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 becuase 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 relatively 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 increase 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.

Japan's marine fisheries catch[1], 1973.

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

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

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-

tions promoting the growth and development of fish, the effects of the regulation of watercourses and the affect of the current on the seabed and the transportation of sediments. The project is interdisciplinary, and nine research institutes are at present involved. Led by Martin Mork of the University of Bergen's Geophysical Institute, the project is planned to last five years, although it may continue beyond this time.

It is also planned to map the exchange of water in the fjords along the coast and the influence of the coastal current on climatic conditions. These studies will, it is hoped, provide the authorities with an improved basis for arriving at decisions on such questions as the development and regulation of watercourses. Studies off northern Norway are to be intensified to provide a large body of scientific data before exploration for and exploitation of petroleum reserves begins in these waters.

There will also be cooperation with an international research project involving all the countries bordering the North Sea. The primary aim of this project is the charting of the inflow and outflow of water in the North Sea. The Norwegian researchers are to concentrate in particular on the northern and northeastern parts of the North Sea.

Papua New Guinea Puts Higher Tax Assessment on Foreign Fish Firms

Three Japanese firms and one U.S. firm engaged in experimental skipjack tuna fishing for the Papua New Guinea Canning Company in late 1974 were notified by the government of Papua New Guinea of new tax measures applicable to their catches. Reportedly, the notification called for a 9 percent corporation tax assessment on all shipments of tuna catches taken by those firms since the beginning of their fishing operations in 1970, and a 5 percent export tax on all shipments from 18 November 1974.

At a meeting held in Tokyo on December 12 with Papua New Guinea's Natural Resources Development Minister, the participating Japanese fishery firms (Kyokuyo, Hokoku Suisan, and Kaigai Gyogyo) expressed objection to the tax measure and requested reconsideration, stating they could not possibly comply with the requirements since the fishing ventures, which are being conducted at huge costs and great risks, are still not producing profits for them. They claimed that the assessments would not only make it impossible to continue the fishing operations but also thwart the planned establishment of a cannery at Madang. The Papua New Guinea Minister was said to have agreed to explain the circumstances of the foreign fishing firms to Papua New Guinea's National Investment and Development Agency and other agencies concerned. Reportedly, the tax assessments against the Japanese firms will total about 300 million yen (approximately US$1 million).

Sources: *Suisan Keizai Shimbun* and *Katsuo-maguro Tsushin.*

FISHERY ASSISTANCE EXTENDED IN CANADA

Canada's Federal Fisheries Minister Roméo LeBlanc announced a $4 million extension to the Cold Storage and Inventory Financing Costs Assistance Program administered by the Fisheries Prices Support Board late last year. Initially approved for the period 1 July 1974 to 31 October 1974, the program was designed to assure fishermen a market for their 1974 catches at current prices and to assist the secondary industry in the orderly marketing of fishery products.

LeBlanc said this assistance will continue in the then-current form and level until 31 December 1974, and from 1 January 1975 to 31 March 1975 at a sliding rate. The program terminated on 31 March 1975. This extension provided for an orderly disposal of current inventories and prevented competition with the 1975 production. The program of credit extensions for additional inventory terminated on October 31 and was not extended.

RUSSIA AND NORWAY INITIAL FISH PACT

An agreement on bilateral cooperation between Norway and the Soviet Union in the fisheries sector was initialled in Oslo on 13 December 1974, the Norwegian Information Service reports. This was one outcome of a week of talks between the Soviet Minister of Fisheries, the Norwegian Minister of Fisheries, and Norway's Minister responsible for law of the sea and fisheries limits questions, Jens Evensen. The agreement, which is intended to further cooperation between the two countries on practical questions connected with the fishing industry, is still to be ratified. The agreement also provides for consultation on these questions with special emphasis on conservation measures and the coordination of fisheries research.

Other results of the talks were a Soviet-Norwegian agreement to propose a total 1975 quota of 800,000 tons for the Northeast Arctic cod fishery at the special meeting of the Northeast Atlantic Fisheries Commission in Bergen next January, and a Soviet acceptance in principle of the Norwegian proposal to create no-trawling areas off the coast of northern Norway. The Soviet Union is reported to have had certain reservations on the question of Norwegian jurisdiction within the zones and on the boundaries of the easternmost of the proposed zones. Questions of detail such as these remain to be settled by later discussions.

At a press conference the Soviet Fisheries Minister stressed the relationship between these three results of the talks. They were all designed to make it possible to conserve fish stocks and conduct a sensible and rational fishery in the waters off Norway and the Soviet Union, he said.

Publications

Closed System Salmon Culture Data Issued

A report on a unique aquaculture system, developed at the University of Rhode Island, is available through the University's Sea Grant program. Entitled, **The Technology of Closed System Culture of Salmonids,** the report describes the URI aquaculture system that reuses water. Key to the compact operation is biological filters that convert toxic ammonia to nitrate, a less toxic form of nitrogen.

The study was coordinated by