest Fisheries Center Experiment Station, Manchester, Wash., are developing vaccines and equipment to immunize coho and chinook salmon against the greatest killer of salmon in salt water, the *Vibrio* bacterium.

Growing salmon in pens both for commercial use and for the management of recreational fisheries is widespread. At the Commerce Department agency's Manchester laboratory, NMFS personnel have assisted in establishing salmon rearing projects from California to Alaska, from New Hampshire to Nova Scotia, and on the coast of France.

The rapid expansion of commercial saltwater rearing in Puget Sound with over 300 metric tons of coho salmon produced in the first half of 1974, has stimulated worldwide interest. In addition, the Washington State Department of Fisheries releases more than 100,000 saltwater-reared chinook and coho salmon into Puget Sound each year for the benefit of recreational fishermen.

The early development of a *Vibrio* vaccine was pioneered under a NOAA sponsored Sea Grant program at Oregon State University, Department of Microbiology, and field trials were conducted on coho and chinook salmon by the Fish Commission of Oregon.

Mortalities from disease can approach 100 percent if saltwater-reared stocks are not treated. However, fish infected with *V. anguillarum*, the most common virulent species of *Vibrio*,

normally respond to orally administered tetracycline antibiotics. This method of treatment, however, is expensive and slow. Many fish die before the antibiotics take effect.

NMFS scientists have found that a single injection of heat-killed cells cultured from a Puget Sound strain of the disease is adequate to provide at least 90 percent protection to the young coho salmon from early summer through late fall. Up to one-half million young salmon can be injected with a little over two pounds of vaccine.

The experimental injection equipment, made from "off-the-shelf" material, consists of flasks to hold the vaccine and plastic tubing through which it flows by gravity into repeating syringes. The heat-killed cells are suspended in a saline solution and injected into the posterior body cavity of the fish.

With minimal training, a worker can vaccinate 600 to 1,000 fish per hour. Cost of the vaccine and labor ranges from \$300 to \$700 per 100,000 fish, considerably less than the cost of administering the vaccine orally.

Several weeks after the fish are vaccinated, they develop detectable agglutinating antibodies against the disease. Rather than maintaining production of antibodies, the scientists found that antibody production in the fish declined as the season progressed. Although antibody production can be restimulated with the followup vaccinations, it is expensive. The NMFS scientists are now testing media that will allow the vaccine to enter the fish more slowly so that it will continue to stimulate antibody production for a longer period.

Seaweed Tank Farms Believed Profitable

A two-acre "farm" growing a common red seaweed found in the Florida keys would be a paying proposition, says a biologist at the University of South Florida, Tampa. Working under a Sea Grant provided by the National Oceanic and Atmospheric Administration, Clinton J. Dawes calculates that intensive tank culture of the Florida seaweed called *Eucheuma*—much in demand for commercial extracts—would yield up to \$9.72 per square meter per year.

A "farm" of seaweed-growing tanks

taking up a little over two acres of land (about the size of three football fields) would thus be expected to bring the growers a gross of about \$85,000 a year.

The three-year Commerce Department-supported study points out that harvesting the red algae under field-grown conditions would yield only about \$0.16 per square meter, meaning that more than 12 acres of area would be required to yield around \$8,000 annually.

"The 60-fold increase in gross revenue by tank culture will have to be considered in the light of such costs as tank construction, water movement, and temperature control," Dawes notes. "However, based on our study of the ecology, biochemistry, and economics of the plant, mariculture seems feasible and desirable." He points out that only after a pilot plant has been established can a sound cost vs. profit balance be struck.

The common Florida red algae, *Eucheuma isiforme*, is one of several kinds of seaweed that, when properly dried and processed, yield an important chemical colloid known as carrageenan. Carrageenan is used principally as a thickener, stabilizer, and gelling agent in food and food products, pharmaceuticals, cosmetics, paints, and textile sizings. In recent years the carrageenan industry has grown more rapidly than that of any other seaweed product, tripling from about 2,200 metric tons in 1960 to more than 8,640 metric tons in 1971. Nearly half is produced in the United States with a value of more than \$16 million.

"There is only a limited supply of natural populations of seaweeds that yield carrageenan," says Dawes. "Collection of these seaweeds is relatively primitive and is mostly dependent upon natural wild populations, thus aggravating the limited natural supply. Not only growth, but the survival of the carrageenan industry will depend upon a reliable and increasing source of raw material." Cultivation of carrageenan-producing seaweeds is now being carried out in the Philippines.

Dawes points out that because most large populations are already being harvested in areas throughout the world, any further increase in production must come from development of mariculture procedures.

The cost of the dried seaweed has

risen as natural populations are overharvested. In 1963 the cost of a kilogram of clean, dried Canadian *Chondrus* (another kind of carrageenan-bearing seaweed) was \$0.22, while ten years later, in 1973, the cost for a kilogram of either *Chondrus* or central Pacific *Eucheuma* varied from \$0.66 to \$1.10, depending upon the purity of the sample.

The common Florida seaweed was selected by Dawes as most promising for mariculture because it is easily accessible, has a high yield of carrageenan, and is perennial with a stable life history. The shallow water form of the plant, found in the Florida Keys, was the form selected.

This seaweed is found in open, exposed marine waters with tidal currents of up to half a knot and where the bottom is limestone. Salinities are rela-

tively high and nutrient levels relatively low. Longevity studies show that individual plants of certain forms in the Florida Keys will remain throughout the year. Growth rates are highest in the spring, summer, and early fall.

At present wild populations of the plant are harvested in the central Pacific at a rate of about 4,000 metric tons per year. The world price for clean, dry seaweed is now greater than \$350 per metric ton. The major factor limiting its harvests is the availability of the wild material, which fluctuates by season and because of storm damage and site depletion.

"Availability of raw material sources for the production of carrageenan is of great concern," says Robert D. Wildman, Director of Project Support Programs of NOAA's Office of Sea Grant.

"Owing to changing political climates imports of seaweed from other countries are not always dependable, and in any case they aggravate the U.S. balance of payments problem. We are therefore looking to ways to increase domestic sources."

Dawes proposed the use of plastic or fiberglass-coated plywood containers with about three square meters of surface area and using compressed air for water circulation. In a tank of this size about 20 kilograms (44 lb) of plant material could be allowed to cycle for about 30 days, increasing in size to about 36.2 kilograms (almost 80 lb). This would reduce in dry weight, to about 7.24 kg (almost 16 lb). Ten such harvests could be carried out each year in each tank using plants collected from the wild or grown under controlled conditions.

Foreign Fishery Developments

Japan's 1973 Marine Catch Up 3 Percent

The Statistics and Information Department of the Japanese Ministry of Agriculture and Forestry in early October 1974 published catch statistics of

1973 for the marine fisheries of Japan. The statistics show that the marine catch during January-December 1973 totaled 9,749,000 metric tons, an in-

crease of 295,000 tons or 3 percent above 1972. Significant gains were recorded for sardines, saury, and skipjack tuna, while sharp declines occurred in the common squid ("surume-ika"), atka mackerel and kelp production.

The most important species landed, in terms of quantity, was Alaska pollock, with a catch of 3,023,000 metric tons. However, compared with 1972, landings were down by 12,000 tons, thus ending the consistent uptrend recorded in recent years. Second in importance was Pacific mackerel, with 1,134,000 tons, down 56,000 tons or 5 percent from 1972.

Tuna (excluding skipjack) landings were 328,000 metric tons. Landings since 1970, the year when a low of 291,000 tons was reached, began to increase annually by over 10,000 tons, recording 308,000 tons in 1971 and 318,000 tons in 1972. Skipjack tuna landings, which totaled 320,000 tons, were 44 percent ahead of the 1972 catch of 223,000 tons and up 87 percent over the 171,000 tons for 1971.

Source: *Suisan Tsushin*.

Coastal Currents Studied off Norway

Norwegian researchers began a broadly-based investigation of the coastal current off that country's coast early this year. Questions studied by the project include the consequences of the oil industry in the North Sea, the condi-

Japan's marine fisheries catch¹, 1973.

Species	Catch	Comparison		Species	Catch	Comparison	
		1973 Over	1972			1973 Over	1972
	1,000 mt	Percent		1,000 mt	Percent		
Tuna				Alaska pollock	3,023	100	
Bluefin	47	101		Cod	109	124	
Albacore	93	101		Rockfish	101	115	
Bigeye	102	104		Atka mackerel	115	64	
Yellowfin	68	100		Croaker	45	107	
Yellowfin (young)	18	132		Sea bream	30	92	
Total, tuna	328	103		Dolphin fish	15	160	
Skipjack				Mullet	6	75	
Skipjack	320	144		Other fish	1,248	—	
Frigate mackerel	34	109		Shrimp	63	108	
Total, skipjack	354	139		Crabs			
Billfish				King	5	52	
Striped marlin	13	76		Tanner	26	62	
Swordfish	14	100		Blue	3	205	
White marlin	11	98		Other crabs	33	129	
Sailfish	6	99		Total, crabs	67	85	
Total, billfish	43	89		Squids			
Salmon	136	114		Common squid	347	75	
Sardines	731	139		("Surume-ika")	12	80	
Jack mackerel	128	84		Cuttlefish	127	106	
Pacific mackerel	1,134	95		Other squids	487	81	
Saury	406	206		Total, squids	487	81	
Sharks	40	94		Octopus	73	109	
Herring	83	133		Sea urchin	26	115	
Yellowtail	53	107		Shellfish	261	84	
Flatfish				Seaweeds			
Flounder	381	109		Kelp	131	86	
Bastard halibut	9	108		Other seaweeds	90	—	
Total, flatfish	390	109		Total, seaweeds	221	95	
				Other marine products	34	—	
				Grand total	9,749	103	

¹Some figures may not add to the listed totals due to rounding.