ANNEX B

Global Developments in Groundfish, Salmon, Shrimp and Tuna

This annex provides an overview of the four major markets for fish and fish products: groundfish, salmon, shrimp and tuna. These four markets (each of them make up a number of species that may, to some degree, have different end uses) are the principal markets in international trade in fish and fish products, and are also subject to foreign direct investment and fisheries access agreements (except for salmon).

This annex is mainly based on readily available data and information from a number of international organisations and trade journals. The purpose of the annex is to provide readers with generic information on the four major fish markets. This annex should be read in conjunction with the main body of this study to give a fuller picture of the issues of globalisation in the fisheries sector.

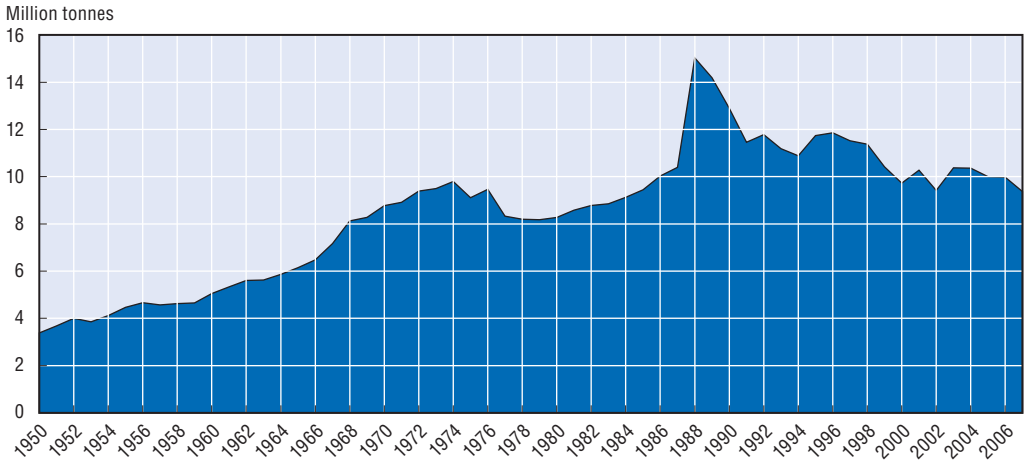
Groundfish

The term groundfish includes a range of species that are in high demand in OECD countries and are the basis for most breaded fish products such as fish fingers and fishcakes, etc. Groundfish is a mainstay of the fishing industry but many stocks are overexploited. This has resulted in increased supply from aquaculture (sea bass, turbot and cod) as demand continues to grow. Globalisation of the groundfish industry is driven by a number of economic factors such as lower labour costs abroad, as the skill requirements for basic groundfish processing is low. China in particular is growing as a groundfish producer. Trade is also affected by the existence of tariff barriers, in particular for value-added products. "Environmentally-friendly" and "sustainability markets" are also growing.

Wild capture

Despite declining catches (Figure B.1), groundfish as a group of species remain the second most commercially important species after shrimp. Groundfish is the generic name for species of fish that live on or near the sea floor and include cod, flatfish (plaice, flounder, sole), haddock, halibut, hake, pollock, turbot and others (such as grenadier and whiting). They can be found in the cool waters of the Atlantic and Pacific Oceans in both the northern and southern hemisphere. Cod, haddock, hake and Alaska pollack are the most commercially important species and a basis for the world's commercial fisheries for centuries. Groundfish species live in a variety of marine environments. Other important commercial species include orange roughy and hoki. Groundfish resources are heavily exploited and under various management systems in many areas. For example, a Moratorium on the Fishing of Cod Stocks off Newfoundland, Canada, has been in place since 1993. Furthermore, production from overexploited cod, saithe and haddock has been gradually replaced by the more prevalent Alaska pollack and hakes. Catches of low value species such as blue whiting have also increased, showing a clear shift from higher to lower value species as the former decline.

Figure B.1. **Groundfish production from capture fisheries, by volume**



Source: FAO.

Cod has traditionally been the mainstay of the groundfish industry. However, the picture today is markedly different due to clear overfishing in cod fisheries; it was estimated that in the 1970s, 200 000 to 300 000 mt of reproductive cod existed in the North-East Atlantic, the North Sea and the Baltic. In 2003, this figure had fallen to below 50 000 mt (far below the safe biological limit of 150 000 mt). Part of the lost Atlantic cod catch has been made up by cod from the Pacific. However, the annual catch of this species has been nearly constant at between 400 000 to 450 000 mt since 1985 and higher volumes are unlikely (*Globefish*, 2003).

Instead, Alaska pollack is now the most abundant white fleshed fish and groundfish species in the world, accounting for 32% of groundfish species production in 2002. Alaska pollack is an important food fish resource and more than 3 million tonnes of Alaska pollack are caught each year in the North Pacific. Alaska pollack is a substitute for cod, particularly in the production of breaded products and for surimi based products; the use of Alaska pollack has accelerated as groundfish resources in other parts of the world have been overexploited. During the 1990s, an increasing portion of Alaska pollack was processed into fillets, blocks and minced products before being exported to the EU and US markets. All Alaska pollack stocks are now considered fully exploited.

The fundamental economic characteristic of the groundfish business is sustained consumer demand for groundfish products, particularly cod. This stems from the fact that most groundfish is white fleshed with a fairly mild taste. However, putting pressure on already depleted stocks has resulted in serious decline and a loss of fishing opportunities. Worldwide, total cod catch has fallen by two thirds in only three decades and stocks of reproductive cod in the North Sea have fallen by 90%. In 1970, every third white fish caught anywhere in the world was cod, while today it is one in ten (*Eurofish*, 2003). Economic pressure as a result of demand for groundfish – coupled with poor management – has resulted in increasing fishing and raw material costs and relocation to more economically viable fisheries, and to increased interest in groundfish aquaculture.

Technology has had an important influence on the groundfish sector as it has permitted fishers to travel faster and further in the search for suitable fishing grounds (*e.g.* the deep sea), increasing efficiency and as a result, reducing costs. Technological advancements also mean that catches can be maintained for a longer period of time, allowing for more efficient planning of fishing trips. Advanced fishfinders and underwater cameras can monitor nets and increase efficiency.

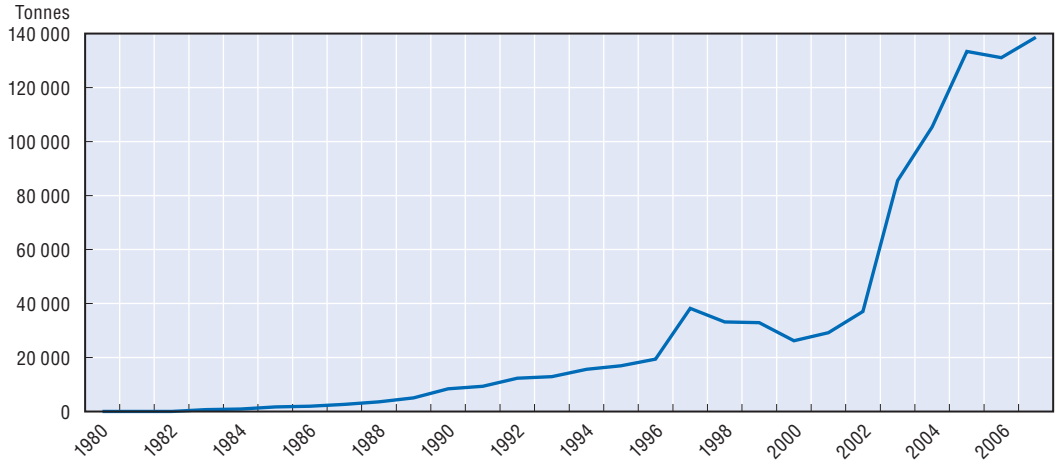
Governments have taken exceptional measures to address the permanent downsizing of the Atlantic groundfish fishery. Some have offered substantial aid packages to assist individuals and coastal communities to adjust to opportunities outside the fishery. Others have regulated the fishery using licensing, species quotas, seasonal closures, designated fishing areas, mesh sizes, dockside monitoring and observer programmes. However, this has put economic pressure on fishers by raising operating costs, sometimes leading to the export of capacity. The international community has responded to the increasing spillover of fishing effort to the high seas by establishing RFMOs that can impose explicit capacity management measures. For example, while the main role of the North-East Atlantic Fisheries Commission (NEAFC) is to allocate the agreed TAC between Contracting Parties, it may also limit the number of boats and effort in line with the fishing opportunities available to that Contracting Party (FAO, 2005).

Groundfish farming

The general state of the groundfish capture fisheries has resulted in increased investment in and supply from aquaculture. Cod is currently the most promising candidate for mass production in a similar vein to salmon. Interest in farming cod to market size developed in Norway in the 1970s and 1980s, and intensive farming was trialled in the 1980s. Commercial production initially encountered considerable problems such as cannibalism, disease, enlarged livers from high-fat feed, early sexual maturity that reduced growth rates, and initial high mortality due to the fragility of freshly hatched larvae (salmon larvae are 140 times heavier than cod) requiring live feed (*Eurofish Magazine*, 2003). With the decline of natural cod stocks and a large and stable market for cod, investment in cod research and farming increased and from 2000 to 2001, the number of juveniles produced doubled to one million (British Marine Finfish Association). Atlantic cod is now cultured in commercial quantities in Canada, Iceland and Norway. Prospects for this particular farming segment are reportedly very good.

Figure B.2 shows increasing production of farmed groundfish, which increased significantly from 2002 onwards as technical obstacles were overcome.

Figure B.2. **Total farmed groundfish production, by volume**



Source: FAO.

The groundfish aquaculture sector is still in the early stages of development, although its influence is growing. However, the search for lower input costs to maintain profits, coupled with an acceptable regulatory environment in developing countries, has resulted in the movement of sites to developing countries.

In the meantime it should be noted that scarcity of fishmeal and oil supplies could favour species that are less reliant on fishmeal than groundfish. As the growth in global aquaculture is likely to continue, particularly in China, demand for fishmeal and fish oil will rise. This could put heavier pressure on already threatened stocks of fish used for feed, constraining aquaculture production for species reliant on fishmeal, altering the relative price of fisheries commodities and affecting other food production that is reliant on fishmeal and oil.

Groundfish processing

The processing sector has also suffered from the decline in groundfish stocks. In Newfoundland, 40 000 fishers caught 800 000 mt of cod per year with a landed value of USD 163 million in 1990. Ten years later, this had fallen to USD 23 million with a significant decrease in the number of fishers involved. In order to safeguard their businesses, processing plants imported raw material from the North Atlantic, the Barents Sea and the waters south of Newfoundland (*Globefish*, 2003).

Technological developments have resulted in the use of onboard processing as a first stage of processing of groundfish. Quick freezing is still unrivalled as a method for preserving raw material quality and there are continuous improvements in processing technology. Freezing on board began in the early 1980s. For example, in Iceland in 1986 less than 5 000 mt (catch weight) of groundfish was processed in this way, but by 2004 this had reached 135 000 mt, just under 35% of total groundfish catch (Icelandic Ministry of Fisheries, 2005). Storage meets the definition of "processing" in HACCP regulation and therefore onboard processing is still subject to the same product and safety requirements as onland processing.

Emerging groundfish processors include Poland and China. In 2005, total production of the Polish fish processing sector amounted to 290 000 mt and total turnover was around EUR 634 million. Polish fish processing is mainly centred on imported raw material including Alaska pollack and hake. The sheer size of Chinese production has significantly altered distribution and trade in groundfish. It is estimated that 700-800 000 mt of frozen groundfish were processed in China in 2005, including more than 500 000 mt of Alaska pollack, and 175 000 mt of cod. Most of the products enter the markets of Europe and the US, while some remain in China or are re-exported to the domestic market in the Russian Federation (Möller and OECD, 2008).

Globalisation in the groundfish processing sector has been driven in particular by lower labour costs. As the majority of groundfish is frozen into blocks, the skill requirement for further processing is low. Asia has been the recipient of much of this outsourcing in the groundfish sector due to lower labour costs. China is now the world's foremost groundfish processor and 10 million mt of seafood was processed in China in 2000, primarily based on imported raw material (Bean, 2003).

Differences in the application of environmental laws and regulations concerning water use and discharges may be an important driver of location decisions in the groundfish sector. For example, further processing of whitefish takes place in plants that require a high consumption of water and energy. High quantities of water are also essential for transporting waste and offal around the plant, for cleaning the plant and equipment, washing raw material and product and for de-icing and thawing. Energy is also required for producing ice and for heating, cooling, drying and operating machinery. Fish processing factories discharge large amounts of effluent with high organic content due to the presence of oils, proteins and solids.

World groundfish trade

Cod has traditionally been the most highly valued groundfish species. Cod is mostly traded fresh (whole, gutted or as fillets), frozen (whole, headed and gutted; fillets with/without skin, blocks and individual) or salted/dried. Further processed products such as breaded cod are traded in more limited quantities. The most important processors and

exporters of cod and cod products are Norway, the Russian Federation, Iceland, Poland and Denmark, while leading importers are the United States, Canada and the EU (Spain, Portugal and France in particular). Most groundfish products are traded in frozen form. For example, around 98% of traded Alaska pollack in 1998 was frozen. Among OECD countries, the major exporters of highly priced groundfish (cod, haddock, saithe, hoki and orange roughy) are Iceland, Denmark, Canada, Norway and New Zealand. Denmark is the primary exporter of frozen cod fillets. Spain is Europe's top importer of hake. In Europe, the largest markets for Alaska pollack are Germany and France. China is the leading supplier to Germany using Russian headed and gutted pollock. An increase in Alaska pollack fillet imports in Germany resulted in a 30% drop in more expensive cod fillet imports. Spain is the leading European hake market with Namibia the leading supplier, supplying roughly half the Spanish frozen import total (O'Sullivan, 2006).

Trade in the groundfish sector is still restricted by a variety of tariffs on processed products that reflect policies by governments who wish to protect domestic processing industries or those industries that rely significantly on imported raw material for processing, *i.e.* tariff escalation. Tariff structures also contribute to changes in the location of processing. Value added products are sold without tariff within the EU's borders. If Norway sold value-added groundfish, the tariff would jump to 2.2% (compared to a zero per cent tariff on raw material of cod for processing). In the US, there is no tariff for fresh and frozen groundfish products but a tariff of 10% is applied to breaded products. Japanese tariffs for fresh and frozen whole groundfish have dropped from 5% to 3.5 % under GATT, although value-added groundfish fetches a tariff of 9.6% (Josupeit, 2006).

Regulations have eased the movement of groundfish across borders through standardisation of products, thus facilitating trade. This also includes the Codex Alimentarius Commission, which promotes the harmonisation of food standards by co-ordinating food standards, guidelines and codes of practice to protect consumer health and ensure fair trade practices. Harmonisation raises the quality and safety of fish products from third countries and makes it easier for foreign exporters to sell abroad, facilitating trade and through it, the international flow of groundfish (Lem, 2002).

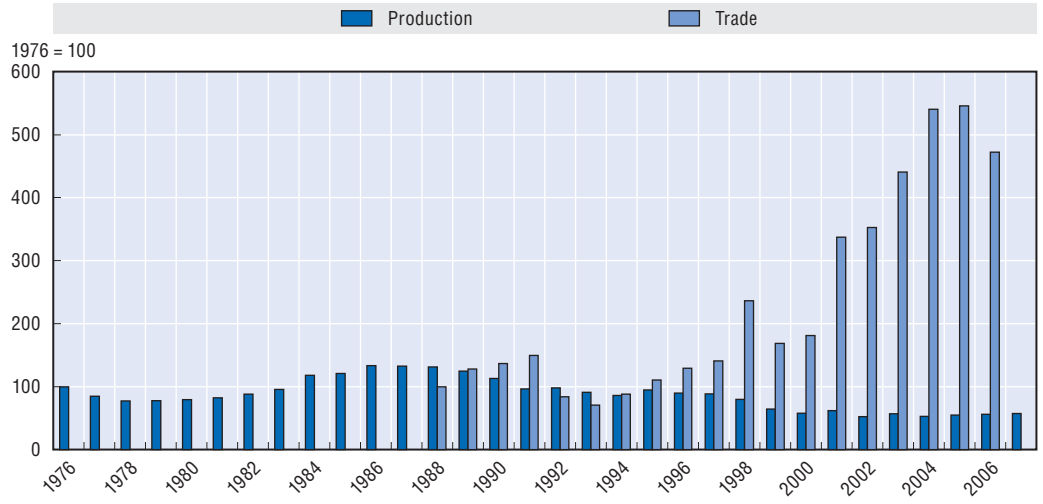
Groundfish market developments

Figure B.3 demonstrates developments in trade and production (by volume) for Alaska pollack over the past three decades. Interest in Alaska pollack as a commercially exploitable substitute species for other groundfish is noticeable from the late 1980s onwards. Although some care should be taken in interpreting these results (as Alaska pollack may undergo processing in a different market to final sale), Figure B.3 shows that despite declining production, international trade in Alaska pollack has been increasing, suggesting that markets have become increasingly integrated.

In large developed markets such as the EU and Japan, the trend for chilled value-added or convenience products (such as ready-to-eat meals, pre-cleaned and pre-prepared fish) continue. Adequate supplies in 2004 kept prices stable and export volumes increased. In 2005, prices rose due to weaker catches, particularly in the Russian Federation (*Globefish*, 2005).

Developed country consumers demonstrate a trend towards a desire for sustainability and environmentally sound fishing practices for groundfish. This has increased interest in ecolabelling. Alaska pollack from the Bering Sea and Aleutian Islands as well as the Gulf of

Figure B.3. **Alaska pollack trade and production, by volume**



Sources: FAO/OECD.

Alaska have been certified by the MSC (although they were certified independently from each other). Pacific cod, North Pacific halibut in US waters and South African hake were all certified in 2004 (Marine Stewardship Council, 2002).

Despite falling stocks, demand for groundfish is increasing as a result of health and convenience choices that favour fish. Changing distribution networks are driving globalisation through the consolidation of retail chains as large companies benefit from economies of scale. Due to the dominance of retailers in this market, wholesalers are no longer as important as they once were as retailers deal with a small number of large suppliers. Leading supermarket chains now source domestic fresh/chilled groundfish directly from large port merchants and leading importers are increasingly also leading processors. France's second largest retail chain, Intermarché, integrated backwards into production by purchasing the fishing and aquaculture divisions of one of the biggest French chilled seafood companies, Furic. Intermarché now owns the largest fishing fleet in the French industry as well as some important processing plants, including four fishing companies operating 39 vessels with 500 employees (*Globefish*, 2005).

As aquaculture farming has recently come under scrutiny for its environmental practices, there is scope to meet consumer environmental perceptions by developing environmentally-friendly markets. Scotland has already developed the world's first commercial organic cod farm (Johnson Seafarms Shetland) which is certified to private standards. Johnson plans to produce 12 000 mt of organic cod by 2010 (Clover, 2006).

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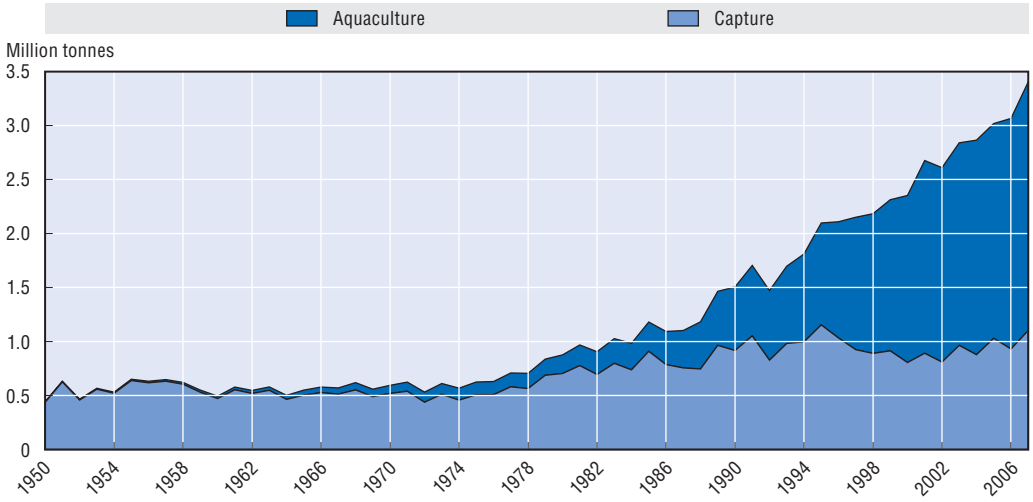
Salmon

Demand for salmon is overwhelmingly met through production from aquaculture as wild stocks have diminished. However, this has raised environmental concerns in the industry and regulatory controls on aquaculture are tightening. Most salmon products are not consumed where they are produced, leading to increased international trade. Economic factors such as labour costs and a liberal FDI environment in aquaculture have resulted in relocation from high to low cost countries. The industry is dominated by a few key players.

Wild capture

Total global production of salmon[1] has increased rapidly since the 1980s when the farming of salmon took off (Figure B.4). Wild salmon can be found in the Pacific (five species) and Atlantic Oceans (one species), and is important to both commercial and recreational fishers. In general, aquaculture production is focused on Atlantic salmon.

Figure B.4. **World salmon production, by volume**

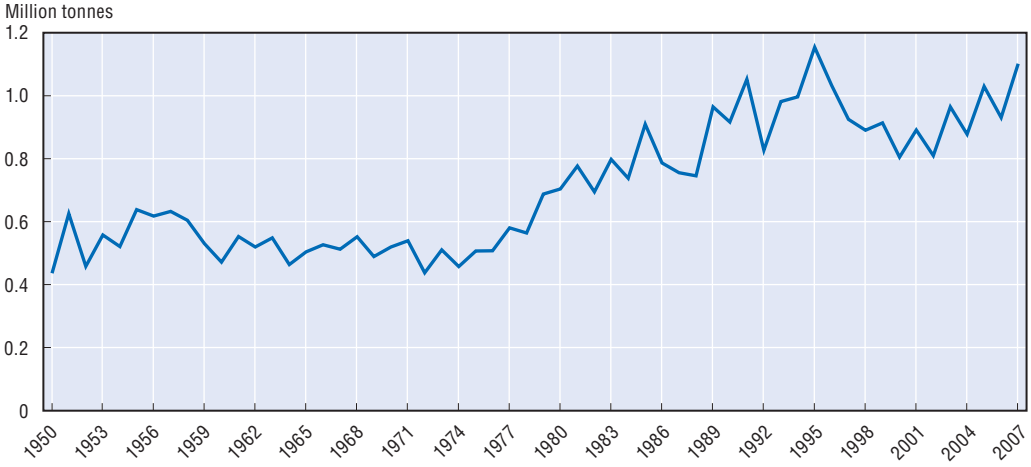


Source: FAO Statistics.

Wild salmon stocks[2] have seen a recent decline (Figure B.5), particularly the North Atlantic populations that spawn in European waters. Reasons for the decline include a number of factors such as ocean and river warming, infection and disease (including from aquaculture), pollution, agriculture run-offs and loss of suitable freshwater habitat. The five commercially most important species of wild salmon can be found in the Pacific waters of the United States, the Russian Federation, Canada and Japan. Together, these countries account for 99% of all wild salmon landings. Most wild salmon is caught in a short harvest season of around three to four months.

Despite these recent falls in wild catches, the world supply of salmon has risen from less than 500 000 tonnes (all wild) to global production of approximately 3.4 million tonnes in 2007. This is due to the industrial mass production of salmon, which has experienced phenomenal growth since 1980. Salmon now constitutes around 60% of total global aquaculture production – by value – of which 89% is Atlantic salmon (Franz, 2006).

Figure B.5. **World catches of wild salmon, by volume**



Source: FAO Statistics.

Wild salmon are managed by a number of international arrangements, *e.g.* the North Atlantic Salmon Conservation Organisation (NASCO), which manages salmon stocks that migrate beyond the 200-mile limit of coastal states in the Atlantic Ocean; the North Pacific Anadromous Fish Commission (NPAFC), which has similar objectives for Pacific salmon; and the Pacific Salmon Commission (PSC).

Salmon farming

Farmed salmon production began in earnest in the mid-1980s with Norway pioneering early production technology. Strong demand, technological breakthroughs and support from governments aided the industry. Markets for farmed salmon developed quickly in the US and Europe, in particular from the 1990s onwards. The contribution of farmed salmon to world salmon supply has increased considerably.

Today, salmon is farmed in 24 countries. Although Norway has been the leading producer for decades, Chile may soon become the top supplier. The United States, Chile, Canada, Japan, Norway and the UK have been the lead producers of farmed salmon (Table B.1).

Table B.1. **Ranking of total salmon production by country in volume, 1981-2001**

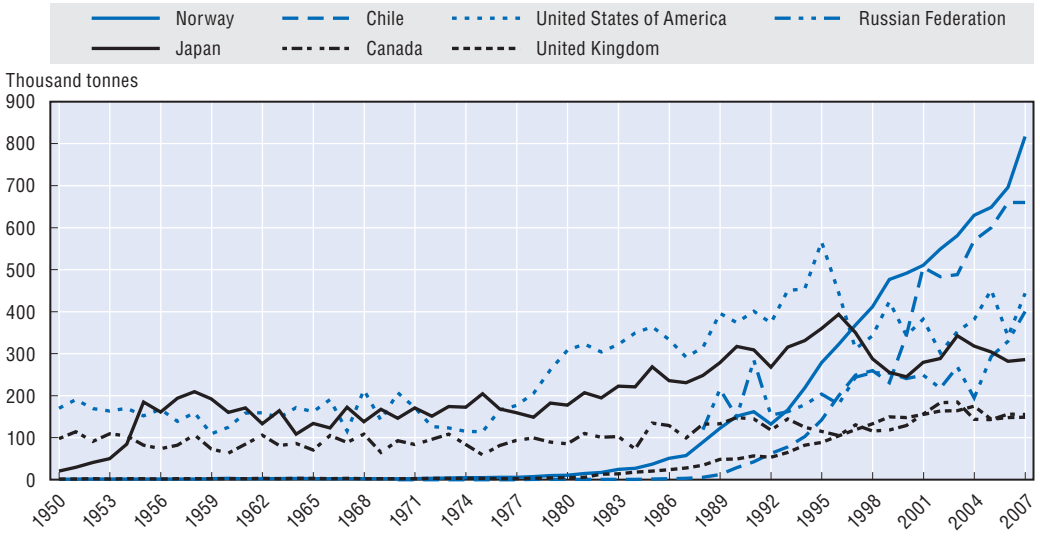
	1981	1991	2001
1	USA	USA	Norway
2	Japan	Japan	USA
3	USSR	Norway	Chile
4	Canada	Canada	Japan
5	Norway	UK	Canada

Note: Wild and aquaculture.
Source: Lizuka (2004).

Salmon processing

Salmon can be processed as a variety of products including fresh, canned, frozen, smoked, minced and as caviar. Norway is the world's foremost salmon producer with 19% of production, followed by the USA and Chile (Figure B.6). Around 95% of wild catch is sold

Figure B.6. **Leading salmon producers, by volume**



Source: FAO Statistics (salmon, trout and smolts).

as canned or frozen while 80% of farmed salmon is consumed fresh. Players in the value-added processing of seafood products are as varied in their geographic location as in the size and variety of products they offer. However, China's increasing role in salmon processing (mostly canning) is noticeable, driven to a large extent by its competitive processing industry benefitting from large and very efficient units with extremely competitive labour and production costs.

Productivity in the aquaculture sector benefits economies as a whole: for example, it is reported that for every job in aquaculture in Scotland, four or five more in other sectors can be linked to it (typically in transport and processing) (Highland and Islands Enterprise, 2007). This signifies how crucial the industry can be to certain remote areas and can be the basis for domestic protectionist measures utilised by some governments.

World salmon trade

Most salmon is produced far away from consuming markets. For example, Norway and Chile, the world's largest producers of salmon, export over 90% of their production. Similarly, the USA and the EU, the largest consumers of salmon, import over 90% of their consumption. In 2003, the value of international trade in farmed salmon and sea trout exceeded USD 3.5 billion. Therefore, tariffs and other trade measures are of particular importance to the salmon sector (Box B.1) (FAO, 2006).

Technological advancement in transportation has facilitated the movement of salmon products around the globe. Developments in freezing and cooling techniques as well as the transportation of fishery products in large container-ships have facilitated such transport. There are also research efforts to develop techniques for preserving the freshness of fish which will allow for expanding the range of operation for transportation on land by trucks, which today is limited. Thanks to air travel, raw material and processed products can now be sold almost anywhere in the world within 48 hours (SOTA, 2003). However, air freight is expensive, and air freight is mostly limited to special niche-products in overseas markets.

Box B.1. **Intervention in the salmon industry**

December 1989-91	EC producers lodge complaint in December 1989. Commission opens *antidumping* investigation against Norwegian salmon in February 1990. Investigation completed without any measures taken.
March 1990	US investigation against Norwegian salmon. Definitive *AD and CVD measures* taken February. Measures still in force.
1991-95	Several instances of periodical EC *minimum import price* on farmed salmon from Norway.
August 1996	Commission initiates new *AD-investigation* against Norwegian salmon. Proposal to introduce AD-duties of 9.98% and CVD-duties of 3.8% in June 1997. EC-Norway Salmon Agreement in force 1997-2002, whereby minimum price measure and price undertakings replace the proposed AD/CVD-measures. Measures terminated 2003.
1997-2003	US initiates investigation against salmon from Chile. Definitive measures taken in 1998. Revocation of measure in 2003.
March-August 2004	*Safeguard* investigation initiated.
August 2005	Provisional SG-measures taken.
February 2005	Adoption of definitive safeguard measures.
March 2005	Chile and Norway hold joint DSU-consultations with the EC.
22 April 2005	Revocation of definitive safeguard measures against imports of salmon.
October 2004-April 2007	The Commission initiates *antidumping* investigation against Norwegian salmon in October 2004. Provisional AD-duties adopted April 2005. Adoption of definitive AD-measures January 2006. Commission initiates review of measure April 2007.
March/June 2006	Norway requests consultations under WTO-DSU. Establishment of WTO-panel. Adoption of *EC-salmon* panel-report January 2008. The EC is requested to bring its measure into conformity with WTO-rules on 22 counts. Norway and the EU agree on reasonable period of time for the EU to implement the panel-report in May 2008.
July 2008	EC-Council terminates the *antidumping* measure 17 July based on its findings from the review initiated April 2007.

Source: Royal Ministry of Fisheries and Coastal Affairs, Oslo, Norway (2008).

Japan is the world's largest salmon market with a total supply of 500 000 to 600 000 mt. Farmed salmon accounts for one third of Japanese salmon consumption. Consumption in Japan revolves around seasonal patterns of availability and social events. Japan and the US together currently consume slightly over 80% of Chilean production of fresh farmed salmon, while the EU is Chile's leading frozen salmon market.

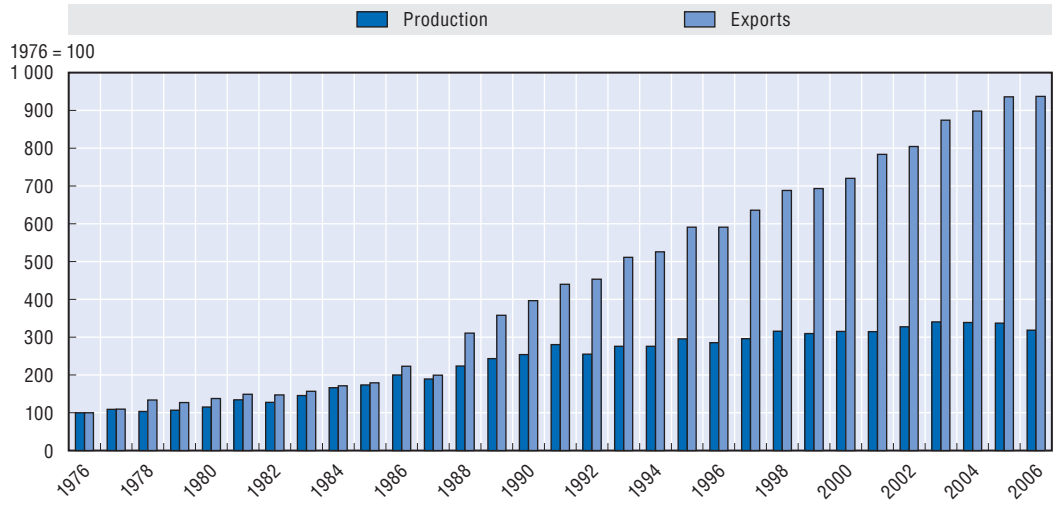
Although the US is a minor producer of farmed salmon, it exerts a large influence on world salmon prices through its wild salmon fishery and the imposition of trade measures on salmon imported from Norway. Salmon is the second leading seafood item on a dollar basis (after shrimp) in the United States. In 2001, farmed Atlantic salmon accounted for 86% of all fresh salmon sales in the United States (Salmon Aquaculture Dialogue, 2006).

Consumption of Norwegian farmed salmon is highly concentrated in the European market (the EU accounted for 48% of Norway's exports in 2003) with France the leading customer, followed by Germany and Italy (Franz, 2006). In general, there has been a shift from frozen wild salmon in Europe to fresh farmed products. The UK produces 160 000 mt annually of farmed salmon, of which 74 000 mt is exported. The majority of these are fresh whole salmon, followed by fillets and smoked salmon. Key markets for UK salmon are France, Germany and Spain.

Figure B.7 demonstrates increasing production of s

almon and substantially higher relative growth in international salmon exports (by volume). Due to statistical issues, caution should be taken in interpreting these figures. However, the increase in world salmon trade as depicted below, shows that markets are integrating at a faster pace than production is increasing.

Figure B.7. **Salmon production and trade, by volume**



Source: FAO FIGIS.

Notes

1. FAO statistics group salmon, trout and smelts together.
2. Principle salmon stocks are Pacific salmon stocks: Chinook salmon (Oncorhynchus tshawytscha), Chum salmon (Oncorhynchus keta), Coho (Oncorhynchus kisutch), Pink (Oncorhynchus gorbuscha), Sockeye (Oncorhynchus nerka), and Atlantic salmon (Salmo salar).

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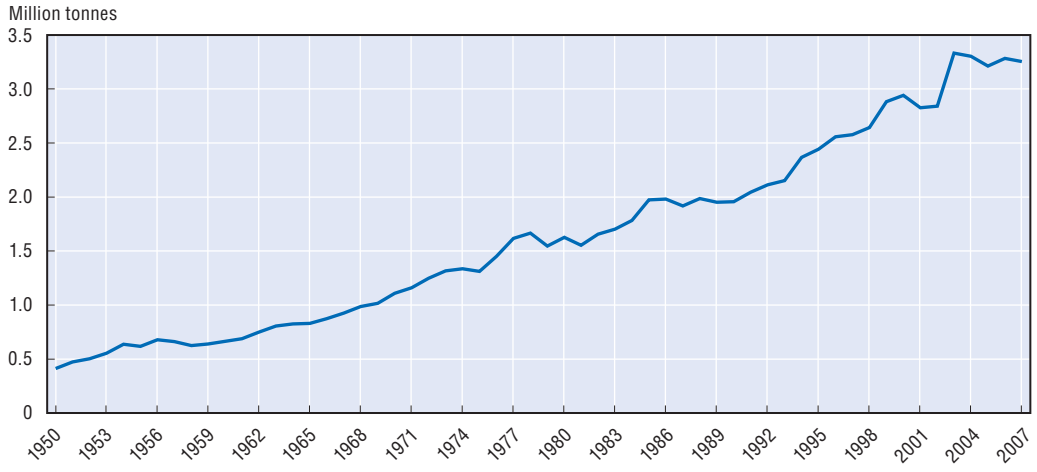
Shrimp[1]

The main feature of the shrimp sector is the rapid development of shrimp farming in developing countries. Developing countries have expanded their role in processing, supported by low labour costs. Shrimp farming and wild shrimp fisheries are highly export-oriented to developed country markets. Economic factors such as high returns on investments and labour cost differences are the key drivers of internationalisation in shrimp farming. Developed country food safety regulations are important for small fishers, processors and traders. Such regulations also underpin further vertical integration, in particular through the business operations of transnational corporations.

Wild capture

Catches from wild shrimp fisheries have steadily increased over the past decades, mainly through the exploration of new fishing areas and increased fishing capacities. Global wild shrimp catches have increased from about 412 165 mt in 1950 to 3.3 million mt in 2006 (Figure B.8).

Figure B.8. **Global wild shrimp catches, by volume**



Source: FAO Statistics (FIGIS).

Most of the world's wild shrimp catches come from tropical or subtropical waters (mainly *Penaeus*), especially in China, India and Indonesia. Chinese catches have been by far the largest, particularly since the mid-1980s. Cold water wild shrimp (mainly *Pandalus borealis*) are caught in the North Atlantic and North Pacific Oceans, primarily by Canada and Greenland.

The increase in shrimp catches over the past decades has not been without consequences. Bottom-trawling techniques employed by parts of the industry destroy marine ecosystems and cause large scale by-catches estimated at between 2.0 and 3.4 kg of other species for every kg of shrimp caught. Overcapitalisation in shrimp fisheries has also been observed, as have vanishing profits and increased competition (Johnston, 2000) in some countries.

Shrimp farming

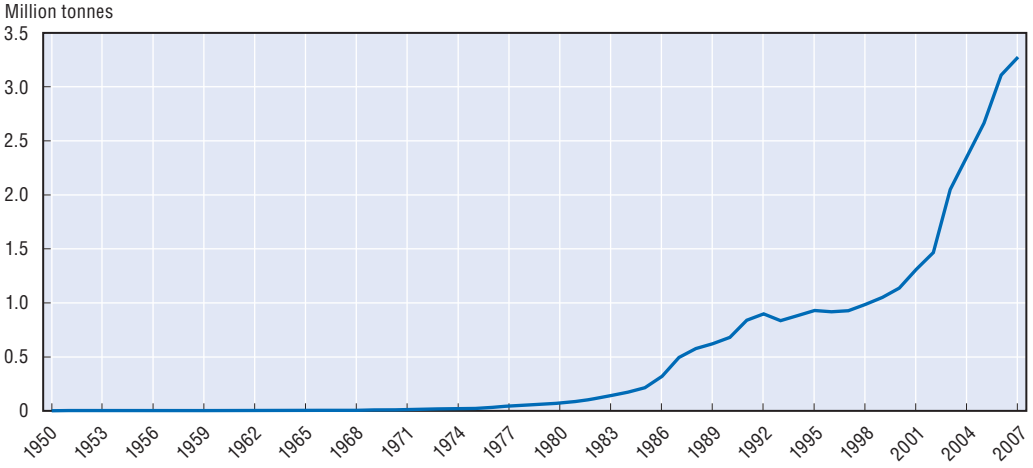
Production of farmed shrimp

Starting in the 1980s with the spread of innovation in aquaculture technology, shrimp farming has experienced explosive development, particularly in tropical or subtropical waters. This happened at the same time as catches of wild ocean shrimp were becoming more expensive and erratic, due in part to overfishing and the degradation of many natural shrimp habitats. Shrimp farming is now an important economic component in many coastal areas in Asia and Latin America, and to a lesser extent Africa and Australia.

By the late 1980s, the centre of shrimp farming in the world shifted to Asia. Approximately 80% of the world's cultured shrimp is produced in Asia. The top shrimp farming countries are China,[2] Thailand, Viet Nam, Indonesia and India. Since 2000, Chinese production has soared.

Problems with disease and poor water quality in the early 1990s slowed world production of farmed shrimp for a few years. Recently, production has been increasing rapidly again due to new disease control protocols and water recirculation and reuse technologies (Whetstone, 2002) (Figure B.9).

Figure B.9. **World production of farmed shrimp, by volume**

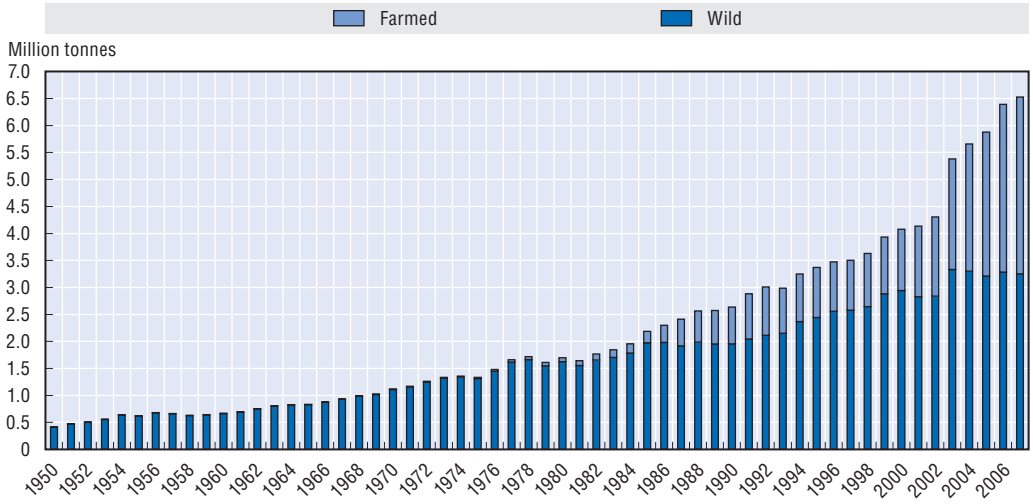


Source: FAO Statistics (FIGIS).

Before 1980, almost all shrimp production came from wild sources. However, with the rapid development of shrimp farming, farmed shrimp as a percentage of total production increased to 48.6% in 2006 from only 4.2% in 1980 (Figure B.10). Main species farmed are the black tiger shrimp (*Penaeus monoden*) and the smaller white shrimp (*Penaeus vannamei*). *P. monoden* is still the primary shrimp species farmed. Recently, however, the proportion of *P. vannamei* has increased rapidly as the shrimp is superior in both flavour and appearance to the black tiger shrimp.

The majority of producers in Asia are small-scale family-owned and -run operations – typically less than 3 hectares and most often less than 1 hectare. This is particularly the case in India, Thailand, Viet Nam, Bangladesh, Cambodia and China. There are also a few very large vertically integrated companies engaged in shrimp production, especially in

Figure B.10. **World production of wild and farmed shrimp, by volume**



Source: FAO Statistics (FIGIS).

Indonesia and, to a lesser extent, the Philippines and Thailand. In contrast, most production in Latin America is dominated by large companies using large pond areas and semi-intensive techniques (Nautilus Consultants Ltd., 2003a, p. 24).

There are several types of shrimp farming ranging from extensive to ultra-intensive techniques, but the most common techniques are extensive, semi-intensive and intensive (Table B.2). Although methods of production vary, the semi-intensive type is preferred in most of Latin America and the Caribbean, and intensive is preferred in Thailand.

Shrimp farm owners or operators producing for international markets have to adopt more intensive technologies in order to be competitive. The trend towards intensive shrimp aquaculture is also encouraged by the high profits for farmed shrimp. However, intensive shrimp farming requires access to financial resources and expensive technology.

Table B.2. **Comparison of three shrimp production types**

Characteristics	Extensive	Semi-intensive	Intensive
Pond size	1~100 ha	5-25 ha	0.01-5 ha
Management	Minimal attention	Continuous, skilled	Continuous, skilled
Pond shape	Irregular	More regular	Uniform square or rectangle
Stocking density (per ha)	5 000~30 000	25 000~200 000	200 000+
Water exchange rate (per day)	5~10% (tides)	10~20% (pump)	30%+ (pump)
Water depth (m)	0.4~1	0.7~1.5	1.5~2
Shrimp feed	Naturally occurring organisms	Shrimp feed, augments naturally occurring organisms	Primarily formulated feed
Survival rates	< 60%	60-80%	80-90%
Crops (per year)	1~2	2~3	2.5~3
Potential energy requirement (horse power/ha)	0~2	2~5	15~20
Labour needs (person/ha)	< 0.15	0.1~0.25	0.5~1
Disease problems	Minimal	Usually not a problem	Can be serious
Production cost (USD) (per kg)	1~3	3~5	5~7
Construction cost (USD) (per kg)	Low	15 000~25 000	25 000~100 000
Yield (kg/ha/yr)	50~500	500~5 000	5 000~10 000

Source: Tobey (1998), p. 14.

Developing countries have often played an essential role in industrialising shrimp farming. The state has frequently provided cheap credits and facilitated access to land, water, etc. Industrialisation has also been supported by international development agencies. The World Bank, the Asian Development Bank (ADB), the United States Agency for International Development (USAID) and many other lending and donor institutions have provided millions of dollars in support of (shrimp) aquaculture projects (Tobey, 1998).

Issues and problems include mangrove destruction, loss of capture fishery stocks, direct and indirect interruption of traditional access to resources (water and land), preferential allocation of new or common land rights to local elites, lowered water tables associated with groundwater pumping, and the salinisation of rice paddies. Other problems are shrimp disease and unplanned developments of shrimp farms; this is particularly related to the numerous small farms of the poorest farmers.

Shrimp processing

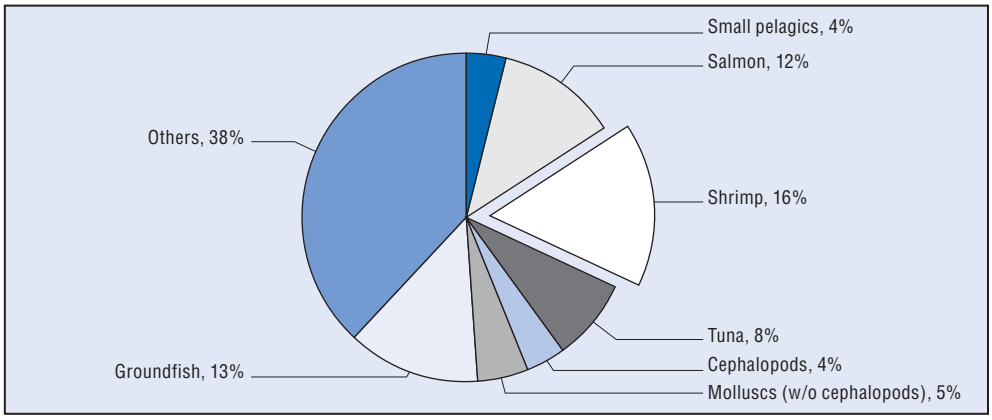
Tropical farmed shrimp is substantially higher in value than small cold water shrimp and usually subject to less processing. Processing involves heading, skinning, sorting, weighing, cooking and freezing the shrimp, and is thus fairly simple. The dominant product form of farmed shrimp is frozen blocks.

Competition between developing countries has been growing as more developing countries join the sector. As a result, product specialisation has occurred between countries according to their labour costs and technologies. Some developed and developing countries (like Thailand) with high processing technologies but higher labour costs (compared to other developing countries) shift to value-added shrimp products, while other developing countries with much lower labour costs (like Bangladesh) produce simple products like frozen blocks. These secondary rounds of "outsourcing" underline the tendencies of the globalisation process.

World shrimp trade

Shrimp is the most important seafood commodity in term of value (USD), accounting for approximately 16% of internationally traded fish products in 2006 (Figure B.11).

Figure B.11. **Share of shrimp exports in international trade in 2006, by value**

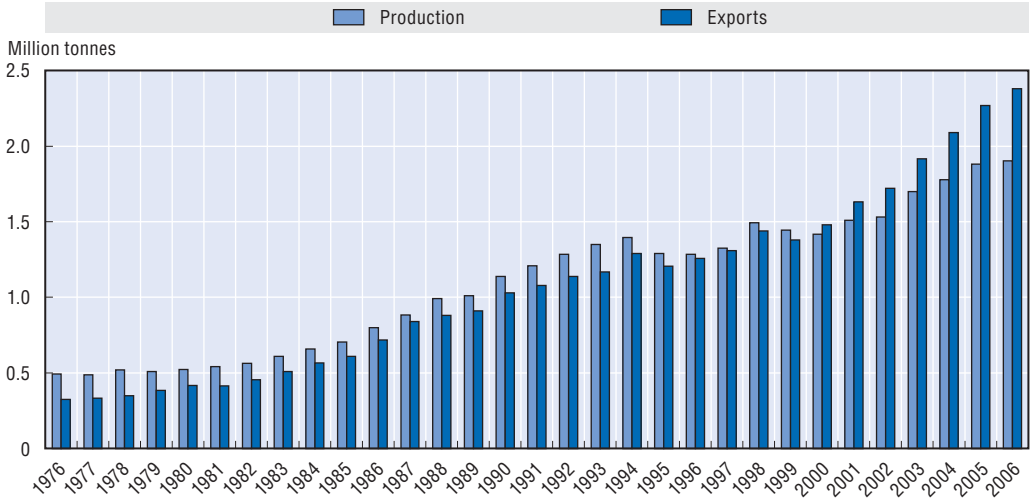


Note: Excludes re-exports.
Source: FAO Statistics (FIGIS).

Shrimp trade flows mainly from developing to developed countries. While approximately 99% of farmed shrimp are raised in developing countries, most is exported and consumed in developed countries, with the United States, European Union and Japan being the principal markets. Major exporters are Thailand, India, Indonesia, China and Viet Nam.

Figure B.12 shows a high ratio of exports to production. In 2001, the amount of export was larger than that of production. It means shrimp fisheries are highly export-oriented and production for domestic consumption is small. Re-exports are also frequent in shrimp trade. In some countries (*e.g.* Thailand, China, the Netherlands and Belgium), raw shrimp is imported, processed and then exported to other countries.

Figure B.12. **World shrimp production and exports, by volume**



Note: Excludes re-exports.
Source: FAO Statistics (FIGIS).

In recent decades, the removal or reduction of many traditional trade barriers such as tariffs and quantitative restrictions through the General Agreement on Tariffs and Trade (GATT), and more recently the World Trade Organization (WTO) have played a significant role in increasing shrimp trade. An overview of applied tariffs is provided in Table B.3.

The importance of NTBs such as food safety and environmental standards (like sea turtle protection[3]), traceability requirements and antidumping measures (Box B.2), have grown as tariffs have been reduced.

Shrimp markets

The three major consuming markets for shrimp are the US, the EU and Japan. Growing markets are currently in Asia (particularly China, Korea, Thailand and Malaysia) and other countries "unfamiliar" with shrimp (particularly the Russian Federation). The demand for shrimp is closely related to the overall economic situation of these countries (Nautilus Consultants Ltd., 2003a).

The main channels for shrimp markets are catering outlets and supermarkets. In the shrimp value chain, retailers are more powerful than producers, keeping down the farm-gate prices for shrimp. The price of shrimp has decreased over the last decades. This decrease has been driven by increased production and increased competition among the producers of Asia, Latin America and Africa.

Table B.3. **Tariff summaries of major shrimp importing countries**

		Most favoured nation-rates	Reduced-rates
USA tariffs			
Frozen		0% (except for the antidumping tariffs)	–
Canned		5% (except for the antidumping tariffs)	–
EU tariffs			
Frozen	Crangon	18%	0% for African Caribbean Pacific countries through the Cotonou Agreement and least developed countries through the "Everything but Arms (EBA)"
	Other frozen shrimp	12%	0% or reduced rates according to trade agreements
Canned		20%	0% for African Caribbean Pacific countries through the Cotonou Agreement and least developed countries through the "Everything but Arms (EBA)" 0% or reduced rates according to trade agreements
Japan tariffs			
Fresh		1.8%	–
Cooked		4.8%	–
Frozen and canned		6%	–

Sources: Josupeit (2006) and OECD Statistics.

Box B.2. **Government intervention in the shrimp industry**

- Growing imports of shrimp into the USA market, combined with falling prices have recently led to accusations of dumping. The Southern Shrimp Alliance, comprised of eight southern coastal states from North Carolina to Texas and representing the harvesters and processors of American wild-caught shrimp, brought an antidumping case to the US International Trade Commission in late 2003.
- On 26 January 2005, the Department of Commerce issued antidumping tariff orders on certain non-canned warm water shrimp from six countries according to the decision of the US International Trade Commission. The six countries are Ecuador, China, India, Thailand, Viet Nam and Brazil. The rate of antidumping tariffs range between 0.07 and 112.81% for each country.
- This action is opposed by US seafood distributors, retailers, restaurateurs, and other businesses involved in shrimp processing and marketing. They claim that: 1) imported shrimp supports jobs and provides additional income; 2) the price would increase significantly if the supply of inexpensive imported shrimp is curtailed; and 3) US commercial shrimp harvesters lack competitiveness due to high costs of production, which cannot be alleviated by taxing imports.
- One of the possible effects of this type of action is that the market would seek to source shrimp from countries unaffected by the tariffs. The exporting countries on which the antidumping tariffs are imposed also try to switch markets. However, antidumping tariffs did not result in a lower share of US imports from the six countries as might be expected. In fact, the combined share in volume terms for these countries increased slightly from 62.4% in 2004 to 63.8% in 2005 (*Globefish*, 2006).
- It should be noted that the US shrimp harvesting industry, by means of the "Byrd Amendment" receives annual compensation which is wholly financed by the antidumping tariff; in 2007 the amount available was USD 39 million.

The development of cold storage technology plays an important role in stabilising shrimp prices. Frozen shrimp may be stored for up to a year. The main production of shrimp takes places from June to November and cold storage holdings are built up during this period. During January to May, stocks are typically run down. This allows for a smoothing out of price over the year (Nautilus Consultants Ltd., 2003a).

The US has been the major market for farmed shrimp over the past few years and US market conditions have been the predominant factor affecting the international market. Shrimp is the number one seafood consumed in the USA, with an annual per capita consumption increasing from 1.3 kg in 2000 to 1.9 kg in 2006. The major types of shrimp consumed in the US are warm water shrimp (80% of consumption) and cold water shrimp (20%). Imports reached 529 000 mt and USD 3.64 billion in 2005 (*Globefish*, 2006). Imported shrimp accounted for 88% of demand, with domestic production only able to meet 12%. Asian suppliers have dominated imports accounting for 72% of total volumes in 2005. The import share of Latin American countries was 23%. Major exporters were Thailand, Indonesia, Ecuador, China, Viet Nam and India (Briggs, 2004). Thailand accounted for 31% of US imports, despite the antidumping tariffs.

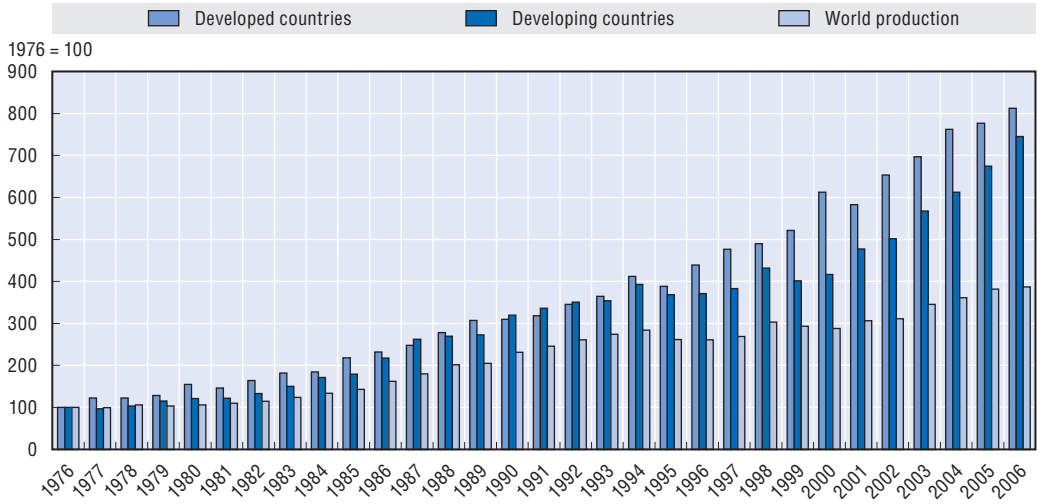
Cold water shrimp dominated most EU markets before 1980. Nevertheless, warm water farmed shrimp species have made significant inroads into the EU market since then. European key shrimp import markets are Spain, France, the UK, Italy and Germany. The influence of the US antidumping process was felt in European markets during 2005, with stronger supplies from Asia boosting overall shrimp imports. China, India, Thailand and Viet Nam all increased sales to the EU significantly in 2004. Spain is Europe's biggest shrimp market, importing 156 000 mt in 2005. China is the leading supplier to the Spanish market. The Chinese share of the Spanish shrimp market increased to 17% in 2005 from 2% in 2004. The switch by Chinese exporters from the US market to the EU, caused by the US imposition of antidumping duties, was the reason for this change (*Infofish*, 2006b).

Annually, Japanese consumer consumption is around 300 000 mt. Japan imports about 90% of its demand while less than 10% is supplied by domestic production (Manarungsan, 2005, p. 15). The Japanese market took 80% of its shrimp imports from Asian countries (particularly Viet Nam, Indonesia, India, China and Thailand) in 2005. Viet Nam took its position as the leading frozen shrimp supplier to the Japanese market in 2005, taking its share of imports to 23.5%. There has been a continuous and steady growth in demand for imported breaded, cooked (including sushi shrimp) and other shrimp products. Nearly 98% of value-added shrimp products were imported from four sources, namely Thailand (40%), China (23%), Viet Nam (17%) and Indonesia (17%) (*Infofish*, 2006a).

In recent years increasing emphasis has been placed on Asian markets. The demand for shrimp has been on the rise in many Asian countries (like Singapore, Hong Kong [China], Chinese Taipei and Korea). Recently, an increasing share of shrimp exports from China, Thailand, Malaysia and Indonesia now go to Asian markets. Growing economic power and trade liberalisation policies in the region are reinforcing Asian growth (*Infofish*, 2004).

In a simple way, Figure B.13 shows that growth in world trade of shrimp has outstripped growth in world production. While some care should be applied in analysing the data, it is revealing that international trade (in volume) has grown faster than production, suggesting that international markets are becoming more intertwined and that both developing and developed countries are major players in the shrimp market, albeit in different elements of the value chain.

Figure B.13. **Growth in world production and export of shrimp (1976-2006)**



Source: FAO.

Notes

1. Data in this section is from the FAO species category "Shrimp, Prawns".
2. Even though China is the world's largest producer, a large portion of production is for domestic consumption.
3. In 1989, the US Congress banned the importation of shrimp caught by foreign shrimpers who were not using Turtle Excluder Devices (TEDs), *http://seattlepi.nwsource.com/business/case1.shtml*.

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Tuna

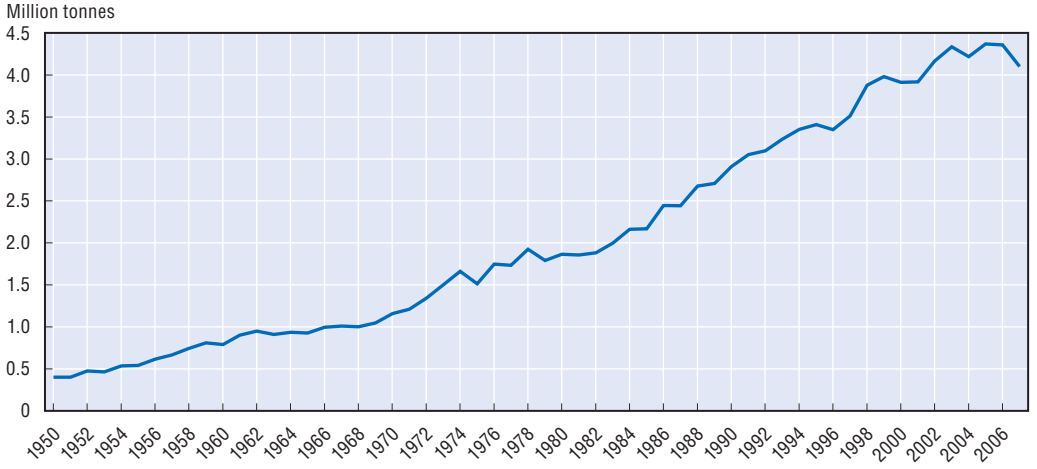
The main feature in the tuna sector is the increasing participation by developing countries following the extension of EEZs. There has been an important relocation of tuna processing facilities from developed to developing countries in order to benefit from low labour costs and proximity to fishing grounds including through the business operations of transnational corporations. Economic factors such as cost differences in access to resources and labour between developed and developing countries are the main factors influencing localisation of tuna operations. Other factors such as access to EEZs, RFMO allocations and tariffs also affect the structure of tuna fisheries.

Wild capture

Tuna stocks are concentrated in tropical regions between 10 °N and 10 °S of the equator. The major (commercial) tuna species are albacore, bigeye, Atlantic, northern and southern bluefin, skipjack and yellowfin tunas. The principal species caught are skipjack followed by yellowfin. Skipjack accounts for half of the world's tuna catches.

Figure B.14 shows world tuna catches (of all the major tuna species) from 1950 to 2004. Total catches increased from about 403 000 mt in 1950 to 4 157 000 mt in 2004; 65% of the tuna are taken in the Pacific Ocean, 21% in the Indian Ocean and 14% in the Atlantic Ocean. The rapid increase of tuna catches has been made possible by the wide spread of tuna purse-seines in the 1970s, amongst other things.

Figure B.14. **World catches of major tuna species, by volume**



Note: FAO Statistics used in this annex are available from FIGIS, FAO's online statistical database, *www.fao.org/fi/statist/statist.asp*.

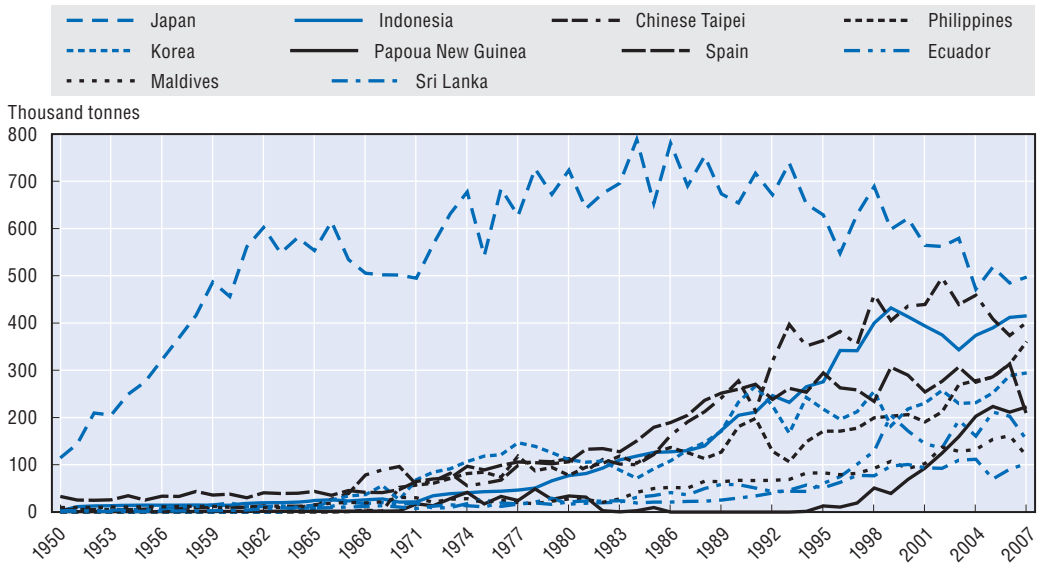
Source: FAO Statistics.

Capture tuna fisheries operate on an industrial scale. Tuna is highly migratory and usually caught by distant water fishing fleets. For example, of the 1 256 vessels registered in the Pacific Ocean in 1998, 905 were distant water fishing vessels. Large-scale capital and business entities are necessary to build and operate these fleets. Tuna fisheries used to be the domain of developed countries. The situation changed, however, when developing

countries began to fish their abundant tuna resource themselves, mainly with the help of developed countries. This trend has intensified as developing countries have used tuna fishing as a means of obtaining foreign currency.

Catches since 1950 of the main tuna species by major tuna fishing countries are shown in Figure B.15. Japanese catches are the largest with 12% of the world total in 2007, although Japanese catches have been decreasing since the mid-1980s. The Japanese tuna harvesting sector expanded its areas of operation very rapidly from the 1950s to the late 1970s.

Figure B.15. **World wild catches of major tuna species[1] by the ten largest countries**



1. Albacore, Atlantic bluefin tuna, bigeye tuna, Pacific bluefin tuna, skipjack tuna, southern bluefin tuna, yellowfin tuna.

Source: FAO Statistics.

In the middle of the 1960s, Korea and Chinese Taipei began large-scale longline fishing, learning the techniques from Japan. Since the early 1970s, after establishing a purse-seine fishery for tropical tunas in the eastern Atlantic Ocean, French and Spanish catches increased considerably (Miyake, 2004).

Around 1980, three major events precipitated the arrival of new players in tuna fishing and processing; the adoption of the 200-mile EEZ, the dismantling of tariff barriers and the signature of the Lomé Conventions[1] between African, Caribbean and Pacific (ACP) countries and the EU (*Oceanic Development*, 2005[2]). Subsequently, many new developing countries entered into tuna fishing.

Distant water fishing fleets access tuna in tropical EEZs through access agreements. These agreements are predominantly between developing coastal and island states (often with little or no capacity to fish in their EEZs), and developed distant water fishing nations.

The access agreements involve the sale of either a defined amount of catch of tuna or access – *e.g.* permission to use a defined fishing effort in an EEZ for a particular period. The access payments are usually financial (see Table B.4) but may also comprise other support, *e.g.* technology transfer, capital loans, joint venture, etc. The fisheries agreements signed

with the major distant water fishing nations (*e.g.* the EU, the US and the Far East) have quite distinctive characteristics:

- The EU agreements are usually bilateral in nature, between the host country and the EU.
- The US has negotiated the only multilateral fisheries access agreement, with all 17 Pacific Island countries.
- The Japanese and Far East distant water fishing nations (Korea and Chinese Taipei) usually fish under private access agreements negotiated between their private sector associations and the host governments (Mwikya, 2006).

Table B.4. **Distant water fishing nations' tuna catches from western and central Pacific Ocean, and payments (2003)**

	US	Japan	China	Korea	Chinese Taipei	EU
Catch, tonnes	94 003	366 783	35 985	208 592	235 188	n.a.
Fleet number	16PS	157 LL 35 PS 35PL	106 LL 8 PS	150 LL 27 PS	153 LL 34 PS	5 LL 3 PS
Financial compensation/ economic benefits	USD 21 million to 17 countries	5% of catch value	5% of catch value	6% of catch value	6% of catch value	100 EUR/mt (about 12% of catch value)

LL: Longline. PS: Purse seine. PL: Pole and line.
Source: Mwikya (2006).

Tuna fisheries are characterised by the migratory nature of these species and the high mobility of tuna fishing vessels. Furthermore, most tuna stocks are fully exploited or overexploited. These characteristics made it essential to establish RMFOs for sustainable tuna resource management. With the adoption of UNCLOS in 1982, the role of RFMOs in managing tuna on the high seas has been intensified.

RFMOs for tuna include the International Commission for the Conservation of Atlantic Tuna (ICCAT), the Indian Ocean Tuna Commission (IOTC), the Inter-America Tropical Tuna Commission (IATTC) for the western Pacific, the Western and Central Pacific Tuna Commission (WCPTC), and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) (OECD, 2005).

Tuna farming

Tuna farming started in the early 1990s. Presently, the main species used in farming are bluefin tuna, but the practice is also spreading to bigeye and yellowfin tuna. Tuna farming is different from other fish farming: wild juvenile tuna are captured at sea by trawlers, transferred into cages and fattened to improve the oil content of the flesh in order to meet Japanese market standards.

Tuna farming has flourished, particularly along the Australian and southern Spanish coasts of the Mediterranean and in Mexico. World production of tuna farming is estimated at 25 000 mt per year, with Australia's 9 245 mt in 2002 making that country the largest producer. Japan imported 14 553 tonnes of farmed tuna from the Mediterranean in 2002 (WWF, 2004). The arrival of farmed bluefin tuna to the Japanese sashimi market has caused a decline in bluefin tuna prices since the late 1990s (Catarci, 2004).

However, tuna farming threatens to destroy the already overfished wild tuna stock, particularly in the Mediterranean.[3] Furthermore, farmed tuna is heavy in feed inputs: while it takes five kg of wild fish to produce one kg of cod, it takes from 10 to 20 kg of wild fish to fatten up just one kg of tuna for market (*The Independent*, 2004).

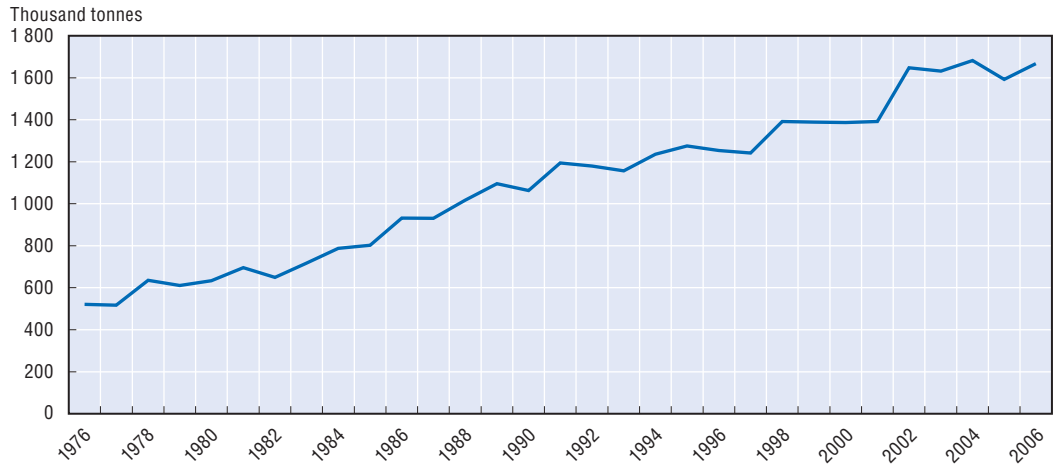
Tuna processing[4]

Tuna is consumed directly for *sashimi* and steaks. Sashimi is prepared from fresh tuna or thawed tuna that has been frozen at temperatures below –40 °C immediately after capture. Tuna that is not acceptable for sashimi is sold in the steak market, generally in Europe and the US. The borderline between sashimi-quality and steak-quality tuna is variable. Exporters decide which market is the most profitable for a certain product, based on the quality of the tuna meat, the cost of shipping and the market prices in various countries.

Tuna loins were introduced in 1989, first in the US and then in Europe, as a way to cut production costs in the canneries of developed countries without having to reduce employment drastically. The loining process (including cutting and cleaning) accounts for up to 80% of labor costs in tuna canning. Traditional and high quality tuna canneries have been resisting the use of tuna loins for years. However, the industry has to follow the rules of the market, where labour cost reduction is the main driver. For example, tuna loins account for 40% of total Spanish tuna imports for tuna canneries, while this figure was only 8% in 2002, mainly from South American countries (*Globefish*, 2006a).

The principal species used for canning are skipjack and yellowfin. World production of canned tuna increased from 520 593 mt in 1976 to 1 667 297 mt in 2006 (Figure B.16). The main producing countries are Thailand, the US and Spain. Thai production increased significantly during the 1980s. The United States was the top producer of canned tuna until 2000. Production, however, fell by 25% between 1989 and 2003 due to competition from Asian countries (*Oceanic Development*, 2005).

Figure B.16. **World canned tuna production, by volume**[1]



1. Tunas, bonitos, billfishes – Fish prepared or preserved.

Source: FAO Statistics.

Relocation of tuna processing facilities

For several decades, developed countries have relocated their tuna canning factories from their original locations (mainly in the US, the EU and Japan) to developing countries.[5] Transnational corporations (TNCs) have played a key role in this process and have benefitted from low labour costs and proximity to the most productive fishing zones.

Tuna processing transnational corporations

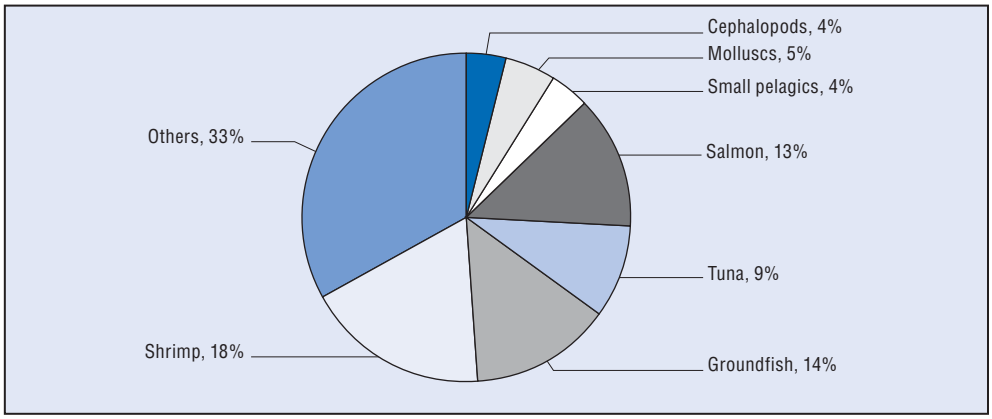
Five transnational corporations (TNCs) dominate the industry: they are Bolton, Bumble Bee, John West/Heinz, Starkist and Thai Union (*Oceanic Development*, 2005). As noted above, they operate canneries in countries where they can benefit from lower labour costs and preferential tariffs when exporting tuna products to the major markets, especially in the developed world.

World tuna trade

Features of tuna trade[6]

Tuna is the third major fish commodity traded internationally after shrimp, groundfish and salmon, with about 9% of total fish and fish product exports in value terms (see Figure B.17).

Figure B.17. **Share of tuna exports in international trade in 2006, by value**



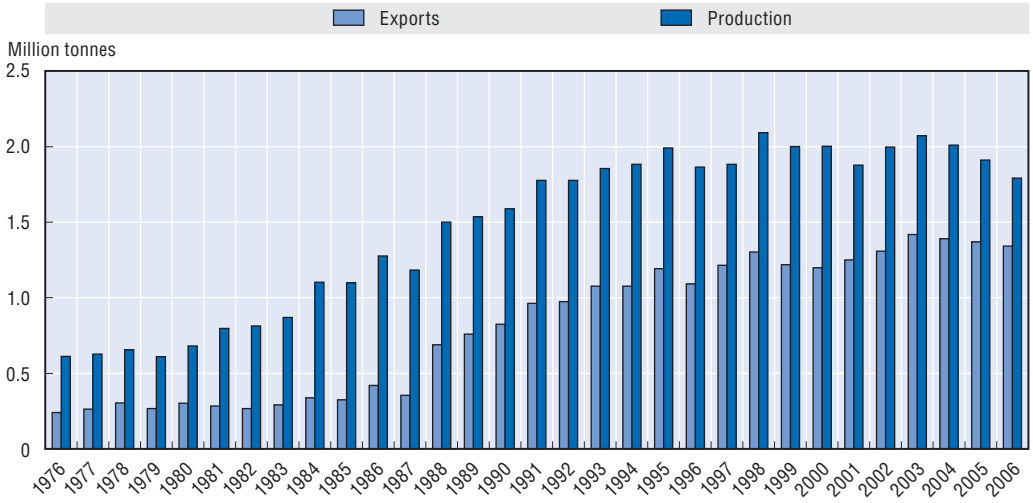
Source: FAO Fishstat.

World production of major tuna[7] commodities (frozen, fresh and chilled, and canned) increased from about more than 600 000 million mt in 1976 to almost 1.8 million mt in 2006. Exports of tuna commodities, however, have increased more rapidly than production. The percentage of exports to production increased from 39% in 1976 to 75% in 2006 (Figure B.18).

Total tuna export value reached USD 5 billion in 2002, up from USD 1.9 billion in 1987 (Josupeit, 2004). The tuna export share of total fish and fish product exports in value terms increased to 8.6% in 2002, from 6.8% in 1987 (Table B.5).

Fresh and chilled tuna is primarily destined for sashimi markets. Japan dominates imports of fresh and chilled tuna due to its strong demand for sashimi (57% of world total in mt and 72% in value in 2001). Fresh and chilled tuna exports increased from 18 967 mt in 1976 to 93 094 mt in 2001. The top exporters of fresh and chilled tuna are Indonesia in quantity and Spain in value. The rapid increase of Spanish exports comes mainly from

Figure B.18. **World tuna production (frozen, fresh and chilled, and canned) and exports of major tuna species,[1] by volume**



1. Albacore, Atlantic bluefin tuna, bigeye tuna, Pacific bluefin tuna, skipjack tuna, southern bluefin tuna, yellowfin tuna.

Source: FAO Statistics.

Table B.5. **Share of tuna exports in total fish and fish product exports**

USD billion

	1987	1991	1995	2002
Total fish and fish products export	27.9	38.7	51.7	58.2
Tuna export	1.9	2.9	4.2	5.0
%	6.8	7.5	8.1	8.6

Source: Josupeit (2004).

booming bluefin tuna farming for the Japanese market. The quantity of fresh tuna exported by Spain is relatively small (11 300 mt in 2002) but the unit value is very high (17.90 USD/kg). By comparison, the unit value of other fresh exports is 3.50 USD/kg (Josupeit, 2004).

The principal traded frozen tuna species are skipjack and yellowfin in terms of quantity and bigeye, yellowfin and skipjack in terms of value (Catarci, 2004). Frozen tuna is traded as whole fish and tuna loins. World imports of frozen tuna increased from 365 000 mt in 1976 to 1 224 000 mt in 2001. World imports show a rapid increase from the mid-1980s to the early 1990s. Since the early 1990s, world imports have stabilised around 1.2 million mt.

Thailand is the top importer of frozen tuna by quantity – mainly frozen skipjack for its canneries. The Thai tuna canning industry depends heavily on imported raw material. Over 90% of raw material is imported from countries such as Indonesia, Korea, Chinese Taipei, etc. Chinese Taipei is the top exporter of frozen tuna. The tuna sector in Chinese Taipei is highly export-oriented as there are not enough canneries to use its catch.

EU countries are among the top canned tuna importers, with a strong increase in imports to all EU countries. For the period 2001-03, 56% of European imports of canned tuna came from African countries, 29% from South-East Asia and 12% from the drug-fighting countries of the GSP-drug arrangement (*Oceanic Management*, 2005). The UK is the main importer of canned tuna in the EU. It imported 132 600 mt in 2005. The Seychelles remain the top supplier to the UK with a 22% market share (*Globefish*, 2006d).

Thailand is the top canned tuna export country. The Thai canned tuna industry is highly export-oriented. Thai domestic consumption of canned tuna is only 10% of total production. The US is the dominant market for Thai canned tuna exports (about 25% of Thai canned tuna exports in 2001).

Tuna trade and tariffs

In many respects, in addition to labour costs and distance to fishing grounds, the tariff structure is also an important factor in the tuna trade and location of the industry. Developed countries have diverse preferential tariffs applied to less developed countries. These preferential tariffs are an important driver for transnational corporations when choosing the country to which to relocate their processing facilities. For example, ACP countries could develop a significant capacity in canned tuna production based on the benefits of preferential tariffs by the EU.

Tariffs on tuna commodities in major tuna markets are summarised in Table B.6. As seen, the tariffs applied to fresh and frozen tuna are generally reduced to zero, whereas the tariffs applied to processed products such as tuna loins and canned tuna are higher than raw tuna in order to protect the domestic processing industry in major markets.

Table B.6. **Tariff summaries of major tuna importing countries**

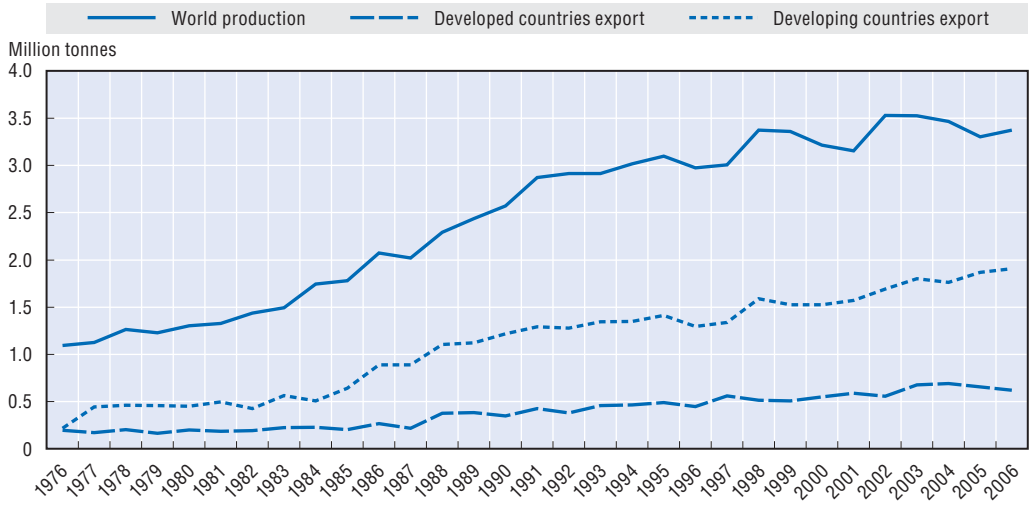
			Most favoured nation-rates	Reduced-rates
USA tariffs				
Fresh and frozen			0%	–
Loins	< 6.8 kg		1.1 cent/kg	0% for least developed countries, other developing countries, Andean countries, Caribbean countries, North American Free Trade Area countries.
	> 6.8 kg		6%	
Pouch	Within quota		6%	
	Over quota		12.5%	0% for Andean Community countries
Canned	In oil		35.0%	0% for Free Trade Treaty for Central American Countries
	In brine	Within quota	6.0%	
		Over quota	12.5%	1~2% for Free Trade Treaty for Central American Countries
EU tariffs				
Fresh and frozen for processing			0%	–
Fresh and frozen for direct consumption			22%	0% for African, Caribbean, Pacific countries and least developed countries through the "Everything but Arms (EBA)" 0% or reduced rates according to trade agreements
Loins			24%	0% for African, Caribbean, Pacific countries and least developed countries through the "Everything but Arms (EBA)" 0% or reduced rates according to trade agreements
Canned			24%	0% for African, Caribbean, Pacific countries and least developed countries through the "Everything but Arms (EBA)" 0% or reduced rates according to trade agreements
Japan tariffs				
Fresh and frozen			3.5%	–
Canned			10%	0% or 6.4% for least developed countries

Sources: Josupeit (2006) and OECD Statistics.

Figure B.19 provides an overview of developments in global production and export of tuna in volume terms. World exports (and in particular exports from developing countries) have increased much faster than production. Since 1976, world tuna production of the most important species has more than doubled, from about 1.1 million mt to close to

3.4 million mt in 2006. Over the same period, exports from developing countries increased from about 200 000 mt to 1.9 million mt. Concurrently, exports from developed countries have stagnated for the past ten years at less than 600 000 mt. While some caution should be applied in interpreting the figures (as developing countries' exports may be double-counted as they have undergone processing in one market before export to another), the graph clearly shows that trade in tuna and tuna products is international in scope and developing countries play a major role.

Figure B.19. **Developments in world production and export of tuna and tuna products,[1] by volume**



1. Tunas, bonitos, billfishes.

Source: FAO FishStat.

Notes

1. Under the Lomé Conventions, ACP countries (by and large the ex-colonies of the EU countries) enjoyed zero tariffs on their tuna and tuna products imported into the EU since 1982. In June 2000, a new trade and aid agreement was reached between the EU and 71 ACP countries. The treaty became the Cotonou Agreement named after Cotonou in Benin, where the convention for the agreement was held.
2. This report provides extensive information with regard to tuna fisheries, trade and market; in particular, the overall state of tuna resources, regulations, the economic analysis of the tuna industry and the impact of the liberalisation of trade on the European tuna sector.
3. This issue has important management implications. The specimens taken for fattening are often juveniles weighing far less than sexually mature adults. This needs to be accounted for in the management regime in two ways, *i.e.* the number of fish removed (per tonne quota) is higher and those removed will not be able to procreate.
4. This part is mainly based on C. Catarci's paper (2004).
5. The first relocation of tuna canneries happened in the 1960s. In the US, the companies, *Bumble Bee, Star Kist and Van Camp*, initially based exclusively in California, opened factories in Puerto Rico and American Samoa. Japanese companies, *Mitsui and Mitsubishi*, also set up canneries in Puerto Rico (*Oceanic Development*, 2005, p. 112).
6. Statistics on tuna trade usually exist for frozen tuna, chilled and fresh tuna, and canned tuna. In this section, world tuna trade is explored according to these categories of major tuna species commodities.
7. This section refers mainly to Albacore, Atlantic bluefin, bigeye, Pacific bluefin, skipjack, southern bluefin, yellowfin.

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