

## Korean Fisheries and the Korea-U.S. Fish Trade

### Introduction

The Republic of Korea (ROK), the world's fifth largest importer of U.S. fishery products in 1988, purchased over 16,000 metric tons (t), valued at nearly \$46 million. The ROK, however, accounted for only about 2 percent of the total U.S. fishery products sold worldwide. The U.S. share of the ROK fisheries import market has fluctuated widely over the last decade. It decreased from nearly 80 percent in 1980 to only 18 percent in 1984, but rebounded to 30 percent in 1986. Conversely, the United States purchased about 61,000 t of fishery products, valued at \$243 million, from the ROK in 1988. The United States has historically been the ROK's second largest market for fishery commodities, purchasing an average 11 percent of Korea's total fishery exports annually, from 1980 to 1986.

### Background

The ROK has, in recent years, become one of the world's leading traders of fishery products. The country's tight import regulations have generally discouraged the importation of fish for domestic consumption, and have instead emphasized importing for the purpose of processing and re-exporting to earn foreign currency. Most of Korea's fishery imports from the United States were earmarked for re-export to Japan where they competed with U.S. fishery exports. Although the ROK still imports and re-exports a large quantity of fishery products, a booming domestic economy (with real GNP growth of about 10 percent in 1988) and a higher standard of living has greatly affected this pattern. Per capita disposable income in the ROK quadrupled between 1975 and 1986, from under \$500 per year to \$2,100 per year. This has resulted in a growing

population and an increasing consumer demand for fish and processed fishery products. The ROK's fishing industry has not been able to keep pace with this demand; as a result, South Koreans have had to increase fishery imports to satisfy domestic consumption.

The Korean fisheries catch has averaged about 2.5 million t per year since 1980 (Table 1). In 1986, the ROK had a record catch of 3.1 million t, but the 1987 catch slipped back to 2.8 million tons<sup>1</sup>, primarily due to difficulties in obtaining access to distant-water fishing grounds. The Korean Government is hoping that the expansion of fishing grounds (particularly in the Bering Sea

<sup>1</sup>The ROK's 1988 catch statistics were unavailable.

Table 1.—Republic of Korea fisheries catch, 1980-87. (Source: FAO data.)

Year	Quantity (t)	Year	Quantity (t)
1980	2,091,134	1984	2,477,080
1981	2,365,990	1985	2,650,026
1982	2,280,821	1986	3,103,468
1983	2,400,387	1987	2,876,367

Table 2.—The Korean fishery trade with the United States: Imports and exports in current and real dollar values, 1980-88<sup>1</sup>.

Year	Inflation rate	Imports (US\$1,000)		Exports (US\$1,000)	
		Current	Real <sup>2</sup>	Current	Real <sup>2</sup>
1980	13.5	27,679	27,679	69,793	69,793
1981	10.3	26,853	24,356	91,659	83,135
1982	6.2	21,639	18,478	89,218	76,192
1983	3.2	22,529	18,631	99,890	82,609
1984	4.3	12,288	9,744	101,451	80,451
1985	3.6	25,314	19,390	109,880	84,168
1986	1.9	32,728	24,579	165,196	124,062
1987	3.6	42,732	30,981	282,510	204,820
1988	N/A <sup>3</sup>	45,898	N/A	243,146	N/A

<sup>1</sup>Sources: U.S. Department of Commerce, Bureau of the Census, 1980-1988; Consumer Price Index, U.S. Bureau of Labor Statistics.

<sup>2</sup>1980 constant dollars.

<sup>3</sup>N/A = Not available.

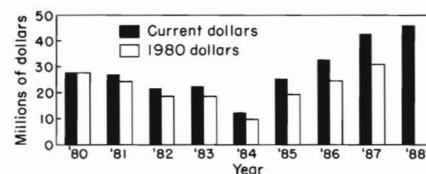


Figure 1.—Korean fishery imports from the United States by value, 1980-88. Source: U.S. Bureau of the Census (Consumer Price Index inflation rate).

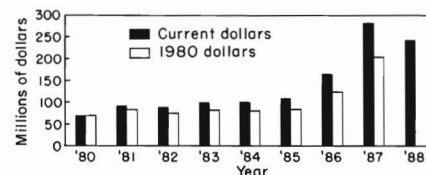


Figure 2.—Korean fishery exports to the United States by value, 1980-88. Source: U.S. Bureau of the Census (Consumer Price Index inflation rate).

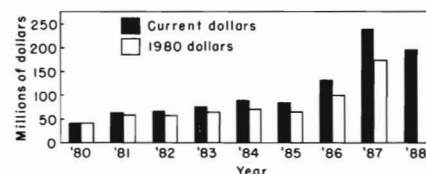


Figure 3.—U.S. fisheries trade deficit with the Republic of Korea, 1980-88. Source: U.S. Bureau of the Census.

and the South Pacific), promotion of new harvesting and processing technology, replacement of older fishing vessels, renewed emphasis on aquaculture, and strengthening of marine pollution control regulations will boost the fishery catch back over the 3 million t mark.

Despite growing consumer demand in the ROK, the U.S. fisheries trade deficit with South Korea has steadily increased in this decade, both in real and current dollars (Fig. 1-3; Table 2). The trade deficit grew from \$42 million in 1980 to nearly \$240 million in 1987. Record U.S. fishery exports to the ROK in 1988, however, reduced the deficit to \$197 million. From 1986 to 1988, the Korean

Table 3.—Korean fishery imports and exports, all countries compared to the United States, by value, 1980-88<sup>1</sup>.

Year	Imports (US\$1,000)		Exports (US\$1,000)	
	Total <sup>2</sup>	From U.S. <sup>3</sup>	Total <sup>2</sup>	To U.S. <sup>3</sup>
1980	35,070	27,679 (79)	759,524	69,793 (9)
1981	58,010	26,853 (46)	931,686	91,659 (10)
1982	56,372	21,639 (38)	861,171	89,218 (10)
1983	57,167	22,529 (39)	826,839	99,890 (12)
1984	68,044	12,288 (18)	877,518	101,451 (12)
1985	89,977	25,313 (28)	890,815	109,880 (12)
1986	117,079	32,728 (30)	1,273,338	165,196 (13)
1987	N/A <sup>4</sup>	42,732 N/A	N/A	282,510 N/A
1988	N/A	45,898 N/A	N/A	243,146 N/A

<sup>1</sup>Sources: FAO (for total ROK fishery imports, 1980-1986); Ministry of Agriculture and Fisheries, Republic of Korea (for total Korean fishery exports, 1980-1986); U.S. Department of Commerce, Bureau of the Census (for U.S. import and export statistics, 1980-88).

<sup>2</sup>The total imports and exports columns may not be completely compatible, as FAO statistics (total imports) do not include seaweeds, but ROK Ministry of Agriculture and Fisheries statistics (total exports) do.

<sup>3</sup>Joint venture sales are not included. Data in parentheses indicate the percentage of the total.

<sup>4</sup>N/A = Not yet available.

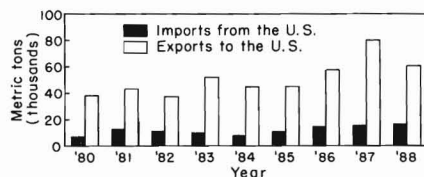


Figure 4.—Korean fishery trade with the United States by quantity (inedible partial fishery products not included), 1980-88. Source: U.S. Bureau of the Census.

won<sup>2</sup> appreciated more than 30 percent against the U.S. dollar, partially accounting for the success of 1988 U.S. fishery exports to Korea. Korea has also taken advantage of the rapid appreciation of the Japanese yen and has boosted fishery exports to Japan, many of which are re-exported imports from the United States.

### Korea's Imports From the United States

#### Overview

Although South Korean imports of U.S. fishery products have fluctuated over the past 9 years, the overall trend

<sup>2</sup>The exchange rate was at about 630 won per U.S. dollar.

Table 4.—Korean fishery imports from the United States, by commodity and quantity, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Commodity	Imports (t)								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Edible</b>									
Fish									
Frozen <sup>1</sup>									
Whole <sup>2</sup>	3,886.9	9,173.2	7,043.1	6,364.5	6,276.0	6,946.0	10,223.0	10,630.0	5,271.1
Fillets	21.4	2,011.8	1,556.5	1,257.1	236.5	158.9	799.2	831.0	1,622.0
Canned	3.4	5.6	9.6	5.2	0.1	0.9	14.3	20.5	1.2
Cured	459.5	1.3	745.5		4.4	0.8		2.0	12.4
Roe	1,728.1	986.5	1,680.0	1354.5	657.5	2,801.0	289.8	423.6	2,321.5
Other	26.8	58.4	40.4	59.7	55.5	8.1	10.3	37.1	3,639.5
Subtotal	6,126.1	12,236.8	11,075.1	9,041.0	7,230.0	9,915.7	11,336.6	11,944.2	12,867.7
Shellfish									
Frozen <sup>1</sup>	41.7	66.5	31.4	861.9	731.5	1,075.4	2,897.3	2,852.6	1,961.3
Canned	38.9	9.3		92.0	17.5	5.5	10.1	22.0	42.7
Other		3.5	0.6		2.3	0.7	3.1	5.4	43.3
Subtotal	80.6	79.3	32.0	953.9	751.3	1,081.6	2,910.5	2,880.0	2,047.3
<b>Total edible</b>	<b>6,206.7</b>	<b>12,316.1</b>	<b>11,107.1</b>	<b>9,994.9</b>	<b>7,981.3</b>	<b>10,997.3</b>	<b>14,247.1</b>	<b>14,824.1</b>	<b>14,915.0</b>
<b>Inedible</b>									
Meal/scrap							96.2	364.7	518.9
Oil	18.2	6.4	9.9	3.8	6.9		0.4	0.2	59.5
Other <sup>3</sup>	606.6	584.0	249.8	261.6	130.1	53.1	328.2	645.4	761.0
<b>Total inedible</b>	<b>624.8</b>	<b>590.4</b>	<b>259.7</b>	<b>265.4</b>	<b>137.0</b>	<b>53.1</b>	<b>424.8</b>	<b>1,010.3</b>	<b>1,339.4</b>
<b>Inedible partial fishery products</b>	<b>N/A<sup>4</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
<b>Grand total<sup>5</sup></b>	<b>6,831.5</b>	<b>12,906.3</b>	<b>11,366.7</b>	<b>10,260.3</b>	<b>8,118.4</b>	<b>11,032.2</b>	<b>14,671.8</b>	<b>15,834.4</b>	<b>16,254.4</b>

<sup>1</sup>May include small quantities of live and fresh product.

<sup>2</sup>May include small quantities of live product.

<sup>3</sup>Marine shells and other industrial fishery products.

<sup>4</sup>N/A = Not available.

<sup>5</sup>Columns may not sum to total because of rounding.

is up (Fig. 1, 4; Table 3). The ROK is the fifth largest importer of U.S. seafood products in the world, behind Japan, Canada, the United Kingdom, and France. The United States shipped 16,250 t of fishery products, valued at nearly \$46 million, to the ROK in 1988 (Tables 4-7). This represented an increase of nearly 3 percent by quantity and 8 percent by value over U.S. fishery exports to South Korea in 1987 (15,800 t, valued at \$43 million). Despite this increase, the ROK purchased only 2 percent, by value, of the total U.S. fishery products exports to all countries in 1988.

Along with the small increase in fishery imports from the United States, the ROK has also greatly increased its joint venture fishery operations in the U.S. Exclusive Economic Zone (EEZ) in recent years. The value of over-the-side sales of Alaskan groundfish (primarily walleye pollock) by U.S. fishermen to Korean processing vessels grew from

\$6.5 million in 1983 to about \$55 million in 1988 (Table 8). This increase was triggered by a drop in the ROK directed fishing allocation in U.S. waters, from 279,000 t in 1983 to 0 in 1988. Although U.S. Customs has not recorded joint venture sales of fish over-the-side to Korean processing vessels as exports in the past<sup>3</sup>, the ROK Customs has counted them as imports from the United States. If U.S. Customs had included joint venture sales as exports, however, U.S. fishery exports and joint venture sales to the ROK would have totaled over \$100 million in 1988. Foreign fishery joint ventures in U.S. waters will be phased out in the near future because of the growing demand for fishery resources by U.S. fish processors. There is not enough fish to satisfy both U.S. domestic demand and foreign joint venture requests.

<sup>3</sup>The U.S. Customs Service will begin counting U.S. Fishery Joint venture sales as exports in 1989.

## Korea's Import Policies

The ROK prohibited imports of many fishery products for domestic consumption until 1978. At that time, the Korean Government began to relax import restrictions to prevent an increase in domestic prices caused by expanded consumer demand for fishery products. However, Korea still requires import licenses and imposes tariffs on foreign fishery imports to protect its domestic fishing industry and prevent an over-reliance on foreign fishery imports. Fishery products can be imported duty free when they are processed in Korea and then re-exported.

### Import Licensing

A serious barrier in exporting fishery products to the ROK is the Korean government's requirement for import permission (i.e., an import license). Some fishery commodities are approved without question and are said to be on the "automatic approval" list. Despite some progress in liberalizing fishery imports, many fish and shellfish products are still on a restricted list. To import a restricted fishery commodity, special permission must be secured from the Administrator of the National Fisheries Administration on a case-by-case basis.

ROK government officials have rejected U.S. requests that specific fishery commodities be liberalized, stating that licensing restrictions are actually protecting U.S. exporters of these commodities by keeping cheaper imports from the Soviet Union and other countries from competing with U.S. fishery products on the Korean market. They also claim that it has not been politically expedient for the Korean government to completely liberalize fishery imports. South Korea's fishermen present a potent political force and the government has had to show a strong front against outside pressures to liberalize to please this constituency. The restricted commodities most important for U.S. exporters are various Alaska groundfish (walleye pollock, turbot, flounders, yellowfin sole, and halibut). Other items, such as rockfish, sablefish, and herring are among the many commodities on the ROK's automatic import approval list, but these products are mainly re-exported to Japan.

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Table 5.—Korean fishery imports from the United States, by commodity and value, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Commodity	Imports (US\$1,000)								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Edible</b>									
<b>Fish</b>									
Frozen <sup>1</sup>	6,061.0	20,188.2	12,714.8	13,023.4	8,199.6	12,144.6	20,341.7	21,956.8	14,822.3
Whole <sup>2</sup>	56.1	3,454.0	2,590.5	2,610.4	520.9	270.7	1,229.3	1,134.7	3,900.3
Fillets	17.2	25.7	63.3	14.0	0.8	5.5	31.5	76.1	20.3
Canned	456.5	9.9	2,111.1	3,653.8	1,009.2	9,833.9	570.6	1,995.3	5,969.5
Cured	20,292.6	1,905.0	3,458.9	3,653.8	1,009.2	9,833.9	570.6	1,995.3	5,969.5
Roe	99.5	172.8	132.5	193.1	179.6	26.1	14.3	114.7	7,083.8
Other	26,982.9	23,879.1	16,396.7	19,494.7	9,921.0	22,285.0	22,187.4	25,300.8	31,681.8
Shellfish	96.4	237.2	183.9	2,225.8	1,911.3	2,798.0	9,620.3	15,632.6	11,750.2
Frozen <sup>1</sup>	97.0	58.6	259.2	98.3	25.2	129.9	468.1	199.6	199.6
Canned		32.5	7.3	13.6	5.5	19.0	44.6	150.6	
Other									
Subtotal	193.4	328.3	191.2	2,485.0	2,023.2	2,828.7	9,769.2	16,145.3	12,100.4
<b>Shellfish</b>	27,176.3	26,084.0	21,262.3	21,979.7	11,944.2	25,113.7	31,956.4	41,446.1	43,782.2
<b>Total edible</b>									
Inedible									
Meal/scrap	72.8	52.0	30.4	9.8	8.7	23.6	92.9	157.2	
Oil	401.3	706.1	343.7	518.4	319.9	66.6	431.6	1,009.2	1,667.1
Other <sup>3</sup>	474.1	758.1	374.1	528.2	328.6	66.6	458.0	1,103.7	2,014.6
<b>Total inedible</b>	28.5	11.1	2.5	21.4	15.6	133.5	313.8	182.3	101.1
<b>Inedible partial fishery products</b>	27,678.9	26,853.2	21,638.9	22,529.3	12,288.4	25,313.8	32,728.2	42,732.1	45,898.9
<b>Grand total<sup>4</sup></b>									

<sup>1</sup>May include small quantities of live and fresh product.

<sup>2</sup>May include small quantities of live product.

<sup>3</sup>Marine shells and other industrial fishery products.

<sup>4</sup>Columns may not sum to total because of rounding.

Table 6.—Korean fishery imports from the United States, by species and quantity, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Species	Imports (t)								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Edible</b>									
Herring <sup>1</sup>	782.1	7,957.3	6,017.4	4,753.5	4,521.0	5,804.5	5,866.0	6,627.5	3,609.1
Salmon <sup>1</sup>		2,434.2	2,377.1	1,747.6	1,321.3	670.9	4,685.1	2,561.8	2,579.9
Crabs		64.9	2.9	358.1	520.4	1,049.5	2,862.9	2,668.3	1,766.2
Pollock <sup>1</sup>							36.1	553.9	1,005.9
Cod							167.5	246.8	654.2
Eels									248.0
Oil								18.1	224.0
Squid								195.1	158.2
Sablefish								37.1	139.4
Halibut								6.9	22.0
Abalone						2.2	9.2	12.4	4.7
Lobster						5.2	2.1	3.4	4.7
Shrimp	1.0	1.4	3.4	5.0	10.7	3.0	2.5	1.3	2.8
Scallops									
Mackerel		77.5	34.6						
Sardines				3.4					
Other fish	5,342.9	1,754.9	2,645.5	2,535.7	1,387.8	3,440.3	349.6	1,656.6	4,729.7
Other shellfish	79.6	13.0	25.7	590.7	220.3	3.6	27.2	154.4	44.9
Other edible <sup>2</sup>	1.1	12.8	0.5	0.9					
<b>Total edible</b>	6,206.7	12,315.9	11,106.9	9,994.9	7,981.3	10,979.2	14,247.3	14,824.1	14,915.0
<b>Inedible</b>									
Meal/scrap	18.2	6.4	9.9	3.8	6.9		96.2	364.7	518.9
Oil	606.6	584.0	249.8	261.6	130.1	53.1	328.2	645.4	761.0
Other <sup>3</sup>	624.8	590.4	259.7	265.4	137.0	53.1	424.8	1,010.3	1,339.4
<b>Total inedible</b>									
<b>Inedible partial fishery products</b>	N/A <sup>4</sup>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Grand total<sup>5</sup></b>	6,831.5	12,906.3	11,366.7	10,260.3	8,118.4	11,032.2	14,671.8	15,834.4	16,254.4

<sup>1</sup>Including roe.

<sup>2</sup>Includes fish sticks, pastes, balls, etc., of various species.

<sup>3</sup>Marine shells, carrageenan, etc.

<sup>4</sup>N/A = Not available.

<sup>5</sup>Columns may not sum to total because of rounding.

**Table 7.—Korean fishery imports from the United States, by species and value, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.**

Species	Imports (US\$1,000)								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Edible</b>									
Crabs	1.0	218.5	57.6	1,095.5	1,351.7	2,723.2	9,437.8	15,037.7	11,608.7
Salmon <sup>1</sup>	1,668.7	9,618.7	4,035.0	4,364.9	1,900.1	1,177.9	7,707.7	6,084.8	9,539.9
Herring <sup>1</sup>		12,727.3	11,015.9	9,794.9	6,169.3	10,623.5	12,908.6	15,411.6	8,181.8
Pollock <sup>1</sup>							19.9	369.8	2,166.0
Cod							506.2	463.7	1,826.9
Eels									662.2
Halibut							115.8	621.3	198.1
Squid								11.4	131.5
Lobsters						39.8	70.7	135.8	80.7
Shrimp	4.8	10.2	38.0	29.3	138.4		10.4	17.0	62.3
Scallops							28.4	31.2	16.5
Abalone							10.0	117.8	468.
Sablefish							585.2	179.5	
Sardines				7.3					
Mackerel		104.1	51.6						
Other fish	25,311.3	3,290.7	5,965.4	5,324.0	1,851.7	10,483.6	343.9	2,170.0	9,106.9
Other shellfish	187.6	99.5	95.7	1,360.3	533.0	27.3	101.3	458.9	176.0
Other edible <sup>2</sup>	2.8	14.9	3.2	3.6					
<b>Total edible</b>	<b>27,176.3</b>	<b>26,084.0</b>	<b>21,262.3</b>	<b>21,979.7</b>	<b>11,944.2</b>	<b>25,113.6</b>	<b>31,956.4</b>	<b>41,446.1</b>	<b>43,782.2</b>
<b>Inedible</b>									
Meal/scrap							23.6	92.9	157.2
Oil	72.8	52.0	30.4	9.8	8.7		2.8	1.7	190.3
Other <sup>3</sup>	401.3	706.1	343.7	518.4	319.9	66.6	431.6	1,009.2	1,667.1
<b>Total inedible</b>	<b>474.1</b>	<b>758.1</b>	<b>374.1</b>	<b>528.2</b>	<b>328.6</b>	<b>66.6</b>	<b>458.0</b>	<b>1,103.7</b>	<b>2,014.6</b>
<b>Inedible partial fishery products</b>	<b>28.5</b>	<b>11.1</b>	<b>2.5</b>	<b>21.4</b>	<b>15.6</b>	<b>133.5</b>	<b>313.8</b>	<b>182.3</b>	<b>101.1</b>
<b>Grand total<sup>4</sup></b>	<b>27,678.9</b>	<b>26,853.2</b>	<b>21,638.9</b>	<b>22,529.3</b>	<b>12,288.4</b>	<b>25,313.8</b>	<b>32,728.2</b>	<b>42,732.1</b>	<b>45,898.0</b>

<sup>1</sup>Including roe.

<sup>2</sup>Includes fish sticks, pastes, balls, etc., of various species.

<sup>3</sup>Marine shells and other industrial products.

<sup>4</sup>Columns may not sum to total because of rounding.

### Tariffs

Korean tariffs for U.S. fishery products are 20 percent ad valorem on the c.i.f. (cost, insurance, and freight) price at the time of import declaration. Fishery tariff rates are expected to fall to 15 percent in 1989, the first phase of a planned reduction to 8 percent by 1992.

### Import Quotas

Until recently, the ROK imposed import quotas (quantitative restrictions) in combination with tariffs (called "tariff quotas") on certain categories of imported fishery products, in addition to the import licensing requirement. The purpose of these "tariff quotas" was to allow specific quantities of fishery imports for domestic consumption into the country at reduced tariff rates. For example, frozen fish and cuttlefish were subject to a 10 percent tariff rate (considerably lower than the "normal" rate of 20 percent) with import quota ceil-

ings of 15,000 t and 3,800 t, respectively. "Tariff quotas" were trade concessions set up in response to outside pressure for the liberalization of fishery imports. The Korean government no longer imposes "tariff quotas."

### Marketing

Korean marketing channels for fish and fishery products (both imported and domestic) can be quite complicated. Coastal landings are usually sold to local wholesalers, shippers, or processors by dealers who handle the fish on a consignment basis at the local wholesale market. The fish are then transported to inland wholesale markets where they are again sold to wholesalers through dealers. The ROK has 12 inland fish wholesale markets and 10 public fish markets operated by fishery cooperatives. The wholesalers supply the fish to retailers who then sell them to the consumers. In all, the fish may change hands six or seven times before ending

**Table 8.—Korean catches and joint venture purchases of Alaska groundfish in the U.S. EEZ, by quantity and value, 1983-1988<sup>1</sup>.**

Year	Directed catch (t)	Joint-venture purchases	
		Quantity (t)	Value (\$10 <sup>6</sup> )
1983	279,000	57,000	6.5
1984	276,000	98,000	11.4
1985	225,000	177,000	21.5
1986	97,000	378,000	44.8
1987	3,000	452,000	63.0
1988		389,000	55.0

<sup>1</sup>Source: Office of Trade and Industry Services, National Marine Fisheries Service, 1989.

up on the family table, substantially escalating retail prices.

The Korean government has been trying to expand market channels by increasing the number of local fish markets, as well as bypassing the coastal middlemen. Fishery products are shipped directly from the landing port to inland wholesale marketing centers. The inland markets then supply the fish to direct retail outlets or supermarkets on a consignment basis. As a result, the number of direct retail outlets for fishery products has reportedly increased in recent years.

### Fishery Commodities

The ROK imported a record 16,300 t of fishery products, valued at nearly \$46 million, from the United States in 1988 (Tables 4, 5). This was a 3 percent increase in quantity and a 7 percent in value over 1987 imports. As in the past, U.S. shipments consisted primarily of frozen whole fish and fish fillets, fish roes, and frozen shellfish (Fig. 5). Together these commodities accounted for 69 percent of the total quantity and 79 percent of the total value of the 1988 imports from the United States.

### Frozen Finfish

The largest and most valuable U.S. export commodity is frozen whole fish and fish fillets. The United States shipped a record 11,500 t to the ROK in 1987, valued at over \$23 million. Although frozen whole fish and fillets still held the number one spot in 1988, the quantity exported was only about two thirds of the 1987 level and value was



Table 9.—Korean fishery exports to the United States, by commodity and quantity, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Commodity	Exports (t)								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Edible</b>									
<b>Fish</b>									
<b>Fresh/frozen</b>									
Whole	11,000.4	14,321.8	5,944.8	12,510.3	6,679.1	1,678.3	3,195.6	1,722.2	1,375.5
Fillets	1,087.0	1,361.8	1,173.9	2,377.9	4,489.0	6,753.6	11,030.0	16,956.8	10,300.5
Blocks	19,205.0	18,568.7	18,681.9	25,913.2	23,094.4	22,420.3	23,022.0	33,846.7	23,497.9
Loins/discs	559.1	964.7	870.7	273.7					
Subtotal	31,851.5	35,217.0	26,671.3	41,075.1	34,262.5	30,852.2	37,247.6	52,525.7	35,173.9
<b>Canned</b>									
In Oil	213.3	351.7	146.5	231.0	224.3	151.3	228.3	259.9	307.3
Not in Oil	152.5	198.4	172.3	317.1	964.0	1,991.7	3,238.1	4,552.1	3,638.4
Subtotal	365.8	550.1	318.8	548.1	1,188.3	2,143.2	3,466.4	4,812.0	3,945.7
<b>Cured</b>	124.9	218.9	240.5	242.7	332.3	631.6	650.5	724.5	913.9
Roe	15.5	19.9	47.6	74.5	76.3	129.6	151.0	149.5	142.8
Surimi, analogs							1,141.8	3,245.7	4,728.2
Other	253.2	38.4	207.4	294.6	340.3	621.1	699.4	920.0	1,085.8
Subtotal	5,501.5	6,854.0	9,968.5	9,609.0	8,589.1	10,307.6	14,318.7	17,188.7	13,703.9
<b>Shellfish</b>									
Fresh/frozen	1,716.8	1,733.8	2,498.9	2,812.7	2,831.8	3,651.3	5,841.5	7,591.2	6,360.4
Canned	3,784.7	5,120.2	7,469.6	6,796.3	5,744.9	6,643.9	8,414.9	9,447.9	7,237.5
Other					12.4	12.4	62.3	149.6	106.0
Subtotal	5,501.5	6,854.0	9,968.5	9,609.0	8,589.1	10,307.6	14,318.7	17,188.7	13,703.9
<b>Total edible</b>	38,112.4	43,096.4	37,454.1	51,844.0	44,788.7	44,685.3	57,675.4	79,566.1	59,694.2
<b>Inedible</b>									
Meal/scrap						240.4	75.3	361.1	708.5
Oil							Negl. <sup>1</sup>	0.1	9.9
Canned pet food				13.3		12.2			74.2
Other industrial	49.7	123.7	78.4	151.6	108.3	82.7	83.9	67.4	134.5
Subtotal	49.7	123.7	78.4	165.1	108.3	335.3	159.3	428.5	927.1
<b>Inedible partial fishery products</b>	N/A <sup>2</sup>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Grand total<sup>3</sup></b>	38,162.2	43,220.1	37,532.5	52,009.1	44,897.0	45,020.6	57,834.7	79,994.6	60,621.3

<sup>1</sup>Negl. = Negligible.

<sup>2</sup>N/A = Not available.

<sup>3</sup>Columns may not sum to total because of rounding.

down by over 20 percent (Tables 4, 5). Sales of U.S. frozen fish (and a number of other fishery commodities, such as salmon, crabs, and lobster) to the ROK are largely dependent on Japanese market conditions. With the increased appreciation of the yen and high prices offered by the Japanese in 1988, U.S. fishermen were able to boost sales of frozen fish to Japan by over 50 percent, hence the decrease in frozen fishery exports to the ROK. Japan was the preferred export market for these commodities.

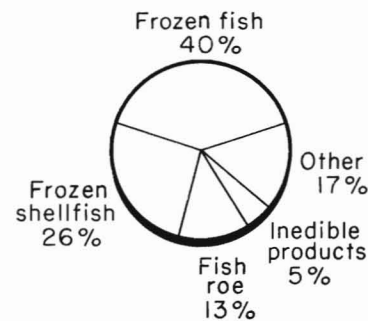
#### Frozen Shellfish

Frozen shellfish was the second most valuable U.S. fishery commodity exported to the ROK in 1988, accounting for over \$12 million (Table 5). Almost

94 percent of this was frozen tanner crab. The record-high year for frozen shellfish exports was 1987, when nearly \$16 million worth were shipped to South Korea. As was the case for frozen fish, Japanese markets competed strongly for U.S. crab exports in 1987 and 1988 and are largely responsible for the drop in exports to South Korea.

#### Fish Roe

Fish roes were the third most valuable U.S. fishery commodity export to the ROK in 1988, valued at almost \$6 million. Roe exports increased from only 424 t in 1987 to 2,300 t in 1988 and tripled in value. According to U.S. Customs, herring roe comprised over 70 percent of the total value. These statistics may be misleading, however, as U.S.



Total = \$45.9 million

Figure 5.—Major fishery commodities imported by Korea from the United States by value, 1988 (percent of total). Frozen fish is whole and fillets. Source: U.S. Bureau of the Census.

fishery officials suspect that Customs agents may have mistakenly recorded roe herring (herring from which the South Koreans later remove the eggs) as herring roe. The remainder of U.S. roe exports was reportedly pollock roe. The United States exported a record \$20 million worth of fish roes to the Koreans in 1979 and 1980.

#### Species

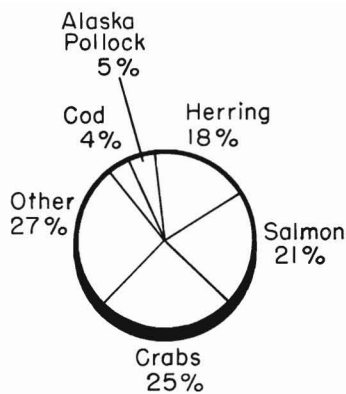
The most important species exported by the United States to the ROK in 1988 were, by value, crab, salmon, herring, and walleye pollock (Fig. 6, Table 7).

#### Crab

The United States exported 1,800 t of frozen crab, valued at almost \$12 million in 1988. Alaska tanner or snow crab accounted for nearly 95 percent of the quantity (1,600 t) and value (\$11 million) of this total. King crab exports to the ROK in 1988 were small—only 19 t of frozen and 40 tons of canned (valued at \$275,000). Overall, 1988 U.S. crab exports decreased in both quantity and value from 1987 exports (see Frozen Shellfish section).

#### Salmon

U.S. 1988 frozen salmon exports to the ROK amounted to 2,600 t and had a value of \$9.5 million. The quantity exported increased only 1 percent, but the



Total = 45.9 million

Figure 6.—Major fish species imported by Korea from the United States by value, 1988 (percent of total). Salmon, herring, and pollock data includes roe. Source: U.S. Bureau of the Census. Total = \$45.9 million.

value increased by 57 percent over that of 1987. World salmon prices were forced sharply upward in 1988 because of high Japanese demand. Japan's overall salmon catch was down in 1988 (with the exception of the fall chum salmon run in Hokkaido) and Japanese buyers offered top dollar for U.S. salmon. As a result, Korean prices were pushed up, netting the large increase in value of U.S. salmon exports, despite the small quantity increase. Frozen pink salmon was the major species exported, accounting for 65 percent of the quantity and 55 percent of the value of the total (1,670 t, valued at \$5.2 million). Chum salmon was the next most important species (\$2.6 million), followed by sockeye (\$0.8 million), silver (\$0.5 million), and chinook salmon (\$0.2 million).

### Herring

The United States exported 3,600 t of herring and herring roe, valued at over \$8 million, to the ROK in 1988. This was about half of the quantity and value of the U.S. herring exported to Korea in 1987. The Japanese market for herring products was favorable in 1988 and was most likely responsible for diverting more U.S. herring to Japan. Herring roe accounted for nearly 50 percent of the quantity and 53 percent of the value of total 1988 U.S. herring exports to the

Table 10.—Korean fishery exports to the United States, by commodity and value, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Commodity	Exports (US\$1,000)									
	1980	1981	1982	1983	1984	1985	1986	1987	1988	
<b>Edible Fish</b>										
Fresh/frozen										
Whole	13,836.0	19,198.2	7,786.2	12,581.3	7,082.4	2,746.0	3,836.5	3,974.3	4,159.9	
Fillets	2,214.1	2,930.3	2,478.1	6,276.8	13,511.0	18,106.0	32,754.9	58,059.5	37,559.4	
Blocks	26,627.2	30,817.3	28,011.5	35,585.6	33,136.0	30,568.0	38,100.6	79,209.5	45,596.1	
Loins/discs	2,152.9	4,718.8	4,119.4	790.2						
Subtotal	44,830.2	57,664.6	42,395.4	55,233.9	53,729.4	51,421.0	74,692.0	141,243.3	87,355.4	
Canned										
In Oil	435.2	897.5	327.4	491.2	521.2	299.5	460.1	627.8	805.0	
Not in Oil	360.5	446.7	468.4	844.6	2,014.6	3,911.9	7,426.0	10,714.2	8,998.7	
Subtotal	795.7	1,344.2	795.8	1,335.8	2,535.8	4,211.4	7,886.1	11,342.0	9,803.7	
Cured	444.6	832.2	866.0	960.7	1,216.2	2,407.3	2,396.7	3,001.3	4,613.6	
Roe	91.8	111.8	331.3	510.5	360.5	760.7	990.3	1,088.9	1,185.9	
Surimi, analogs							3,476.8	9,692.6	14,750.4	
Other	649.7	890.8	699.6	811.9	1,242.4	1,609.5	2,380.8	3,268.1	5,405.9	
Shellfish										
Fresh/frozen	4,558.2	4,716.3	11,148.2	12,095.5	11,540.7	13,646.6	27,739.8	46,316.9	43,178.0	
Canned	12,628.7	16,809.4	22,907.6	20,587.7	19,133.6	21,301.0	25,268.7	31,521.4	33,974.5	
Other					26.2	27.0	125.8	247.6	233.8	
Subtotal	17,186.9	21,525.7	34,055.8	32,683.2	30,700.5	34,975.0	53,134.3	78,085.9	77,386.3	
<b>Total edible</b>	63,999.0	82,369.2	79,143.9	91,535.9	89,784.8	95,385.0	144,957.0	247,722.2	200,500.9	
<b>Inedible</b>										
Meal/scrap						88.4	25.5	89.8	247.2	
Oil				0.7			1.6	3.9	350.1	
Canned pet food				10.3		9.2			58.1	
Other industrial	576.3	866.4	621.0	786.5	894.7	550.7	815.1	660.4	460.5	
<b>Total inedible</b>	576.3	866.4	621.0	797.5	894.7	648.3	842.2	754.1	1,115.9	
<b>Inedible partial fishery products</b>	5,217.4	8,423.3	9,453.4	7,556.9	10,771.8	13,846.1	19,396.3	34,033.9	41,529.7	
<b>Grand total<sup>1</sup></b>	69,792.7	91,658.9	89,218.3	99,890.2	101,451.2	109,879.9	165,195.6	282,510.2	243,146.4	

<sup>1</sup>Columns may not sum to total because of rounding.

ROK (see Fish Roe section). South Korean imports of U.S. herring have fluctuated historically, but increased by about \$3 million per year from 1984 through 1987.

### Pollock

U.S. walleye or Alaska pollock exports to South Korea have increased yearly from only 36 t, valued at \$20,000 in 1986, to over 1,000 t, valued at \$2.2 million, in 1988. U.S. Customs listed the majority of this total as pollock roe (530 t, valued at \$1.6 million). South Koreans have traditionally consumed walleye pollock, which is also harvested off their own coast, but fishermen are now having difficulty supplying it as the United States, the Soviet Union, and North Korea are tightening regulations on foreign fishing in their waters. Con-

sequently, pollock imports are expected to increase rapidly in the near future.

## Fishery Exports to the United States

### Overview

The value of ROK exports of fishery products to all countries increased by nearly 50 percent from 1985 to 1986 (from \$0.9 billion to \$1.3 billion—Table 2). Fishery exports in 1986 accounted for about 4 percent of all Korean exports, up from 3.5 percent in 1985. (More recent figures were not available.) The increase in fishery exports was caused by an increased demand for fishery products in Japan and the United States, increasing world export prices, favorable exporting conditions caused by the appreciation of the Japanese yen,

Table 11.—Korean fishery exports to the United States, by species and quantity, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Species	Exports (t)									
	1980	1981	1982	1983	1984	1985	1986	1987	1988	
<b>Edible</b>										
Pollock <sup>1</sup>	15,207.7	14,881.4	14,299.8	21,900.1	18,957.2	18,356.9	17,155.3	23,354.3	19,502.4	
Oysters	3,675.5	5,352.7	6,875.0	7,043.9	6,202.6	7,652.8	8,882.4	10,069.6	8,183.4	
Flat fish		208.6	94.3		848.4	2,225.8	3,563.9	5,493.1	5,876.0	
Surimi, analogs							1,141.8	3,245.7	4,728.2	
Crabs	158.9	191.5	796.3	750.1	970.5	1,053.7	3,189.5	3,715.2	3,052.5	
Cod	3,018.0	3,221.9	2,430.7	3,290.7	3,144.2	2,518.4	4,633.7	8,284.4	2,577.8	
Sardines	25.2	33.7	7.4	7.3	256.4	683.7	541.4	1,152.9	960.4	
Tuna	11,488.2	15,003.8	6,500.7	12,532.5	6,381.1	1,098.5	3,039.1	823.4	711.6	
Clams	564.3	519.3	1,660.6	988.9	628.9	568.6	843.3	1,106.5	672.4	
Groundfish	354.7	412.7	866.2	943.0	772.3	1,189.4	1,954.5	3,494.1	610.3	
Squid							743.2	916.4	502.3	
Mackerel	103.2	67.0	70.4	83.7	231.8	272.3	300.1	417.4	451.6	
Shrimp <sup>1</sup>	153.0	196.4	82.7	120.4	118.6	140.2	329.9	522.6	418.1	
Salmon <sup>1</sup>					2.6	0.2	50.7	1,011.4	63.0	
Yellow perch									51.1	
Anchovies							23.7	36.9	43.8	
Turbot	42.4	96.7	36.3	16.5		32.2		195.3	38.6	
Lobster		0.1		19.1	0.4	7.8	13.2	6.9	18.3	
Halibut					26.9			97.9	7.5	
Trout				0.2			2.9	74.2		
Whiting	1,352.2	764.7	916.6	309.5	109.4	26.3	36.3	46.5		
Swordfish	0.9		2.0		1.3	3.9		37.5	2.8	
Shark fins							0.3	0.3	2.3	
Herring <sup>1</sup>					1.9	31.5	52.5	2.0	0.9	
Scallops	0.1	0.6	1.8	0.8	0.5	20.2	6.1	4.3	0.7	
Ocean perch				61.1	68.1	32.7		32.3		
Abalone		0.1	0.3	3.9			17.8	2.3		
Other fish	771.6	1,343.9	2,088.2	1,957.6	3,714.5	6,155.0	8,401.8	13,701.6	8,577.5	
Other shellfish	950.5	601.2	559.3	693.1	667.5	864.3	493.4	840.6	848.5	
Other edible	246.0	200.2	165.7	273.2	306.3	413.1	529.4	497.6	628.4	
<b>Total edible</b>	<b>38,112.4</b>	<b>43,096.4</b>	<b>37,454.1</b>	<b>51,844.0</b>	<b>44,788.7</b>	<b>44,685.3</b>	<b>57,675.4</b>	<b>79,566.1</b>	<b>59,694.2</b>	
<b>Inedible</b>										
Meal/scrap						240.4	75.3	361.1	708.5	
Oil				0.2			Negl. <sup>2</sup>	0.1	9.9	
Canned pet food				13.3		12.2			74.2	
Other industrial	49.7	123.7	78.4	151.6	108.3	82.7	83.9	67.4	134.5	
<b>Total inedible</b>	<b>49.7</b>	<b>123.7</b>	<b>78.4</b>	<b>165.1</b>	<b>108.3</b>	<b>335.3</b>	<b>159.3</b>	<b>428.5</b>	<b>927.1</b>	
<b>Inedible partial fishery products</b>	<b>N/A<sup>3</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	
<b>Grand total<sup>4</sup></b>	<b>38,162.2</b>	<b>43,220.1</b>	<b>37,532.5</b>	<b>52,009.1</b>	<b>44,897.0</b>	<b>45,020.6</b>	<b>57,834.7</b>	<b>79,994.6</b>	<b>60,621.3</b>	

<sup>1</sup>Including roe.  
<sup>2</sup>Negl. = Negligible.  
<sup>3</sup>N/A = Not available.  
<sup>4</sup>Columns may not sum to total because of rounding.

low oil prices, and the development of high-valued processed fishery products by the Koreans. The United States purchased over \$165 million worth of Korean fishery products in 1986. The United States has historically been the ROK's second largest market (after Japan), purchasing an average of 11 percent of all Korean fishery exports annually, from 1980 to 1986 (Fig. 7, Table 2). In 1988, the United States purchased a total of nearly 61,000 t of fishery products, valued at \$243 million (Fig. 2, 4; Tables 9-12). Because ROK trade statistics were not readily available for years following 1986, the relative significance

of fishery exports to the United States was not determined for those years (Fig. 7).

### Fishery Commodities

The largest and most valuable Korean fishery commodities exported to the United States are frozen fish (primarily blocks and fillets), frozen and canned shellfish, inedible fishery products, and surimi and surimi analogs (Fig. 8, Tables 9, 10). These commodities accounted for about 88 percent by quantity and 90 percent by value of the total U.S. imports of ROK fishery products in 1988.

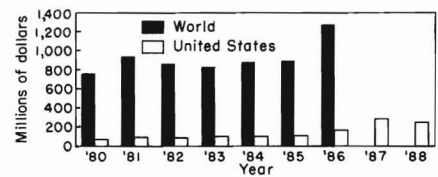


Figure 7.—Korean fishery exports to world markets, compared with the U.S. market, by value, 1980-88. Sources: U.S. Department of Commerce and ROK Statistical Yearbook of Agriculture, Forestry, and Fisheries.

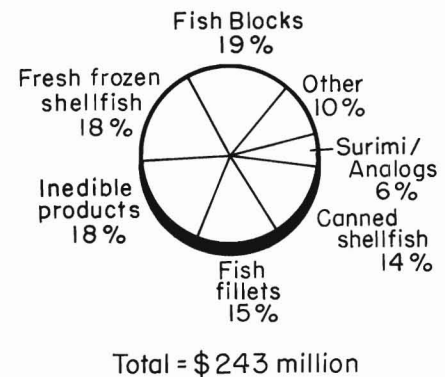


Figure 8.—Major Korean fishery commodities exported to the United States by value, 1988. Source: U.S. Bureau of the Census.

### Frozen Fish Block and Fillets

Fish blocks were the single most important ROK fishery commodity exported to the United States in 1988; 23,500 t, valued at \$45.6 million. This is down by over 10,000 t and \$34 million from 1987 fish block exports (33,800 t, valued at \$79.2 million). A major factor in this decrease is the reduced access of the South Koreans to raw materials, especially in the U.S. EEZ. In addition, the Koreans are diverting some of the product which was formerly sold in block and fillet form to surimi production, which commands much higher prices. Of the 1988 ROK fish block exports mentioned above, walleye pollock blocks comprised nearly 70 percent of

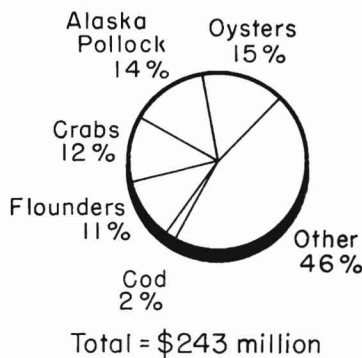


Figure 9.—Major fish species exported by Korea to the United States by value, 1988. Pollock data includes roe. Source: U.S. Bureau of the Census.

the total value—\$31.5 million. Cod blocks were second in importance (1,800 t, valued at \$5.6 million), followed by flounder blocks (1,600 t, valued at \$5.2 million). In the frozen fillet category, flounder fillets topped the list (5,400 t, valued at \$21.6 million). Unspecified saltwater fish fillets were second (4,700 t, worth \$15 million), followed by hake, haddock, Alaska pollock and cod fillets (a combined 2,500 t, valued at \$6.3 million).

#### Fresh/Frozen and Canned Shellfish

The ROK exported over \$77 million worth of these two commodities to the United States in 1988. Fresh/frozen shellfish accounted for about 56 percent of the total (\$43.2 million). Fresh/frozen crabs and crabmeat were the most important commodities; 3,000 t were shipped, valued at nearly \$28 million. Other important commodities were frozen oysters and squid. Of all ROK canned shellfish commodities shipped to the United States in 1988, canned oysters were by far the most important, comprising over 90 percent of the total. Over 6,600 t of canned oysters and canned smoked oysters, valued at \$31 million, were shipped. The ROK also exported small amounts of canned clams, shrimp, and mussels.

Table 12.—Korean fishery exports to the United States, by species and value, 1980-88. Source: U.S. Department of Commerce, Bureau of the Census.

Species	Exports (US\$1,000)								
	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Edible</b>									
Oysters	11,773.1	16,794.2	21,619.2	21,243.2	20,162.5	23,731.5	26,451.4	33,618.2	35,734.4
Pollock <sup>1</sup>	20,184.7	23,520.0	20,403.7	27,379.6	24,516.6	22,436.7	25,346.9	47,634.0	33,753.0
Crabs	623.5	674.3	6,139.3	5,641.7	5,566.8	5,077.3	20,415.0	32,225.8	28,116.1
Flatfish		490.7	251.3	2,601.8	6,350.7	9,334.6	16,019.7	20,486.7	26,874.9
Surimi, analogs							3,476.8	9,692.6	14,750.4
Cod	5,009.2	6,851.7	4,871.1	6,948.8	6,693.6	5,306.0	11,261.1	29,960.2	8,434.1
Clams	2,231.1	2,027.2	4,678.3	3,068.4	2,320.7	2,146.6	2,023.4	3,614.0	3,651.6
Squid							1,565.8	2,980.0	2,978.7
Tuna	15,900.8	23,337.0	11,095.0	12,737.5	6,174.1	1,083.4	3,316.7	1,198.3	1,832.1
Shrimp	369.4	501.7	203.6	276.7	363.4	331.4	814.3	1,568.2	1,732.8
Groundfish	583.1	796.4	1,553.9	1,715.9	1,387.6	1,892.5	3,455.1	8,812.2	1,595.1
Sardines	32.0	48.4	12.0	23.4	292.7	730.4	608.3	1,318.2	1,246.6
Mackerel	165.6	140.4	136.5	138.9	360.3	400.1	463.9	736.0	1,043.1
Salmon <sup>1</sup>					1.6	3.2	207.2	2,934.3	242.5
Lobster		2.3		209.8		21.6	20.5	96.1	195.1
Anchovies					0.8		45.9	86.3	169.9
Turbot	86.7	189.7	94.8	43.9		110.6		957.1	138.4
Yellow perch									136.5
Halibut					161.0			827.0	68.7
Shark fins							26.5	28.8	51.6
Swordfish	2.8		1.1		2.6	26.1		233.9	19.2
Scallops	0.7	14.4	8.6	12.9	11.1	160.1	15.2	58.3	13.6
Herring <sup>1</sup>				1.5	9.3	49.2	130.9	6.7	5.7
Ocean perch				186.4	216.7	117.3		185.3	
Trout				3.2			8.8	151.5	
Whiting	2,380.8	1,414.4	1,718.5	520.1	199.5	41.2	85.4	102.5	
Abalone	0.9	3.1	12.6	11.4	2.5		43.1	25.9	
Other fish	1,854.6	3,239.7	4,401.9	5,784.8	11,630.8	17,920.9	25,572.7	42,378.2	29,020.8
Other shellfish	2,190.9	1,524.3	1,406.7	2,243.6	2,272.7	3,506.6	1,781.6	3,892.2	4,925.0
Other edible	608.9	799.4	535.8	742.3	1,087.1	956.2	1,800.8	1,913.7	3,770.9
<b>Total edible</b>	<b>63,999.0</b>	<b>82,369.2</b>	<b>79,143.9</b>	<b>91,535.9</b>	<b>89,784.6</b>	<b>95,385.6</b>	<b>144,957.0</b>	<b>247,722.2</b>	<b>200,500.8</b>
<b>Inedible</b>									
Meal/scrap						88.4	25.5	89.8	247.2
Oil				0.7			1.6	3.9	350.1
Canned pet food				10.3		9.2			58.1
Other industrial	576.3	866.4	621.0	786.5	894.7	550.7	815.1	660.4	460.5
<b>Total inedible</b>	<b>576.3</b>	<b>866.4</b>	<b>621.0</b>	<b>797.5</b>	<b>894.7</b>	<b>648.3</b>	<b>842.2</b>	<b>754.1</b>	<b>1,115.8</b>
<b>Inedible partial fishery products</b>	<b>5,217.4</b>	<b>8,423.3</b>	<b>9,453.4</b>	<b>7,556.9</b>	<b>10,771.8</b>	<b>13,846.1</b>	<b>19,396.3</b>	<b>34,033.9</b>	<b>41,529.7</b>
<b>Grand total<sup>2</sup></b>	<b>69,792.7</b>	<b>91,658.9</b>	<b>89,218.3</b>	<b>99,890.2</b>	<b>101,451.2</b>	<b>109,879.9</b>	<b>165,195.6</b>	<b>282,510.2</b>	<b>243,146.4</b>

<sup>1</sup>Includes roe.

<sup>2</sup>Columns may not sum to total because of rounding.

#### Inedible Fishery Products

Although the value of 1988 ROK edible fishery exports to the United States was down by almost 20 percent from 1987, inedible fishery commodities (both inedible and partial inedible) were up by 22 percent, from \$34.8 million to \$42.6 million. The most important inedible fishery products in 1988 were jewelry (\$17.7 million), leather belts (\$9.4 million), and small mirrors (\$5.8 million)<sup>4</sup>.

<sup>4</sup>There is only a small fishery component to most of the inedible partial fishery products. They are included in this report so that the data corresponds to that reported in the "Fisheries of the United States."

#### Surimi and Surimi Analogs

The ROK first exported surimi and surimi analog products to the United States in 1986, when it shipped over 1,100 t, valued at \$3.5 million. The growth in exports of these commodities has been phenomenal; 1988 shipments to the United States totaled 4,700 t, valued at \$14.8 million. Nearly 100 percent of these were analog products—raw surimi exports were negligible.

#### Species

On a species basis, the ROK's top ten exports to the United States (in order of importance) in 1988 were oysters, wall-eye pollock, crabs, flatfish, cod, clams,



squid, tuna, shrimp, and various groundfish (Fig. 9, Tables 11, 12). Quantities shipped were down for all of the above, with the exception of flatfish (which increased by nearly 20 percent). Details of the top five exports (by value) follow.

Over 8,000 t of oysters, primarily canned, valued at \$35.7 million, were exported to the United States in 1988. The quantity shipped was down 19 percent from 1987, when a record 10,000 t was exported, but the value was up 6 percent.

Walleye pollock was the top species export to the United States by quantity in 1988 (19,500 t), but it took second place by value (\$33.8 million). As previously stated, pollock blocks and fillets comprised the bulk of the exports although canned pollock (770 t, valued at \$2.3 million) and small amounts of smoked, dried, and salted pollock were also exported (quantity and value not available). U.S. imports of pollock products from the ROK have averaged a little over 18,000 t for the last 9 years. Until 1986, the value of these imports averaged about \$23 million. In 1987, the Koreans, exported an all-time record

23,000 t to the United States, worth nearly \$48 million.

In 1988, the United States purchased 3,000 t of Korean crabs, valued at \$28 million. This was an 18 percent decrease by quantity and a 13 percent decrease by value below record 1987 purchases. U.S. imports of frozen crab and crabmeat have exceeded 3,000 t annually since 1986 (Table 11).

South Korean exports of flatfish (flounders) to the United States have enjoyed steady growth since 1983, when 848 t, valued at \$2.6 million, were shipped. By 1988, a much larger amount (7,000 t) of flatfish, worth \$26.8 million, was exported—ten times the 1983 exports by quantity and value. The most important commodity forms are frozen fillets, followed by frozen flatfish blocks.

Total 1988 ROK cod exports to the United States were 2,500 t, valued at nearly \$8.5 million. Of this total, the most important commodity was frozen cod blocks (totaling 1,800 t, valued at \$5.6 million). Cod fillets were next in importance (700 t, valued at \$2.4 million) followed by small quantities of frozen whole cod and salted cod. The

1988 ROK cod exports to the United States were down approximately 70 percent by quantity and value over 1987 cod exports (8,200 t, valued at \$30 million). This decrease is most likely due to increased sales of cod to the Japanese.

### Conclusion

There is little doubt, given South Korea's phenomenal growth rate and increasing affluence, that U.S.-ROK fisheries trade will continue to grow. The rate of growth, however, will continue to be dependent upon the relaxation of import restrictions (import licenses and tariffs) by the Korean Government. An additional factor, the influence of the Japanese market on U.S. fishery exports to South Korea, adds a further element of unpredictability. However, as fishery raw materials become more difficult for the Koreans to obtain because of increased control of coastal countries over their own EEZ's, the prospects will continue to improve for U.S. exporters. (Source: IFR-89/52. Prepared by Paul E. Niemeier of the NMFS Foreign Fisheries Analysis Branch, Silver Spring, MD 20910.

## The Sea Urchin Market in Japan

The Japanese market for live sea urchin and sea urchin roe from the United States is growing rapidly, but it has not yet been fully developed. Although imported sea urchin has penetrated the Japanese market (U.S. sea urchin exports to Japan have increased from 540 metric tons (t) in 1984 to 1,740 t in 1988: Figure 1), foreign-processed roe remains unpopular, largely because of inconsistencies in quality and supply. The strict quality requirements of the Japanese market will necessitate higher standards on the part of U.S. sea urchin roe processors to guarantee export success.

### Consumption

#### Roe

Sea urchin roe is considered a delicacy in Japan, where it is primarily served raw in sushi. The Japanese name for sea urchin roe is "uni." Most sea urchin roe buyers at Tokyo's Tsukiji Central Wholesale Market purchase for expensive traditional Japanese-style restaurants which demand extremely high quality in both appearance and taste.

Although some imported sea urchin roe is currently shipped to Hokkaido

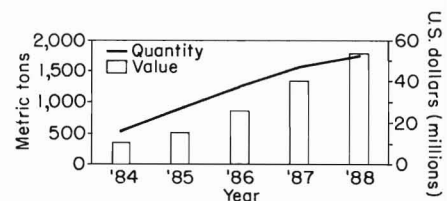
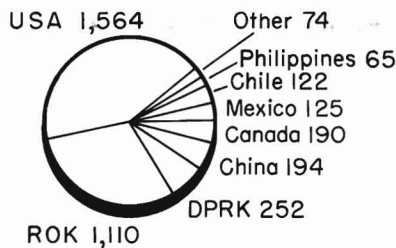


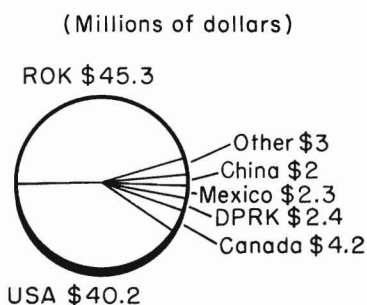
Figure 1.—Japanese sea urchin imports from the United States by quantity and value, 1984-88. Source: Fisheries Agency of Japan.

and northern Honshu for processing, inferior quality has prevented an increased market share for imported roe. The demand for sea urchin roe is seasonal, with the largest amount being consumed in December. Sea urchin roe is marketed in different product forms: Fresh (nama uni), frozen (reito uni), baked and frozen (yaki uni), steamed (mushi



1987 total: 3,696 tons

Figure 2.—Japanese sea urchin imports by country of origin and quantity (metric tons), 1987. Source: Fisheries Agency of Japan.



1987 total: \$99,284,215

Figure 3.—Japanese sea urchin imports by country of origin and value (millions of dollars), 1987. Source: Fisheries Agency of Japan.

uni), and salted (shio uni). Salting is used primarily for lower-grade roe. Two fermented urchin roe products are also popular in Japan: Neri uni (a blended urchin paste) and tsubi uni (a lumpy paste).

### Live Urchin

Virtually no live imported sea urchin is sold at the Tsukiji Market. Buyers of live sea urchin usually prefer the domestic Japanese sea urchin which is limited in supply. Because of the difficulties in shipping and handling live, whole sea urchins, Japanese importers generally prefer to have the roe processed at the place of origin.

### Imports

Japan imported 3,700 t of sea urchin

in 1987, valued at about \$100 million (Fig. 2, 3). Nearly half of the value was supplied by the Republic of Korea (1,110 t valued at \$45.3 million), followed by the United States (1,560 t valued at \$40.2 million), Canada (190 t valued at \$4.2 million), and North Korea (250 t valued at \$2.4 million). In 1988, imports from the United States amounted to 1,740 t, with a value of \$54 million, becoming the fourth largest U.S. fishery export to Japan by value. Values were not available for 1988 Japanese urchin imports from other countries.

### Price

The highest priced sea urching products imported from the United States are the red sea urchin, *Strongylocentrotus franciscanus*, shipped from Los Angeles and from San Francisco. Processed roe from the New England green sea urchin, *S. droedachiensis*, ranks third in price on the Japanese market, and green sea urchin roe harvested in British Columbia, Canada, and Puget Sound, Washington, ranks fourth. Prices of Los Angeles-origin sea urchin roe as of March 1989 were \$8.20-\$40.98 per tray<sup>1</sup> while British Columbia-origin roe brought only \$4.92-\$16.39 per tray. The wide price spread reflects the uneven quality of imported sea urchin roe.

The average wholesale price of live sea urchins from the U.S. west coast is around \$10.00 per kg from October through April, but falls to around \$6.00 per kg during the summer months when fear of food poisoning depresses consumer demand.

### Quality Standards

Japanese consumers prefer pale yellow or orange roe over roe with mottled or dark brownish or reddish color. Roe color is largely dependent on the diet, sex, and harvest time of the individual sea urchin. In the Sanriku area of Japan, sea urchin roe is steamed and therefore color is not as significant in determining quality and price. Roe from British Columbia is considered to be of inferior quality because the individual roe sacs, which are over 2 inches long,

<sup>1</sup>At an exchange rate of \$1 = ¥122. One tray contains 260 g of roe.

are too large for use in sushi.

Japanese processors look for a roe recovery rate of about 10 percent and require a minimum of 3 metric tons of live sea urchin per day to run their plants efficiently. Inconsistent roe color and recovery percentages and unreliable supply are Japanese processors' chief complaints against U.S.-produced sea urchin products. Because roe recovery percentage and color vary with fishing season and region, U.S. suppliers must pay careful attention to harvest techniques and be willing to adapt them to Japanese taste.

### Handling

Tsukiji Market auction house experts advise that improvement in the quality of U.S.-processed sea urchin roe would enhance sales. Because the roe deteriorates quickly during shipment, they make the following recommendations:

1) Use only the best fresh roe. Deteriorated roe melts around the edges during the brining process and has a poor appearance.

2) Keep the temperatures of the processing room and the brine water low.

3) Drain the brine water well off the roe before putting it on the trays. Keep the roe color uniform in trays.

4) Avoid freezing at any point during shipment. Repeated freezing and thawing causes loss of firmness and poor appearance. (Source: IFR-89/36. Prepared by Karen Kelsky and Paul Niemeier of the NMFS Foreign Fisheries Analysis Branch, Silver Springs, MD 20910.)

## THE JAPANESE ABALONE MARKET

Although abalone is expensive in Japan, it is popular among Japanese consumers, who eat it in sashimi, Chinese food, and holiday gift preparations. There are five major abalone species consumed in Japan. The United States was the fourth-largest exporter of abalone to Japan in 1988.

### Species

Japan's major abalone species are the Japanese abalone or "kuro awabi," *Nor-*

*dotis discus*; the giant abalone or "madaka awabi," *N. gigantea*; Siebold's abalone or "mekai awabi," *N. gigantea seiboldii*; the northern abalone or "ezo awabi," *N. discus hannai*; the tokobushi abalone or "tokobushi," *Sulculus diversicolor*; and a subspecies of the tokobushi abalone known as the "fuku tokobushi," *S. diversicolor aquatilis*. Although the northern abalone is found in shallow coastal waters off northern Honshu and Hokkaido (at depths of less than 15 m), the other species are found in warmer waters at depths ranging from 10 to 50 m.

Japanese abalone is thick-shelled, has dark colored meat, and grows to approximately 20 cm in length. Although it is good to eat fresh or steamed whole, the meat is considered tough. Giant abalone also reach lengths of 20 cm, but the meat shrinks slightly when steamed. Siebold's abalone, which grows to 25 cm, is flatter than the other species and is consumed raw. Northern abalone has a relatively thin shell and is suitable for any type of preparation. Tokobushi abalone is smaller than the other species, growing to lengths of only 7 cm. Tokobushi is characterized by 7-8 open holes on the shell, whereas other species of abalone have only 3-4 holes.

### Consumption

Abalone is extremely expensive in Japan, and is generally bought by restaurants for preparation as sashimi. Almost all species are considered suitable for sashimi, although Japanese consumers prefer abalone with tan-colored meat. Giant and tokobushi abalone are also used in preparations known as "ni-gai" or "ni-awabi", whole abalones cooked with fish broth and soy. "Ni-awabi" packed in plastic bags or cans is a popular choice for the winter gift season. A leading Japanese manufacturer produces over 500 metric tons (t) of various kinds of ni-gai annually for the Japanese gift market. Other popular preparations are abalone steaks sauteed in butter and abalone marinated in vinegar. Dried abalone is used for Chinese cooking. The Japanese demand for fresh abalone increases in the summer because the Japanese believe that the quality improves as the season progresses.

### Marketing

Live abalone is sold at auctions in Japan, generally in sizes ranging from 150 to 500 g. The most popular size is 200-300 g. Live Japanese abalone commands the best prices—\$22.90-\$53.00 per kg (U.S.\$1 = ¥131)—and is normally sold to luxury Japanese restaurants for sashimi. Japanese shippers of live abalone keep the abalone in tanks at water temperatures of 15-18°C without feeding for about a week before shipment. Depriving the abalone of feed is believed to slow down its metabolism, thereby reducing mortality rates during shipping. Another benefit of the premarketing feed cut is to enhance the flavor of the abalone by reducing odor and excessive fat caused by feeds. The precise duration of the feed cut depends on the size of species.

### Imports

Japan imported over 56 t (valued at \$1.7 million) of abalone in 1988. The leading suppliers were, by quantity, China (25 t), the Republic of Korea (19 t), Australia (9 t), and the United States (4 t) (Fig. 1).<sup>1</sup> By value, however, South Korea (\$820,000) surpassed China (\$690,000) by 17 percent, because of the higher quality of its abalone.

Imported abalone is said to be tougher than Japanese abalone, although live or fresh imports are considered more tender than the frozen product. Imports are generally not used for sashimi, but processed and canned. About 40,000 cartons of canned abalone are distributed in Japan annually.<sup>2</sup> U.S. abalone is not considered suitable for drying because the flavor is said to be insufficient to produce a quality broth.

Live California black abalone (>1 kg each) and pink abalone (about 2 kg each) were sold in the Tokyo Central Wholesale Market (TCWM) in September 1988 for about \$12.20 per kg, and \$17.50-20.60 per kg, respectively. Other U.S. species are unknown in Japan. A specialist at a TCWM auction house advised U.S. exporters that a premarket-

<sup>1</sup>Some of the U.S. imports may be Mexican-origin products shipped through Los Angeles, Calif.

<sup>2</sup>Canned abalone are packed 48 cans per carton, about 200 net per can.

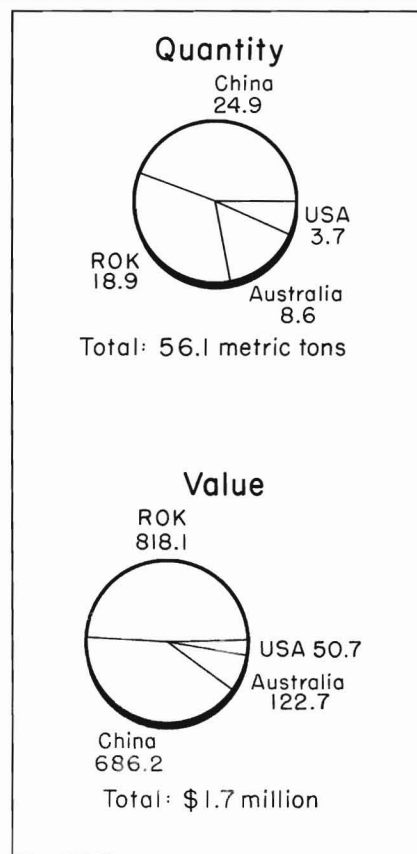


Figure 1.—Japanese imports of live, fresh, or chilled abalone, by country of origin, quantity (t) and value (US\$1,000), 1988.

ing feed cut of 3-4 days for black abalone and 7 days for pink abalone should help reduce mortality rates. He also suggested sorting both species according to size<sup>3</sup>. The recommended carton size is 10 kg, although sometimes 12 kg cartons may be packed to compensate for water loss during shipment. Imported abalone often loses about 20 percent of its original weight by the time it is sold at auction. The specialist suggested that U.S. exporters should begin with trial shipments of 100-200 kg, and increase the quantity to 400-500 kg per shipment later. Consistency in shipping quantity

<sup>3</sup>Abalone sizes are: L (400 g and up) and M (under 400 g) for the black abalone, and L (1 kg and up) and M (under 1 kg) for the pink abalone, unless U.S. exporters are unable to provide 200-300 g sizes.

and stable quality are important for Japanese buyers.

Tsukiji import houses import fish and seafood on a consignment basis and remit payment to exporters about 1 week after the auction. They deduct 5.5 percent commission, import duties, truck-

ing charges, etc. They are authorized by Japan's Ministry of Agriculture, Forestry and Fisheries to sell to middlemen or wholesalers at auctions through bidding, bargaining, or at a fixed price. The goods may be consigned by producers or purchased by the auction houses from

producers. The wholesaler's selling commissions are fixed at 5.5 percent for marine products. (Source: IFR-89/44R. Prepared by Karen Kelsky and Paul Niemeier of the NMFS Foreign Fisheries Analysis Branch, Silver Springs, MD 20910.)

## MALAYSIAN SHRIMP CULTURE

Malaysian shrimp culture has begun to succeed commercially after suffering years of heavy financial losses. Improved aquaculture methods and the commitment of a few large companies are largely responsible for the turnaround. Malaysian production, mostly of giant tiger prawns<sup>1</sup>, *Penaeus monodon*, was 1,260 metric tons (t) in 1987, almost five times the 1986 harvest of 270 t. Estimated 1988 production was 1,800 t. In 1987, Malaysia produced 300 million shrimp post larvae for stocking growout ponds. Production of post larvae in 1988 was estimated at 360 million. Malaysia's post larvae production exceeds domestic shrimp farmers' needs, and the surplus is exported—about 78 million in 1987 and an estimated 11 million in 1988. About 80 percent of the Malaysian shrimp culture production is exported, mostly to Singapore, Japan, the United States, and Europe.

### Production

Malaysian shrimp farmers harvested 1,260 t of shrimp in 1987, nearly five times the 1986 production (Table 1). Of this total 760 t were produced in peninsular Malaysia, and 500 t were produced in Sabah, East Malaysia. The estimated 1988 crop was 1,800 t, with 1,000 t produced in peninsular Malaysia and 800 t produced in Sabah. There are currently about 230 farms operating in Malaysia, covering a total of about 730 hectares (ha). In peninsular Malaysia, 190 farms are operating on 560 ha, and in Sabah, 36 farms cover about 170 ha. The Malaysian Government has targeted a total of 22,000 ha of mangrove swamp

<sup>1</sup>*Penaeus monodon* are also marketed commercially as black tiger prawns. Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.

for development into aquaculture ponds, which are expected to yield 21,000 t of shrimp by the year 2000.

Most (about 85 percent) of the cultured shrimp produced in Malaysia are giant tiger prawns, and the remaining 15 percent are banana prawns, *P. merguensis*. Both are grown in brackish water ponds.

### Development Potential

Between 1986 and 1988, the government approved 36 shrimp aquaculture projects with a proposed investment of \$122 million. Of this total, 23 projects, worth \$102 million were approved in 1988 alone, indicating a dramatic rise in the stock of Malaysian aquaculture. If all 36 projects are completed, their combined production will be about 30,000 t annually, surpassing the government's official annual production goal of 21,000 t by the year 2000. Many of the projects are joint ventures with Taiwanese partners. Some of the larger projects have their own hatcheries, and some are integrated with processing plants. Projects have been sited in Sabah, as well as the states of Johore, Pahang, Trengganu, and Kelantan on the east coast, and Selangor, Perak, and Kedah on the west coast of peninsular Malaysia.

### Corporate Investments

Three major corporations have located projects within a very small area at Kuala Sedili, in the state of Johore. They are: the Johore State Economic Development Corporation, which runs the East Asia Marine Farms (EAMF); the Anglo-Dutch Unilever Corporation; and the Lion Corporation, which also has shrimp farms in Malacca and Sabah,

through holdings of its subsidiary, Aquabio.

U.S. Embassy officials in Kuala Lumpur recently visited the EAMF project and talked with its managing director, Ahamad Bin Mohamed. EAMF produced 420 t of shrimp on 200 ha (50 ponds of 4 ha each) in 1988 and is predicting 1989 production of 660 tons. It is expanding its Kuala Sedili operation by another 200 ha and is building a 450 ha farm near Mersing, Johore, for \$18 million. EAMF uses the semi-intensive culture method, which has consistently yielded 600-700 kg of shrimp per ha annually in Malaysia. However, EAMF achieved yields of 915 kg per ha in 1988 and is currently producing 1,200 kg per ha annually. The company's goal is 2,000 kg of shrimp per ha, and it already has some ponds producing above this rate. EAMF's harvesting cycle is approximately 4½ months for each pond. Most of its efforts for increasing productivity are focused on reducing turnaround time; its equipment for cleaning and repairing ponds after harvesting becomes inoperable in the frequent rains.

Table 1.—Malaysian total shrimp production, by fishery with cultured shrimp as percentage of total shrimp production, 1983-1988, and 2000 projection.

Year	Shrimp production (t)			Percent <sup>1</sup>
	Wild catch	Cultured	Total	
1983	52,821	415	53,236	1
1984	53,650	682	54,332	1
1985	80,349	205	80,554	Negl.
1986	57,982	269	58,251	Negl.
1987	71,693	1,260	72,953	2
1988 <sup>2</sup>	N/A <sup>3</sup>	1,800	N/A	N/A
2000 <sup>4</sup>	N/A	21,000	N/A	N/A

<sup>1</sup>Cultured shrimp production as a percentage of total production.

<sup>2</sup>Estimated.

<sup>3</sup>N/A = Not available.

<sup>4</sup>Projected.



EAMF currently imports shrimp feed from Taiwan but is constructing its own feedmill. Feed accounts for about 60 percent of production costs in Sabah and 40-50 percent of production costs in peninsular Malaysia. Sabah has recently announced that it will embark on a feed mill joint venture with an unnamed foreign partner.

EAMF is vertically integrated, with its own hatchery and processing plant. It would like to process shrimp from other projects, but currently a substantial percentage of Malaysian shrimp are shipped live for processing to Singapore where they command higher prices. EAMF processes and freezes its shrimp for shipment to Japan where they are marketed under both premium-brand and general-brand names.

According to EAMF's managing director, the Kuala Sedili-based Unilever and Lion shrimp farms have just gone into production. At present, Lion's farm is producing 2 t per month, and Unilever is producing 1 t per month. Lion's shrimp farms in Malaysia are expected to harvest a total of 100-150 t in 1989. The company plans to expand from the current 40 ha in production to over 1,200 ha within the next 5 years. Press reports state that the Unilever project will eventually cover 1,000 ha (150 ponds), yielding 1,200 t per year. Unilever's total investment is expected to be \$39 million.

The increased profitability of shrimp culture in Malaysia is largely because of better siting. Previous projects often failed because ponds were located in mangrove areas where pond excavation resulted in a level of water acidity that is lethal to shrimp. In contrast, the Kuala Sedili projects are located on a tidal river at the edge of a mangrove area where the soil is more suitable.

Despite identical siting, however, there is strong disagreement among the three companies on the best production methods. The Unilever project has higher capital costs because the company lines its ponds with concrete and uses more expensive pumping equipment. The American farm manager for EAMF believes these costs are unnecessary, citing a previous Unilever failure in Sri Lanka. However, an industry source (not asso-

ciated with any of the three companies) believes that EAMF and Lion risk failure precisely because their less expensive approach leads to costly pond maintenance and significant down time.

Other than feed, the greatest expense for all three projects is the pumping of thousands of gallons of brackish river water in and out of the ponds to maintain proper oxygen levels and to flush them of waste. According to EAMF's, Ahamad, while the government is still endorsing the use of mangrove land for aquaculture, the cognoscenti in Malaysian aquaculture will be setting up on sites similar to Kuala Sedili. The east coast is dotted with relatively unpolluted tidal rivers with adjacent state land theoretically available for aquaculture.

### Hatcheries

At present, 32 shrimp hatcheries are registered with the Malaysian Fisheries Department (23 in peninsular Malaysia and 9 in Sabah). Post larvae production in 1987 was 300 million (240 million in peninsular Malaysia and 60 million in Sabah). Estimated 1988 post larvae production is 360 million (280 million in peninsular Malaysia and 80 million in Sabah). Although 78 million post larvae were exported in 1987, it is estimated that only about 11 million were exported in 1988. The reasons for this decline are not known. The major foreign markets for Malaysian post larvae are Sri Lanka, Oman, Pakistan, Hong Kong, Italy, China, and Thailand.

Sabah dominates production of wild tiger prawn broodstock in Malaysia. Live gravid females sell locally for between \$58 and \$110, with prices going as high as \$1,820 in Taiwan, the major export market<sup>2</sup>. (Tiger prawns accounted for 70 percent of Taiwan's shrimp exports to Japan and 29 percent of Southeast Asia's shrimp exports to Japan in 1987). Malaysia has banned the export of gravid shrimp, but smuggling them out of the country through Singapore is reportedly common.

### Research

The Malaysian National Prawn Re-

<sup>2</sup>The official exchange used in this report is U.S.\$1.00 = M\$2.75.

search Center was completed in 1987 with a \$8.4 million grant from the Japanese Government. It has also received assistance from two Japanese aquaculture experts supplied by the Japanese International Cooperation Agency. The Center has cut shrimp post larvae production costs by 50 percent over the last 5 years, from \$0.015 per fry to \$0.007. A new technique for mass production of post larvae through induced spawning was developed at the Center and is being applied in most of Malaysia's hatcheries.

### Government Incentives

The Malaysian government assists the shrimp culture industry through the Department of Fisheries, which provides advice and technical assistance. Shrimp culture firms are also eligible to receive the tax rebates and tax relief, which the Malaysian government provides to most developing industries. A 5 percent investment tax credit is extended to all shrimp culture investors, i.e., 50 percent of the first 5 year's qualifying capital expenditures may be deducted from taxable income. These expenditures include the clearing of land, pond construction, the purchase of plant and machinery, and building construction. Investors may also borrow from the government's new low-cost investment fund at reduced rates or benefit from a reduced interest rate export credit refinancing scheme.

### Outlook

Malaysia will be pushing to join the ranks of major Asian shrimp producers over the next 10 years. Prospects are bright for continued investment now that the larger companies are beginning to demonstrate that shrimp aquaculture can succeed commercially in Malaysia. Whichever production method is employed, potential large players, such as plantation companies and state economic development corporations with foreign joint-venture partners, are likely to move into the shrimp culture business. (Source: IFR-89/50. Prepared by Karen Kelsky and Paul Niemeier of the NMFS Foreign Fisheries Analysis Branch, Silver Spring, MD 20910.)