



The 66-foot seine netter, M/V 'Skanderborg', operates in North Sea. Vessel is owned by Boston Deep Sea Fisheries of Hull, England.

OECD MEMBERS REPORT 1970 WAS GOOD YEAR

The members of the Organization for Economic Cooperation and Development (OECD) have reported that their catches of fish for human food remained steady in 1970 and that the year was "highly satisfactory from the economic viewpoint." This information is contained in the fourth review produced by the Committee for Fisheries of OECD.

- Overall, the volume of fish landed for human food remained steady--but it was more expensive to catch them. This was so despite the continued rise in catching efficiency. Excepting isolated cases, the upward trend in market returns noted in 1969 continued significantly through 1970.

- The unsettled economies of some countries affected adversely the conduct of fisheries at governmental and industrial levels. But the adverse effect was limited to these countries--"and did not prevent 1970 from being generally described as highly satisfactory from the economic viewpoint."

- There had been fears of sharp drops in the total yields of certain major fishing areas, but these did not occur. However, the North Atlantic continues to cause concern. More attention was paid to the nutritional purity of fish as food and to its environment. A few reports adversely affected demand, but these occurred too late in 1970 to be noticeable.

INTERNATIONAL COOPERATION

- There was growing awareness of danger to fish stocks from pollution--oil, unwanted minerals, waste matter (radioactive or otherwise poisonous), or other origins. Man's use or misuse of the ocean's wealth was the theme of several international forums.

- Conservation regulations continued to emerge from the North East Atlantic Fisheries Commission (NEAFC), International Commission for North West Atlantic Fisheries (ICNAF), and the North Pacific bodies for salmon and halibut. These included mesh-size control (NEAFC), closed seasons

(ICNAF), quota and time limitations in Pacific, and restrictions on fishing specific stocks, such as the Atlanto-Scandian herring. International policing on the high seas to support the North Atlantic measures was in force.

- Significant to the signers and nations trading with them was the agreement towards the end of 1970 by the six members of the European Economic Community (EEC) on a common fisheries policy scheduled to go into effect early in 1971.

- In 1969, the European Free Trade Association (EFTA) agreed on minimum prices for frozen fillets imported into the United Kingdom. The prices became effective on January 1, 1970; increases for 1971 were agreed on in October 1970. Canadian and Nordic producers of frozen fillets continued to work together in facing marketing problems.

GOVERNMENT INTERVENTION

In 1970, there was no sharp drop in government involvement, but the cost to the taxpayer probably was less. Because of improved returns, operational subsidies were less. Aid to shipbuilding was down somewhat. Price-support schemes were used less often.

But government machinery remained ready for emergencies.

Non-financial aid is increasing--from improvement of fishing harbors to the design of retail fish shops to technological developments in fish finding, catch handling, unloading, product research, etc.

Such services are becoming more expensive and more sophisticated. Industry's chances "of ever being able to meet the bill become more remote. The best that can be expected is that realistic contributions be made by those receiving the direct benefit."

The members of OECD are: Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Greece, Iceland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

CATCHING POWER

The history of fishing industry reveals that two successive "reasonably good" years stimulated new building. But the current fleet renewal is comparatively slow, especially for larger vessels. Only in one or two countries building for others--France--is there "remarkable expansion" in launchings.

The inactivity is attributable partly to high cost of building and equipping deep-sea fishing craft. Construction costs rose in the Netherlands, and these may be fairly typical. Using 1960 as base year, indices from 1967 were:

1967	-	143
1968	-	152
1969	-	164
1970	-	178

The cost of building a fishing vessel probably doubled in about 12 years, while fish prices at the landing stage advanced slowly. That explains reluctance to order larger-type fishing craft.

For smaller vessels, 50 to 100 G.R.T., several countries reported satisfactory intakes of new vessels. The numbers of inshore boats in the lowest category fell again in 1970.

In 1970, the deep-sea fleets of OECD members decreased numerically and in overall gross tonnage; the other categories became more powerful.

PEOPLE

Again, the number of people making their living by fishing fell. There was more action by governments to prevent further reduction. The governments set up subsidized fishing schools or courses of instruction with subsistence allowances to students.

The OECD report states that "it has not been uncommon" for fishing countries to record a 25% drop in full-time fishermen over a 10-year period. "There is no need to stress the consequences of a further fall of similar magnitude before the end of this decade."

Compared with labor disputes in other industries, there were few in fishing. But those that did develop among crews and shoreworkers caused much local disruption that lasted months.

CATCH

The slight drop in overall catch recorded in 1969 was more than recovered in 1970. The reason was the higher landings of fish for reduction to meal and oil. The volume of fish for direct human use remained almost the same. By species and country, however, there were some important changes.

For those countries relying to a great extent on the waters around the British Isles (ICES Regions IV, VI and VII) for their food fish (Belgium, Netherlands, Sweden, etc.), nearly all landed less in 1970 than in 1969. This reflected the deterioration in yields of certain groundfish: sole and North Sea herring. By contrast, herring stocks in the western part of these waters improved. This allowed higher returns for Ireland and the United Kingdom.

The coastal areas of Norway and Iceland provided good yields, particularly of cod, for their fleets. Vessels of other nations operating near Iceland also enjoyed good fishing; in some cases, catches were over 25% higher than in 1969.

But other northern sea areas, including the offshore Norwegian grounds, were not quite so productive as in preceding years. This is not noticeable in combined landings because there was more transfer of effort from the North West Atlantic and this kept up the landed weight.

Yields in the North West Atlantic were no better in 1970 than in 1969. For some species, there were sharp drops--apart from losses resulting from temporary closure of Georges Bank.

For the whole North Atlantic, the cod catch was about the same in 1970 as in 1969. Preliminary figures indicate a drop not exceeding 4%. Main reductions occurred in the catches of Canada, Germany, Portugal, Spain, and the United Kingdom. These averaged about 10% in each case. The deficit could not be made up by the better landings in Iceland and Norway, the latter's at record level.

There was a general scarcity of certain qualities of herring for human use. This created good demand and encouraged more intensified fishing and produced higher landings in Ireland, Netherlands, Norway, and the

United Kingdom. However, scarcity in the North Sea continues; so does the poor state of the Atlanto-Scandian stock.

The 1969 level of raw material for reduction was maintained in 1970. Shortfalls of 44,000 tons in Canada and 29,000 tons in Denmark were more than made good by Iceland (up 18,500 tons), Norway (up 418,000 tons), and Sweden (up 60,000 tons).

Again there were striking changes in species composition. For the main OECD producers, these were important changes:

	1967	1968	1969	1970
 ('000 Tons)			
Denmark:				
Gadidae (e.g. haddock)	72	119	465	261
Norway Pout	183	428	68	158
Herring	273	369	273	228
Sandeel	208	201	114	191
TOTAL	787	1,167	997	1,066
Iceland:				
Herring	376	56	3	1
Capelin	97	77	169	190
TOTAL (incl. demersal)	476	137	178	199
Norway:				
Capelin	403	522	679	1,301
Norway Pout	15	71	80	116
Herring	1,097	612	140	217
Mackerel	841	745	674	248
TOTAL	2,410	1,983	1,601	1,934

In 1965 and 1966, Iceland used about 670,000 tons of herring, and Norway about 1,000,000 tons each year. Canada's raw material now is predominantly Atlantic herring; production rose from 13,000 tons of meal in 1965 to 92,200 tons in 1969. In the U.S., more than half the meal production long has come from menhaden in varying amounts.

The Nordic countries combined have been catching around 3,000,000 tons a year for reduction; capelin took precedence over herring and mackerel in 1969 and 1970. Catch restrictions have been imposed from time to time for industrial or conservation reasons. In 1970, Norway introduced a catch quota on mackerel. This led to fishing stoppages in the summer and autumn. Denmark's 1970 production was affected by strikes.

SHELLFISH

Shellfish (crustaceans and molluscs) have growing value to almost every country. Generalizations on the developments in catching or harvesting them are difficult.

Canada's lobster catch, although regulated, was more valuable than any species, including the much-improved salmon returns.

The U.S. shrimp catch of about 112,000 tons (U.S. 1970 consumption was around 200,000 tons) was a record. It was worth about a quarter of the total and over twice as much as any other species. Crabs, oysters, lobsters, clams, and scallops were all among the 10 most valuable U.S. species.

France's landings of shellfish (excluding highly prized oyster production) was 20% of total value of all landings; in the United Kingdom, it was about 10%.

Because of wide differences in character, each fishery has to be treated separately. In 1970, higher landings on the Maine coast and Alaska were mainly responsible for record U.S. shrimp landings. This allowed exports of fresh and frozen shrimps, mainly to Europe, to be more than tripled from 1967 to 15,000 tons in 1969. The Alaskan king crab fishery again was low, but the weight shortage was partly made good by other, less-appreciated, types, Dungeness and Snow; so, altogether, about 60,000 tons of crabs were landed.

The king crab catch rose from 65,000-ton level in 1957/59 to 73,000 tons in 1966. It fell to 22,600 tons in 1970. Besides closed seasons, Alaska imposes a catch quota. Japanese factory ships fishing king and snow crabs are limited by quotas set by Japan and U.S. An unusual development in 1970 was price drop in the U.S. and in Japan despite further drop in king crab catch.

In a manner similar to the Nordic countries' switch to other species to offset the dwindling herring landings, Alaska gave more attention after 1966 to dungeness and snow crabs; landings rose significantly from a

combined 13,100 tons in 1965 to 32,700 tons in 1970. In 1965-1970, too, Alaska's shrimp production rose from 5,200 tons to 23,600 tons.

The Nordic and Alaskan examples illustrate that much of catching power for a specific purpose can be transferred. Seeking alternatives, European herring vessels have gone to the North West Atlantic, and the Norwegian flotilla to the Central Atlantic, both for reduction.

RETURNS

The general price recovery in 1969 was welcomed after two years of depressed demand. In 1970, the upward trend continued. Only rarely were individual countries unable to report better gross returns. Particularly notable improvements occurred in the Nordic countries (excluding Finland), the United Kingdom, and the U.S.

The improvement resulted from the maintenance of food-fish landings at 1969 level, higher landings of industrial fish, and better overall average prices.

Among the foodfish, a few species did not conform to market requirements and had a dampening effect: the occasionally heavy landings of North Sea small haddocks. However, where this happened, the leeway was regained by higher prices for other kinds. One was cod, a staple of many fisheries of Atlantic-bordering OECD members. Cod prices increased as high as 30% in the United Kingdom. Steadily rising prices for blocks of cod fillets in the U.S. produced better returns to cod fishermen of Canada, Iceland, Norway and, to lesser extent, Denmark and Greenland.

MARKETING

In 1970, as in 1969, there was more international trade in fishery products and value rose 15%. Reporting rises in value of a third or more in their exports were the Faroes, Finland, Ireland, Iceland, Spain, and the United Kingdom.

Imports by Belgium, Denmark, France, Finland, Germany, and Sweden rose by about 20% in value. Only in Portugal was the value of exports or imports less than in 1969.

In the U.S., major importing country, the value of fish imports set record of \$962 million. This was nearly 14% above 1969 despite drop in fish meal imports of about 100,000 tons, or one third.

Usually, the higher values resulted from rising prices. The price level has caused some apprehension about its possible effect on demand. But the higher prices did not apply to all produce. Canned fish was on 1969 level, partly because of species composition.

Certain factors were influential in producing the higher prevailing prices. On supply side, there were occasional shortfalls in domestic production of raw material for some processing industries, or particular outlets, in countries that are both major consumers and producers. In Germany, for example, there was shortage of home-produced herring for makers of semipreserves, and not enough wet fish; lower cod landings by British trawlers; reduced sole catch by Dutch fleet. Although such reductions are made good by imports, the price of home-caught produce is likely to predominate. Also, price is likely to be pushed higher before external suppliers are used. The latter benefit from seller's market.

DEMAND

In 1970, sales promotion was intensified. This should stimulate both the domestic fisheries and imports of sponsoring countries because none of them is self-sufficient in fishing.

In the U.S., there are upward trends in the quantity and price of imported frozen blocks of fish fillets. Demand for cod fillets is "very strong" for two reasons: to meet the growing offtake for raw material for fish sticks and steaks; and to serve the spreading chains of fish-and-chip shops. So more pressure has been exerted on a supply that has its limitations. It could be a primary reason for the rising price curve in North Atlantic countries.

One event in 1970 is the type that could hurt the industry. In the U.S., quantities of canned tuna were withdrawn from sale because of excessive mercury content. Other countries followed. The mass media covered the subject. The timing was such that no detrimental effect on sales of tuna or other fish was noticeable before the end of 1970.

FORM IN WHICH CATCH SOLD

At national level, the amount sold merely chilled by ice continues to fall off slowly. But it still accounts, by far, for the highest proportion of the catch. Freezing is used increasingly. Curing and, to a lesser extent, canning are declining.

In international trade, in value, all forms for human consumption improved but particularly fresh and frozen (together) and shellfish products.

(a) Fresh

The trade in fresh fish expanded to meet shortages. Germany received direct landings from Icelandic vessels, the United Kingdom, through Denmark, and from East Europe. The Netherlands' search for sole led to consignments being sent overland from Britain's west coast.

This trade probably is more vulnerable than less perishable commodities to hindrances to commerce between countries. In 1970, there was a further lessening in the official trade restrictions, but industrially imposed obstacles remained strong.

(b) Frozen

The proportion of products in frozen form traded internationally grows. For principal producers, frozen fish was a much more valuable export than in 1969. Denmark and the Faroes together recorded an increase of about 30%. Iceland's rose 45% and Norway's 16%.

Imports of frozen fish into the United Kingdom rose about 25%. Frozen fillets from her EFTA partners were subject to minimum prices. In the U.S., imports of frozen fish blocks, mainly for fish sticks and portions, rose only about 2%; only Iceland among the principal suppliers improved (by more than a third) on 1969 figure. In value, the rise was much more substantial.

In 1970, U.S. imports of fresh or frozen fillets of all species were 270,000 tons--9% above 1969, and equal roughly to 750,000 tons live weight.

(c) Cured

There was expansion overall in trade volume of cured fish; however, this hides opposing movements.

In Norway, the rise for all types of cured fish was about 20%. Wet salted fish rose from 12,000 tons to 20,000 tons (75%); dry salted went from 47,000 tons to 52,000 tons (11%) and stockfish fell from 20,000 tons to 18,000 tons (minus 10%). This means the end of the Nigerian war has not led to the expected restoration of demand for stockfish; in fact, the Faroes export of dried cod stopped altogether. Canadian exports fell in value and were confined more than before to North America and the Caribbean.

Imports of cured fish by France and Germany increased considerably in value: 37% and 23%.

(d) Canning

To a great extent, international trade in canned fish is confined to OECD members. It is particularly important to fisheries of Canada, Norway, Spain, Portugal, Germany, and U.S. Between 1969 and 1970, there was little change in overall trade. Slightly more (3-4%) was exported, while imports fell about 2 to 3%. In view of higher production costs in most countries and generally higher prices for raw material, herring in Germany, sardines in Spain, etc., the total value remained steady. Smaller quantities were bought by the two main importers--the United Kingdom (-17%) and U.S. (-4%); exports from Norway (+11%) and Spain (+32%) were above 1969.

On the Pacific Coast of the U.S. and Canada, fish canning is centered on tuna and salmon. Both species yielded very good returns in 1970. The U.S. tuna pack was a record 200,000 tons (product weight) worth \$380 million; the salmon pack, second largest in 15 years, was 85,000 tons worth \$142.7 million.

The tuna pack, rising almost continuously, has been more than doubled over 20 years. Salmon has tended to decline.

The Canadian output of salmon also was unusually high--31,000 tons against 13,700 tons in 1969.

Among other canned fish products in North America, canned sardine fell about 20% but most shellfish other than oysters (down 10%) increased. The pack of canned shrimps was a record. As with other OECD members, the U.S. production of canned pet food continued to grow; in 1970, it was worth \$105 million.

The ingredients include food other than fish, but even at 10% this remains an important outlet. It seems likely to grow.

(e) Fishmeal

The fishmeal market is largely international, so the OECD report includes non-members.

In 1970, aggregated fish-meal output of major producers is estimated at around 4,890,000 tons. This is a rise of 14% above 1969 and 6.5% above 1968's record. Then, production was 4,593,000 tons. Around 35% (1969: 39%) of this production was OECD produced; the remaining 65% (1969: 61%) by six others.

The latter increased production from 2,632,000 tons in 1969 to 3,193,000 tons in 1970 (up 20%). This was due to a sharp improvement in Peru's output which, in every year since 1963, has been around four times higher than any other country's. In 1970, Peru's share reached its peak: 45% of world production. Unfavorable hydrographical conditions and fishermen's strike had cut output by 27% in 1969; in 1970, production was a record 2.2 million tons.

Rough estimates put USSR production higher again--probably around 375,000 tons in 1970, No. 3 producer. Japan is second.

The other main producers outside OECD are South and South West Africa. These produced less than in 1969 due to fewer pilchards and government quota system. Around 303,000 tons of meal was produced in 1970, compared with 471,000 tons in 1968 peak year (down 35%).

OECD production rose from 1,525,000 tons in 1966 to around 1,695,000 tons in 1970--annual rate of around 2%. Compared with 1969, less meal was produced in 1970 in Canada (-9%), Germany (-11%), and the United Kingdom (-9%). Japan and Denmark, which account for around 30% and 10% of OECD total, showed little change. Norway's output, which fell 19% in 1968, and 24% more during 1969 to 309,000 tons, was again higher in 1970, when around 40,000 tons more were produced.

In 1970, the weighted average annual price of Peruvian meal was U.S. \$196.5 f.o.b. U.S. East Coast, compared to U.S. \$157.10 in 1969 (up 25%) and U.S. \$130.95 in 1968. Prices

generally were higher during first half: around U.S. \$195 against U.S. \$185 from July until December, when prices stayed around U.S. \$85.

In Germany, prices for Peruvian meal declined during first quarter from U.S. \$238 in January to U.S. \$196 in March. Then prices stabilized at around U.S. \$210 until end of 1970.

This stabilization of prices during second-half 1970 was said to be caused largely by market policy of EPCHAP, Peru's central fish-meal marketing body. It happened when there was significantly higher production. It could be, says OECD report, that by restricting sales EPCHAP avoided price collapse same as 1966/67's. Then, output of 350,000 tons higher depressed prices from U.S. \$156.40 per ton in 1966 to U.S. \$130.15 in 1967.

Prices for fish-meal substitute--soya bean meal--increased from U.S. \$82.9 to U.S. \$87.1 per ton from 1969 to 1970. This resulted from increased demand for protein additives in Europe and U.S. and despite record U.S. soya harvest of around 30.9 million tons. Prices for soya meal fluctuated widely, especially during first 6 months, but they stabilized after summer peak. However, soya meal still had a price advantage over high fish-meal prices: the ratio was 2.26 in 1970 against 1.89 in 1969; a ratio of 1.3/1.4 can be taken as normal to achieve same protein content.

The above price development further reduced trade in fish meal. In 1968, 3.4 million tons were imported by main producer countries; it is estimated that in 1970 only 2.7 million tons were shipped following 1969 reduction to 2.8 million tons.

Significantly less was exported by Angola (-44%), Chile (-32%), South Africa (-43%), and Norway (-18%). On the other hand, Peru increased exports by around 230,000 tons--from 1.65 to 1.88 million tons in 1970. This was due to increased exports to centrally controlled countries, mainly Poland and Yugoslavia. These took around 22% of Peru's exports (1969: 15%).

OECD members imported about 18% less meal. They took 1.9 million tons in 1970, compared with 2.3 million tons in 1969, and 2.7 million tons in 1968. This decline was caused by price development and, to a large

extent, by new contract conditions imposed by EPCHAP.

According to EPCHAP conditions, the weight and quality of fish meal have to be determined at loading time. This means importers cannot claim shortage or defect on receipt. So several importers decided to take less meal from Peru. Significantly less was imported by U.S. (down 26% from 1969 and about 68% from record year 1968); the United Kingdom (minus 123,000 tons), and the Netherlands (minus 57,000 tons).

Germany again was leading importer: about 18%, or around 500,000 tons of meal entering world trade. Although imports to Germany decreased slightly (minus 7%), the high imports indicate compounders' preference for fish meal in mixed feed. It had been thought generally after law requiring a certain percentage of fish meal in feed mix was abolished in December 1969 that imports of fish meal would be cut.

Stocks of fish meal held by FEO countries at end of 1970 were estimated at 834,000 tons. These were more than double the extremely low stocks held at end of 1969, and 59% higher than 1964/69 average. Fishmeal Exporters Organization (FEO) members are: Angola, Chile, Iceland, Norway, Peru, South and South West Africa.

With exception of South and South West Africa, where much less meal was produced, stocks in all countries were above 1969 level; lower exports and higher production were responsible. Peru alone held around 660,000 tons, or 75% of total, then Norway (107,000 tons), and Chile (40,000 tons).

The OECD report states that 1971 development on fish-meal market will depend to a larger extent than before on price of fish meal vs. prices of competing food ingredients. The level of production may not be as important. Even a 10% decrease in Peruvian output would have limited effect on market because of extremely high stocks.

A highly important factor will be EPCHAP's policy. If it stipulates prices at 1969 level, around U.S. \$196 f.o.b. U.S. East Coast, less meal may be imported by U.S. and Europe--especially because soya bean meal will be available as substitute.

Estimates of 1971 U.S. soya harvest indicate around 30 million tons. If such a switch resulted in higher prices for soya meal, the ratio of fish meal to soya meal favors the latter so much that even a 10-15% price rise would still favor use of soya.

If, however, Peru lowers the price, more fish meal likely will be used in some countries. Much depends on sales during closed fishing season (January to March). If global stocks fall to around 450,000-500,000 tons, this would release the pressure of inventories on prices, closed season and, possibly, bring lower selling prices.

At end of March 1971, inventories seemed below 500,000 tons and average prices in U.S. and Europe were still very high and favoring the use of competing feed ingredients. Therefore, world market prices were expected to remain at December 1970 level, although less fish meal would be used. As a result, stocks at end of 1971 could be higher than at end of 1970.

CONCLUSION

In 1970, the outstanding feature, undoubtedly, was the better returns at landing stage because of generally higher prices paid to catchers.

It is believed that higher quotations of meal prices hurt sales. A drop of 500,000 tons, over 50% of 1968 usage, in the U.S. is held mainly attributable to price factor. But for fish sold for human food, there is little evidence of consumer resistance, except for one or two isolated items of shellfish in semi-luxury class.

In some respects, says the OECD report, this is surprising because it is only the latest rise for mass consumers in industrial countries. These rises have affected fish much more than other foods. In the U.S., the overall average retail price of fish in 1970 rose 10% over 1969 (nearly double all foods) and brought index (1957/59 = 100) to 143.7. By comparison, the index for other sources of first-class protein were: meats 133.8; poultry 97.9; eggs 111. Only fresh fruit (144.5) rose about as much as fish.

The arguments explaining or justifying why fish prices are so much ahead of competing foods are: a much lower starting point, more ground covered in refining products, development of more costly preservation, etc. But the fact remains that for every dollar's worth of fish bought in 1960, the consumer was paying \$1.40 in 1970, the buyer of beef \$1.30.

In 1970, as in 1969 and 1968, U.S. per-capita consumption of fish rose; it was at a 17-year high.

When landings are being maintained and meeting strong demand, it might be expected that expansion, perhaps even of excessive fishing power, would result. So far, taking productive capacity as a whole, there has been no such pronounced tendency. New fishing units are being added--but more to consolidate. These additions often fall short of replacement and rest on much government help and, occasionally, on capital from other industry sectors.

Freezer-tractors require from \$4.5 million to \$5.5 million, so any building is more and more confined to integrated companies. The only class of vessel that might be increasing is the one able to stay at sea for up to a week. Any proportional increase would be slight.

After some miscellaneous building in the 1960s, it seems that the size of the combined fleets has stabilized. Using the most optimistic forecasts of marine biologists, the fleets will draw on stocks likely lower than in 1970. At best, the supply will remain constant.

So the continued 1970 pressure of demand inevitably will bring higher consumer prices.

The most popular outlet, except where distance is an obstacle, is fresh fish, although frozen fish have made some inroads. The distribution chain for fresh fish is highly specialized and expensive to maintain. Although vigorous attempts have been made to make trade suitable for supermarkets, by and large it remains in specialists' hands. These specialists are becoming scarcer. Thus fresh fish would become more difficult to find and more expensive to buy. This process has been underway for years, but the 1970 experience points to fresh fish becoming still more costly food and being accepted by the public. But quality must be kept high to maintain consumer interest.

To producers of frozen foods, the attractions of fish as a raw material were its low price that allowed comparatively expensive treatment, storage, distribution, and sales promotion--but resulted in a commodity that still could be offered at acceptable price alongside other consumer packs. So far, the price of landed fish has not advanced sufficiently to prevent growth of quantities sold through retail cabinets. But displayed with other products, price factor has a greater influence on future trade than with fresh fish. As long as price for fresh fish keeps advancing, the price asked for fish to enter the freezing chain will also rise. This could be the basis for the concern expressed where, in one instance, export prices rose 25% over 1969.

The OECD summary concludes: "It could be that trading in food fish in the next few years will be maintained at a constant level as regards quantity of fish sold fresh but perhaps with some easing in the volume sold through other outlets as the price of raw material keeps rising."



COMMUNIST-BLOC SCIENTISTS FORESEE NO MAJOR CHANGE IN ICNAF COD STOCKS

No major changes in the condition of cod stocks in the area of the International Convention for the Northwest Atlantic Fisheries (ICNAF) are foreseen for 1972 by fishery biologists of the Soviet Union, East Germany, Bulgaria, Poland, and Romania. The scientists of the 5 East-European nations adhering to the Agreement of Cooperation in High-Seas Fisheries met recently in Poland. They made these predictions for 1972:

Greenland cod (ICNAF Subarea 1) will stay at 1968-69 level, with large adults (55-75 cms.) predominating.

Labrador cod (Subarea 2) will remain at 1970 level.

Newfoundland cod (Subarea 3) stocks are expected to increase because the abundant 1968 year-class will enter the fishery in 1972.

Cod Catches in ICNAF Convention Area, 1966-70

Subarea

	1	2	3	4	5	Total ICNAF Convention area
	(Metric tons)					
1970	103,994	209,801	520,094	255,703	35,387	1,124,979
1969	204,790	412,293	569,087	206,065	45,823	1,438,058
1968	381,869	449,342	732,813	247,333	49,176	1,860,533
1967	429,479	297,809	720,604	194,447	42,310	1,684,649
1966	366,126	337,877	498,665	215,254	57,255	1,477,257

Statistical area 6 was not included because cod catches there are insignificant.



FISH STOCKS IN W. MEDITERRANEAN ARE HEAVILY OVERFISHED

Fishing for Mediterranean hake, sole, red mullet, sea bream, and shrimp has increased so much in the last 10 years that catch yields have decreased seriously.

Stocks most affected are along the French, Italian, and Spanish coasts, the oldest and heaviest exploited areas. The situation along the Tunisian, Yugoslavian, and Algerian coasts is less alarming.

These were the findings of the Working Group of the General Fisheries Council of the Mediterranean at Rome meeting early in June.

Reduced Fishing Suggested

The group warned that because of present exploitation, and particularly small mesh size of nets, more fishing likely would result in even lower catches. Reduced fishing would improve stocks.

As a first step, the group urged that all nets with mesh size smaller than 40 millimeters, stretched measure, be banned.

The group will meet again in December to consider improvements in statistics on catches and fleet activities, and in research on effect of exploitation on individual stocks.



COD AND THE WEST

C.L. Sulzberger

REYKJAVIK, Iceland--Future strategy of the NATO allies depends on what agreement they can reach about catching the glistening, nutritious codfish abounding in this island's waters. Cod and haddock harvested from the neighboring sea comprise Iceland's greatest natural resource and finance its high standard of living and remarkable culture.

In the nineteenfifties, when Reykjavik extended national fishing limits out twelve miles, Britain, the main market, ignored this and there were actual armed incidents involving violators although nobody got hurt. In 1961 Britain accepted the new limits and it was agreed to send future disputes to the World Court.

Now Iceland announces it will scrap the accord and extend territorial waters out fifty miles to exclude foreign trawlers. The British flatly reject this and the West Germans go along.

As if this dispute with two allies were not enough, the new Government has also proclaimed its intention of expelling the American forces that tend and protect the NATO base here. Iceland itself is wholly unarmed so the base would be left up for grabs, although this country doesn't want to quit the alliance itself.

Finally, faced with the prospect of Britain joining, Iceland wants an arrangement with the Common Market to assure adequate fish exports. It doesn't covet associated status but

a special deal comparable with that between this country and the United States on air transport.

Icelandic Airways is not a member of the International Air Transport Association (I.A.T.A.) and therefore isn't bound to its price scales. It manages to undercut I.A.T.A. planes on trans-Atlantic flights but Washington permits Icelandic planes--the only non-I.A.T.A. line--to land, although U.S. as well as foreign airlines object.

The new Government raised all these problems together by bold promises before the elections that brought it to power: to ban foreign fishermen inside a fifty-mile limit, to oust the Americans, and to stake out a deal with the Common Market. It is beginning to wonder if all these vote-getting pledges are workable.

And London and Bonn have announced they won't accept the fifty-mile limit. The British insist the 1961 agreement was ironclad. Neither London nor Bonn are going to ask the Common Market to favor Iceland just after they have been kicked in the teeth.

So there is a dispute inside NATO apart from the dispute on NATO inside Iceland. Reykjavik might find after studying all the difficulties involved that it would be wiser to renege on electoral promises and not shove the Americans out. It has already deferred that matter to the looming cod war.

Reprinted from The New York Times, Aug. 13.

"An agreement on fishing limitations has priority," Foreign Minister Einar Agustsson told me. "We will go very slowly on other questions until this is settled. I'll take my time studying the base problem. The fishing issue has much more popular support than the base issue."

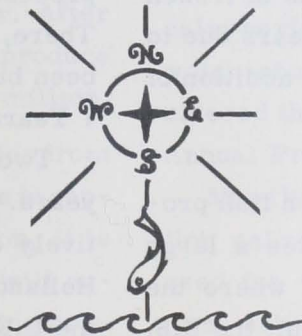
He hopes to settle fishing by September 1972. In other words, the NATO base argument need not even warm up for more than a year while passion spends itself on the cod. The allies hope that as the Government familiarizes itself with the dangers involved in ending protection of the Iceland base, less drastic solutions will be suggested.

Once before, during a brief 1956 crisis that was shelved when Russia invaded Hungary, the now-dominant parties asked that "Icelanders shall themselves undertake care and maintenance of the defensive installation, other than military duties."

This is scarcely feasible. A wholly unarmed country couldn't protect the base and two hundred thousand Icelanders don't have enough trained technicians or a counterespionage apparatus. The base is directly linked to planes in the air and ships on and beneath the sea which coordinate information.

The original concept under which Iceland joined NATO in 1949--no foreign troops or bases in peacetime--is no longer workable. It is difficult to contemplate a substitute arrangement. The Denmark Strait between this country and Greenland and the Iceland-Faroes Gap are crucially important and can best be plugged from here.

But it is hoped patient diplomacy plus goodwill will eventually find compromise arrangements assuring Iceland generous fish supplies, adequate European markets, continued cheap air rates and some means of keeping an allied force to preserve the NATO base. The emotional priority of cod and haddock allows time to cool the strategic issue.



ICELAND

FAROE ISLANDS & ICELAND COOPERATE IN FROZEN-FISH EXPORTS TO U.S.

Faroese and Icelandic exporters have agreed to merge their export of frozen fish to the U.S. market to compete better with other countries. Previously, Faroese exports of quick-frozen cod and haddock fillets to the U.S. and Great Britain were handled by private importers.

Faroese producers have felt handicapped in entering large markets even though their products have been highly regarded. Their export associations realized that a merger would help.

Coldwater Seafood Corp.

Since May 1, Faroese exports to the U.S. have been handled by the Coldwater Seafood Corp. This is a private Icelandic sales firm to the U.S. with annual sales of about 50,000 metric tons. The corporation is backed by about 70 of Iceland's 100 fillet factories. The merger adds the production of 15 Faroese fillet factories and several factory trawlers to its supply chain. Faroese exports of frozen fish quadrupled in the last two years due to improved inshore fishing and the addition of modern factory trawlers.

Iceland's U.S. Factory

The U.S. buys 80% of all frozen fish produced in Iceland. Iceland operates a large factory in Cambridge, Maryland, where the fillets are cut into portions to suit the U.S. customer. The headquarters organization in New York City maintains a wide distribution system for its ready-made products. ('Vestkysten', June 28)



UNITED KINGDOM

BRITISH FIRM TO PRODUCE PROTEIN FROM PETROLEUM

British Petroleum's plant at Grangemouth, Scotland, the world's largest for producing protein-rich yeast by hydrocarbon fermentation, will begin operations early in 1972. Toprina, the trade name for BP's protein, will be used to enrich animal foodstuffs, principally for turkeys, chickens, pigs, and for fish farming.

The first year's production already has been ordered by leading animal-feed compounders.

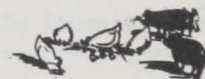
BP's 2 Plants

Grangemouth has a capacity of about 4,000 metric tons of protein a year. It is the first of two units to be operated by BP. The second, output of about 15,000 metric tons a year, is nearing completion at Lavera, near Marseilles, France. The possibility of producing protein on an industrial scale was first recognized there in 1959.

Technology has been developed for this process, which has been licensed in Japan. There, a 1,000-ton-a-year plant already has been built.

7 Years' Pilot Operation

Two pilot plants have been operating for 7 years. The product has been tested exhaustively at independent scientific institutes in Holland, and with animal-feed compounders in the U.K. and France. The protein has been blended into food and fed successfully to several generations of animals. ('South African Shipping News & Fishing Industry Review')



SALMON ARE REARED COMMERCIALY AT BERGEN

The Norwegian firm Mowi A/S of Bergen has established after years of research that it is possible to rear salmon commercially. Similar attempts to produce salmon have been made by firms in Scotland, Canada, and East European countries without success.

The culture takes place in small bays and sounds surrounding the archipelago at Bergen. This location takes advantage of the natural flow of water from the Atlantic and the North Sea. The technique was started in 1965 by a food-processing plant named Compact.

Mowi

Mowi, established in 1969, is owned by Norsk Hydro and Compact. By mid-July 1971, Mowi had delivered 35 tons of salmon; it was expected to deliver another 40-50 tons in the following weeks. The present plant is expected to produce about 500-600 tons a year. After maximum expansion, it will be able to produce about 1,500 tons worth about US\$4.2 million.

The Mowi-reared salmon do not differ from Atlantic salmon. Since salmon culture in captivity has reached the third generation, it is not yet known whether degeneration will occur in later generations. The breeding process involves crossing "tame" and "wild" salmon. Attempts to cross with Icelandic salmon also have been made.

Rearing Salmon

Production takes place around four islands. Two are equipped with fresh-water plants for culture and breeding of the fry until time when salmon normally would travel to sea. Hatching is advanced by flow of heated water through the plants. When the salmon eggs are hatched, they are placed in large fiberglass tanks containing a mixture of fresh and sea water. The fish are fed to speed growth. Normally, the smolt stage takes 2-4 years, but at Mowi 80% have reached this stage in one year. The water in these tanks is not heated, except in winter. This procedure allows the young salmon to become adjusted to sea water.

When salmon reach the smolt stage, they are moved to ocean waters. These impoundments are small sounds closed off at both ends. Pumps have been installed to supply oxygen and circulate the water in the sound during calm periods. At the final stage, the salmon weigh about 12 to 16 pounds, which is considered the most desirable size.

Annual Production

Mowi's annual production is about 1.5 million salmon fry; of these about 500,000 are used for the firm's salmon production. The firm estimates that about 300,000 fry reach the final stage. About one million fry are sold to stock rivers and fjords in Norway. ('Borsen', July 19)



CANADA

FISHERY IMPROVEMENT LOANS INCREASE

Canada's Finance Minister has reported that C\$1.2 million was loaned under the Fisheries Improvement Loans Act from Jan. 1 to March 31, 1971. In the 1970 period, \$861,335 was loaned.

The Government may guarantee loans granted by chartered banks and other designated lenders to fishermen for many purposes. A maximum of \$25,000 may be loaned to a borrower at any one time. Loans must be secured. They are repayable over a period up to 10 years. The maximum rate of interest is determined semiannually, on April 1 and October 1. The maximum rate during the period reviewed was 8%.

The Fisheries Improvement Loan Act came into effect in Dec. 1955. From then to end of March 1971, C\$13.2 million was loaned.

* * *

PACIFIC SALMON STOCKS INCREASED DURING PAST 10 YEARS

Canada's Pacific salmon stocks increased up to 24 million fish (13%) in past 10 years compared to previous decade.

Commercial fishermen caught 230 million salmon in 1961 to 1970; in 1951 to 1960, 206 million. Fishermen earned roughly C\$40 million more.

Salmon Stocks Rise

Salmon stocks have increased despite industrial expansion, slides, stream abuse by loggers, and loss of spawning areas to rural development.

Contributing to increase were: 1) the \$18-million resource development program of Canada's Department of Fisheries since 1950, and 2) cooperation by pulp and paper industry in setting strict pollution standards in new mills. ('Fisheries News', Canada's Department of Fisheries)



LATIN AMERICA

MEXICO

1970 CATCH ROSE 10% FROM 1969

In 1970, Mexico's fish industry reversed its downward trend: its 255,840 metric tons of all species were 10.3% above 1969. This was disclosed by preliminary figures from Mexico's Secretary of Industry and Commerce.

Anchovy led: up 33.4%; shrimp landings increased 26.5%. Among industrial products, fish-meal production was up 33% over 1969; however, Mexico still needed to import 78,063 tons to meet her requirements.

Shrimp Still No. 4 Export

As a result of increased production, shrimp exports, mostly to the U.S., jumped 21.8% to US\$63.1 million. Shrimp retained fourth place among exports, after sugar, cotton, and coffee.



CHILE

1970 FISH-MEAL
PRODUCTION DOWN FROM 1969

Chilean fish-meal production during 1970 was only 162,627 metric tons, about 63,000 less than 1969, reports the Corporacion de Pesca S.A. (CORPESA).

Exports of fish meal during 1969 were 145,139.8 metric tons; exports of fish meal during 1970 were estimated at 110,000 metric tons worth US\$17.9 million.

Production of fish oil was 19,447 metric tons in 1970, about 11,000 metric tons below 1969. Exports were 9,512 metric tons in 1969 and are estimated at 7,500 metric tons for 1970. (U.S. Embassy (FAS) Santiago)



ASIA

JAPAN

FISHERY CATCH IN 1970 TOPPED 9 MILLION TONS

Japan's fishery catch, excluding whales, reached a record 9,275,000 metric tons in 1970, according to the Statistics and Survey Division, Ministry of Agriculture and Forestry. The figure is 662,000 tons, or 8%, above 1969's 8,613,000 metric tons.

	1970	1969	+ or - from 1969
	(No. of Whales)		%
WHALING:			
Whalebone whale (blue-whale units)	2,422.49	2,510	-3
Sperm whale	6,548	6,668	-2
Minke and other species	624	1,415	66

The increase was attributed primarily to the sharp rise in Alaskan pollock catch in North Pacific mothership-type trawl fishery, good mackerel fishing in purse-seine fishery, and increased trawl catches off Hokkaido.

NORTH PACIFIC SALMON MOTHERSHIP FLEETS ACHIEVE QUOTA

The 11 Japanese salmon motherships that began fishing in Area A (north of 45° N. lat. and west of 175° W. long.) in the North Pacific on May 20 attained their 1971 salmon catch quota of 37,357 metric tons. The operations ended four days earlier than in 1970.

The 1971 high-seas salmon fishery was characterized by: (1) low ratio of red salmon catch (estimated 22-23% of total landings); (2) abundance of chum and pink; (3) absence of concentrations of Bristol Bay reds (result was that only the 2 fleets operating off Aleutians caught small reds during final weeks; and (4) landings of king and silver salmon were small, possibly because season was too early. ('Suisan Tsushin', July 19.)

SURVEY SQUID RESOURCE OFF CALIFORNIA

The newly formed semigovernmental Marine Fishery Resources Development Center of Japan was scheduled to charter the 300-gross-ton vessel 'Ryo-un Maru' this summer to survey the squid resource off California. The objective is to locate new grounds for large squid vessels. These vessels are having trouble because under Japanese licensing system they cannot operate in Japanese coastal fishery and, farther offshore, squid abundance has diminished considerably in recent years.

The Center's Job

The Center is collecting data on the squid catch of Japanese tuna longliners and of U.S. squid fishery off California. Over 40 U.S. vessels fish during the April-August season. They harvest over 10,000 tons annually.

California vessels report squid concentrations fairly close to shore. For Japanese fishermen, therefore, the most important question is how much squid can be taken in deeper offshore waters.

EXPLORE FOR SKIPJACK TUNA OFF SOLOMON ISLANDS

The Japanese Taiyo Fishing Co. has sent 2 tuna motherships to the Solomon Islands area in the South Pacific on a skipjack resource development cruise. They are 'Satsu Maru No. 18' (500 tons, 450-ton carrying capacity), and 'Kairyu Maru' (450 gross tons, 300-ton capacity).

Taiyo plans to establish in Guadalcanal and other islands 2-3 bases of operations for these motherships. The latter will buy skipjack from four 39-ton Okinawan vessels.

Taiyo is also exploring for skipjack off the Fiji Islands for FAO.

JAPAN (Contd.):

Other Firms Already There

Among major Japanese fishery firms, Taiyo is a late comer to the South Pacific skipjack fishery. Kyokuyo, Hokoku Suisan, and the Overseas Fishery companies already are conducting "exploratory" fishing off Papua-New Guinea and Nichiro off Halmahera Island near Molucca Sea. ('Katsuo-maguro Tsushin')

* * *

HOPE TO BREED SEA BREAM
AND FLATFISH BY 1972

Commercial cultivation of marine fish in Japan is an ancient and profitable business. However, fish farming generally has been limited to a few species: shrimp, octopus, eels, yellowtail, and clams. Other marine species are being cultivated but largely on an experimental basis. Now the Japanese will culture red sea breams ("Ma-dai," CHRYSOPHRYS MAJOR) and flatfish ("hirame," PLATICTHYS STELLATUS, or bastard halibut).

Sea Bream & Flatfish

For the past 3-4 years, scientists at Kinki University's fishery experimental laboratory have been breeding and raising sea bream and flatfish. The fish are grown in 30 water tanks. Each tank is about 3 feet high, holds a half-ton of water, and contains 3,000 fry.

Scientists have succeeded in coloring the sea bream a suitable pink (the Japanese consumer is highly conscious of fish coloring) by feeding the sea bream special foodstuffs. Recently, the lab sold samples of the sea bream on the open market; they were favorably received.

Building Incubation Facilities

With financial support from the Shirahama Fishery Cooperative, Kinki's techniques will be put into practice. Several incubation facilities are being built at a 6,600-sq.-meter site at Sakata Beach, near Shirahama City. The facilities, costing US\$416,000, are scheduled to be completed in March 1972. The project will mass-produce "finned" fish, which are considered difficult to raise artificially. Shigeru Iwasaki, director of the Shirahama Fishery Cooperative, has said that fish farming

throughout Japan would benefit due to a stable supply of fry produced by the incubation facilities. Orders for the young fish are said to be "pouring in." ('Japan Times')

* * *

38 VESSELS LICENSED FOR
HIGH-SEAS SAURY FISHERY

The Japanese Fisheries Agency has licensed 38 vessels for experimental high-seas saury fishing in 1971 in the North Pacific east of 160° E. long. The agency is expected to make a decision on the remaining 10 of the 48 vessels that applied this year.

* * *

LARGEST STERN TRAWLER
JOINS BERING SEA FLEET

The 5,300-gross-ton 'Tenyo Maru', Japan's largest stern trawler, was delivered to its owners on May 20, 1971. After running trials, the vessel departed on June 1 for the Bering Sea. There it will engage primarily in "surimi" (minced fish) and fish-meal production for 7 months. Production target is 4,000 tons of frozen surimi, 2,000 tons of fish meal, and 1,000 tons of frozen fish.

Cost \$4.7 Million

The vessel cost 1,700 million yen (US\$4.72 million). It is 366 feet long, 55.8 feet wide, and 36.7 feet deep. Main engine is 5,700 hp., maximum speed 17.3 knots. It can accommodate a crew of 115. ('Nihon Suisan Shimbun', June 7)

Larger One On Way

The 5,500-gross ton factory trawler 'Chikubu Maru' was scheduled to be launched at the Usuki Ironworks on June 13, 1971. When completed in late October, it will be Japan's largest and fifth 5,000-ton class trawler. In mid-November, it will be sent to the Bering Sea trawling grounds.

Main specifications are: length 342 feet, width 58.4 feet, depth 36.1 feet, 5,700-hp. main engine, and speed of 15.5 knots. The ship will carry a 122-man crew. ('Suisan Tsushin')

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JAPAN (Contd.):

JAPANESE TO FORM COMPANY IN MAURITANIA TO OPERATE ICE BOATS

In early 1971, Mauritania and several Japanese fishing firms reviewed a 1-year agreement. Under it, the Japanese are sending 11 ice-carrying fishing boats and will form a local corporation to operate them.

The new company, to be named Mauritania Suisan Marine Products Co. will be established in Nouadhibou with Japanese paid-up capital of 40 million CFA francs (about US\$150,000).

Ice Boats There

Most of the ice boats arrived at Nouadhibou in May and are fishing; the rest were expected in June. The agreement provides for the Japanese to help in the development of Mauritania's fishing industry. The vessels will fish in the coastal waters with arrangements to export catches to Japan. ('Suisan Keizai Shimbun')

* * *

COLD-STORAGE PLANT
BEGINS OPERATIONS

The firm Kenya Fishing Industry has a new 2,000-ton cold-storage plant at Mombasa processing tuna. The plant is operated jointly by two Japanese firms (Taiyo & Ataka Sangyo), local business interests, and the Kenyan Government. The firm was established with US\$167,000 (60 million yen), one-third each by participants.

Tuna Base

Taiyo is using Mombasa port as a tuna-fishing base under an exclusive agreement. Previously, it used a refrigerated fish carrier anchored offshore to store tuna caught in the Indian Ocean.

10 Longliners Off Mombasa

In 1970, 20 Taiwanese and 2 Okinawan tuna longliners supplied Mombasa under a contract with Taiyo. In mid-June 1971, the 10 longliners off Mombasa were catching about 2.5 tons a day (about 50% yellowfin, 25-30% big-eyed; the remainder marlin and other species). ('Katsuo-maguro Tsushin')



THAILAND: Harvesting tilapia from a fish farm. (FAO)

SOUTH PACIFIC

NEW ZEALAND

EXPORT WELL-BRED EELS

New Zealand has escaped pollution of its natural waterways so far, says the country's information service. This is good for eels-- and for New Zealand's export market.

Until about 1953, New Zealand eels were unknown to the world's eel eaters. The story is different today.

Eels spawn hundreds of miles from New Zealand. The small leaf-shaped creatures (*Leptocephalus*), carried by ocean currents, arrive in the spring as small transparent glass eels. They make their way up many rivers and streams around the country to the headwaters; they grow as they progress. After 3 or 4 years, they are ready to migrate. This normally begins towards end of February and lasts 4 to 6 weeks. During migration, the best eels are caught for processing and export.

A Dutchman Pioneered

The catching and exporting of eels were pioneered by a Dutch migrant. He had handled and processed eels in Holland and knew Dutch and European markets. Most eels exported from New Zealand have been "live frozen," not eviscerated. In recent years, however, the method adopted by the Dutch migrant has produced change: eels are now cleaned and deslimed before freezing. Considerable improvements have been made in trapping, handling, and processing eels. Packing plants are required to meet high standards of cleanliness and hygiene.

Packed Many Ways

Eels are packed in several ways to satisfy foreign customers. They are available block frozen alive; frozen alive, each eel interleaved; stick frozen alive; gutted and deslimed, head on; completely dressed; and in fillet form with skin off or on. In some cases, individual fillets are frozen and glazed; in other cases, a solid block of fillets with skin off is prepared for special orders, or smoked whole. Solid block, individually wrapped and smoked eel fillets in small retail packs, or large fillets also are available to catering trade. Not all processors provide so many products.

In most cases, eels are double-glazed, and cartons polythene-lined. Carton sizes vary with customer requirements, but the net weight ranges between 10 and 15 lbs. (5.53 and 6.80 kgs.). Some packers of smoked eels provide these in cartons between 10 and 30 lbs. (5.53 and 13.60 kgs.) to suit customers. The demand for smoked eels is growing.

Eels Graded

The eels are graded. First step determines which eels are most suitable for the various processes; the second is a grading to size to suit customers. Generally, the short-finned (*Anguilla australis*) are required in 1-2 lbs. (0.45-0.90 kg.) or 2 to 4 lbs. (0.90 to 1.81 kgs.) sizes. The long-finned (*Anguilla dieffenbachii*) are asked for mainly in 1 to 2 lbs. and 2 to 3 lbs. (0.90-

1.36 kgs.). Some customers specify 4 to 10 lbs. (1.81 to 4.53 kgs.) long-finned eels for canning and similar purposes.

The long-finned eel attains 35 to 40 lbs. (15.86 to 18.14 kgs.). These very large eels are not used. But they are of high-enough quality for canning, jellied eel fillets, and for sausages. Most processors could supply the very large long-finned eels.

Large Export Potential

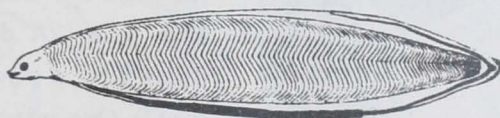
The potential for eel exports is so large that New Zealand's Fishing Industry Board began investigating the possibility of farming them. They used the methods of Japan's long-established industry. Following the visit of Dr. Isao Matsui, a leading authority on eels, to advise Board, the interest in exporting glass eels to Japan grew. When results of this experiment being conducted in Japan be-

come known, they will show whether New Zealand glass eels can be farmed under Japanese conditions.

At same time, research has begun in New Zealand on the eel's life cycle. Practical experiments are under way to grow baby eels in ponds. Eel farming is successful in Japan, and New Zealanders hope they too can put it on a sound basis.

Rapid Industry Growth

The eel industry has grown rapidly. Next to rock lobsters, eels are the most important fish export. In 1967, eel products were worth NZ\$79,737; the estimate for 1970 exports was NZ\$454,000. New Zealand exports eels to West Germany, Netherlands, Japan, Australia, U.S., Britain, South Africa, Italy, and Sweden.



Leptocephalus



Late-stage Leptocephalus