

the Strait of Juan de Fuca and northern Puget Sound. In addition, arrangements were made to coordinate weekly fishing periods on the Fraser River and at Point Roberts during the chinook season in the spring and the chum salmon season in the fall.

With respect to the Pacific coast it was also agreed to include in the Agreement provision for limited fisheries for black cod in the reciprocal areas of both countries.

On the Atlantic coast the modifications included provisions governing a limited Canadian fishery for tuna within the U.S. reciprocal area and regulation of the larger U.S. trawlers in areas off Canada where similar Canadian trawlers are prohibited from operating. Provisions regarding herring will continue relatively unchanged.

Source: U.S. Department of Commerce News, 73-144.

Coho Introduced Into Barren Alaska Waters

By planting tiny coho salmon called "fry" in unused Alaskan lakes and streams, fisheries scientists of the Commerce Department's National Oceanic and Atmospheric Administration plan to increase Pacific salmon returns there. Similar programs have been used by Federal and State fisheries scientists in Oregon and Washington for several years.

On Baranof Island alone, high barrier falls prevent adult salmon from reaching thousands of acres of productive streams and lakes for spawning. Such waterfalls generally do not hinder downstream migration of young salmon, however. Other parts of Alaska have an abundance of similarly obstructed waters, many of which could be used for rearing newly hatched salmon to the migrant or "smolt" stage, thus increasing adult salmon returns. "Smolts" are juvenile salmon about six inches long that are physiologically ready to migrate from fresh water to the sea.

The plan is geared to making use of unused waters by annual plantings of fry, rather than attempting to establish self-perpetuating salmon runs, according to National Marine Fisheries Service Alaska Regional Director Harry L. Rietze. With modern techniques, salmon fry are relatively inexpensive to produce in established hatcheries. The major cost—feeding and rearing the fish to the smolt stage—would be taken care of naturally in the lakes and ponds now barred to salmon production.

In a pilot study at the Little Port Walter Field Station on Baranof Island in Southeastern Alaska, 12,000 coho salmon fry were stocked in a four-acre lake. They grew rapidly, and 6,800 migrated to sea as one- and two-year-old smolts. After spending about 16-18 months in the rich ocean pastures, 724 adults (more than a 10 percent return) came back to the outlet stream. Possibly an equal number of adult migrating coho salmon were caught by sport and commercial fishermen. Studies are continuing, including the experimental planting of an additional 132,000 coho fry last summer.

Encouraged by the results, a large-scale interagency demonstration project of stocking salmon fry in unused waters in southeastern Alaska is now planned by the NMFS, the Alaska Department of Fish and Game and U.S. Forest Service biologists. Once stocking levels for different types of lake, pond, and stream habitats are established, fishery scientists foresee stocking the fry from centralized hatcheries from airplanes or helicopters in the larger lakes and ponds.

Currently the fry come from brood stocks of coho salmon whose eggs are incubated and hatched in gravel "incubator" boxes at Little Port Walter. The fry are then carried by backpack to the isolated areas where they grow to migrating size. As adult spawning salmon attempt to return to inaccessible stream or lake areas, the entire run would be available for sport and commercial fishermen.

Foreign Fishery Developments

U.S., Mexico Examine New Fisheries Rules

The fourth of a series of U.S.-Mexican talks on the implications of a new Mexican fisheries law for certain groups of California fishermen was held in Mexico City in January. The other meetings on the matter took place in 1972 in Washington, July 12-13, in Mexico City, November 14-16, and in San Diego on December 20.

The fisheries law giving rise to these bilateral discussions became effective June 13, 1972. The law seriously concerned a number of southern California fishermen, who had for many years been fishing inside Mexican waters under a "via la pesca" licensing system. The principal reason for their concern was that the article of the Mexican law dealing with foreign fishing could have, in their opinion, made it very difficult for many U.S. vessels to continue to operate in Mexican waters. The provision creating the most difficulty was one requiring vessels operating under Mexican licenses to employ crews comprising at least 50 percent Mexican nationals, which could have caused certain small vessels severe economic hardship and created serious problems for other slightly larger ones which presently operate in Mexican waters.

Other provisions of the new fisheries law could also have created difficulties, such as those relating to cash deposits for licenses and penalties for violations.

Another Mexican law, a decree by the Government in December of 1971, also fundamentally altered the terms under which many U.S. Pacific Coast fishermen for years obtained licenses. In essence, these new regulations terminated the long established schedule outlining periods of license validity for various size classes of vessels and substituted a revised set of vessel size classes and corresponding periods of

validity, thereby making the practical application of the new licensing system most difficult, in fact, almost useless for certain sizes of vessels.

These problems were pointed out to Mexican fishery officials as early as July 1972, and after a series of discussions the following understanding was reached in January 1973: 1) the 50-percent Mexican manning requirement would be applied on an overall fleet basis, with certain exemptions which will, in effect, require no changes in present U.S. practices; and 2) on periods of validity of "via la pesca" permits, vessels could have permits extended on a pro rata basis up to 5 or 10 days, depending on size.

The Mexicans confirmed that: 1) cash deposits under the licensing system can be made on a group basis in San Pedro and San Diego (as has been done in the past); 2) it would exercise discretion in applying the confiscation provision for violations of the fisheries law; and 3) both sides understand that "similar pay and benefits" provision of the law means equal pay for equal work.

Regarding the law's most difficult provision, calling for at least 50 percent Mexicans in crews of U.S. vessels operating under Mexican license, it was agreed that in calculating the percentage of Mexicans aboard U.S. vessels, a global or fleet figure would be used, rather than the requirement being applied to each individual vessel. Vessels with three men or less on board would not be counted, nor would captains and engineers. Further meetings are scheduled to review the practical and administrative difficulties that may arise.

U.S. Purchases Of ROK Fish Products Rise

South Korea exported US\$36,387,000 worth of fishery products to the United States in 1972 (\$29.3 million in 1971) (Table 1). Most of this was tuna (valued at \$31 million) and canned oysters (\$3.5 million). The value of ROK's fishery ex-

Table 1. — Value of South Korea's fishery exports to the United States, 1971-72

Commodity	1971	1972
Fish:		
Fresh	26,893	31,287
Frozen	367	411
Canned	1,309	3,596
Pickled & salted	19	18
Seaweeds:		
Laver	220	137
Agar-agar	16	24
Other	21	43
Other:		
Fish nets	430	796
Other	57	175
Total	29,332	36,387

ports to the U.S. increased by 33 percent over similar exports in 1971, reports the NMFS International Activities Staff.

South Korea's total world fishery exports were valued at \$152,564,000 in 1972 (\$114,981,000 in 1971) with the most valuable commodities being: Tuna (\$68 million), "other" live and fresh fish (\$27 million), frozen seafoods (\$12 million), fresh squid (\$11 million), fish nets (\$10 million) and canned seafoods (\$5 million).

Source: U.S. Embassy, Seoul, February 8, 1973.

Japanese, Irish Enter Joint Fishery Venture

The Japanese Nichiro Fisheries Company and the Irish Government have begun to jointly develop new fishing grounds off Ireland, according to a report received by the National Marine Fisheries Service. After one year of experimental fishing, Nichiro and the Irish Government will form a joint venture company for full-scale commercial operations, including the processing and sales of the fish catches.

During the first year of exploratory fishing, one 500-gross-ton Japanese trawler will be operated out of County Cork, in southern Ireland, with a catch target of 2,000 tons of fish, including squid, cuttlefish, flatfish and herring. Present plan calls for increasing the number of trawlers to five in five years for a total catch of 10,000 tons annually. Some of the fish will

be filleted, frozen or packaged for export to Japan and others will be sold to the Common Market countries.

In this venture, Nichiro is tied up with the Irish Government's Industrial Development Board and the Marine Fisheries Bureau. The Japanese firm plans to invest approximately 1,500 million yen (about US\$5.66 million) in this undertaking within the next five years and will also cooperate in the operation of cold storage and processing plants.

Norway Posts Second Best Fisheries Year

The Norwegian fisheries had its second best year in 1972 with landings of 2,852,000 metric tons, according to Salvatore Di Palma, Regional Fisheries Attache for Europe at the U.S. Embassy, Copenhagen, Denmark. The value of the exports reached a record \$375.9 million with higher prices for cod and saithe products contributing to the increase.

LIMITED ENTRY

Failure to join the European Community (EC or Common Market) will affect only about 12 to 15 percent of the Norwegian exports of fishery products, even without any expected concessions. In June 1972, the government was given authority to limit entry of vessels into the fisheries. Norway agreed to international limits on fishing for herring and salmon. Despite a strong effort to secure wider fishing limits than the present 12 nautical miles, the government decided in 1972 to await the outcome of the United Nations Law of the Sea Conference. Mr. Salvatore's findings are outlined in the NMFS Foreign Fisheries Leaflet No. 73-15, *Marine Fisheries of Norway, 1972*.

LESS FISHERMEN

The number of Norwegians involved in commercial fishing continues to decline, according to Di Palma.

From 61,000 commercial fishermen in 1960, the number fell to 35,000 in 1971. Of these, 25,000 were full-time or main-occupation fishermen and the rest were only part-time fishermen.

Predictions are that the total number will drop to 15,000 by 1980, with the ratio of full-time fishermen increasing. The catch per fisherman has risen over the past years and better gear and improved fishing techniques are cited as the reasons.

Most Norwegian commercial fishermen are said to earn more than most skilled and unskilled land workers in Norway. Yet, there is a declining interest among the young to become fishermen and, as a result, the average age of fishermen has increased. To encourage the type of young men wanted for the fishing industry, training is being improved, earlier retirement (at 62 years of age) has been proposed, and even special tax advantages are being considered.

Japanese Hike Shrimp Purchases

Japan imported 88,120,260 kilograms (193,864,572 pounds) of frozen shrimp, valued at US\$291.9 million, in 1972, according to William B. Folson in NMFS Foreign Fisheries Leaflet No. 73-11. This record figure represents a 12 percent increase in quantity and a 36 percent increase in value over 1971 imports. Table 1 shows the phenomenal growth in Japan's shrimp imports since 1960.

Table 1. — Japan's frozen shrimp imports, 1960-72

Year	Value	Quantity
	US\$1 million	1,000 metric tons
1972	291.9	88.1 ¹
1971	214.0	78.8
1970	137.0	57.1
1969	121.7	48.8
1968	78.0	35.2
1967	79.7	44.4
1966	60.0	36.1
1965	35.9	21.0
1964	31.4	17.0
1963	23.5	11.7
1962	6.2	3.6
1961	6.9	4.1
1960	6.6	--

¹ Quantity expressed in heads-off weight.

This record growth was surprising in view of the reported sluggishness of the Japanese shrimp market during most of 1972. Shrimp purchases made by speculators in late 1971 resulted in very heavy accumulations between January and September 1972. Prices were also reported generally depressed for much of the year, and many Japanese importers appeared concerned that increased imports would further dampen the market; yet imports during most of 1972 were higher than they had been in 1971.

The most significant change in Japan's trade pattern in 1972 was that Indonesia replaced India as Japan's major source of frozen shrimp (Table 2). Although imports from India in-

Table 2. — Japan's 10 leading shrimp suppliers, 1971-72

Country	Quantity		Value	
	1972	1971	1972	1971
	Metric tons		US\$1 million	
Indonesia	13,823	8,224	46.1	21.3
India	12,811	9,703	39.9	23.6
Thailand	7,506	7,080	24.2	17.9
Malaya, West	5,840	5,169	13.5	9.8
Mexico	5,406	6,520	22.3	21.3
Taiwan	4,555	4,464	11.8	9.9
Australia	4,095	3,974	19.2	14.1
Hong Kong	3,539	3,951	15.3	14.1
Mainland China	3,519	5,283	15.4	17.6
Pakistan	2,606	3,557	9.0	8.0

creased by 3,008 metric tons (a 32 percent increase), this was surpassed by a 5,599-ton (68 percent) increase in imports from Indonesia. In the past two years imports from Indonesia, where the Japanese are heavily investing in joint shrimp ventures, have increased tremendously.

Imports from Mexico, Taiwan, Hong Kong, the People's Republic of China, and Pakistan, which are major suppliers, decreased. Imports from South Vietnam showed the greatest increase, almost 12-fold. In 1972, Japan concluded an agreement with Mexico to have shrimp shipped directly to Japan, thereby eliminating United States middlemen. This agreement, which provided for the purchase of about 7,000 metric tons of shrimp, apparently has not proven as successful as anticipated.

ROK, Taiwan To Enter Skipjack Tuna Fishery

After remarkable progress in developing tuna longline fisheries, the Republic of Korea (ROK) and Taiwan find they must shift the emphasis of their tuna fishery policy to pole-and-line fishing, according to reports in the Japanese trade press. Both countries now face the problem, often voiced by the Japanese tuna industry, that the subsurface tuna resources in all oceans are being exploited to the limit of their availability and that continued fleet buildup cannot bring about a corresponding increase in catch.

ROK tuna longline landings in 1972 of 83,784 metric tons are reported to be only a slight increase over the 1971 total despite addition of longliners to the fleet in 1971. A number of vessel owners are said to have gone bankrupt as a result.

Thus the ROK and Taiwan are developing plans to enter the pole-and-line skipjack fishery. ROK fishermen are said to have gained much confidence from their government's recent pole-and-line skipjack survey conducted off the Bonin Islands, which resulted in 45 tons of skipjack and albacore landings. Plans reportedly are in progress by the ROK-U.S. joint venture company in Pusan to build a tuna cannery there which would be supplied by a fleet of skipjack vessels. Taiwan is also planning to build 50-ton-class baitboats for skipjack fishing.

Japanese Tell 1972 Joint Fish Ventures

Japan has 77 joint fishery ventures in 38 countries operating a total of 223 vessels, 149 of which are shrimp trawlers, according to the Japan Fishery Agency. Japanese investments in these ventures total \$29.1 million (\$14.9 million for shrimp and dragnet) while foreign counterpart investments total \$43.1 million.

Of the 77 joint ventures, 27 are independent investments by Japan's five largest fishing companies (Taiyo, Nippon Suisan, Nichiro, Kyokuyo, and Nippon Reizo) and 13 involve these five in partnership with trading firms. Some 25 ventures involve smaller fishing companies investing alone or in partnership with trading firms, nine are independent investments by trading firms alone, and three involve other types of investments.

Japanese Firm Tries Culture of U.S. Eels

The experimental culturing of elvers recently imported from North Carolina is being tried by Mochizuki Kinsaku Shoten, a Japanese firm in Yaizu, south of Tokyo.¹ Though the quantity airfreighted to Japan was small—only five kilograms (11 pounds)—the firm is hopeful of achieving success.

The elvers, *Anguilla rostrata*, are reported to be feeding well, but the question is whether they can survive the summer in Japan. If they remain alive until September the venture will have made a successful start.

Successful cultivation of the U.S. elvers will have a large impact on the eel culture industry of Japan. Eel shortage caused by disease and environmental pollution there is also being supplemented with imports from France and other countries. Mochizuki Shoten is the first business firm in Japan to import young eels from the United States. A small quantity of eel fingerlings was first taken to Japan for cultivation in February 1973 by the director of the Eel Culture Research Laboratory in Shizuoka Prefecture who accompanied the Fisheries Agency's Freshwater Fisheries Regional Research Laboratory official to the United States. A second U.S. shipment was scheduled for July.

¹See "Japan's Eel Fishery" by William B. Folsom, MFR Paper 984, and "Elver Investigations in the Southeast" by Robert Topp and Richard Raulerson, MFR Paper 985, both in the May-June issue of Marine Fisheries Review, Vol. 35 Nos. 5-6.

Quotas, Imports For Fillets, Tuna Given

United States imports of frozen fish fillets, from January to June 2, 1973, amounted to 17,062,700 pounds, the limited quota for that period, while imports of tuna canned in brine amounted to 11,775,666 pounds, according to preliminary data compiled by the Bureau of the Customs, U.S. Department of the Treasury.

Fish fillets that may be imported at 17½ cents per pound in calendar year 1973 are limited to a 34,125,403-pound quota. Imports exceeding that quota will be dutiable at 2.5 cents per pound ad valorem. Tuna canned in brine that may be imported at the duty rate of six percent ad valorem in calendar year 1973 has a quota limit of 109,809,104 pounds.

Growth Seen For Brunei Fisheries

The marine fisheries of Brunei (Figure 1) have developed in a relatively short period from traditional fishing



Figure 1.—Brunei, formerly a British protectorate, is situated in northern Borneo between the Malaysian states of Sabah and Sarawak.

to the use of fast boats and modern gear, according to the National Marine Fisheries Service's International Activities Staff. The annual catch has steadily increased to about 2,200

short tons¹ but further significant increase is believed unlikely unless Brunei's fisheries are reorganized and more seaworthy boats, using advanced fishing techniques, are introduced.

A survey carried out by the Brunei Fisheries Department several years ago revealed the existence of fairly rich fish stocks over Brunei's continental shelf. The Department has worked out detailed plans for the development of these resources and a considerable increase in catch can be expected, should these plans be implemented. Orderly fisheries development is possible only with the aid of effective fisheries legislation, such as that passed by the Legislative Council in December 1972.

Brunei's domestic markets were generally well supplied with fish and shrimp during 1972 and the total available in the main markets increased from 1,841 short tons in 1971 to 3,231 tons in 1972. The increase included 450 tons of shrimp and 940 tons of fish. The estimated total catch by Brunei's fishermen alone increased by 569 tons to 2,200 tons.

The market value of all fish and shellfish sold in the three main markets of the country increased by B\$2,519,958² to a total of B\$5,902,989. The consumer price for various grades of fish and shrimp was remarkably stable between 1971 and 1972, varying no more than B\$0.02 per kati³ (less than US\$0.003 per pound).

Brunei's Fisheries Department discovered a ready market for freshwater fish when it harvested its ponds and could have sold many times more fish than were available. Also, imported freshwater fish appeared in one of the country's main markets and sold for B\$3.00 per kati, considerably more than the average B\$1.76 per kati of first grade marine fish. Several businessmen have shown interest in investing in pond culture as a result of the apparent profitability.

¹One short ton is 2,000 lb.

²One Brunei dollar was worth about US\$0.35 during 1972.

³One kati equals 0.6048 kilograms, or about one and one-third pounds.

Marine Fish Farming Seen Within Decade

Man's dream of being able to farm marine fish as farmers have domesticated and bred cattle and other animals over the centuries is a significant step nearer realization as the result of scientific and technological research and experiments during the past ten years or more, reports the United Nations' Food and Agriculture Organization (FAO).

In this connection an interesting account of the work done in the United Kingdom in "farming" plaice, Dover sole, turbot, lemon sole, cod, saithe and gray mullet is given in a paper to be presented at a forthcoming Technical Conference on Fishery Products. The Conference, which is being convened by the FAO, will be held in Tokyo from 4 to 11 December, 1973, at the invitation of the Government of Japan.

The paper, on Studies on the Acceptability of Farmed Fish, has been prepared by members of the staff of the White Fish Authority, London, the Torry Research Station, Aberdeen, and the Marine Laboratory of the Ministry of Agriculture, Fisheries and Food, United Kingdom.

The experimental farms where most of the work has been done by fish cultivation units are in the Scottish sea lochs at Ardtoe and elsewhere and in the warm outflow from the Hunterston

Power Station. In these places Dover sole and plaice have been hatched and reared from egg to marketable size while turbot, lemon sole, cod, saithe and gray mullet have been reared from their juvenile stage after capture at sea to marketable size. Although turbot and lemon sole have also been spawned and hatched they have not yet been reared beyond the early larval stages to metamorphosis in the farms though this has been done in the laboratory.

The teams working on this fish farm program include veterinarians and pathologists looking into problems of health and disease control, nutritionists formulating a variety of wet fish feeds and, lately, moist and dry pelleted feeds, engineers concerned with the design and development of fish holding facilities ashore and at sea, and food science/market development experts who are working with the Torry Research Station staff in assessing the qualities of fish and determining their market and consumer acceptability.

The main effort in all this work is to establish a commercially viable system of fish farming. This includes not only the ability to hatch and rear fish but to produce fish of acceptable appearance, texture and flavor. A series of flavor tests have shown that farm-reared plaice and sole compare

reasonably well with the wild fish.

However, tests relating to shape, and skin and flesh colors have indicated some possible consumer resistance. For example, wild plaice have color on their top side and are white on their underside. Farm-reared plaice may vary from no pigmentation on either side to the top-side type of pigmentation on both sides. Such differences, including the darker tinge of the flesh of farm fish, may call for a special marketing effort. But, as the paper concludes "what will determine to a large extent whether farmed fish will be acceptable to the consumer are the method of presentation and the price, both of which could overcome any consumer resistance due to appearance or flavor."

The paper ends on the optimistic note that within the next ten years fish farms "will be producing perfectly acceptable fish on a viable commercial basis" but adds that "the farmed fish of the future may not resemble closely any of the species which are at present on the market any more than domesticated cattle resemble wild cattle or deer."

The paper is one of about 70 to be presented at the Conference. These papers and the discussion will result in a survey for the first time of the world situation of fishery products industry, identifying areas of critical importance at present and likely trends and developments in future.

Publications

Russian Translations

The following three Russian publications were recently translated and printed in Israel for the National Marine Fisheries Service (NMFS), NOAA, under the Special Foreign Currency Science Information Program (financed with Public Law 480 funds). They are sold at the indicated prices by the National Technical Information Service (NTIS), Springfield, Va. 22151. When ordering, cite the translations'

accession numbers.

1. "Chemistry and Technology of Pacific Fish," by I. V. Kizevetter, Pacific Research Institute of Marine Fisheries and Oceanography (TINRO), Vladivostok, 1971, 304 pp.

The volume presents a precise chemical and technological characterization of traditional Far Eastern fishes as well as of many commercial species handled by Soviet fisheries in the Pacific Ocean. The species studied encompass the western and eastern areas of the North Pacific including the tropical latitudes of the eastern zone, the Korean Straits, the South China Sea, the Gulf of Tonkin, the eastern part of the

Indian Ocean, the coasts of Western Australia and New Zealand, and the Australian Bight.

Accession number: TT 72-50019.
\$6.00.

2. "Life Activity of Pelagic Communities in the Ocean Tropics Based on Data of the 44th Cruise of R/V *Vityaz*," edited by M. E. Vinogradov, Academy of Sciences of the U.S.S.R., P. P. Shirshov Institute of Oceanology, Moscow, 1971, 298 pp.

A collection of 24 papers dealing with the biological productivity of ocean tropics, specifically of an area of the Pacific Ocean south of the equator and west of 180°E. Topics