

Kneaded Fish Product Peak Seen In Japan

The "Kamaboko," a heat-pasteurized fishcake relished by the Japanese, has shown a steady increase in production and improvement in quality in recent years. The production of "Kamaboko" and other kneaded fish products in 1972 totaled 1,156,205 metric tons, compared with the 1967 output of 911,887 tons. However, the rate of increase in production, after the 1-million-ton mark was reached in 1969, has slowed down; and in the opinion of the Executive Director of the National Federation of Kamaboko Processors Associations, the demand may have reached a peak in Japan.

About 70 percent of the steamed and broiled "Kamaboko" is made from frozen surimi (minced fish meat).

Frozen surimi production, 1965, 1971-73, and 1974 target.

Year	Land-Based Plant	Factory-ship	Total
1965	30,505	6,986	37,491
1971	137,000	186,000	323,000
1972	161,210	193,548	354,758
1973 (Estimate)	162,069	224,774	386,843
1974 (Target)	150,000	210,000	360,000

Since the development of surimi from Alaska pollock in 1963 as a suitable ingredient for manufacturing "Kamaboko," its demand began to sharply increase each year. The combined surimi production in Japan, on land and at sea, which recorded 37,491 metric tons in 1965, rose to 354,758 tons in 1972 and to 387,000 tons in 1973. However, because of fishing restrictions on Alaska pollock in the Eastern Bering Sea and other factors, the output in 1974 is estimated to decline to about 360,000 tons. Normally, the yield of surimi from raw fish is said to be 25 to 26 percent, but the surimi factoryship operators in the Bering Sea are hoping to increase the yield about 5 percent to offset restrictions on the catch.

Production of kneaded fish products, 1967-72.

Year	Kamaboko			Fish & Ham Sausage	Fish Hamburger ¹	Others	Total
	Steamed	Broiled	Deep-Fried				
(Metric Tons)							
1967	294,782	171,745	267,549	164,431		13,380	911,887
1968	336,365	194,035	289,501	161,753		17,724	999,378
1969	368,016	204,290	319,191	168,789		16,904	1,077,190
1970	356,398	221,484	313,552	169,539	13,977	6,381	1,081,331
1971	379,816	238,539	322,161	165,368	14,839	6,382	1,127,105
1972	399,783	244,615	329,623	162,398	16,403	3,383	1,156,205

¹Data not available for years prior to 1970.

Source: *Suisan Shuho*, February 15, 1974, and others.

USSR Tests Mini-sub for Fishery Research

Soviet fishery scientists are now testing *TINRO-2*, a miniature underwater vehicle to be used in studying the biological resources of the Continental Shelf, reports the NMFS International Activities Staff.

TINRO-2 was designed for deep dives and autonomous research trips independently of its mothership. It has two hulls; the inner one, made of steel, will be encased by a light-weight outer fiberglass hull. Water can be pumped in between the two hulls to act as ballast. The vehicle can move in any direction, or hover. It is equipped with television and automatic still and movie cameras.

The crew of two persons includes a pilot (who is also the commander of the vehicle) and a research scientist. The gaseous mixture inside *TINRO-2* and its air pressure are those of sea level. Food and drinking water storage space is provided for prolonged underwater research trips.

Now being tested in the Black Sea, *TINRO-2* will later undergo final tests in the Atlantic or Indian oceans. It was designed by "Giprorybflot," in the Soviet Federal Design Institute of the Fishing Fleet, and will be used primarily by the USSR Ministry of Fisheries. A number of Soviet organizations participated in designing the vehicle, but the basic responsibility

for the design rests with M. Girs and V. Deriabin, both employed with the "Giprorybflot" in Leningrad. (Source: *Vodnyi Transport*, February 28, 1974.)

According to the NMFS International Activities Staff, *TINRO-2* was taken to the site of its first trials (the Black Sea, near the Crimean city of Feodosiia) in December 1973 by the scientific research vessel *Ikhtiandr*. A group of engineers, fisheries biologists, and underwater research scientists was brought together for the tests. The Director of VNIRO's¹ Laboratory for Underwater Research, Dr. Marlen Pavlovich Aronov, heads the group.

Dr. Aronov, whose specialty is fish behavior and animal physiology, has been in underwater fisheries research for more than a decade. In the late 1950's and early 1960's, while working at the Sevastopol' Biological Station, he was using underwater research techniques to study conditioned reflex reactions of certain Black Sea fishes. His side interests have led him into underwater research of Crimean Peninsula caves with a group of Moscow speleologists in the summer of 1962. During 1966-1967, Dr. Aronov was active in organizing Soviet participa-

¹VNIRO is the Soviet Federal Scientific Research Institute for Fisheries and Oceanography in Moscow.

tion in a Soviet-FAO Seminar on Gear Technology in Moscow, and an FAO Conference on Fish Behavior in Relation to Fishing Techniques, held in Bergen, Norway.

The *TINRO* class of underwater research vehicles has been so named after the Soviet Pacific Scientific Research Institute for Fisheries and Oceanography (located in Vladivostok), whose Russian initials spell "TINRO."²

The *TINRO-1* and *TINRO-2* projects were first mentioned in the Soviet media in 1966. In January of that year, *World Fishing* (U.K.) reported from Soviet sources that the USSR would "soon" have two new underwater laboratories. By 1968, TINRO biologists were hoping that one of the two underwater vehicles would be operational by 1970, or 1971 at the latest. The construction of *TINRO-2* was delayed by technical and bureaucratic problems for three to four years, and there is no evidence that *TINRO-1* will be built at all.

The Soviets have constructed, in addition to *TINRO-2*, several other small submersibles for fisheries research. Some of these, like *Atlant-1*, *Atlant-2*, *Sever-1*, and *Sever-2*, have been widely publicized in both the Soviet and Western media. The smaller underwater vehicles are deemed by Soviet fisheries scientists as much more convenient research vehicles than was the huge *Severianka*, a naval submarine converted into a fisheries research submarine. The *Severianka* is not only too large and expensive, it is also too cumbersome for effective underwater fisheries research.

The Norwegian Fishing Industry

The basis for the Norwegian fishing industry is its very long coastline and the rich fishing grounds with temperate waters thanks to the Gulf Stream, according to a report by Knut Vartdal,

Norway's Director General of Fisheries.

The fishing on the coastal grounds is to a large degree based on rich shoals of fish migrating to the grounds for spawning or feeding. This, says Vartdal, has determined the development of fishing craft and fishing methods. In addition, fishing activities have through decades been carried out on the open sea in Skagerrack and the North Sea, in the Norwegian Sea and the Barents Sea, off Greenland, Newfoundland and in other parts of the Atlantic, and the last few years also off West Africa.

The landings by Norwegian fishermen in the last 5-year period varied between 2.2 and 2.9 million tons. Approximately $\frac{2}{3}$ of the catch were used for production of meal and oil. This is mainly due to the big catches of capelin.

During the 4-year period 1969-1972 the average catch (in tons) for the 6 most important species were:

Capelin	1,226,870
Mackerel	337,800
North Sea herring	175,930
Arctic cod	156,576
Norway pout	132,879
Saithe	111,765

The average firsthand value (in 1,000 kroner) for the 6 most important species were however different:

Arctic cod	259,800
Capelin	252,310
Mackerel	135,799
Saithe	89,050
North Sea herring	67,961
Cod (from distant waters)	65,656

THE RESOURCES

The main problem of Norway's fishing industry is the overfishing of the most important species in the North Sea, the Northeastern part of the Atlantic and the Barents Sea, says Vartdal. The efficiency of gear and equipment has led to a very serious reduction of many of the main stocks of fish, including some of the following species.

Arctic Cod

This stock is in a period of increasing recruitment of young cod. However, the stock of mature cod is decreasing because of poor year classes from 1965 to 1968 and because of heavy fishing the last years. Therefore, a regulation of the international exploitation of the Arctic cod is of great importance. Norway, the United Kingdom, and the USSR have, after many years of negotiations, agreed on a total quota for 1974 of 550,000 tons, which should lead to a rather considerable reduction of the fishing effort.

However, this quota regulation is far from a satisfactory solution, according to Vartdal. Too much of the catch consists of young cod, which is a result of too small mesh sizes, and also evasion of the mesh size provisions.

Capelin

Besides cod, capelin is now the most important kind of fish for the Norwegian fishing industry and the main basis for the Norwegian purse seiners.

Up to now, Norway has been alone in exploiting the capelin. To prevent overfishing, Norway has through several years imposed a number of national regulations such as closing of spawning grounds, quotas on total catch, minimum size of fish, and closed seasons. So far, the regulation measures have prevented depletion of the stock.

As soon as other nations start fishing for capelin, the regulation and management of the capelin fishing will become an international problem.

Atlanto-Scandian Herring

Up to the end of the 1950's this herring stock was the basis for very rich fisheries on the west coast of Norway. This stock is now very small. Since 1971 there has been an agreement between Iceland, USSR, and Norway limiting the catch. If this

²TINRO is one of VNIRO's five regional research institutes; it specializes in fisheries research in the Pacific and Indian oceans.

policy is continued, there is a chance that this stock can be rebuilt. This will, however, no doubt take years.

North Sea Herring

During several years this herring stock has been fished intensively. This has resulted in catches being halved. More serious is the fact that most of the catches consist of young herring. Up to now, it has not been possible to come to an agreement between the interested countries.

In the meantime, Norway has, alone, introduced a voluntary national regulation on this fishery, according to Vartdal. Norwegian fishermen are now proposing such national regulations, and officials hope that international regulation measures will be introduced without further delay.

Mackerel

Most of the mackerel landings from the North Sea are caught by Norwegian fishermen. Norway has imposed very strict regulations on this fishery. This has enabled them to rebuild the stock after a period of considerable over-fishing.

The Norwegian fishing industry is now hoping that the Law of the Sea Conference will give the coastal states rights to establish economic zones of 200 nautical miles in order to get better management of the fish resources. The cooperation between the European countries in order to prevent over-fishing has taken a long time and too often have the results come too late, Vartdal says. With economic zones of 200 nautical miles the coastal states will be in a position to introduce regulatory measures which keep the fish production at the maximum sustainable yield, he adds.

FISHERMEN AND FISHING FLEET

Norway has approximately 35,000 fishermen out of which 10,000 fish part-time. This is a great reduction since World War II. In spite of this reduction the landed weight has

Japan Eyes Gulf Coast Croakers for "Kamaboko"

Japanese "Kamaboko" (fishcake) processors, who are looking for new sources of raw fish supply for their products, are investigating the U.S. Gulf Coast croaker. They plan to obtain samples for laboratory studies to determine their suitability for "Kamaboko" production. The U.S. croaker came to their attention in the summer of 1973 when two scientists from a U.S. fishery laboratory went to Japan and discussed efficient utilization of the Atlantic croaker with the Fisheries Agency and the Federation of Kamaboko Processors As-

sociations. In December 1973, discussions were again held when the U.S. delegates to the FAO conference on fishery products made available samples for laboratory studies. Opinion among the Japanese processors is that the Gulf croaker are not as ideal as the croaker taken in the East China Sea. However, they believe the U.S. species have good elastic characteristics needed for "Kamaboko" manufacture and estimate that the Gulf Coast could provide around 50,000 tons of supply annually.

Source: "Minato Shimbun, March 20, 1974."

increased considerably in the same time. This means that the productivity has increased and combined with higher prices; this has led to a great increase in the fishermen's income.

Norwegian fishermen are to a great extent owners of their boats. This has for a long time been the declared aim of the government and the fishermen's organizations. The fleet comprises more than 7,000 decked wooden vessels and 600 decked steel vessels totalling 300,000 gross reg. tons. The number of vessels under 100 feet has gone down, on the other hand the number of vessels over 100 feet has increased. There are purse seiners, long-liners, and fresh fish or factory trawlers.

FIRSTHAND SALES AND EXPORTS

In the late 1920's the prices were very low for most of the fish, especially for herring. The herring fishermen therefore formed two fishermen sales cooperatives. This was the start of the organized firsthand sale of all fish landed in Norway. Before World War II Parliament had passed the so-called Raw Fish Act. Owing to this law Norway now has sales organizations in Norway, and no fisherman is allowed to sell outside any of these cooperatives.

Between 80 and 90 percent of the Norwegian catch is exported. In 1973 the export value passed 3 billion kroner, making up nearly 15 percent of the total Norwegian exports. The general world food shortage has given high prices for the Norwegian fish products resulting in high earnings for both the fishermen and exporters. Provided that the future will bring better management of the fish stocks in the North Atlantic, the Norwegian fishing industry is fairly optimistic about the future.

Peru Meets March Anchovy Quota

Peruvian fishermen reached their full quota for the first period (March 5-March 27) of anchovy fishing, with a catch of 500,000 tons, according to the U.S. Embassy, Lima, Peru. While the harvest was generally satisfying, the degree of recovery of the industry remains uncertain. Distribution along the central coast was good, but the average daily catch declined from about 40,000 tons in the first two weeks to 25,000 tons during the last week. (Each "week" lasted only 4 days, Tuesday-Friday.) A seasonal decline appeared in the South, but the northern (Chimbote) region

yielded much less than expected, indicating that this area is still recovering.

The anchovy size was reported good. Fish meal recovery was reported at 21.9 percent, producing thus far, an estimated 109,000 tons. Oil recovery is believed to be over 3 percent or 15,000 tons. Peruvian authorities (EPCHAP) were authorized to renew export of both fish meal and oil beginning 14 March.

Japanese Hatch Eels, Sea Urchins

A Hokkaido University professor is reported to have succeeded in hatching eels in a laboratory, notes the NMFS Statistics and Market News Division. A professor of the University's Fisheries Department extracted a hormone from the pituitary gland of a salmon and gave a weekly 35-milligram injection to grown female eels. After 11 injections, one of the eels laid eggs and after 40-50 hours the researcher applied eel milt to the eggs. Out of this, 100 fry 3.5 mm in length were hatched, but only half survived. The seawater temperature was maintained at 18°C before the spawning and was kept from 23 to 25°C afterwards. The 2-month-old eel fry were fed egg yolk and lobster eggs.

The Fukushima Marine Experiment Station, Kyushu Island, Japan, is also reported to have succeeded in its year-long attempt to breed sea urchins. Starting with some 300,000 eggs of the common green urchins in a seawater tank in November 1972, some 2,500 sea urchins over an inch across were hatched. Scientists induced the female urchins to ovulate with injections of potassium chloride.

Cuban Fishing Fleet Expands

The Astilleros Construcciones shipyard of Vigo, Spain, has started the construction of a series of 21 factory trawlers for the Cuban fishing fleet. The order was initially placed for only

10 trawlers of the *Tacsá-95* class, 3 of which have already been delivered. Since *Mar Del Plata*, one of the delivered trawlers, was destroyed in a fire, the Havana authorities decided to replace it and order 10 more vessels in addition to the ones already ordered, thus raising the total to 21 trawlers. Sixteen of the vessels will be built in the Astilleros shipyard and 5 in Hijos and Barreras shipyards. Delivery will start in 1975 and should be completed by 1977. The *Tacsá-95* trawlers were conceived by the firm Tecnacó, a subsidiary of Astilleros.

Fishery Notes

Canadian Pair Seining: Off-season Source of Income for New England Lobstermen?

Two Point Judith, R.I., lobstermen are trying a fishing method that may provide them with income during the off-season when their boats are not normally in use. If the Canadian pair seining technique proves successful, it could provide income for New England lobstermen with 35- to 55-foot vessels from January to June when lobster fishing is poor. Canadian lobstermen have used the seining technique successfully for several years on both coasts.

Bruce E. Kopf, skipper of the 55-foot steel vessel, *Spartan*, and Charles W. Carpenter, skipper of the 55-foot steel *Atlantic Queen* announced the trials in March at the annual Fishermen's Forum at Galilee, R.I. They said they had modified their vessels and had some success with Canadian pair seining on two days of trials.

Fishing on the second day with the new gear, the Rhode Island skippers caught 2,500 pounds of marketable fish, enough for a good economic return. But it would take at least another month of trials before the feasibility of the method could be fully tested for the Rhode Island coastal waters, according to Robert E. Taber, University of Rhode Island commercial fisheries specialist.

Characteristics of the trawlers are: 106.70 meters long (95 meters long between perpendiculars), 14.50 meters wide, powered by 4,000 hp Deutz engines (built under license by Barreras in Spain), planned speed 14 knots, and storage capacity 2,000 tons of frozen fish and 240 tons of fish meal. The vessels are equipped with Raader fish-processing machinery and with a Schlotterho fish meal plant utilizing leftovers and trashfish. They can fish with pelagic or bottom trawls.

Source: *France Pêche*, No. 186, December 1973-January 1974, pp. 145.

Mr. Taber, who is assisting with the project, said that sustained catches of 2,000 to 4,000 pounds per day are needed if the pair seining method is to be economical. Canadian pair seining is performed by two vessels pulling cable and a bottom net between them. The vessels drag thousands of feet of cable that is first strung out in a crescent shape along the ocean bottom and then pulled into a "V" shape to herd fish into the path of the net.

For two lobster boats to use the method, they must be modified at a cost of about \$6,000, which includes all gear and nets, Mr. Taber said. The vessels may still be used for lobster fishing, he said. Nets and advice on their use have been provided for the trials by the Marine Advisory Service, part of the URI Sea Grant program, Mr. Taber said. The advisory service is also employing the services of Capt. George Thomson, an expert on Canadian pair seining from Lossiemouth, Scotland.

LOWER CATCH SEEN FOR CHESAPEAKE BAY CRABS

Chesapeake Bay landings of blue crabs are expected to remain near 50 million pounds a year for the next