

## Recent Trends in World Fish Harvests

The world catch of fish, shellfish, and other aquatic organisms reached an all-time record of nearly 90 million metric tons (t) in 1986, according to a preliminary estimate prepared by the Food and Agriculture Organization (FAO) of the United Nations (UN). The estimated 1986 catch was a 5 percent increase over the previous record catch of 85.5 million t set in 1986.<sup>1,2</sup> Despite warnings from environmentalists concerned with rising levels of pollution, fishermen, are continuing to report increasing fishery catches. Since 1980, the world fisheries catch has increased an impressive 25 percent. Developing countries are responsible for most of the increased catch.

Preliminary data suggest that efforts by developing countries in the southern hemisphere to expand their fishing industries will result in continued increases through the year 2000, although

<sup>1</sup>This report was prepared as a combined effort of the NMFS Branch of Foreign Fisheries Analysis. Dennis Weidner coordinated the project and was responsible for the world trend and Latin American sections. Other contributors included: Milan Kravanja (Soviet and Eastern European sections), Paul Niemeier (Asian, Oceanian, Japanese, and Chinese sections), William Folsom and Michelle Miller (Western European section), Melissa Zajk (Canadian section), and Steve Wilshire (African section). It is based on preliminary FAO data available in mid 1987. More recent FAO estimates suggest that the 1986 catch may have hit nearly 91.5 million tons.

<sup>2</sup>For the purpose of this study, the Branch had adopted the widely accepted FAO statistical conventions. Catch data is attributed to the flag of the fishing vessels harvesting the fish and not by the national coastal zone in which it was harvested. Thus, Soviet catches off the coast of Angola are considered Soviet and not Angolan catches. The primary source used for these statistics is the FAO, which in turn relies on each individual country to supply national data. The year 1980 was selected as the base year to focus this report on recent catch developments and to limit the amount of statistical data assessed. As appropriate, the authors have referred back beyond 1980 to explain important longer-term trends.

this could be affected by a wide variety of economic and climatic factors. The 1986 increase was primarily due to the expanded Asian and, to a lesser extent, Latin American catches. Nearly 40 percent of the total world catch is taken by Asian countries, including Japan, which dominate the world fishing industry. The most rapidly growing catch, however, is in Latin America, where fishery catches have increased by 60 percent since 1980.

### Catch Increases

The world fisheries catch has grown steadily since 1980. Annual increases have ranged from a high of 7.9 percent in 1984 to a low of 0.6 percent in 1983 (Table 1). The small 1983 increase was primarily caused by the effects of both the 1982-83 El Niño event in the Eastern Pacific and sharp price increases for fuel. Some observers suggested that the world fisheries catch was leveling off at about 70 million tons in the early 1970's (Fig. 1). The collapse of the Peruvian anchovy fishery in 1971-72 did cause overall world catches to decline during the early 1970's. The predictions, however, that the world catch had reached its maximum potential of conventional species proved erroneous. The expected leveling off did not materialize, and the world catch has expanded continuously since 1977.

The average annual increase during the 1980's was 3.3 percent. The catch since the 1982-83 El Niño has been well above that average level, suggesting that the expansion of the world catch has not yet begun to level off. The increases since 1982 have come mostly from developing countries, and have been achieved even though many countries, especially in Latin America, have had to scale back government-financed fish-

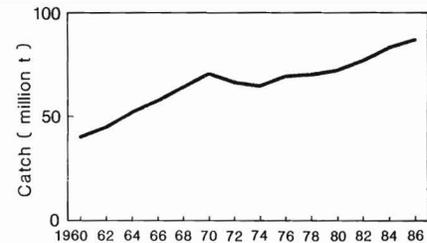


Figure 1.—World fisheries catch, 1960-86.

Table 1.—Annual world fish catch increases, 1980-86.

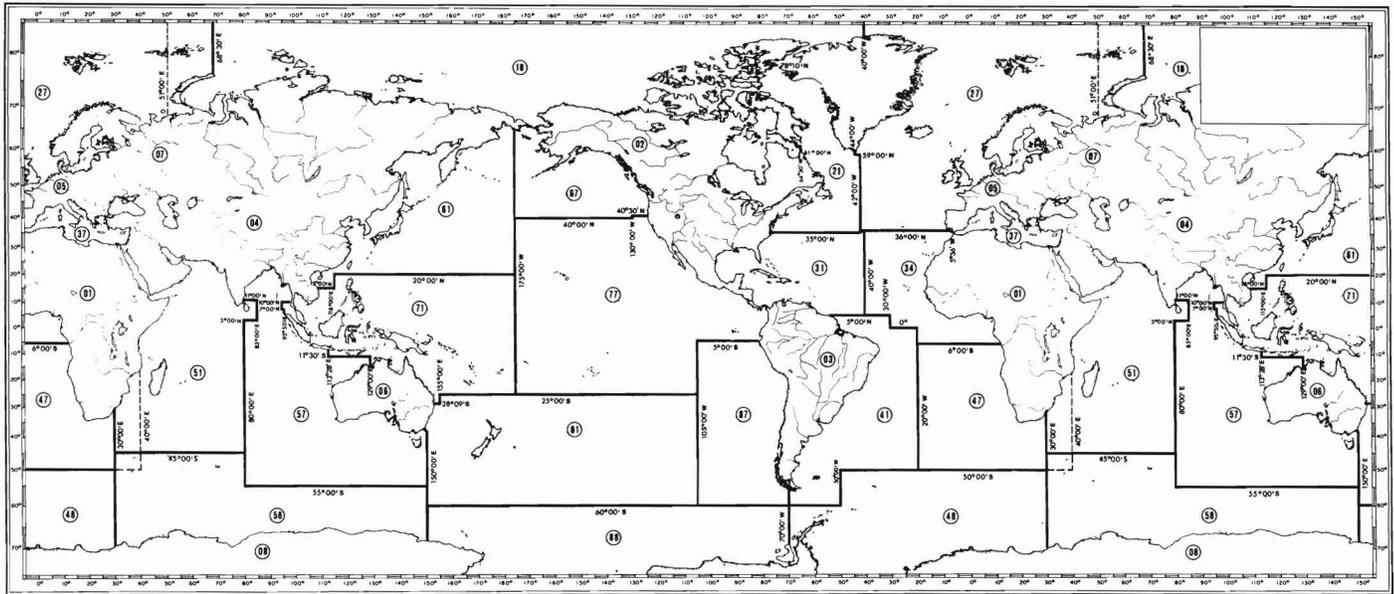
Year	Catch (million metric tons)	Percent increase
1980	72.1	1.4
1981	74.9	3.9
1982	76.8	2.5
1983	77.3	0.6
1984	83.4	7.9
1985	85.5	2.5
1986	89.6	4.8
Average		3.4

Source: FAO "Yearbook of Fishery statistics."

ery development programs as a result of the world debt crisis. Many developing countries have benefited from commercial joint venture arrangements with distant-water fishing companies which in many cases have limited opportunities in their local fisheries and, as a result, have maintained their involvement in overseas fisheries.

The NMFS Branch of Foreign Fisheries Analysis has prepared this article based on the quantity of fish and shellfish harvested. Some of the conclusions based on catch trends would be radically different if the value of the catch was calculated. The Branch, however, has decided to deal only with the quantities involved.

This decision is based on several factors. First, the collection and assessment of value data is a much more difficult undertaking, and would require a research effort that cannot at this time be justified. Second, value data includes many nonfishery components such as prices, interest rates, and exchange rates. As a result, such a study would often show fluctuations because of a number of economic factors other than developments in the fishing industry.



Major FAO fishing areas.

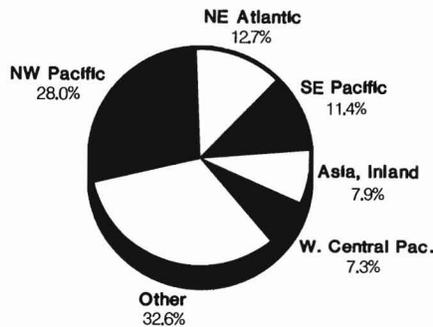


Figure 2.—World fisheries catch by fishing area, 1985.

For these and other reasons the authors have decided to focus this discussion primarily on catch trends. Readers should, however, be aware of the limitations of the data and conclusions presented in this report.

### Fishing Areas

The world fisheries catch comes from three main geographic areas (Fig. 2). The two most important areas are located in the northern hemisphere: the Northwest Pacific, FAO area 61, and the North Atlantic, FAO area 27 (see map). Fishermen took about 34.6 million t of

Table 2.—World fisheries catch, by principal fishing areas, 1985-86.

Region	FAO fishing area	Catch (10 <sup>6</sup> t)		1986 Percentage
		1985	1986	
Northwest Pacific	61	23.8	24.1	27
Northeast Atlantic	27	10.9	10.8	12
Southeast Pacific	87	9.7	11.9	13
Asia, Inland	04	7.1	7.1	8
W. Cent. Pacific	71	6.2	6.5	7
Others		27.7	29.2	33
<b>Total</b>		<b>84.9<sup>1</sup></b>	<b>89.6</b>	<b>100</b>

<sup>1</sup>This world 1985 catch figure has been updated by FAO to 85.5 million t (Table 1). The updated figure, however, was not used here as the revised breakdown by FAO area was not yet available.

fish and shellfish from these two areas during 1985, over 40 percent of the world total and over 45 percent of total marine catch (Table 2)<sup>3</sup>. Both areas have large continental shelves supporting important fishery stocks, but their domination of world fisheries is also due to the fact that most of the major developed fishing countries (Japan, the U.S.S.R., China, the United States, South Korea (ROK), Norway, Den-

<sup>3</sup>The 1986 catch by area was not available when this article was written, but the basic pattern is unlikely to change significantly. The FAO data on which this article is based is catch data recorded by the flag of the vessel which caught it and can differ substantially from the area where it is eventually landed.

Table 3.—World fisheries catch by major species, 1985-86.

Species	Catch (10 <sup>6</sup> t)		1986 Percentage
	1985	1986	
Alaska pollock	6.1	6.6	7
Peruvian anchovy	1.0	5.1	6
Japanese sardine	4.7	4.8 <sup>1</sup>	5
South American sardine	5.8	4.3	5
Capelin	2.3	2.2	2
Atlantic cod	1.9	1.9	2
Chilean jack mackerel	2.1	1.8	2
Chub mackerel	1.8	1.8	2
Atlantic herring	1.4	1.4	2
Other	57.8	57.0	
<b>Totals</b>	<b>84.9<sup>2</sup></b>	<b>89.6</b>	

<sup>1</sup>Estimated

<sup>2</sup>This catch figure, published in the FAO "Yearbook of Fisheries Statistics," 1985, has been updated by the FAO to 85.5 million t (Table 1). The updated figure, however, was not used here as the revised breakdown by FAO species group was not yet available.

mark, Iceland, and Canada) are located in the two regions. The third major fishing area is the Southeast Pacific (FAO area 87), where coastal upwelling supports the massive fisheries for small pelagics off of Chile and Peru.

### Species of Fish

Only about eight species are caught in quantities exceeding 1.0 million tons annually (Table 3). The world's single largest fishery in terms of quantity is Alaska pollock, *Theragra chalcogram-*

Table 4.—World catch by major FAO species group, 1980-86.

Name	FAO species group no.	Catch (10 <sup>6</sup> t)						
		1980	1981	1982	1983	1984	1985	1986 <sup>1</sup>
Small pelagics	35	15.5	17.0	17.9	17.6	19.7	21.2	
Cods	32	10.8	10.7	11.0	11.2	12.3	12.4	
Jacks/mulletts	34	7.3	8.0	7.8	8.0	8.5	8.0	
Misc. freshwater <sup>2</sup>	13	5.2	5.5	5.7	6.2	6.5	7.2	
Redfishes	33	5.4	5.3	5.4	5.0	5.5	5.3	
Mackerel/snoeks	37	4.6	4.0	3.8	3.7	4.3	3.7	
Tunas	36	2.6	2.7	2.8	2.9	3.1	3.2	
Shrimp	45	1.7	1.6	1.7	1.8	1.8	1.9	
Others, combined		19.0	20.0	20.7	20.9	21.4	22.0	
Total <sup>3</sup>		72.1	74.8	76.8	77.3	83.1 <sup>4</sup>	84.9 <sup>4</sup>	89.6

<sup>1</sup>Species group data not available.

<sup>2</sup>Does not include other freshwater species groups: Carps (group 11), tilapias (12), and sturgeons (21); the combined total of these three groups in 1985 was 1.3 million t.

<sup>3</sup>Totals may not agree due to rounding.

<sup>4</sup>These world 1984 and 1986 catch totals have been updated to 83.4 million t and 85.5 million t, respectively in Table 6, but are not to be used here as the revised breakdown by FAO species group was not available.

ma, and reported catches of that species totaled 6.6 million t in 1986. Most of the fisheries for these important species were little changed in 1986. The only major shift was a massive increase in the Peruvian anchovy fishery. Fishermen from Peru and Chile reported a 1986 catch of 5.1 million t, more than a 400 percent increase from the 1.0 million t reported in 1985.

North Pacific pollock fishermen reported the only other significant increase (+0.5 million t). Peruvian and Chilean fishermen reported the largest declines, in the sardine (-1.5 million t) and jack mackerel (-0.3 million t) fisheries.

The world catch is composed primarily of three species groups: Small pelagics, cods, and jacks, which had a combined catch of over 40 percent of the world catch for all species in 1985 (Table 4). The single most important group is small pelagics (anchovies, herrings, sardines, etc.) and catches of that group totaled 21.2 million t, nearly 25 percent of the world total for all species. About half of the increase in the world catch since 1980 has resulted from increased catches of these small pelagic species (Table 5). Other important increases were reported for various other marine fish and shellfish (up 23 percent), miscellaneous freshwater fish (up 16 percent), and cods (up 13 percent).

The massive increases of small pelagics

is significant because the expansion of these fisheries means that the increase of the world catch has not resulted in a corresponding increase in the production of edible commodities. A large portion of the small pelagic catch is reduced to fishmeal, used principally for animal feed<sup>4</sup>. Catches of all major species groups used for edible products have been increasing at very low rates or have actually declined (Table 5)<sup>5</sup>. It should also be noted that small pelagic fisheries are subject to sharp annual fluctuations. Overall fluctuations may be less likely in the 1980's as fishing effort is now divided over a number of different stocks. In the early 1970's, small pelagic fisheries were centered on a single species, the Peruvian anchovy. The catch of Peruvian anchovy in 1970 was 13.1 million t, 60 percent of the world small pelagic catch of 21.4 million t. Obviously, significant changes in that stock had a major impact on the total world catch of small pelagic species. Catches are now more widely diversified over several different stocks in different areas. The most important small pelagic

<sup>4</sup>Eventually, of course, most of the animals are slaughtered for human consumption, so even fishmeal production does increase food production. The increase of poultry and livestock produced, however, will only be a fraction of the amount of fish used to produce the fishmeal.

<sup>5</sup>Cods are the only major species group used primarily for direct human consumption that has increased more than 5 percent since 1980.

Table 5.—World catch increase of major species groups, 1980-85.

Name	FAO species group	Changes 1980-85	
		Amt. (10 <sup>6</sup> t)	Percent
Small pelagics	35	5.7	45
Other (unspecified)		3.0	23
Misc. freshwater	13	2.0	16
Cods	32	1.6	12
Jacks/mulletts	34	0.7	5
Tunas	36	0.6	5
Shrimps	45	0.2	2
Redfishes	33	-0.1	-1
Mackerels/snoeks	37	-0.9	-7
Total		12.8	18

taken in 1985 was South American sardine, but its catch of 5.8 million t was only 27 percent of the 21.2 million t of small pelagics taken worldwide. Various small pelagic species react differently to climatic changes. Thus, while Peruvian anchovy declined after the 1972 El Niño, stocks of sardine and mackerel increased. Thus, when stocks are more diversified, fluctuations of one species may, to some extent, be offset by countervailing fluctuations of other species.

### Developed and Developing Countries

A major shift occurred in the harvest of world fishery resources during the 1980's. Developing countries replaced developed countries as the principal world harvesters of fishery stocks (Fig. 3)<sup>6</sup>. The developed countries have traditionally dominated world fisheries. In 1980, developed countries reported a catch of 38.4 million t, or 53 percent of the world total (Table 6). Since 1980, the developed countries have reported only a modest catch increase of 12 percent to 42.9 million t in 1986. The combined effect of overfishing in the coastal waters of developed countries (primarily in the North Atlantic and North Pacific) and the increasing restrictions, placed by developing countries on distant-water fishermen have limited the recent catch

<sup>6</sup>The FAO's definition of developed and developing countries is used. The FAO breakdown is detailed in Table A-5 of the 1985 "Yearbook of Fishery Statistics." Data submitted by some developing countries should be considered rough estimates as they are often computed without an extensive data collection system.

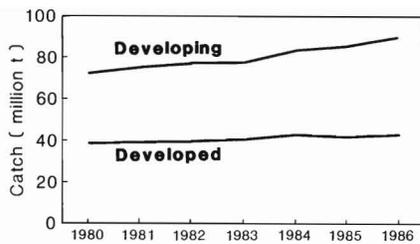


Figure 3.—Fisheries catch by type of country, 1980-86.

increases of the developed countries. Developing countries, on the other hand, achieved a catch of 46.7 million t by 1986, or 52 percent of the world total. The 1986 catch of the developing countries was nearly 40 percent over 1980 levels. (From 1967 to 1971 the total catch of the developing countries increased sharply because of massive catches of Peruvian anchovy.) The steadily expanding catch of Chile and Peru and the rapidly expanding fisheries of several developing Asian countries account for most of the increase. Many developing countries, however, have not participated in this expansion. Few African countries, for example, have increased their catch since 1980, even though fish is a critical component of the diet in many of them.

#### Type of Industry

The economic organization of the major fishing countries varies sharply (Table 7). The two leading countries are classic examples of private (Japan) and state-owned (Soviet Union) fishing industries. Japan's fishing industry is the most modern in the world, efficiently providing food and jobs to Japan as well as tax revenues to the Government. In recent years, however, the Government has increasingly funded programs to assist Japanese fishermen adjusting to the ever tightening restrictions on distant-water fishing. The Soviet fishing industry, only slightly less productive than the Japanese, is markedly less efficient.

A rough estimate of the relative efficiencies of the two countries can be obtained by comparing their fleets. The Soviets, in 1986, reported a fleet of

2,800 fishing vessels totaling 3.7 million gross tons. The Japanese, on the other hand, exceeded the Soviet catch with a much smaller fleet, about 2,700 vessels totaling only 0.9 million gross tons. Precise data are not available on the profitability of the Soviet fishing industry, but it is widely believed that the real cost of the fish produced by the Soviets could not be justified by market-based prices. (An accurate comparison of the two countries would require a much more detailed assessment including differences in fleet deployment, target species, operating costs, markets served, and many other factors.)

The predominant pattern for fishing industries is private companies. Of the 16 leading countries in 1986, 11 with over 60 percent of the world catch had basically privately owned industries (Tables 7, 8). Three countries with 30 percent of the catch had state-owned industries. Only one major fishing country (Peru) had a mixed fisheries economy with ownership by both private and state-owned companies.

#### Pollution

Environmentalists warn that increasing levels of pollution may adversely affect fisheries production. The United Nations Environmental Program (UNEP) has attempted to address the oceanic pollution problem through its Regional Seas Program, but most observers continue to report rising levels of pollution in the world's oceans. Some small fisheries have been impaired, especially freshwater fisheries and estuarine-dependent coastal fisheries. Marine

Table 6.—World fisheries catch, by type of economy<sup>1</sup>, 1980-86.

Year	Catch (10 <sup>6</sup> t)		Total
	De-veloped	Under-developed	
1980	38.4	33.8	72.1
1981	39.0	35.8	74.9
1982	39.4	37.4	76.8
1983	40.4	36.9	77.3
1984	42.7	40.7	83.4
1985	41.9	43.6	85.5
1986	42.9	46.7	89.6

<sup>1</sup>Developed and developing countries are identified in Table A5 of the 1985 edition of the FAO "Yearbook of Fishery Statistics."

Table 7.—Catch and industry data for major fishing countries, 1986.

Country	Catch		Type of industry
	Amt. (10 <sup>6</sup> t)	Share <sup>1</sup>	
Japan	11.9	13%	Private
U.S.S.R.	11.1	12	State owned
China	7.3	8	State owned
Chile	5.6	6	Private
Peru	5.3	6	Mixed
United States	4.9	5	Private
Korea (ROK)	3.1	3	Private
India	2.8	3	Private
Indonesia	2.5	3	Private
Thailand	2.1	2	Private
Norway	1.9	2	Private
Philippines	1.9	2	Private
Denmark	1.8	2	Private
Korea (DPRK)	1.7	2	State owned
Iceland	1.6	2	Private
Canada	1.5	2	Private
Other	22.6	25	
Total	89.6		

<sup>1</sup>Percentage of the total world catch.

Table 8.—World fisheries catch of major fishing countries by economic organization, 1986.

Type of industry	Catch <sup>1</sup> (10 <sup>6</sup> t)	Per-centage
Private	41.6	62
State owned	20.1	30
Mixed	5.3	8
Total	67.0	100

<sup>1</sup>Only the catch of the major fishing countries detailed in Table 9 are computed in this table. These countries represent about 75 percent of the world catch.

debris, especially "persistent" plastic materials, is causing increasing mortalities of several marine mammals, sea turtles, birds, and other marine life. Environmentalists, however, have not yet compiled conclusive evidence to substantiate their concerns regarding damage to the major marine fish stocks such as Alaska pollock, capelin, Japanese or Chilean sardine (FAO refers to some sardines as pilchards), or others as a result of marine pollution.

The world fisheries catch has expanded during the 1970's and 1980's despite increasing levels of pollution. Increases have been reported even in heavily polluted areas. For example, the Mediterranean is probably the FAO area most heavily polluted, but catches there

increased from 1.6 million t in 1980 to 1.9 million t in 1985. Some observers warn that pollution is affecting fish stocks, but the impact, if any, has so far been masked by other factors. Fish stock abundance has apparently been affected less profoundly by pollution than the combined effects of increasing fishing effort and climatic variations. The effects of these two variables may be masking the more limited impact of pollution on important marine stocks. Considerable caution should be used in using global catch statistics to assess the impact of pollution. Most of the increased fisheries catch since 1980 has come from a small number of small pelagic stocks (Table 5). A thorough examination of the pollution problem would have to assess possible impact on the much larger number of traditional species for which catches have increased only marginally despite substantially increased fishing effort (Table 5).

While scientists have yet to prove that substantial declines in catches of major marine species have been caused by pollution, there is mounting evidence that some marine stocks are being affected. While the catch of cods as a group has increased since 1980 (Table 4), scientists are increasingly concerned over Atlantic cod (Table 3). Atlantic cod catches have declined from 2.2 million t in 1980 to only 1.9 million t in 1985.

Pollution does result in the contamination of some fishery resources. However, concerns over product safety are for the most part limited to freshwater fish and marine or near-coastal species subject to incidental exposure to industrial and agricultural chemicals such as PCB's and pesticides. It should be noted also that many of the species likely to be affected are caught by recreational fishermen and may not be of major commercial importance. Individual countries vary in the extent to which they are alert to these problems. Some countries provide effective consumer protection through the issuance of public health advisories and, if judged necessary, by closure of selected fisheries. Action levels for specific contaminants are set with the added insurance of large safety factors, usually several orders of magnitude.

Table 9.—World fisheries catch by regions, 1980-86.

Region	Catch (10 <sup>6</sup> t)							Percent increase 1980-86
	1980	1981	1982	1983	1984	1985	1986	
Asia	30.1	31.5	32.3	34.0	36.0	36.7	38.2	27
Latin America	9.6	10.3	11.4	9.2	12.0	13.6	15.6	62
Europe	12.5	12.5	12.2	12.6	12.9	12.6	12.3	-2
U.S.S.R.	9.5	9.6	10.0	9.8	10.6	10.5	11.1	17
North America	5.1	5.3	5.5	5.7	6.2	6.3	6.6	29
Africa	4.1	4.3	4.1	4.4	4.1	4.1	4.2	2
Middle East	0.8	0.9	0.9	1.0	1.0	1.0	1.0	25
Oceania	0.5	0.5	0.5	0.6	0.6	0.6	0.6	20
Total <sup>1</sup>	72.1	74.9	76.8	77.3	83.4	85.5	89.6	24

<sup>1</sup>Totals may not agree because of rounding.

### Geographic Regions

The world fisheries catch is dominated by Asian<sup>7</sup> fisheries (Table 9). Asian fishermen caught 38.2 million t of fish and shellfish in 1986, nearly 40 percent of the total world catch (Fig. 4). The most rapidly growing area, however, is Latin America, and catches in that region, especially in the Pacific, have grown over 60 percent since 1980 (Table 9a), primarily because of steadily increasing catches of small pelagic species by Chile, Peru, and Ecuador. Major developments in each of the important world fishing regions are given below.

#### Asia

Asian countries dominate the world fishing industry, accounting for over 40 percent of the total world catch in 1986 (Table 9). The Asian catch increased by 4 percent over the 1985 catch and has increased by over 25 percent since 1980. One of the most significant developments in Asia during the 1980's has been the steady increase of important aquaculture industries. At first, farmers in developing countries targeted low-valued

<sup>7</sup>The Branch has chosen to assess fishery catch developments by continent because of interest in national developments. Such an analysis, however, is not a good way of organizing biological trends, especially for regions such as Asia and Latin America which have coasts spanning two or more oceans. An assessment by ocean region could provide useful insights, but for the purposes of this study this subject has been addressed only briefly. Note also that the following data is calculated on the basis of the flag of the fishing vessel, and not where the fish was caught. In some regions, especially Africa, the regional catch total would be much higher if the catch of the distant-water countries operating off Africa was added to the regional total.

Table 9a.—World fisheries catch increase, 1980-86.

Region	Percent increase (1980-86)	Region	Percent increase (1980-86)
Latin America	62	U.S.S.R.	17
North America	29	Africa	2
Asia	27	Europe	-2
Middle East	25		
Oceania	20	World average	24

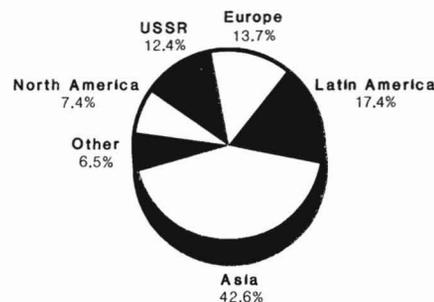


Figure 4.—World fisheries catch by region, 1986; total for 1986 was 89.6 million t.

species for local consumption, but many others increased the production of high-valued species for luxury markets. The most spectacular development has been the massive expansion of the pond-shrimp industry. The Branch estimates that Asian shrimp farmers harvested about 260,000 t of shrimp in 1986, nearly a 400 percent increase from the 55,000 t harvested as recently as 1982. The leading shrimp farming countries

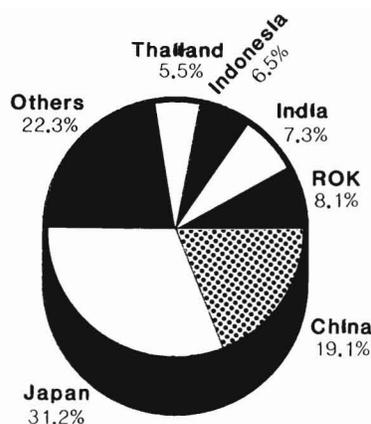


Figure 5.—Asian fisheries catch by country, 1986; total for 1986 was 38.2 million t.

are China, Taiwan, Indonesia, the Philippines, and India.

Japan is the single most important Asian fishing country, but the region's catch is divided among seven other major countries: China, South Korea (ROK), India, Indonesia, Thailand, the Philippines, and North Korea (DPRK) (Fig. 5). Eight of the world's 16 leading fishing countries are Asian (Table 7). These eight countries accounted for

87 percent of the 1986 regional catch. All of these countries, except for Thailand and the Philippines, reported catch increases in 1986. The fishing industry plays a much more important economic role in these countries than is the case for the United States or European countries. In Japan, for example, about half of the animal protein consumed is derived from marine organisms.

Asian countries reported several major developments in 1986. Japan harvested a near record 11.9 million t and reported increased aquaculture production and offshore catches, especially of sardines. China reported steady growth in all sectors of the fishing industry. The 7.9 million t catch increased 7 percent and included impressive increases in marine and freshwater fisheries and aquaculture. Chinese Government officials are projecting a catch of 9 million t by 1990, primarily as the result of increased aquaculture production. The ROK 1986 catch totaled 3.1 million t, an impressive 15 percent increase over 1985 results. Much of the ROK increase was due to the country's expanding U.S. joint venture fishery and entry into the squid fisheries of the North Pacific and Southwest Atlantic. The country's aquaculture

industry has also continued to grow steadily.

India's catch of 2.8 million t has changed little since 1984, with most of the marine catch coming from heavily exploited inshore waters. The Indian Government has been trying to promote a deep-sea fishery since 1968, but has had only limited success. Indonesia reported a 1986 catch of 2.5 million t, an increase of 9 percent over the 1985 catch. Indonesia, like India, depends on artisanal fishermen using traditional methods for most of its catch. The 1986 increase was primarily due to the gradual mechanization of the Indonesia fleet, extending its range to more distant coastal fishing grounds. Government officials believe that the country can significantly expand the fisheries catch to as much as 8 million tons.

Thailand and the Philippines both experienced slight declines in 1986. Thai grounds are heavily fished and Thai fishermen are having increasing difficulty maintaining their fisheries off other countries. Filipino fishermen have some of the same problems and may be feeling the effect of using such destructive fishing practices as using dynamite and cyanide. Much of the decline in the Filipino catch is being offset by the steady growth in the country's aquaculture industry.

### The Taiwanese Fishing Industry

Taiwan's 1986 fisheries catch totaled a record 1,095,000 t, nearly a 6 percent increase over the 1985 catch of 1,038,000 t. The value of the 1986 catch increased even more (by over 18 percent) to almost \$2 billion. The deep-sea fisheries catch, over 45 percent of the total, was nearly 500,000 t. Inshore, coastal, and aquacultural production totaled 276,000 t, 55,000 t, and 266,000 t, respectively.

Taiwan exported 265,000 t of seafood in 1986, valued at \$1.2 billion, an increase of 19 percent by quantity and 43 percent by value over 1985 exports. (The large increase in value reflects, in part, the fact that the new Taiwan dollar appreciated by 13 percent against the U.S. dollar in 1986.) Shrimp, eel, and tuna continued to be the three major fishery export commodities, comprising a combined 43 percent by quantity and 76 percent by value of total 1986 fishery

exports. Japan was by far the largest purchaser of Taiwan's fishery products, followed by the United States, Australia, Saudi Arabia, Hong Kong, Italy, and the Federal Republic of Germany. The American Institute in Taiwan has prepared a 28-page report on Taiwan's fishing industry in 1986-87 containing a general outline and sections on the fisheries catch, fleet, processing capability, development plans, trade, and international agreements. The report also includes a brief section describing opportunities for U.S. exporters of fishery products and equipment. U.S. companies can obtain a copy of this report for \$12.95 plus a \$3.00 handling fee (personal check or money order) by ordering report number PB88-209002/GBA from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

### Latin America

Latin American countries report the world's second most important fisheries catch, representing nearly 20 percent of the world total. Over 80 percent of the Latin American catch is taken in the Pacific. Catches totaled 15.6 million t in 1986, a 15 percent increase over the 13.6 million t taken in 1985. The 15.5 million t total does not include the more than 1.0 million t taken by distant-water countries (primarily the U.S.S.R., Poland, and Japan) off various Latin American countries (primarily Argentina, Chile, and Peru). Latin American catches increased in 1986 to a level approaching the record regional catch levels taken before the collapse of the Peruvian anchovy fishery in 1972.

Two countries, Peru and Chile, dominate Latin American fisheries (Fig. 6). Chile is the leading country with a catch

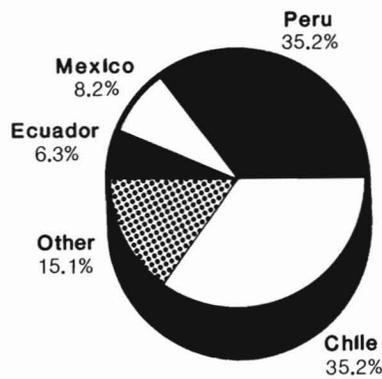


Figure 6.—Latin American fisheries catch by country, 1986; total for 1986 was 15.6 million t.

totaling 5.6 million t in 1986, followed by Peru with a catch of 5.3 million tons. The two countries combined accounted for 70 percent of the regional total. Almost all of the Latin American 1986 increase was the result of increased harvests by these two countries. Over 90 percent of the Chilean and Peruvian catch is sardine, anchovy, jack mackerel, and horse mackerel which is reduced to fishmeal. Peru reported substantially increased anchovy catches in 1986. Anchovy was the mainstay of the Peruvian fishing industry during the 1960's and early 1970's, but had declined to negligible levels in 1985. The Chilean increase was also due to increased anchovy catches, as the sardine and jack mackerel declined. Other important fishing countries in the region include: Mexico (1.3 million t), Ecuador (1.0 million t), Brazil (0.9 million t), and Argentina (0.4 million tons).

A few species dominate the Latin American catch. Latin American countries primarily harvested massive quantities of the reduction species mentioned above. Fishermen also conduct smaller fisheries, but in some cases more valuable ones, for hake, tuna, shrimp, and lobster. A wide variety of other species are caught in smaller quantities.

Several countries reported major fishery developments in 1986. Mexico significantly expanded its tuna industry, and now operates one of the world's most modern tuna fisheries. Ecuador

reported record results in its pond shrimp industry which allowed it to become the second most important source of shrimp imported by the United States. Many observers believe that Ecuador may replace Mexico as the major source of U.S. imported shrimp in 1987.

Argentina achieved encouraging results because of a strengthening international market for groundfish, the country's principal fishery, but fishermen reported a declining shrimp catch. Argentine companies complained of increasing competition with the foreign companies operating off the Falklands. The British announced in 1986 that they planned to begin managing fishery resources off the Falklands. Chilean farmers have begun to harvest salmon; while harvests are still small, some observers believe it could develop into an important new fishery. Peru reported a sharp drop in its new scallop fishery, but Panama reported an increase. At the end of 1986, several Eastern Pacific countries began to report a mild El Niño event, but it apparently had little impact on year-end results. The event was centered in waters off Ecuador and

northern Peru. Preliminary reports suggested that the 1987 catch of several countries might have been significantly affected.

## Europe

European fishermen caught 12.3 million t of fish and shellfish in 1986, making Western Europe the third most important fishing area in the world. European catches, unlike those of many other regions, have remained stable during the past 7 years, ranging from a low of 12.2 million t in 1982 to a high of 12.9 million t in 1984. The major fishing countries are the Scandinavian countries and Spain (Fig. 7).

### Eastern Europe

Eastern European countries harvested almost 1.4 million t of fish and shellfish in 1986, or over 35 percent more than in 1970 when the total catch amounted to only 1.0 million tons (Table 10). The most important country is Poland, which harvested 0.6 million t, nearly half of the total for the entire region. The Poles consume about 17 kg per capita of fishery products annually,

## Peruvian Fisheries, 1986-87

Peru's 1986 fisheries catch totaled 5.5 million t, a 34 percent increase over the 1985 catch, mostly generated by a 300 percent increase in the anchovy catch. The catch of other major species declined. Fishery exports in 1986 were 780,000 t, an increase of 13 percent, mostly because of increased fish meal production. Fish meal exports accounted for about 8 percent (\$200 million) of Peru's total 1986 export earnings. The Peruvian Government, in early 1987, initiated a Fisheries Reactivation Fund aimed at rebuilding the fleet and upgrading the equipment of the artisanal fishermen. The Fund will be financed by a 5 percent tax on the fishmeal exports earnings of the private companies.

The Government plans to increase nontraditional exports, including frozen shrimp and scallops, by making credit available and improving the management of these resources. The Peruvian Government is also promoting domestic con-

sumption of fishery products by creating a state-owned fishing fleet (FLOPESCA) and negotiating joint venture agreements with distantwater-fishing countries. The U.S. Embassy in Lima has prepared an 18-page report reviewing the status of the Peruvian fishing industry in 1986 and 1987. The report covers the 1986 fisheries catch, impact of the fishing industry on the economy, state-owned companies, domestic consumption, modernization of the fleet, fishmeal production, new initiatives (shrimp and scallops), joint ventures (Cuba and the U.S.S.R.), 1987 projections, and implications for U.S. exporters. The report includes statistical tables, with data available up to June 1987. U.S. companies can obtain a copy of the report "Peru: Annual Fisheries Report, 1986-87" for \$12.95 and a \$3.00 handling fee (total \$15.95, personal checks or money orders only) by ordering report PB88-205422/GBA from NTIS, Springfield, VA 22161.

the highest in Eastern Europe. Most of the Polish catch is taken by the country's distant-water fleet which extended its operations in the southern Atlantic.

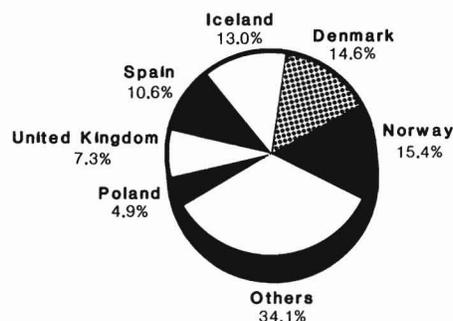


Figure 7.—European fisheries catch by country, 1986; total for 1986 was 12.3 million t.

The Poles currently conduct a major fishery for squid and southern blue whiting off the Falklands.

Bulgaria, East Germany (GDR), and Romania also obtain most of their fisheries catch from distant-water operations. Most of the Eastern European catches peaked in 1975 before the extension of 200-mile zones by many coastal countries. The major exception is Ro-

mania, whose catch has more than doubled since 1975. Yugoslavia and Albania, unlike the other Eastern European countries with marine coasts, fish primarily in coastal Adriatic waters. Both countries report only small catches. The isolationist tendency of Albania has discouraged the development of a fishing industry. Landlocked Hungary and Czechoslovakia harvest a

Table 10.—Eastern European fisheries catch, 1970-86.

Country	Catch (10 <sup>6</sup> t)					Population in millions (1986)	Consumption (kg per capita)
	1970	1975	1980	1985	1986		
Poland	469.3	800.7	640.6	683.5	645.2	37.2	17.3
Romania	58.6	136.6	173.6	237.6	271.1	22.7	11.9
E. Germany (GDR)	321.8	376.2	235.3	197.7	208.9	16.7	12.5
Bulgaria	95.6	158.1	126.4	100.2	109.2	9.0	12.1
Yugoslavia	46.2	56.6	58.4	75.0	77.6	23.1	3.4
Hungary	26.0	30.8	33.7	36.9	36.1	10.6	3.4
Czechoslovakia	13.4	16.9	16.0	19.8	20.7	15.5	1.3
Albania	4.0 <sup>1</sup>	4.0 <sup>1</sup>	4.0 <sup>1</sup>	4.0 <sup>1</sup>	4.0 <sup>1</sup>	3.1	1.3
Total	1,034.9	1,579.9	1,288.0	1,354.7	1,372.8	137.9	10.0

<sup>1</sup>Estimated

## FRG SEAFOOD MARKET, 1986

The demand for fishery products in the Federal Republic of Germany (FRG) has increased from \$1.0 billion in 1985 to \$1.5 billion in 1986, and could exceed \$2.0 billion by 1990. German per capita consumption of fishery products rose from 11.8 kg in 1985 to 13.2 kg in 1986 because of greater consumption of frozen fish by private households, institutions, and "fast-food" restaurants. In 1986, frozen fish outsold fresh fish for the first time. Purchases of frozen fish products, particularly frozen fish sticks and fish fillets, are expected to continue and to contribute to growth in the German fish consumption.

Landings by the FRG fleet during 1986 decreased to 201,000 t from 229,000 t in 1985. Fishery landings are expected to decline to 185,000 t by 1990 due to the reduction of the fleet, which now consists of 7 fresh fish trawlers and 5 stern factory trawlers. As a result, imports will continue to supply most of the rapidly increasing German demand for fishery products. Fish and seafood imports in 1987 are expected to reach \$1.1

billion compared with \$0.6 billion in 1985. Imports of fishery products from the United States amounted to only \$8 million in 1986. On the other hand, the United States imported \$75 million worth of fishery products from the FRG in 1986. The U.S. Consulate General in Hamburg has prepared a 9-page report reviewing the market for fishery products in the FRG. The report includes statistical tables of landings, trade, and consumption, and lists of trade fairs, trade associations, and trade publications. U.S. companies can obtain a copy of "The Federal Republic of Germany's Seafood Market, 1986" for \$9.95 and a \$3.00 handling fee (total of \$12.95, personal checks or money orders only) by ordering report PB88-114582/GBA from NTIS, Springfield, VA 22161.

## Fish Consumption Grows in France

French consumption of fresh, frozen, and otherwise processed fish and shellfish during 1984 increased to some 680,000 t, or 11 kg per household. This 4 percent increase continues an upward trend observed since 1979. Sales of

frozen seafood increased by 10 percent, while sales of smoked, dried, or salted seafood rose by 4 percent. Of the total fishery market, whole fresh fish represent over half of sales. Particularly important species are whiting, pollock, cod, hake, and sardines. Traditional methods of marketing fish in France (fishmongers, open markets) have given way to dominance by large supermarkets. During 1984, supermarkets handled more than one-fourth of all the whole fresh fish sold in France and 37 percent of the fresh fillets.

Despite steadily decreasing inflation in France since 1982, the average retail price for fish has increased more than 18 percent from 1984 to 1985, due to higher transportation and storage costs. The U.S. Embassy in Paris has prepared a 9-page report reviewing the French market for fishery products during 1984, including data on sales, pricing, and distribution of seafood. U.S. companies can obtain a copy of "The French Fishing Industry, 1984" for \$9.95 and a \$3.00 handling fee (total \$12.95, personal checks or money orders only) by ordering report PB88-114640/GBA from NTIS, Springfield, VA 22161.

small catch from inland waters and growing fish culture operations.

### Western Europe

Increases in catches have taken place mostly in Iceland, the Netherlands, and Ireland, while decreasing in Norway, the Federal Republic of Germany, Spain, and Portugal. The decline in the Western European catch was caused by over-fishing, stricter enforcement of regulations in the heavily fished European waters, and the loss of traditional distant-water fishing grounds. Of particular concern to many European nations has been the decline in popular species such as Atlantic cod, saithe, and haddock catches in the North Sea. The discovery of rich squid fishing grounds off the Falkland Islands has helped maintain catch levels for the Spanish fleet, which has been particularly hard-hit in recent years. The European Community (EC) is actively seeking new fishery agreements with developing nations around the world which will permit EC vessels to continue fishing.

### U.S.S.R.

The U.S.S.R. is the world's second most important fishing country. The Soviets reported a 1986 catch of 11.1 million t, a 6 percent increase from the 10.5 million t reported in 1985. (This does not include the fish taken by U.S.

Table 11.—The U.S.S.R. fisheries catch, 1976-86.

Year	Catch (1,000 t)	Change <sup>1</sup>	
		Tonnage	Percentage
1976	10,121	157	1.6
1977	9,351	-770	-7.6
1978	9,000	-351	-3.8
1979	9,049	49	0.5
1980	9,476	427	4.7
1981	9,546	70	0.7
1982	9,957	411	4.3
1983	9,757	411	-0.2
1984	10,593	836	8.6
1985	10,523	70	-0.1
1986	11,100	567	5.4
10-Year change		+979	+9.7

<sup>1</sup>Change from previous years, in 1,000 t and percentage.

fishermen and then sold over-the-side to the Soviets. These joint venture purchases provided the Soviets an additional 223,000 t in 1986.) The Soviet Union has invested massively in developing its high-seas fisheries for both economic and strategic reasons.

From a relatively small catch of about 1 million t in the 1920's, Soviet fishermen expanded their operations into all of the world's oceans and harvested over 11 million t of fishery products in 1986 (Table 11). The Soviets first reached the 10 million t harvest in 1975, before most major coastal countries extended their fisheries jurisdiction to 200 miles (Fig.

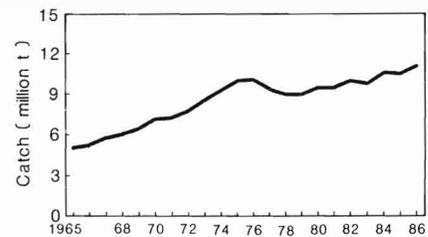


Figure 8.—Soviet Union fisheries catch 1965-86.

8). In the years that followed, many coastal fishing countries severely limited (the United States and Canada) or prohibited (the EC) Soviet fishing operations. Soviet fishermen developed a reputation for ruthless exploitation of fishery resources and many coastal countries extended their coastal jurisdiction to 200 miles to protect their coastal resources from Soviet and other distant-water fishermen. As a result, the Soviet fisheries catch decreased by over 11 percent during 1977-78 and did not reach the 10 million t level again until 1984 (Table 11).

The Soviets were much slower than the Japanese in countering the limiting effects of extended jurisdiction by concluding joint-venture and fisheries-assistance agreements. Their state-owned company, Sovrybflot, though ad-

## Norwegian Salmon Exports

Norwegian fish farmers seem set to break all previous records in farmed salmon exports. Total exports for 1988 could well outstrip last year's figures by as much as US\$166 million, according to the Norwegian Information Service, Norinform. Production and exports have soared so far this year, and the final export figure for 1988 will be between US\$500 and 590 million.

First quarter sales figures showed a first-hand turnover of US\$107 million, compared with US\$67 million last year. Production in the same quarter was 15,625 tons, against 11,720 million tons in the same period last year. Information officer Odd Ustad in the central sales organisation for fish farmers says

that favorable temperatures have stimulated growth, and that the major disease problems appear to be under control. Demand in the markets is high, with France retaining its first place as recipient of Norway's farm salmon.

## Norwegians Target Antarctic's Krill

Three Norwegian firms are planning to harvest the bountiful supplies of krill in the Antarctic to sell to the United States, Great Britain, and Japan, according to the Norwegian Information Service. Millions of dollars will be invested in projects which are scheduled to be under way as early as autumn 1988, when giant factory ships will move south to start the fishing.

The high-protein, shrimplike krill can, according to Norwegian sources, be eaten plain, ground into forcemeat, or served as krill "sticks." It can also be used as a coloring matter for other foods such as trout, salmon, and sausages. Furthermore, krill oil, rich in polyunsaturates, could be useful to the pharmaceutical industry, as a possible rival to cod liver oil, Norinform reports. About 200-250 tons of krill per day is believed a realistic target and the Norwegians believe that there will be no danger of depleting the enormous resources for "many years." However, they also warn that if the supplies of krill, the main food of seabirds and whales, were to be threatened, the entire ecological balance of the oceans could be disrupted.

ministered by capable and experienced managers, was saddled with numerous regulations and bureaucratic inefficiencies that are so prevalent in Soviet operations with foreign companies. This may change now that former Minister of Fisheries (V. M. Kamentsev) was appointed by General Secretary Gorbachev to become not only a member of the Soviet Council of Ministers, but also Chairman of the Federal Foreign Economic Commission. In this latter capacity, Kamentsev will oversee and determine the policy of joint ventures with foreign countries and companies.

One important trend in Soviet fisheries since 1980 has been an increasing reliance on coastal waters. Soviet catches in coastal waters (FAO areas 18, 27, and 61) totaled 6.7 million t in 1985, a 30 percent increase over the 5.1 million t reported in 1980. All of the increase has occurred along the Soviet Pacific coast as catches along the heavily fished Atlantic and Barents Sea coast have declined and catches along its northern Arctic coast are negligible. The Soviets have also shifted their fishing industry from the Atlantic to the Pacific (Fig. 9). Soviet fishery harvests (by FAO fishing area) have changed greatly during the last decade. In 1975, the Soviet Atlantic catch (5.0 million t) was more than twice the Pacific catch (2.2 million t). By 1985, this relationship had totally changed and the Soviet Pacific catch, at 6.2 million t was 50 percent larger than the Atlantic catch of 4.1 million t (Table 12).

The Soviet Atlantic catch has decreased in all regions, except the Southeast Atlantic (FAO area 47) off Namibia and Angola where the Soviets operate under the International Commission for Southeast Atlantic Fisheries (ICSEAF) regulations. In the Northwest Atlantic (FAO area 21), the Soviet catch has declined over 1.0 million t between 1975 and 1985 as the United States and Canada extended their fisheries jurisdiction to 200 miles and severely reduced distant-water fishing. In the Northeast Atlantic (FAO area 27) the Soviet catch has declined another 1.2 million t because of declining stocks and the fishing regulations enforced by the European Community (EC) and several

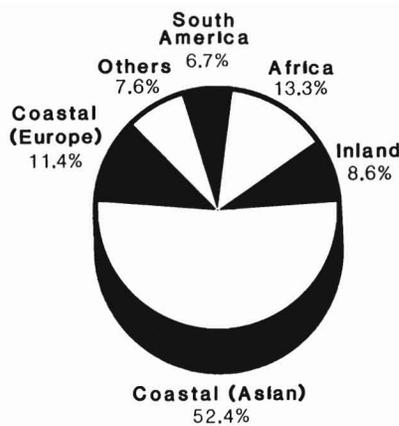


Figure 9.—Soviet Union fisheries catch by area, 1985; total for 1985 was 10.5 million t.

coastal countries. The Soviet fishery in that area is now limited to the Barents Sea and international waters between Iceland and the Svalbard Islands. Worried by a tottering resource base and the Soviet penchant for relentless overfishing, the EC has permitted no Soviet fishing since extending their coastal zone to 200 miles in 1977.

In the Western Central Atlantic (FAO area 31), the Soviet catch has always been small and proved such an economic burden that they abandoned it in 1977. The Soviets, however, retain a vessel repair and transshipment operation in Havana, Cuba. In the Eastern Central Atlantic (FAO area 34), the Soviets conduct one of their most important distant-water operations aided by bilateral agreements with several African countries and by fishing in the coastal waters of several countries with which they have no such agreements. Few African countries have effective surveillance and enforcement capabilities.

In the Pacific, the largest Soviet fishery has historically been conducted off their own coasts and the adjacent waters of the Bering Sea and Northwest Pacific (FAO area 61). The catch in this area has doubled during the past 10 years, but it remains greatly, and possibly dangerously, dependent on a single species, the Alaska pollock. The Soviet pollock catch, amounting to 3.3 million t in 1985, or 30 percent of the entire Soviet catch in that year. It is landed in Siber-

Table 12.—U.S.S.R. fisheries catch for selected years by major fishing areas, 1970-85.

Fishing grounds	FAO area	Catch (1,000 t)			
		1970	1975	1980	1985
Inland waters	7	855	944	753	906
Black Sea	37	303	350	391	345
Atlantic					
Northwest	21	812	1,167	108	133
Northeast	27	1,566	2,406	1,984	1,239
W. Central	31		69		
E. Central	34	613	1,166	942	708
Southwest	41	421	9	28	71
Southeast	47	423	421	825	698
Subtotal		4,993	6,532	5,031	4,100
Indian Ocean					
Western	51			37	32
Eastern	57				1
Subtotal				37	33
Pacific					
Northwest	61	1,448	2,719	3,196	5,462
Northeast	67	748	573	59	11
W. Central	71			4	10
E. Central	77	20	31		1
Southwest	81		45	70	66
Southeast	87			552	624
Subtotal		2,216	3,368	3,881	6,174
Antarctic					
Atlantic	48			424	188
Indian Ocean	58			103	28
Pacific	88				
Subtotal				527	216
Grand total		7,209	9,900	9,476	10,523

Source: FAO "Yearbook of Fishery Statistics," various years.

ian ports and then primarily shipped by rail to population centers in the western part of the country where it is marketed to Ryba and other retail stores. Few other Pacific grounds are important to Soviet fishermen, except for the Southeast Pacific where the Soviets fish outside the 200-mile zones of Peru and Chile. Efforts to gain access to coastal waters failed when the Allende Government fell in Chile during 1973 and when the Peruvians refused to renew joint venture agreements in 1985.

In the Antarctic, the Soviets have attempted to initiate a krill fishery, and catches reached a record 0.5 million t in 1982. The operation, however, proved difficult and costly, and Soviets had difficulty marketing krill products. Catches declined sharply in 1983 and in 1985 totaled only 0.2 million tons. The Soviets announced in late 1987 some technical innovations which they believe

will make it easier to process krill. If successful, these innovations may justify an increase in Antarctic fishing effort in coming years.

In the Black Sea and inland waters, the Soviet fishery has stagnated. The Soviet Union has the potential to become a major producer of cultured fish, yet inland fisheries and cultured production have actually declined in recent years.

### North America

The North American catch totaled 6.6 million t in 1986, a 5 percent increase over the 6.3 million reported in 1985. Data on the U.S. and Canadian fish catch are illustrated in Figure 10. Geographically, Mexico is located on the North American continent, but for sociological reasons, the Mexican catch has been included in the Latin American totals.

#### United States

The U.S. fish catch hit 4.9 million t in 1986, a 2 percent increase from the 4.8 million t reported in 1985<sup>8</sup>. While the overall catch increase was not large, specific fisheries exhibited some sharp fluctuations. Catches of Alaska pollock, shrimp, and crab increased, but catches of other important species such as menhaden, Pacific salmon, and cod declined. A variety of resource and marketing problems caused most of the declines. The salmon catch declined after records set in previous years, but 1986 was still above normal.

#### Canada

Canada's fisheries catch is slowly recovering, following a period of decline caused by heavy fishing off Canada's Atlantic coast. During 1986, Canadian fishermen caught 1.4 million t of fish and shellfish, an increase of 16 percent over the 1.2 million t caught in 1980. Canada's most important fishing grounds lie off the Atlantic coast, contributing 1.2 million t, or two-thirds of the total catch. Top groundfish and pelagic spe-

<sup>8</sup>The preliminary U.S. catch data reported by FAO differs from "Fisheries of the United States, 1986," primarily because FAO calculates the live weight of mollusks while the United States calculated only the weight of the edible meats.

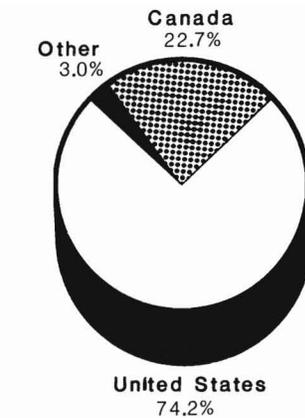


Figure 10.—North American fisheries catch, 1986; total for 1986 was 6.6 million t.

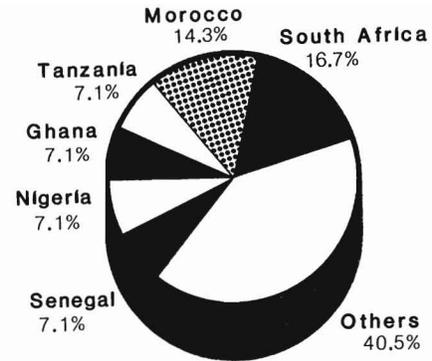


Figure 11.—African fisheries catch, 1986; total for 1986 was 4.2 million t.

cies landed in 1986, by quantity, were Atlantic cod (457,000 t), Atlantic herring (177,000 t), various flatfishes (85,000 t), redfish (75,000 t), and capelin (65,000 t). The top mollusk and crustacean species, by quantity, were scallops (56,000 t), snow crab (42,000 t), and lobster (35,000 t).

The International Court of Justice decision to award the disputed rich fishing grounds off Georges Bank to Canada (prior to this decision, both the United States and Canada were allowed to fish in the contested area off of Georges Bank), strict enforcement measures on fishing by domestic and foreign fleets in Canadian waters, and rigid management plans imposed on the stocks, have helped to increase Canadian catches in recent years, although many stocks remain depressed. Despite lower catches, the value of Canadian fishery landings has helped produce record incomes for Canadian fishermen, thanks to the strong demand for fishery products in the United States and on world markets. In 1986, the Canadian catch was valued at almost C\$1 billion.

### Africa

The African fisheries catch has fluctuated between 4.1 and 4.4 million t since 1980. The 1986 catch was 4.2 million t, up slightly from the figure reported in 1985. African countries report a very small part of the world fisheries catch. In 1986, the African

catch comprised only 5 percent of the world total, down 6 percent from 1980. The decline is a result of expanded fisheries in other areas, while African fisheries have experienced little growth. African catch data, however, do not include the extensive distant-water catch of the Soviet Union and other countries off the continent. The distant-water catch in 1985 totaled about 2.8 million t, which comprises about one-third of the total catch taken from African waters.

Seven countries (South Africa, Morocco, Tanzania, Ghana, Nigeria, Senegal, and Uganda) comprised nearly 60 percent of the 1986 African catch (Fig. 11). South Africa and Morocco are the two most important countries, and they accounted for about 25 percent of the African total, with 1986 catches of 0.7 million t and 0.6 million t, respectively. In 1985, Cape hake accounted for about 25 percent and anchovy about 40 percent of the South African catch; presumably, the composition of the 1986 catch is similar. In 1986, the sardine fishery supplied over 40 percent of the Moroccan catch, with mackerel accounting for nearly 20 percent. The remaining five countries each had 1986 catches in excess of 0.2 million tons each. South Africa's catch was stable, increasing by only 1 percent in 1986. Morocco's 1986 catch increased 25 percent, primarily because its leading fishery for sardines increased an

impressive 50 percent, according to statistics supplied by Morocco's Institute Scientifique des Peches Maritimes.

### **Middle East**

Middle Eastern fishermen reported a catch of only about 1 million t in 1986. The small Middle Eastern catch is probably a combination of limited resources and lack of interest in developing the available resources. While small by world standards, the 1986 Middle East catch represented an increase of 25 percent over the 0.8 million t taken in 1980. Most of that increase occurred by 1982 and since then the catch has been stable at about the 1 million t level. The leading country in the region is Turkey, with a 1986 catch of 0.6 million tons. The Turkish catch has increased by nearly 35 percent from the 0.4 million t reported in 1980. European anchovy and horse mackerel made up about 70 percent of the catch in 1985.

### **Oceania**

Fishermen in Oceania reported a catch of about 0.6 million t in 1986. The

two major fishing countries are New Zealand (0.3 million t) and Australia (0.2 million t). New Zealand fishermen have reported steady growth since the early 1970's and achieved a new record catch in 1986. Much of the recent increase has come from expanding fishing effort to offshore fisheries and by careful management of the heavily fished coastal resources. Australian fishermen reported catch declines in 1985 and 1986. New management measures enacted to protect heavily fished stocks account for much of the decline.

### **Major Countries**

World fisheries are dominated by 16 major countries which accounted for 75 percent of the catch in 1986 (Table 7). The two leading countries were Japan (11.9 million t) and the Soviet Union (11.1 million t). Other leading countries included China (7.3 million t), Chile (5.6 million t), Peru (5.3 million t), and the United States (4.9 million t). All have reported catch increases since 1980. The Soviet and Japanese increases are interesting as both countries heavily fish

their own coastal waters and have also had to adjust to restrictions on their distant-water grounds by many coastal countries. The large increases reported by Peru and Chile were primarily due to a resurgence of the anchovy stock. While most of the principal fishing countries have reported catch increases in 1986, a few countries have reported declines: Norway (-10 percent), Iceland (-6 percent), and Thailand (-5 percent). The Norwegian trend in particular continues a trend begun in 1978. Major fishery developments in Japan, China, Chile, and Peru follow (U.S.S.R. developments were reported in a previous section).

Japan is the world's leading fishing nation, harvesting over 11.9 million t in 1986 (12.6 million t according to preliminary Japanese Government statistics), 13 percent of the world's catch. The 1986 catch is nearly a 4 percent increase over the 1985 catch of 11.5 million t and is second only to Japan's all-time record catch of 12 million t in 1984. Japan's catch has remained relatively stable since 1983, averaging about 11.7 million t annually.

Increasing enforcement of foreign 200-mile exclusive economic zones has kept Japan's distant-water catch fluctuating around 2.1 million t since 1979, with little possibility for growth. This factor has forced Japan to reevaluate its fishing strategy and to begin to fully develop its offshore and coastal resources, take a renewed look at aquaculture, and seek new fishing agreements with other countries. Although coastal production remained stable in 1986, marine culture and offshore fisheries grew by 9 percent and 5 percent, respectively. Sardines accounted for the largest increase in Japan's 1986 catch. Japanese fishermen caught about 4.5 million t, 9 percent more than in 1985. Sardine harvests in the waters off eastern Hokkaido and northern Honshu (both in the Sea of Japan and the Pacific) increased significantly in 1986. Other important species were Alaska pollock (1.4 million t), and Spanish mackerel (955,000 t); skipjack tuna registered the largest percentage increase in 1986, up 34 percent to 420,000 t.

China is the third largest fishing

### **Iceland's Fish Catch Steady, Value Climbs**

Iceland's fisheries catch reached 1.7 million t in 1986, slightly less than Iceland's record 1985 catch. The value of the catch increased from \$312 to \$458 million. The cod catch again proved plentiful (366,000 t vs. 323,000 t) and the shrimp harvest rose by 44 percent from 25,000 t to 36,000 t, while the capelin catch (used mostly for reduction) declined from 993,000 t to 895,000 t. Large catches, high world prices, low oil prices, and a relatively low rate of inflation made 1986 a prosperous year for the Icelandic fishing industry. The debate over the pros and cons of fresh fish sales to Western Europe continued as representatives of the freezing industry expressed concerns over declining supplies of raw materials to meet demand for processed fishery products, mostly in the United States.

The U.S. market declined to 25 percent of the value of total Icelandic fish

exports in 1986, while the continued growth in Icelandic sales to the United Kingdom makes it Iceland's most important market. The U.S. Embassy in Reykjavik has prepared an 11-page report reviewing Iceland's fisheries in 1986. The report includes sections on Iceland's fish, catch, the debate over fresh versus frozen fish sales, the growth of the United Kingdom market, foreign fishing in Icelandic waters, and the outlook for 1987. The report also includes statistical tables on Iceland's fish catch and how it is utilized, exports of fishery products by destination, exports by product form, exports to the United States, and Iceland's fishing fleet and number of fishermen. U.S. companies can obtain a copy of "Iceland's Fisheries, 1986" for \$9.95 and a \$3.00 handling fee (total of \$12.95, personal checks or money orders only) by ordering report PB88-114566/GBA from NTIS, Springfield, Virginia 22161. (The handling fee is per order, regardless of how many reports are ordered.)

nation in the world, behind the Soviet Union, with a catch of over 7.3 million tons in 1986. The Chinese reported steady growth in all sectors of its fishing industry in 1986. The marine fisheries catch increased by 12 percent, to 3.9 million t. Principal marine species caught were croaker, hairtail, filefishes, mackerel, and shrimp. Equally spectacular growth was recorded by the freshwater fishery sector (+12 percent to 530,000 tons), marine aquaculture (+12 percent to 797,000 t), and freshwater aquaculture (+24 percent to 2.9 million t). Although China is a relative newcomer to high-seas fishing, its distant-water fleet has grown from about a dozen vessels fishing off West Africa in 1985 to over 30 fishing in the economic zones of seven countries by the end of 1986.

Despite this development, the prognosis is not overly optimistic for continued growth of China's marine fisheries sector. China's 1987 marine fisheries catch was expected to remain about the same as the 1986 catch. Chinese Government officials have predicted that fisheries production would reach 9 million t by 1990, with most of the increase coming from aquaculture. The breakthrough is expected to come in marine farming, with an estimated growth rate of over 11 percent per year. Major cultured marine species will include giant sea perch, shrimp, abalone, clams, mussels, scallops, sea cucumbers, and kelp. The main species used in freshwater culture are carp and tilapia.

Chile is the fourth most important fishing country with a 1986 catch of 5.6 million t. The fishing industry has been the fastest growing sector of the Chilean economy over the past 10 years. Officials were relieved that the 1986-87 El Niño did not adversely affect the 1986 catch, but were concerned about declining catches in 1987. Catches of the two most important species over the past few years (sardines and jack mackerel) declined in 1986, but were more than offset by increased anchovy catches. Most of the catch is reduced to fish meal, and Chile has become the world's leading fish meal exporter. Most companies are reporting good results, even though fish meal prices were substantially below

1980 price levels in constant dollars. While the large fish meal companies reported good results, Chilean fishermen reported declining catches in several traditionally important fisheries (shrimp, sea snails, sea urchins, langostinos, and several other valuable shellfish) in 1986. Other fishermen reported several promising developments in 1986, including expanded harvests of cultured salmon, small-scale surimi production, increased krill landings, and expanded landings of high quality fresh fish for the export market.

Peru was the fifth leading fishing country in 1986 with a catch of 5.3 million t. Peruvian fishermen reported a massive 25 percent increase over their 1985 catch. The increase was primarily due to the resurgence of anchovy stocks. Fishermen in northern Peru were affected by the 1986-87 El Niño beginning in late 1986. Fishermen along the central and southern coast did not begin to report catch declines, however, until mid-1987. (It is not known to what extent the declining 1987 catches in Peru and Chile were due to El Niño or other factors such as overfishing.) While the El Niño was affecting 1987 catches, most of Peru's reduction plants and can-

neries reported substantially improved results for 1986. The Government gave special priority to efforts aimed at increasing the catch of edible fish to increase supplies to the domestic market. An agreement was signed with Cuba to permit Cuban distant-water trawlers to operate in Peruvian waters and land their catch in Peru. The Government also provided funding so that the state food fish company, the Empresa Publica de Servicios Pesqueros (EPSEP), could acquire its own fishing fleet. Even though catches increased sharply, several long-standing problems plagued the industry in 1986, including labor strife, unused canning capacity, the inability to reach an agreement with the Soviets on joint ventures, high interest rates, low fish meal prices, and a sharp decline in scallop catches.

### **Aquaculture**

While some have predicted that aquaculture, sometimes referred to as the "blue revolution," would rapidly replace wild capture fisheries (which many expected to decline), this has not proven to be the case. Capture fisheries have not declined, nor has aquaculture begun to account for more than a small share

## *Atlantic Canada's Aquaculture Industry*

Atlantic Canada's 33 commercially viable fish farms produced 1,800 t of mussels, 500 t of salmon, and 110 t of trout in 1986. The leading province in Atlantic Canada's aquaculture industry is Nova Scotia (11 farms), followed by New Brunswick (9 farms), Prince Edward Island (6-8 farms), and Newfoundland (5 farms). In 1986, these aquaculture facilities generated about C\$9 million and it is projected that this amount could be increased 30 times in 10 years.

Many Canadian fish farmers are short on working capital and technical knowledge. Provincial governments have limited themselves to providing technical aid, but not funding. Future expansion of aquaculture facilities is expected to be opposed by homeowners living near potential aquaculture sites. The region has limited access to processing

facilities and the severity of Canadian winters are factors that need to be examined before Atlantic Canada's aquaculture industry can meet its full potential. The U.S. Consulate General in Halifax has prepared a 9-page report reviewing Atlantic Canada's aquaculture industry. The report includes sections on the scope of the industry, aquaculture legislation, funding programs, public opposition, technical problems, and comments. The report also includes list of Federal and provincial legislation in the field of aquaculture. U.S. companies can obtain a copy of "Atlantic Canada's Aquaculture Industry, 1986" for \$9.95 and a \$3.00 handling fee (total of \$12.95, personal checks or money orders only) by ordering report PB88-114574/GBA from NTIS, Springfield, VA 22161. (The handling fee is per order.)

of the world's fisheries production. The combined total of cultured production and freshwater fisheries was only 8.4 million t in 1985, about 10 percent of the world total<sup>9</sup>. For the foreseeable future, fishermen will be able to catch most species in larger quantities and more cheaply than fish farmers will be able to culture them. Fish farmers have, however, reported some successes. The greatest commercial successes have come from efforts to culture high value species for luxury food markets. Efforts to culture salmon and shrimp have been particularly noteworthy. The Branch of

<sup>9</sup>Precise data on cultured harvests are not readily available, but the Branch believes that a rough estimate of aquaculture trends can be obtained by following catch trends in inland areas reported by FAO.

### **The Latin American Shrimp Culture Industry**

Latin America is a leading world producer of cultured shrimp. Shrimp farmers in the region harvested over 50,000 t of shrimp in 1985, a 40 percent increase over the 37,000 t of shrimp cultured in 1985. Ecuador dominates the region's shrimp culture industry—nearly 85 percent of the Latin American harvest was produced in that country. The industry continues to expand in Ecuador and is rapidly growing in several other countries as well. Prospects for the development of important shrimp culture industries are especially good in Brazil and Colombia.

Ecuador reported major increases in pond harvests during 1987. Several other countries also reported substantial, if less spectacular, 1987 harvests. Based on these increases and continuing expansion of the industry, the NMFS Branch of Foreign Fisheries Analysis conservatively estimates that the cultured shrimp harvest in Latin America could reach nearly 115,000 t by 1990. That projection is based primarily on one country (Ecuador) and one species (*Penaeus vannamei*). As more countries enter the industry and technical advances enable farmers to increase yields and perhaps use different species of shrimp, it is likely that production will continue to increase during the 1990's. Many ob-

Foreign Fisheries Analysis estimates that fish farmers harvested about 70,000 t of salmon and 310,000 t of shrimp in 1986. While small in quantitative terms, these are particularly valuable species and many observers believe that production will increase far beyond current levels. Other fish farmers have reported success with catfish, trout, mullet, oysters, and mussels. Experimental work is currently underway on a wide range of other species. In some cases, however, fish farmers will not increase the total world supply of food. Many fish farmers, for example, use low-value fish to feed the species which they are culturing. The operation is profitable, but may not result in a net increase of edible commodities. Several developing countries have pursued projects to

servers are unsure, however, about the impact of rising world production on the international shrimp market. If substantially lower prices result from the increased production, profit margins could be significantly affected. If so, many farmers may have to adjust their production and expansion plans.

The NMFS Branch of Foreign Fisheries Analysis has prepared an 80-page report reviewing the current status of the shrimp culture industry in Latin America. The report covers: harvest levels, the regional importance, traditional fisheries, quality/size control, species, government support, postlarval seedstock, variables (economic, technical, environmental, and political), investments, and a separate section on each country. The report includes extensive statistical appendices on harvests and exports and is a slightly updated version of the Latin American section in the U.S. Department of Commerce's "Aquaculture and Capture Fisheries: Impact in U.S. Seafood Markets," published earlier in 1988. U.S. companies can obtain a copy of "Latin American Shrimp Culture Industry, 1986-90" for \$14.95 and a \$3.00 handling fee (total \$17.95, personal checks or money orders only) by ordering report PB88-210745/GBA from NTIS, Springfield, VA 22161.

culture tilapia, carp, mullet, and various other species. Some of these projects have resulted in increases of edible commodities. Increases in carp and tilapia catches and Asian catches of a wide variety of freshwater species suggest that aquaculture is gradually increasing the production of edible fish in developing countries, although statistical data separating aquaculture and freshwater fisheries is not readily available.

### **Potential**

The world potential fish catch of edible species has been debated for some years. One widely accepted—although not undisputed—estimate in the world fisheries community, is that the world catch will continue to increase until about the year 2000 when it could total 100-120 million t of conventional species, a figure that many experts believe is the approximate maximum world yield. These estimates may have to be revised. If current trends continue, the 100 million t figure could be reached as early as 1990. However, several Latin American countries have reported declining catches in 1987, principally due to El Niño. Year-end results for the entire world may be about the same as or a small decline from 1986 figures.

Projections of future fish catches, however, are tenuous at best. A wide variety of factors will affect actual increases: Fuel prices, interest rates, national management and development measures, fish prices, technological developments, interest rates, and other developments. Many biologists currently believe that conventional stocks will not support catches significantly beyond the 120 million t level.

Further increases could, however, come from species not currently being utilized. If profitable ways of utilizing Antarctic krill, for example, could be developed, the world catch could expand significantly beyond the 100-120 million t level. Some experts have projected that an intensive krill fishery could double or triple the world catch, but more recent assessments have been more conservative. The 1985 krill catch was less than 0.2 million tons, mostly taken by the Soviets who have been

reducing fishing effort in recent years.

Even within existing catch levels, the production of edible products could be substantially increased. Production of edible products from fisheries could be expanded by better utilizing existing catches. About 30 percent of the catch is currently used for reduction fisheries producing fish meal and oil. Animal feed, of course, is not lost to human

consumption as most of the animals will be slaughtered for food. The amount of protein available, however, would be increased if the fish were consumed directly instead of being used for fish meal production. Perhaps as much as 10 percent of the world catch is lost as a result of poor handling and processing procedures. Many fishermen discard large quantities of unwanted fish at sea.

Suggestions concerning utilization of fish currently reduced to fish meal, landing species currently discarded, improved handling, and other measures to increase food production are often presented in unrealistic terms. They must be tempered by economic reality. Processors must be able to produce a product that will appeal to consumers at affordable prices. (Source: IFR-87/63.)

## **Argentine Fisheries See Good Growth**

Argentine fishing companies reported an excellent year in 1986. Higher international prices and the emergence of Brazil as a major buyer in the third quarter of 1986 were crucial factors in Argentina's improved 1986 export performance. Argentine fishery exports totaled \$219 million in 1986, an 110 percent increase over the \$104 million exported in 1985. Several long-term difficulties still plagued the Argentine fishery industry in 1986: An outdated fleet, limited port facilities, outmoded processing plants, and inefficient infrastructure, all of which prevented an even better performance. The Argentine Government has instituted some assistance programs for the fishing industry. Several companies were able to put vessels back into service during 1986 by taking advantage of a new credit line offered by the Argentine Development Bank which was designed to promote the renovation of the fleet. The Government also signed fishery agreements with Bulgaria and the Soviet Union which, it hopes, will result in export sales to the Soviet Union and Eastern Europe.

The U.S. Embassy in Buenos Aires

has prepared a 24-page report reviewing the current status of Argentina's fishing industry. The report includes sections on landings, industry performance, economic conditions, foreign fishing, port facilities, fishing fleet, markets, and production. The report also includes extensive tables, including data on catch, exports, biomass, maximum sustainable yields, and fleet. There is also a list of Argentine fishery associations. U.S. companies can obtain a copy of "The Argentine Fishing Industry, 1986" for \$11.95 and a \$3.00 handling fee (total \$14.95, personal checks or money orders only) by ordering report PB88-114475/GBA from NTIS, Springfield, VA 22161.

## **Open-Sea Salmon Farm Is Started off Norway**

What Norwegian authorities describe as the world's first fish farm for salmon in the open sea, began operation in late April to the west of the island of Værøy, one of the Lofoten Islands off north Norway. The small fry have to be set out in June, and the first artificially cultivated deep sea salmon should be on

the market next year, reports Norinform.

The development of the farm, budgeted at US\$670,000, was planned in cooperation with industry in north Norway, and based on the technology used in the offshore sector. The depth of water at the farm will be more than 100 m, and waves up to 13 m in height have been measured at the location. The plant has therefore been dimensioned to tolerate wave heights up to 22 m. The facilities will comprise 20 enclosures firmly anchored to the seabed by heavy weights, and totalling 23,000 m<sup>3</sup>, vs. the normal coastal farm size of 8,000 m<sup>3</sup>. A ship anchored at the plant will steer operations.

The initiators took advantage of the fact that the location of the farm is outside the 4-mile concession limit. A spokesman for the Ministry of Fisheries has stated that the ministry may consider changes in legislation so that farms outside normal 4-mile limits also must comply with regulations. Free access for the establishment of fish farms in open sea conflicts with the intention of the law, which is to regulate such establishments out of consideration to public interests, says Gunnar H. Gundersen of the Ministry of Fisheries.