The Asian Surimi Industry

The Asian surimi industry is undergoing a period of rapid change as the Republic of Korea, Thailand, New Zealand, and the United States are increasingly challenging Japan's position as the world's leading surimi producer. The appreciation of the yen and the Japanese exclusion from U.S. and Soviet walleye or Alaska pollock resources, have caused Japanese production to decline from its 1984 peak of 418,000 metric tons (t) to only 310,000 t in 1989. Meanwhile, the output of the other four major producing countries has increased from about 26,000 t to 260,000 t during the same period (Fig. 1, Table 1).

The Korean surimi industry shows the greatest potential for independent growth among the Asian surimi producers, with an output of 60,000 t in 1989. The Thai and New Zealand industries also show considerable growth potential, but are at present dependent upon Japanese technical assistance. Quality and adequate raw material resources are the primary obstacles facing these three up-and-coming Asian surimi producers.

Background

Fish paste products have long been a part of traditional Asian cuisine, but surimi has become one of the most dynamic commodities in the Asian seafood industry because of recent innovations in production and utilization. Surimi is an intermediate product made from minced fish meat that has been washed, refined, and treated with cryoprotectants. Although fish paste products have been hand-made for centuries, a process for freezing surimi, invented in 1960, provided the impetus for expanding the industry and surimi markets based on the vast walleye pollock, *Theragra chalcogramma*, resource.

In 1975, Japanese firms introduced imitation crabmeat and analogs of other shellfish, generating much greater interest in surimi overseas than did traditional Japanese surimi-based food products. About 90 percent of Japan's surimi production is used to manufacture traditional products (known as kamaboko), imitation crabmeat (kanikama), scallops, and other analogs (Table 2). The other 10 percent is used to make fish hams and sausages. Surimi can be produced on factory trawlers at sea, or in land-based processing plants. Because fresher fish is used, at-sea surimi is generally considered to be of higher quality than land-based surimi. Walleye pollock is the most commonly used species in surimi production because of its abundance, high gel-forming capability, year-round availability, white color, and pleasant taste. Walleye pollock is predominantly found in the North Pacific, in waters off Alaska, the Bering Sea, and within the Soviet Exclusive Economic Zone (EEZ). As foreign access to pollock stocks in the U.S. and Soviet EEZ's is being reduced, however, other demersal species such as hoki, *Macruronus novaezelandiae*, and blue whiting, *Micromesistius poutassou*, as well as pelagic species such as jack mackerel, *Trachurus japonicus*, and sardine, *Sardinia melanostrichus*, are also being used in surimi production (Table 3). To date, however, producers have not found any single species besides pollock that both satisfies the necessary processing criteria and is sufficiently abundant to supply the growing world market. In the

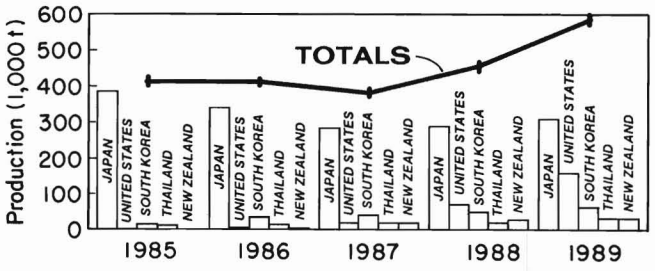

Figure 1.—Major surimi producers and production by country and year, 1985-89 (1988-89 data estimated).

Table 1.—World surimi production by country and year, 1985-89.

Country	Surimi production (1,000 t)					
	1984	1985	1986	1987	1988	1989[1]
Japan	418	385	342	285	290	310
Korea	14	15	34	40	50[2]	60
United States	0	0	4	18	57	141
Thailand	10	11	15	20	20[2]	30
New Zealand	0	0	6	19	28[2]	30

[1]Projected.
[2]Estimated.

Table 2.—General glossary of surimi-related terms[1].

Commodity	Definition
Chikuwa	Broiled kamaboko with a cylindrical shape.
Hanpen	Sponge-like fish cake dumplings for soup made from a boiled kamaboko and ground yam mixture.
Kamaboko	Fish cake made from surimi. Sometimes mixed with ingredients such as starch, egg albumin, and mirin (Japanese sweet liquor). Comprises 90 percent of surimi-based products. May be steamed, fried, or broiled and consumed directly or further processed.
Kanibo	Surimi-based imitation crab legs.
Kanikama	Surimi-based imitation crab meat.
Naruto	Steamed kamaboko with a cylindrical shape containing a pinka nd white spiral pattern on the cross section.
Neriseihin	Any surimi-based processed food product.
Satsuma-age	Surimi-based fish cake patties with vegetables and flavoring added.
Surimi	A semi-processed wet fish protein made from washed and refined minced fish meat mixed with cryoprotectants and sugar. Not for direct consumption.

[1]Source: OECD Multilingual Dictionary of Fish and Fish Products, 1978.

Table 3.—Fish species used for surimi production by common name, fishing grounds, and quantity, 1984-86.[1]

Common name	Fishing grounds	Production (1,000 t) 1984	1985	1986
Walleye pollock	N.E. Pacific	1,373	1,399	1,605
	N.W. Pacific	4,614	4,733	5,154
Atlantic cod	N.W. Atlantic	651	635	635
Croaker	W. Indian Ocean	136	146	132
	E. Indian Ocean	36	32	35
Gulf menhaden	Gulf of Mexico	983	884	829
Hoki	S.W. Pacific	55	39	104
Jack mackerel	S.E. Pacific	2,314	2,148	1,958
Pacific whiting	N.E. Atlantic	598	656	799
Southern blue Threadfin bream	E. Indian Ocean	74	76	81
Whiting	S.E. Atlantic	113	95	104

[1]Source: FAO data.

Table 4.—Japanese surimi production by type and quantity, 1978-87.

Year	At-sea[1] prod. (t)	Shore-based (t) Pollock	Other	Total	Total domestic production (t)
1978	175,853	177,655	12,075	189,730	365,583
1979	190,621	162,422	14,543	176,965	367,586
1980	179,331	165,818	19,097	184,915	364,246
1981	176,442	160,200	18,280	178,480	354,922
1982	177,095	178,941	17,013	195,154	373,049
1983	153,593	210,855	15,425	226,280	379,873
1984	146,000	248,186	24,258	272,444	418,444
1985	126,067	226,420	32,106	258,526	384,593
1986	101,054	205,074	43,419	248,466	341,833
1987	64,402	195,921	24,406	220,327	284,729
1988	90,000	180,000	20,000	200,000	290,000
1989[2]	120,000	170,000	20,000	190,000	310,000

[1]Produced by Japanese factoryships at sea.
[2]Estimated.

Table 5.—Japanese Alaska pollock directed fishing catch quotas in the U.S. EEZ, by round weight quantity, region and year, 1985-89, and U.S. domestic annual processing allocation (DAP).

Year	Quotas (t) Bering	Aleutians	Alaska	Total amt. (t)	U.S. DAP (t)
1985	594,200	50,900	25,000	670,100	75,900
1986	261,800	36,300	0	298,100	135,100
1987	3,300	0	0	3,300	255,400
1988	0	0	0	0	622,500
1989	0	0	0	0	1,117,200

last 20 years, world demand for surimi-based foods—marketed as inexpensive, healthful alternatives to natural seafood—has grown dramatically, and surimi production, originally dominated by Japan, has spread to over 20 countries in Asia, Europe, and North and South America.

Japan continues to dominate both production and consumption of surimi and surimi-based foods, but other countries have begun to challenge Japan's position in recent years. The U.S. and South Korean industries are particularly dynamic. The U.S. surimi industry has almost doubled in size each year since it was established with Japanese technical assistance in 1986. It is expected to produce over 140,000 t of surimi in 1989. (For an explanation of the Japanese production and import figures used in this report, please see "Note" at end of article.) The South Korean surimi industry, capitalizing on the high Japanese yen, is beginning to displace Japan in the main export markets of Europe and North America. The surimi industries in Thailand and New Zealand also show considerable growth potential. Japan will also eventually have to contend with other countries in Europe (France, United Kingdom, Norway, etc.) and Latin America (Argentina and Chile) which are developing surimi industries.

Japan

Japan's surimi production expanded sharply in the 1950's and 1960's and peaked in 1984 at over 418,000 t (Table 4), accounting for about 95 percent of the total world supply. Production has steadily decreased since 1984, however, for several reasons. First, the United States and the Soviet Union have greatly reduced Japan's allocations of pollock. Second, Japan's consumption and production of surimi-based foods has been declining, leading to reduced domestic demand for surimi. Third, a significantly stronger yen has helped make foreign products much more competitive in both Japanese and foreign markets. Today Japan accounts for less than 75 percent of the world total, producing only about 290,000 t of surimi in 1988.

Raw Materials

The most serious problem facing Japanese surimi processors is reduced access to walleye pollock resources. Because about 80 percent of Japanese surimi is manufactured from walleye pollock, Japan currently requires about 1.5 million t (round-weight) of pollock annually)[1]. Traditionally, Japanese producers relied upon domestic landings for their supply of raw materials. However, the Japanese pollock catch dwindled rapidly when the United States and the Soviet Union established their 200-mile fisheries jurisdictions (in 1976 and 1977, respectively), encompassing major pollock fishing grounds, and began to cut Japanese pollock catch allocations (Table 5).

Currently there is no pollock catch allocation for directed Japanese fishing in the U.S. EEZ. Under the 1989 Japan-U.S.S.R. bilateral groundfish agreement, the Soviets allocated about 121,000 t of pollock to Japanese fishermen. Of this total, 53,480 t was free-of-charge while for the remaining 67,530 t the Japanese have to pay a fee. In response, Japan has moved the bulk of its pollock fishing operations into the highseas "Donut Hole" region in the Bering Sea. Japan has also begun experimenting with the utilization of other fish species for surimi production. New Zealand hoki has been one of the most promising alternative sources of raw materials because of its abundance and the high quality of hoki surimi. But, for 1989, New Zealand reduced its catch allocation to Japan by over 75 percent—to only 2,899 t—bringing independent Japanese fishing in those waters also to a virtual halt. In response, the Japanese appear to be targeting Canadian Pacific hake, Chilean jack mackerel, and various Argentine demersal species.

Japan has also turned to joint venture (JV) agreements with the United States, the Soviet Union, and other countries to ensure access to raw materials. Total joint venture surimi production—whereby Japanese surimi factory vessels purchase Alaska pollock over-the-side from foreign trawlers within their respective EEZ's, and process it at sea—increased from 6,000 t in 1979 to 143,000 t in 1987. This number fell to about 141,000 t in 1988, however, because of decreased U.S. joint venture processing (JVP)

[1]Using a conversion rate from the round-weight to the processed product of 22-25 percent.

Table 6.—Japanese surimi joint ventures[1] by quantity produced and year, 1978-89.

Year	Partner and quantity (t)				Total prod. (t)
	U.S.[2]	U.S.S.R.[2]	DPRK	U.S./Can[3]	
1978	6,000		0	0	6,000
1979	6,000		0	0	6,000
1980	7,225		0	0	7,225
1981	10,750		0	0	10,750
1982	23,444		0	0	23,444
1983	55,859		0	0	55,859
1984	80,282		0	0	80,282
1985	105,156		0	0	105,156
1986	122,668		0	0	122,668
1987	143,210		0	0	143,210
1988[4]	113,500	23,400	2,300	2,000	141,200
1989[4]	31,000	13,800	1,500	6,000	52,300

[1]Although the Japanese Government records joint venture surimi production as an import, the surimi is produced by Japanese factoryships from fish purchased over-the-side from joint venture partners.
[2]Country not specified until 1988.
[3]Pacific hake-based surimi production.
[4]Estimated or projected.

Table 7.—Japanese production of fish paste products by product form and quantity, 1975-87.

Year	Chikuwa	Kamaboko	Fried kamaboko	Other	Subtotal	Ham/sausage	Grand total
1975	259	444	327	10	1,033	121	1,154
1980	174	326	269	18	824	89	913
1983	195	347	297	59	898	98	996
1984	196	330	298	71	896	95	990
1985	200	327	291	73	891	92	984
1986	195	309	276	74	855	91	945
1987	189	307	271	69	836	89	926
1988	190	308	278	61	836	84	920

Table 8.—Prices of Japan's frozen surimi.

Year	Grade[1] (¥/kg)			Year	Grade[1] (¥/kg)		
	A	B	C		A	B	C
1983	400	251	234	1986	492	352	332
1984	412	203	221	1987	480	266	243
1985	426	278	258	1988	NA[2]	200	NA

[1]A = highest grade of offshore product; B = on-land, 1st grade; C = on-land, 2nd grade.
[2]NA = Not available.

Table 9.—Japan surimi imports by major supplier and quantity, 1978-89.

Country	Imports (t)					
	1984	1985	1986	1987	1988	1989
U.S.A.	0	0	0	5,500	30,500	90,000
S. Kor.	1,000	4,000	9,000	8,000	8,000	10,000
Thail.[1]	0	10,000	12,000	21,000	25,000	30,000
Total	1,000	14,000	21,000	34,500	63,500	130,000

[1]May include a small amount from Taiwan.

allocations (Table 6). JV production is expected to fall further in 1989 to a projected 52,000 t. About 23,000 t of surimi was produced through joint ventures with the Soviet Union in 1988. About 50,000 t (round weight) of joint venture pollock purchases are negotiated yearly with North Korea. New Zealand, Thailand, Chile, Argentina, and Canada have also been small-scale joint venture partners.

Production

The Japanese domestic production of surimi has dropped from its peak of 418,000 t in 1984 to 290,000 in 1988 (Table 4) primarily because of recent competition from less expensive U.S. and South Korean imports. The decrease also results from declining demand from surimi-based food processors, as the domestic consumption of their products falls off due to changing Japanese eating habits (Table 7). Prices for all grades of surimi have fallen precipitously since 1987, putting many producers out of business (Table 8).

Imports

The decreasing domestic surimi production has spurred on a dramatic growth of imports from 14,000 t in 1985 to a projected 130,000 t in 1989 (Fig. 2, Table 9). Because of the recent fall in the value of the U.S. dollar and the Korean won against the yen, most of Japan's surimi imports come from the United States and South Korea, although New Zealand, Thailand, and Taiwan also supply small amounts. As U.S. domestic surimi consumption grows, however, U.S. exports to Japan are expected to level off. Although South Korean surimi retains an image of poor quality in the Japanese market, its price, 20-30 percent lower than Japanese surimi, has made it increasingly popular. Industry sources predict that Japan will import 10,000 t of South Korean surimi, and 90,000 t of U.S. surimi in 1989. According to the same sources, the availability of these inexpensive imported materials has permitted Japanese analog producers to cut prices and retain most of their domestic market share.

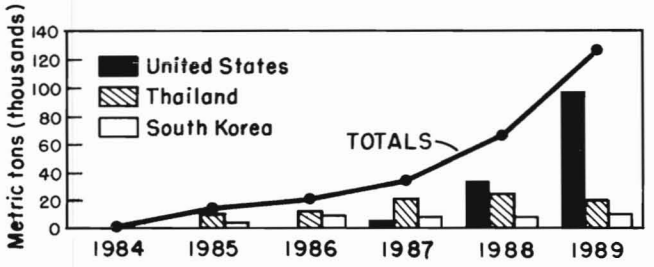

Figure 2.—Japanese surimi imports by major supplier and quantity, 1978-89, not including joint venture production (1989 data estimated).

Japan controls imports through a surimi import quota (IQ) system. The Japanese claim that biannual IQ's prevent foreign countries from oversupplying the Japanese surimi industries by bringing down prices. The pollock surimi IQ is distributed to three major categories of user groups—fishermen, processors, and traders. The fishermen's quota is earmarked for imports of Japan-U.S. joint-

venture processed pollock products (primarily surimi). The processor's quota covers South Korean surimi. Finally, fishermen, processors, and traders are all entitled to use the Overseas Fishery Development (OFD) quota, which applies to imports of surimi and other processed pollock products from countries with pollock resources within their EEZ's. As Japan's access to pollock resources has shrunk in recent years, total import quotas have increased dramatically from 95,000 t (round weight) in fiscal year 1986 to 631,000 t of pollock in fiscal year 1988 (Table 10). With domestic catch and joint venture production falling yearly, this trend is likely to continue.

Table 10.—Pollock surimi import quotas for Japan's fiscal years[1] 1986-88.

Recipient commodity	Import quota (t, round wt.) Apr.-Sept. 1986	Oct. 1986-March 1987	Apr.-Sept. 1987	Oct. 1987-March 1988	Apr.-Sept. 1988	Oct. 1988-March 1989
Fishermen's quota						
Surimikyokai (Japan Surimi Association) (U.S.-processed surimi[2])	10,000	20,000				
Daisui (Japan Fisheries Association)[3] (Japan-U.S. Joint Venture surimi)	10,000	45,000		28,000		NA
Processor's quota						
Zenkama (All Japan Federation of Kamaboko Manufacturers Association) ROK-processed surimi)	2,000	7,500	8,500	8,500	8,500	NA
Gyoniku (Fish) Sausage Association (ROK-processed surimi)		1,000	1,000	1,000	1,000	NA
Overseas Fishery Development quota[4] (Surimi from all countries)			100,000	0	200,000	NA
Total	22,000	73,500	109,500	37,500	209,500	421,500

[1]Japan's fiscal year extends from April through March of the following year. Pollock and pollock surimi quotas are allocated twice each year—the first allocation covering April through September and the second covering October through March.
[2]As of April 1987 this quota was incorporated into the Overseas Fisheries Development quota.
[3]May include other processed pollock products.
[4]Issued for the first time in April 1987.

Exports

The appreciation of the yen from a rate of ¥240/$1 in 1985 to ¥125/$1 in 1988 damaged Japan's world export share in many commodities by raising their prices to potentially uncompetitive levels. Although other sectors of the Japanese economy have weathered this crisis by cutting costs and streamlining production, the surimi industry, already hit by high costs caused by inadequate access to fishery resources worldwide, has been severely disadvantaged. Consequently, surimi exports to the United States declined from about 6,000 t in 1986 to only 800 t in 1988 (Table 11). Imitation crabmeat exports also declined precipitously in the past year, with exports to the United States decreasing by one half (Table 12). In response to these trends, the Japanese producers have shifted their export focus to the rapidly expanding European market. Surimi exports to Europe rose by 50 percent in 1987, and accounted for 40 percent of total Japanese fishery exports in 1988. However, this increase was not large enough to offset an overall decline in Japanese world surimi market share in both 1987 and 1988.

Table 11.—U.S. surimi supply by domestic production, imports, exports, and quantity, 1980-89.

Year	Domestic production	Imports (t) from: Japan	Other[1]	Total	Exports
1980		703			
1981		829			
1982		1,114			
1983		1,708			
1984		2,306			
1985		4,801	122	4,923	
1986	4,000	6,056	1,528	7,584	
1987	18,000	1,000	2,165	3,165	5,500
1988	57,200	800	2,000	3,500	30,500
1989[2]	141,000	400	500	900	106,000

[1]Primarily from South Korea, with small amounts from New Zealand.
[2]Projected.

Table 12.—Japanese exports of imitation crabmeat by country, quantity, and year, 1982-88.

Year	Exports (1,000 t) U.S.	Canada	Europe	Aust.	Other	Total
1982	6.7		0.5	1.8	0.3	9.3
1983	13.8	0.2	2.8	1.6	0.4	18.8
1984	26.8	0.8	2.3	1.6	1.0	32.5
1985	30.9	1.4	3.8	1.9	1.0	39.0
1986	25.3	1.9	5.8	1.6	1.1	35.7
1987	17.6	1.8	7.1	1.1	0.8	28.4
1988	8.7	1.7	7.5	1.3	0.6	21.1

Current and Future Developments

To gain access to hoki, jack mackerel, and southern demersal stocks, Japanese producers have increasingly been turning to South American countries, especially Argentina and Chile. Japanese vessels have been using Chilean jack mackerel to produce surimi for several years. Five Japanese vessels began producing hoki and southern blue whiting surimi in Argentine waters in 1987, but this project reportedly lapsed in 1989. The Japanese company Nippon Suisan expected to begin experimental surimi production of about 3,000-4,000 t through a joint venture with the Argentine company Mejino in 1989. Pacific hake joint ventures with Canada were also on the rise, accounting for a projected 6,000 t of surimi in 1989.

In addition, several unprecedented agreements were signed or discussed with the Soviet Union in 1988 for the initiation of Alaska pollock joint ventures in eastern Siberia and on the Sakhalin Island in the Northwest Pacific. The potential for future joint ventures with the Soviet Union, which has been enthusiastically pursuing closer economic ties with Japan since beginning business restructuring moves in 1986, is great. Joint ventures with New Zealand are also likely to increase because of the 75 percent cut in the Japanese hoki catch allocation in New Zealand waters for 1989.

In contrast, joint ventures with the United States are on a downward trend. Over the last 2 years, the United States has sharply reduced U.S. joint venture processing allocations (JVP) to the Japanese to keep pace with the raw material requirements of the rapidly expanding U.S. surimi industry. JVP's are the maximum round-weight amount of a particular species that the Japanese are permitted to buy over-the-side from U.S. vessels within the U.S. EEZ. The 1989 Alaska pollock JVP allocations, reflecting the 79 percent growth in the U.S. domestic surimi production since 1988, have been reduced from 504,000 t in round weight (20,000 t in surimi weight) in 1989 (Table 6). Total Japanese joint venture surimi production was expected to decline from 141,000 t in 1988 to 52,000 t in 1989.

Growing competition from South Korea in both domestic and JV surimi productions also has industry sources concerned. Some U.S. competitors fear that cheap South Korean surimi may be profitably reexported by Japan, but the Japanese producers believe that it will glut an already stagnating market, resulting in a further harm to the industry. They also fear that a recently concluded JV agreement between a South Korean company and the Soviet Union presages a trend toward Japanese exclusion from cooperative surimi production opportunities with the Soviet Union. The agreement permits South Koreans to enter traditional Japanese pollock fishing regions for maintenance privileges for Soviet factor vessels in Korean shipyards.

The outlook for the Japanese surimi industry is thus bleak. Although the search continues for a fish species to use as an alternative raw material to Alaska pollock, few can be turned at low cost into the white, high-quality surimi preferred by the Japanese. In addition, the high yen, U.S. and Korean competition, and adequate supplies of raw materials are likely to grow more problematic with time. The era of Japanese predominance in the surimi industry may be reaching its end.

The Republic of Korea

The most significant development in the Asian surimi industry has been the rapid rise of the Republic of Korea (ROK) as a major independent producer and exporter of surimi and analog products. It is the only Asian surimi industry which does not depend on Japanese technical assistance and aid. Production has more than tripled over the last 8 years, as ROK surimi, boosted by the fall of the won against the yen, has succeeded in penetrating not only the Japanese domestic market, but also markets in Europe and North America. The South Korean industry, however, must overcome not only the challenges of reduced access to raw materials in the U.S. and Soviet EEZ's and growing U.S. competition, but also a reputation for poor quality. In addition, an increasing domestic consumption rate may also limit the growth of ROK's world export share.

Raw Materials

The South Korean surimi industry, like Japan's, is primarily based on walleye pollock utilization. In contrast to Japan, however, ROK pollock catches rose steadily during the 1980's (from about 367,000 t in 1983 to 726,000 t in 1987). Since 1988, however, reduced access to raw materials from the U.S. EEZ has forced Korea also to move operations to the Bering Sea and New Zealand, and to turn to joint ventures with European countries, the Soviet Union, and the United States. Statistics for 1988 reveal a 25 percent decrease in Alaska pollock catch to 181,500 t. Despite this, the ROK continues to be a net exporter of walleye pollock, with 30 percent of its catch being exported in fillet form. Exports go mainly to the United States and Japan. In 1989, about 36 ROK vessels are operating in U.S. waters, through JV agreements with U.S. companies. South Korean-U.S. JM pollock production increased from 98,000 t in 1984 to 452,000 t in 1987, but has declined since then to 389,000 t in 1988, and an estimated 270,000 t in 1989. In one recent JV, a South Korean company has agreed to purchase 86,000 t of pollock from the Soviets off the western coast of the Kamchatka Peninsula. Joint ventures with North Korea, although still on a small scale, are also on the rise, with pollock constituting one of the most significant commodities in the growing North-South trade.

Table 13.—Korean frozen surimi production facilities by company.

Company[1]	Vessel name[1]	Vessel size (GRT)(t)	Daily capacity (t)
Goyo Fishery	Goyogo	5,377	40
Korei Deepsea	Keiyogo	5,377	60
	Kaitakugo	28,000	170
Namboku	Nambokugo	5,549	40
Toei Sangyo	Tosango	4,347	60
Sanko Bussan	Taihakugo	5,510	45
Shinro Koeki	Shinango	5,689	80
Dairin Fishery	#52 Daishingo	4,050	35
Nanyosha	Sunflower	3,200	30

[1]Names in Japanese pronunciation; mention of trade names or commercial firms in this article does not imply endorsement by NMFS, NOAA.

Production

At-sea surimi production began in 1984 aboard three vessels with a yearly capacity of only 14,000 t. The capacity of the fleet doubled in 1986 with the addition of 3 factory ships. Nine factory vessels and 185 shore-based processing plants were operating in mid-1989, to produce about 50,000 t of surimi per year (Table 13). Analog production, including imitation crab, has increased from 69,000 t in 1985 to 87,120 t in 1988. Although the maximum production capacity of the Korean industry is still small compared to Japan's, it has benefited greatly from the recent fall of the Korean won against the yen, and is expanding rapidly. Domestic consumption of surimi-based foods is increasing as the ROK population grows more affluent and demands more non-traditional, higher-quality foods, such as imitation crabmeat.

Imports

ROK imported a small amount of surimi for the first time in 1988, when a South Korean importer purchased 5,000 t from the Great Land Seafoods Company of the United States. To supply its growing domestic market, the industry will probably be forced to import more in the future.

Exports

South Korean exports of surimi to the United States have grown dramatically since 1985; they increased from 122 t in 1985 to 2,000 t in 1987 (Table 11). During the same period, ROK surimi

exports to Japan increased from 4,000 t to 8,000 t. In 1988, total ROK exports of imitation crabmeat approached 20,000 t. Exports to the United States and Japan may be stabilizing because of a stagnating market on the one hand and growing domestic competition on the other. However, ROK surimi exports to Europe are growing rapidly.

Current and Future Developments

ROK faces the same difficulties as Japan in terms of access to foreign surimi raw material resources. Joint venture allocations with the United States are on a downward trend, as the pollock requirements of the U.S. surimi industry increase. However, future South Korean supplies of pollock may be influenced by political developments. Although ROK does not maintain diplomatic relations with any Communist nation, it is actively pursuing closer economic ties in many sectors of its economy with the Soviet Union, the East European countries, China, and North Korea. As surimi JV's are a common avenue for economic exchange, the industry stands to benefit from improved relations. The ROK is also focusing on Europe as a major JV base and export market. Several joint ventures with European companies, such as Demaine Bros. in France, have already been signed. To date, however, Korea has not done as well in either the Japanese or European market as in the United States market, because of the poorer quality of its surimi. Quality, access to raw materials, and domestic consumption are three factors that the South Korean industry must stabilize to continue expanding its position in the world surimi market.

Thailand

Fish jelly products, such as fish balls and fish satay, have a long history in Thailand. Barracuda, sea eel, and sole were traditionally the main raw materials, but today threadfin bream and croaker, available in much larger quantities, are the most commonly utilized species. The Thai surimi industry is developing quickly and exported more surimi to Japan in 1988 than did South Korea. At present, however, the Thai surimi industry is still dependent on Japanese technical assistance.

Raw Materials

Thai production is based on threadfin bream, *Nemipterus japonicus*, because it is the most abundant raw material found in Thailand's waters and because it also exhibits the proper characteristics for processing export-quality surimi. Thailand's yearly supply of raw materials was estimated at about 1.1 million t for 1987. The yield of surimi from the threadfin bream is the same as the yield from walleye pollock—about 22-24 percent of whole weight—but the flesh is slightly darker and oilier, making it a somewhat less desirable product than pollock surimi.

Production

Surimi processing remained a small industry throughout the 1970's, with three surimi plants producing only 2,000 t annually. Since 1983, however, demand for and output of surimi products has increased dramatically. To date, there are 11 plants in operation, producing 20,000-25,000 t yearly. The rapid growth is due to the expanding Japanese market for cheap, lower-quality imported surimi, as well as the rising domestic demand for new products such as fish noodles and fish sausage. Although the Thai Government does not compile statistics on domestic consumption, industry sources believe that 3,000-4,000 t of surimi will be used by Thai food processors, including 1,000 t for imitation crabmeat in 1989.

Imports and Exports

Thailand imports no surimi raw materials and only a small amount of imitation crabmeat. Exports, on the other hand, have been growing steadily over the last few years, increasing from about 11,000 t in 1985 to 20,500 in 1987. Thai exporters hope to sell nearly 30,000 t of surimi to Japanese companies in 1989. About 80-90 percent of Thai surimi goes to Japan, while 10-20 percent goes to the United States, Singapore, and Europe.

Current and Future Developments

The future of the Thai industry hinges on technological improvements and resource management. Thai surimi is particularly disadvantaged in the Japanese market because of its low quality compared to the South Korean product. The industry is currently receiving technical assistance from the All-Japan Federation of Kamaboko Manufacturers Associations (Zenkama), and from Japanese buyers such as Hiraki Corporation. Because of the tropical climate, Thai producers must emphasize reduced landing times and improved icing and freezing of raw materials. Modern plants and equipment, as well as improved worker hygiene levels, are also necessary to ensure that the produce passes the microbiological standards of importing countries.

According to the Thai Government, Thailand may also have to deal with declining resources, especially in the Gulf of Thailand. In 1963, fishing effort for threadfin bream yielded 276 kg of fish per hour. In 1988, only 80 kg per hour were caught. Joint ventures and exploitation of the previously unutilized Andaman Bay waters have been identified as possible countermeasures. SIFCO Corporation, Thailand's largest surimi producer, has been involved with Japanese assistance since 1987 in many successful efforts to upgrade the quality and supply of its surimi.

New Zealand

New Zealand was the world's fourth largest producer of surimi in 1987, representing 3 percent of the estimated world production. New Zealand's rise to this position was rapid and was due primarily to the growing Japanese demand for New Zealand hoki, *Macruronus novaezelandiae*, to help offset the expected decline in pollock supplies. All New Zealand's surimi operations, however, are joint ventures with Japanese or Korean companies.

Raw Materials

Hoki is excellent for surimi because of its high gel-forming capability, abundance, and good color. It constitutes New Zealand's largest commercial fishery,

and is considered to be the second-largest surimi resource after walleye pollock, with a biomass of about 1.5 million t. It is covered by one of the seven New Zealand TAC (Total Allowable Catch) allocations, usually set at 200,000 t. Because of rising foreign demand, hoki catches by both foreign and domestic vessels more than doubled from 91,000 t in 1986 to 210,000 t in 1988. A stated concern about stock depletion, however, as well as a desire to promote the domestic surimi industry, has led the New Zealand Government to consider abolishing the Japanese and Korean hoki catch allocations. Also, New Zealand fishermen, handling hoki for export, object to foreign allocations. Japan's 1989 allocation has been reduced to 2,899 t, only 26 percent of its 1988 level, and industry sources expect the allocation to be phased out entirely within the next few years. Should this occur, the Japanese and the Koreans will be forced to depend upon joint ventures and imports for future access to New Zealand's hoki resource.

Production

New Zealand's hoki surimi production began in 1986 at 5,700 t, and rose to 17,300 t by 1987. One Korean and 15 Japanese factory vessels, under charter to 6 New Zealand companies, produced a total of 28,000 t of surimi in 1988. A small amount (3,000 t) of southern blue whiting surimi was also produced. Fletcher Fishing, Amaltal, Independent Fishing, and Skeggs companies are the largest surimi producers in New Zealand. Most New Zealand surimi is of the highest quality, valued in 1988 at $3.40-3.50 per kg. There is a limited consumption of surimi-based products in New Zealand. It is estimated that the total market is worth about $2.7 million annually—mostly supplied by imports from Japan. However, industry sources expect that domestic production will expand in response to both rising domestic consumption and high potential export earnings.

Imports and Exports

Nearly the entire New Zealand domestic production is exported to Japan, although some is also shipped to Australia, Singapore, and the United States. Many producers hope to emulate the success of the U.S. surimi industry and make surimi a major fisheries export earner for New Zealand.

Current and Future Developments

The development of an independent New Zealand industry will largely depend upon future foreign fishing allocations for hoki. If the allocation is cut completely, the New Zealand industry is likely to benefit from joint ventures and technology transfers from Japanese and South Korean companies. There is a strong desire within the industry to follow the example of U.S. producers, who used Japanese technical expertise to build a strong domestic industry. Some New Zealand companies are requesting subsidization from the government to develop the domestic surimi industry which, they claim, has the potential to produce as much as 15 percent of the world's surimi supply. To date, however, the industry has not received any government subsidies.

Note: There are considerable discrepancies between U.S. and Japanese statistics for Japan's surimi production and imports. These are mainly due to a difference in U.S. and Japanese attitudes toward Japan's surimi joint venture production with other countries. In joint ventures, surimi is generally produced by Japanese-owned factory vessels using fish purchased over-the-side from foreign vessels in foreign waters. In Japanese statistics, all joint venture production is included as imports, and is clearly differentiated in our main source, the *Minato shimbun*, from the domestic Japanese production, despite the fact that the surimi is produced by Japanese companies. In this report, because we have primarily utilized Japanese sources, we have followed the Japanese custom of referring to JV surimi production as imports. Other reports, however, may include JV production in Japanese domestic production, thus resulting in much higher domestic production figures than are used in this report. (Source: IFR-89/73, prepared by Karen L. Kelsky, Foreign Affairs Assistant, Foreign Fisheries Analysis Branch (F/IA23), National Marine Fisheries Service, NOAA, Silver Spring, MD 20910.)

The Fisheries of Denmark

Introduction

Danish fishermen increased their landings of fish and shellfish 17 percent by quantity to 1.8 million metric tons (t) but the value of the catch decreased 2 percent to about $504 million[1] in 1988. Landings of edible fish decreased slightly to 0.3 million t, while landings of fish for reduction into fishmeal and oil, increased by more than 20 percent, to 1.5 million t. Danish exports of fish and shellfish products totalled $1.9 billion, some 3 percent above 1987, giving the country a trade surplus of $0.9 billion. The European Community (EC) was Denmark's most important market, purchasing nearly 70 percent of the country's total fishery exports in 1988. The Federal Republic of Germany is the largest single destination for Danish seafood exports. Danish imports of fishery products amounted to 0.6 million t worth $0.8 billion.

[1]Value figures are shown in United States dollars, based exchange rates reported by the U.S. Treasury (US$1.00 = 6.660 Danish krone), for 1988.

Government Programs

Resource Management

As an EC Member State, Denmark is required to faithfully execute the terms and provisions of the EC's Common Fisheries Policy (CFP) and other EC regulations and directives. Danish Fisheries Minister Lars Gammelgaard and members of his staff administer several programs designed to maintain or expand fishing opportunities for Danish fishermen, while at the same time ensuring that Danish quotas allocated under the CFP are not exceeded. Some of the management programs initiated in 1987-88 include the following items.

Quotas

A seasonal division for EC quotas allocated to Denmark was established. Fishermen also were allowed to supplement their catch quotas for cod, haddock, and saithe as well as herring and mackerel in the pelagic fisheries. Minimum fish sizes for cod, haddock, saithe, and plaice were increased in 1987 and 1988.

Vessel Limitations

Access to sprat stocks was restricted to vessels under 19 m in Kattegat and under 22 m in Skagerak. These smaller sized vessels were prohibited from catching herring and from fishing in other waters. Vessels over 22 m were granted access to "industrial" fish species (for reduction to fishmeal and oil), but not to sprat stocks.

North Sea and Greenland

Herring and mackerel fishing by purse seiners in the North Sea and shrimp fishing in the waters off Greenland were managed by means of a licence system based on a quota per vessel. Regulatory measures were also adopted for coastal fishing.

Financial Aid to the Industry

The Danish Government extended about $1 million in grants to develop or improve plants processing or storing fish and fishery products for human consumption. These Danish grants were made in accordance with EC Regulations (355/77) which identify specific areas where subsidy programs may be given as part of the CFP. The grants are limited to a maximum of 25 percent of project costs.

The Danish Government in 1988, also approved about $1.6 million in grants to improve the profitability of the Danish fleet and to upgrade the quality of the raw material being delivered to processing plants. These grants are allocated for modernization of fishery vessels. According to EC regulations (4028/86), smaller sized fishing vessels (less than 12 m) can obtain financial support on the same conditions as larger vessels (those over 12 meters). Grants are designed to speed the introduction of new and improved technology: more effective fishing techniques, faster fish handling, energy savings, and improved safety for fishermen. Under the provisions of the 1988 annual Appropriation Acts, grants of $705,000 were allocated to promote experimental fisheries and grants of $90,000 were given to Danish aquaculture projects (representing 10 percent of project costs), in accordance with EC Regulations (4028/86).

The Royal Danish Fisheries Bank (Kongeriget Danemarks Fiskeribank) provided $38 million in loans in 1988, of up to 70 percent of the construction costs of new fishing vessels, and of up to 60 percent of costs of purchasing second-hand vessels. The Fisheries Bank also granted loans to cover as much as 60 percent of the cost for the purchase of processing plants and machinery. Interest rates for the loans corresponded to the market rates of interest and repayment is scheduled over 10-20 years.

Fishing Fleet Reduction

The EC published regulations for reducing the fishing capacity of the EC fishing fleet in 1985. The result, for Denmark, has been a substantial reduction in both the number of licenses granted to fishermen and in the number of new vessels allowed to join the Danish fishing fleet. The main elements of the EC regulations as they apply to Denmark are: 1) Only allow entry of vessels of the same capacity to replace vessels withdrawn from the fleet; and 2) Within a limit of 15 percent of the reduction in the fleet capacity to allow building of new fishing vessels, modernization which increases the capacity by less than 15 percent, and vessels which are used exclusively to fish noncritical stocks (stocks for which there were no regulatory measures).

In implementing the EC directive, grants are available for the permanent withdrawal of vessels from fisheries within EC waters. A total of $6 million was appropriated for the years between 1984 and 1986 and $45 million for the years 1987 through 1991. Since the introduction of the program for the permanent withdrawal of vessels in 1987, the Danish fishing fleet has been reduced by about 7 percent, from 136,000 gross registered tons (GRT) to 126,000 GRT. No financial assistance was granted for the construction of new fishing vessels in 1987 and 1988.

International Agreements

The European Community is responsible for negotiating all international fishery agreements affecting Danish fishermen, including fishery agreements with the Faroe Islands and Greenland. Denmark, however, is responsible for conducting international negotiations on behalf of the Home-Rule Governments of both the Faroe Islands and Greenland. This sometimes places Denmark in the unique position of seeking to expand access for EC fishermen (i.e., Danish fishermen) in waters off Greenland, for example, while, at the same time, being responsible for reducing EC fishing in these same waters.

Denmark also has concluded fishery agreements with Norway and Sweden, within the framework of the EC Common Fisheries Policy, concerning fishing in the Skagerak and the Kattegat. In 1988, Sweden allocated to the EC 2,500 t of cod, 1,500 t of herring, and 170 t of salmon, in the contested "white zone" between Sweden and the Soviet Union. On 12 December 1988, however, a joint protocol was signed in Riga dividing up the "white zone" between Sweden and the Soviet Union, ending years of conflict between the two nations, but also ending EC access to the zone on 31 December 1988.

When it became apparent to Danish

fishermen that they would lose their access to the "white zone" off Sweden, they pressured the Danish Government to approach the EC to open negotiations with the Soviet Union to provide access to Soviet-controlled waters in the Baltic Sea. EC negotiators met with Soviet officials in Moscow on 8-9 September 1988. These were the first fishery talks between the EC and the Soviet Union since 1977, when the EC extended its international fishery boundaries, excluding the foreign fisheries. The opening of negotiations was an important step because for years the Soviet Union did not recognize the EC and refused to meet with EC fishery officials. Negotiations were continuing, but the results were not yet clear. Danish fishermen were particularly eager to receive permission to fish for cod in Soviet-controlled portions of the Baltic Sea.

Danish fishery interests with the neighboring German Democratic Republic (GDR) began a new era of cooperation when, on 14 September 1988, Danish officials and representatives of the GDR initialled an agreement recognizing Danish sovereignty over waters around the island of Bornholm and dividing the Continental Shelf and fishing zones between the two countries, ending a long dispute. The ratified agreement entered into force on 14 June 1989.

Sanitary Regulations

General regulations concerning the catching, storing, carrying, freezing, preserving, processing, and the sale of fish and shellfish products are codified in the Fisheries Act of Quality Control with Fish and Fisheries Products No. 339 of 29 May 1987. Control is carried out by the Danish Fish Inspection Service. In accordance with EC regulations, all Danish companies storing, handling and/or processing fish and fishery products must be authorized by the Ministry of Fisheries. By the end of 1988, there were about 400 plants authorized to store, handle, or process fishery products in Denmark. There were 108 firms registered in Greenland, including factory ships and several vessels which are able to cook shrimp using onboard equipment.

Quality is of great concern to Danish fishermen and processors because of the importance of the quality-conscious FRG market which accounts for nearly one-fifth of Danish exports. In 1987, reports of nematodes in fish were televised on West German television and fish consumption declined dramatically. On 8 August 1988, the FRG published new regulations on the handling and processing of fishery products. Danish fish processors were well prepared to meet or exceed these strict standards.

Imported fish and fishery products must comply with all EC regulations enforced in Denmark. Before importing any fish or shellfish product, an importer must notify the Danish Fish Inspection Service, which may perform laboratory control of samples. Fishery products destined for export are also covered by the sanitary regulations.

Aquaculture

Denmark had 635 registered fish farms in 1988, including 565 freshwater farms (mostly raising rainbow trout), 38 saltwater farms (mostly raising seatrout in salt water), and 32 farms devoted to raising European eels, *Anguilla rostrata*. Total aquaculture production has remained steady in recent years, mostly because of environmental concerns which led to a ban on establishing new fish farms. Because of this ban, no new fish farms have been established and expansion of existing saltwater installations has been prohibited since December 1986. As a result, Danish aquaculture harvests have changed little since 1985 (Table 1).

In 1988, Danish fish farms received permission from the FRG to sell their saltwater-raised trout as "salmon trout." The decision was not uniformly welcomed in West Germany, since it causes confusion among consumers. Danish fish farmers do not raise Atlantic salmon because restrictions on new fish farms have prevented culture of this high-valued species.

Fleet and Fishermen

The Danish fishing fleet consisted of 3,007 powered vessels in 1988, a decrease of 205 vessels from the 3,212 vessels registered in 1987 and the 3,243 vessels in 1986. The total tonnage of the Danish fleet declined by 7 percent, to 126,000 GRT in 1988, when compared to 1987. The decrease is due in large measure to the EC program to reduce the size of the members' fishing fleets. In 1988, Denmark was one of only two EC countries to meet the EC goal; fishing fleets in a number of other countries increased slightly, despite the EC programs.

The Danish fishing fleet is dominated by small vessels; more than two-thirds of the fleet consists of vessels below 25 GRT (Fig. 1). Most of the Danish fishing fleet operates out of ports on the island of Bornholm (285 vessels), followed by Friderikshaven (262 vessels), Esbjerg (208 vessels), Skagen (205 vessels), and Hirtchals (190 vessels). The remaining vessels were registered at 25 other ports in Denmark (Fig. 2).

By the end of 1988, there were about 8,000 fishermen registered in Denmark, including 2,200 who are members of the Danish Fishermen's Producers' Organization (DFPO) which was established in 1973, according to EC regulations for the Common Market Organization for fishery products. The DFPO guarantees its members certain minimum prices for

Table 1.—Denmark's aquaculture production by quantity, 1983-88.

	Harvest (t)			
Species	1985	1986	1987	1988
Trout				
Freshwater	24,000	24,000	23,000	22,500
Saltwater	3,300	3,600	3,700	5,200
European eel	NA	200	250	235
Total	27,300	27,800	26,950	27,935

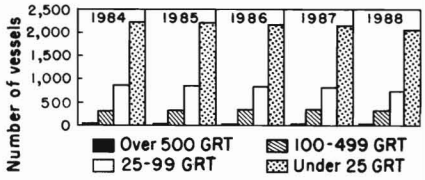

Figure 1.—Denmark's fishing fleet by number and size of vessels, 1984-88.

Figure 2.—Principal fishing ports of Denmark.

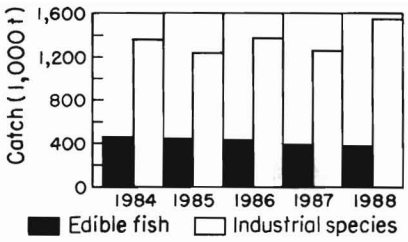

Figure 3.—Denmark's fishery catch by quantity, 1980-88.

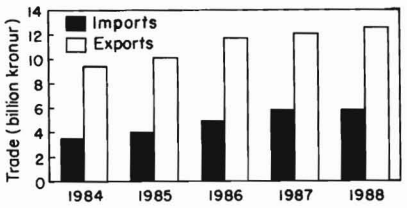

Figure 4.—Denmark's trade in fishery products by value, 1984-88.

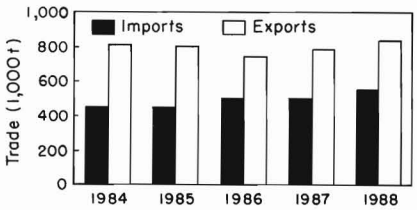

Figure 5.—Denmark's trade in fishery products by quantity, 1984-88.

Table 2.—Fisheries landings by Danish vessels, in domestic and foreign ports, by quantity, 1986-88.

	Landings[1] (1,000 t)		
Species	1986	1987	1988
Edible			
Cod	136	132	113
Herring	80	66	92
Plaice	39	36	31
Mackerel	22	27	25
Haddock	17	9	10
Saithe	9	6	6
Norway lobster	3	3	2
Hake	3	2	1
Whiting	2	1	1
Common sole	1	1	1
Atlantic salmon	1	1	1
Other	123	118	106
Subtotal	436	402	389
Nonedible[2]			
Subtotal	1,365	1,244	1,532
Total catch	1,801	1,646	1,921

[1]Figures may not agree because of rounding of edible species.
[2]Industrial fish species for reduction into fishmeal and oil.

their landings of fish. Two other organizations, the Purse Seiners' Producers Organization and the Skagen Fishermen's Producers' Organization, also provide price supports to their members.

Landings

Danish landings of fish and shellfish have averaged about 1.8 million t during the past decade. Landings peaked at 2.0 million t in 1980 and declined to 1.7 million t in 1987. In 1988, total landings by Danish fishermen in Danish ports increased by 17 percent to 1.9 million tons. This was a recovery from the 1.7 million t harvested in 1985, but is below the 2 million t caught in 1980. Landings of fish and shellfish destined for human consumption, however, decreased by some 3 percent to 389,000 t (Fig. 3, Table 2).

Most of the Danish fisheries catch is made in the North Sea (72 percent), Skagerrak (12 percent), Kattegat (5 percent) and Baltic Sea (6 percent). Danish landings in domestic ports were valued at $504 million, 2 percent below the value of landings in 1987. The principal ports where most of the Danish fish catch was landed in 1987, included: Esbjerg (687,000 t), Thyboron (234,000 t), Hirtshals (171,000 t), Skagen (149,000 t), Hanstholm (52,000 t), and Hvide Sande (43,000 t). Landings of edible fishery products were worth $360 million, while industrial species used to make fishmeal and oil were valued at $144 million, in 1988. Landings of fish for reduction into fishmeal and oil increased to 1.5 million t in 1988, 20 percent above 1987 landings. The landings yielded 338,000 t of fishmeal in 1988, versus 270,000 t in 1987 and 302,000 t in 1986. It is noteworthy that three-fourths of Danish landings, by quantity, consist of fish for reduction which contribute less than one-third of the value of the entire catch; meanwhile, fish for human consumption, one-fourth of landings, account for over two-thirds of the value of the harvest. It is also noteworthy that the catch of fish and shellfish for human consumption is gradually decreasing in Denmark. In addition to Danish landings in domestic ports, foreign fishermen also unload their catches in Danish ports and Danish fishermen also land a portion of their catch in foreign ports.

Trade

Denmark is one of Europe's leading seafood exporters, importing low-value raw material and exporting high-value finished seafood products. During the past 5 years, Danish exports have remained important, providing the country with a source of foreign exchange. However, the seafood industry is relying more and more on imported fishery products to maintain its processing plants. Imports have gradually increased in recent years as compared with stable export levels (Fig. 4, 5).

Imports

Danish imports of fish and fishery products amounted to some 550,000 t in 1988, vs. 494,000 t in 1987 and 454,000 t in 1986. Danish imports have been growing at about 10 percent per annum during the last few years. The value of Denmark's imports, however, remained stable at $870 million in 1988. Shrimp

was the most important item; imports of shrimp amounted to $330 million in 1988, representing almost 40 percent of total Danish imports in value terms.

In 1988, U.S. seafood dealers exported 1,992 t of fishery products valued at $10.7 million to Denmark. This include $6 million worth of chum salmon and $1.5 million worth of other salmon (including fillets, canned salmon, and salmon roe). Danish importers also purchased $1.8 million worth of seaweeds from the United States in 1988. The U.S. Embassy in Copenhagen in 1987, reported that the best prospects for U.S. suppliers in Denmark include whitefish fillets, eels, salmon roe, lobster, and crayfish.

Exports

Danish exports of fish and shellfish products amounted to 823,300 t in 1988, a 5 percent increase over 1987 exports of 804,000 t. Fishery exports were worth about $1.7 billion, some 3 percent above 1987. Canned or prepared seafoods were the most valuable commodities, earning $375 million, 11 percent above corresponding 1987 levels. Shrimp was by far the most important item in this group, representing a total value of $165 million. Uncertain market conditions for traditional groundfish products, such as cod and haddock, have depressed Denmark's export earnings from frozen fillets which dropped from $405 million in 1987 to $315 million in 1988. Other important export earning commodity groups include shellfish, cured fish, whole fish (fresh and chilled) and freshwater fish (mostly trout).

In 1988, exports of fishmeal increased both in terms of value and quantity. A total of 252,373 t was exported in 1988, 26 percent above the 200,000 t exported in 1987 and 225,000 exported in 1986. The value of Danish fishmeal exports was $150 million in 1988.

The European Community was by far the most important market for Danish fishery products in 1988, purchasing $1.3 billion worth of Danish fishery exports, equivalent to 70 percent of Denmark's total export earnings. The FRG was the largest single market for Danish fishery exports in 1988, accounting for $348 million, or nearly one-fifth of total exports. Danish exports to the UK increased from $197 million in 1987 to $204 million in 1988.

Outside the EC the main market outlets for Danish fishery products, by value, in 1988 were: Japan (7 percent, $139 million), Sweden (6 percent), Switzerland (5 percent), and the United States (4 percent or $72 million, down from $138 million in 1987). The weaker U.S. dollar and the lower prices for frozen cod blocks in the U.S. market contributed to the decline in sales of Danish fishery products in the United States.

Outlook

Danish fishermen are being caught in an increasingly tight squeeze. Fishing quotas for profitable species (such as cod) are growing smaller while restrictions on fishing grounds, seasons, net sizes, etc., increase. The EC is reducing the size of the Danish fishing fleet. Competition, from countries such as Iceland and Norway, has grown in recent years, further increasing pressure to reduce prices on many traditional fish species. Danish fishermen are experiencing difficulty in providing consumers, processors, and export markets with supplies of desired species from domestic fishermen. The rising demand for fishery products is forcing suppliers to increase imports. Limitation on aquaculture suggests that Danish processors will have little option but to import in the coming years.

The long-term outlook for many Danish fishermen is not optimistic. Most of the fleet (2,015 vessels) consists of small fishing vessels (mostly under 25 GRT); these vessels cannot take advantage of distant fishing grounds where EC negotiations have succeeded in obtaining access for member fishing vessels. There is little chance that stocks of fish in Danish waters or in neighboring waters will increase substantially in the near future, although some fishermen hold out the hope that the EC will be able to negotiate access to the Soviet Baltic waters.

The Danish fleet includes 299 vessels over 100 GRT that can sail to distant fishing grounds. In 1988, several Danish fishermen decided that fishing in the North Sea had become too difficult and set sail for the Indian Ocean where they attempted to fish for tuna. In 1989, it was announced that 20 licenses have been issued to Danish fishermen allowing them to fish in waters off Tanzania and Zanzibar in East Africa. The licenses were obtained by an Anglo-Danish group. Danish fishermen will be allowed to fish for tuna, swordfish, spiny lobster, and shrimp. Vessels participating in this fishery will fly the Danish flag, but must land their catch for processing ashore in the host country. Thus, for larger vessels, the future might be more attractive in distant waters where skilled Danish fishermen can use their experience to assist developing countries expand their fisheries—a mutually profitable endeavor. (Source; IFR-89/89, prepared by William B. Folsom, Office of International Affairs, National Marine Fisheries Service, NOAA, 1335 East-West Highway, Silver Spring, MD 20910.