

SEAFOOD: TRADE LIBERALIZATION AND IMPACTS ON SUSTAINABILITY

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In many ways, fish as a commodity is treated differently from agricultural products. For one thing, it is not part of the agricultural negotiations of the World Trade Organization (WTO). That it continues to be treated as an industrial product in negotiations may be a mixed blessing—leading to lower trade protection but less discipline on domestic subsidies. Yet fish is the most important source of protein for many around the globe. Seafood constitutes the biggest category of food and agriculture exports from developing countries, at an annual average of \$33 billion (2000–01), or 18 percent of exports—more than combined exports of coffee, cocoa, tea, spices and nuts, cotton, and sugar. Globally, per capita consumption of fish is estimated at 14.3 kilograms per year (Delgado and others 2003). Per capita consumption in 1997 was led by Japan, with 62.6 kilograms per year, and China, at 26.5 kilograms per year (up from 8.1 in 1985). The European Union (EU) consumes 23.6 kilograms per year per capita, and Southeast Asia 23 kilograms, up from 19.8 in 1985. By 2020 per capita consumption of fish is expected to rise to 35.9 kilo-

grams per year in China and to 25.8 kilograms per year in Southeast Asia, whereas it will remain constant or decline in developed countries (Delgado and others 2003).

The goal of this chapter is to present the structure and important features of the global seafood market, including illustrations of the complexities of the market, followed by a discussion of the impacts of trade liberalization, with a particular focus on developing countries. Developing countries play a very important role in international seafood trade (FAO 2002b). Many rely on seafood for export earnings—among them the Maldives, Mozambique, Peru, Senegal, and Sierra Leone. Fisheries production, both caught and farmed, has doubled in the last 30 years, and most of that increase has come from developing countries. Over half of global fish exports by value come from Latin America and the Caribbean and the developing nations of Asia and Africa, and the majority of that production goes to developed nations.

With rapid growth in production and trade have come the overexploitation of fish stocks and a rapid

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expansion of aquaculture. Both have had severe impacts on the environment (FAO 2002c). Thus, the issue of trade liberalization in seafood markets relates directly to sustainability of fish production and, by implication, the sustainability of international trade in fish products.

Production

Production of fish (finfish, mollusks, and crustaceans) takes two forms, aquacultured (or farm raised) and captured. The vast majority of captured fish (by volume) are marine, while the majority of aquacultured fish are freshwater species. The fishing sector has expanded considerably in the past 50 years, with capture fisheries landing 19 million (metric) tons in 1950 to 98 million tons in 2000 (FAO 2002b). During this time the importance of developed countries in the fishing sector has declined relative to the developing nations because of overfishing of waters contiguous to developed countries and an increase in fishing in the developing world. Aquaculture has further expanded the seafood industry, increasing production from 2.5 million tons in 1970 to more than 35 million tons in 2000, with most of the increase occurring in developing nations (FAO 2002b). Production of carp and mollusks dominated aquaculture production during the 1990s, but shrimp have the highest value.

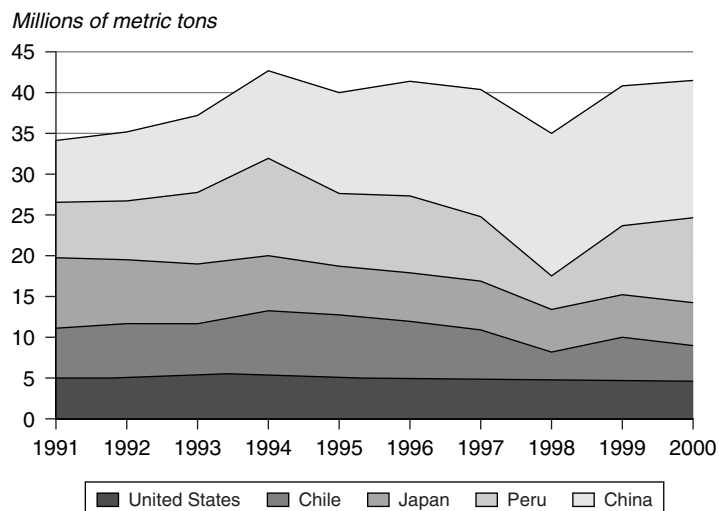
Thus, with the combination of capture fisheries and aquaculture, the volume of world production has doubled in the last 30 years. Most of the growth in aquaculture is occurring in developing countries, especially China, where it is destined predominantly for domestic consumption. Marine aquaculture has grown very slowly in developed countries, largely because of limited available shoreline.

China is the world's largest producer of captured fish, marine and inland, at 17 million tons (figure 15.1). Peru and Chile follow, primarily capturing anchoveta, largely used to produce meal and oil for industrial use. U.S. fleets catch large volumes of low-value pollock off Alaska. Most of the catch goes into surimi, a refined, stabilized fish protein concentrate used in making imitation crab meat and processed fish such as breaded fish sticks and patties.

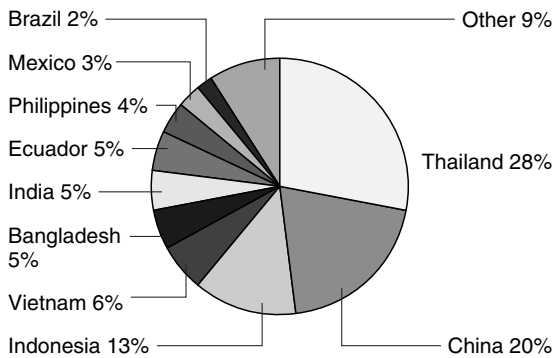
China is the leading producer of carp. The majority of that harvest is retained for domestic consumption. Norway, Chile, Scotland, Ireland, and Canada are the leading producers of farmed salmon and trout, and most of that production is traded on the international market.

China and Thailand produce almost 50 percent of the world's supply of shrimp (figure 15.2), with other developing countries supplying most of the rest. Shrimp and prawns account for just 6.4 percent of the volume of the world fish trade but about 20 percent of its value (OECD 2003a). The global

FIGURE 15.1 Fish Catches by Leading Countries, 1991–2000
(millions of metric tons)



Source: FAO. Fishstat Database.

FIGURE 15.2 World Aquaculture Production of Shrimp, by Volume, 2000

Source: FAO. Fishstat Database.

shrimp trade is valued at more than \$10 billion annually.

It is estimated that more than 60 percent of Asia's mangroves have already been converted to aquaculture farms, primarily for the production of shrimp (ESCAP and ADB 2000), degrading habitats and land. Because shrimp is such an important export earner for Southeast Asia and South America and has such a marked negative effect on their environments, it is worthwhile to discuss its production in some detail.

Sustainable Shrimp Aquaculture in Bangladesh and Thailand

Subsistence fishermen have caught shrimp in Bangladesh for hundreds of years. But since the mid-1980s the cultivation of shrimp for export has grown significantly. In 1972–73 exports of captured shrimp were valued at \$2.9 million. By 1985 exports had grown to \$90 million, primarily from aquaculture. In 2000 the figure was \$330 million (FAO 1999, 2002b).

Some of the credit for this rise goes to a structural adjustment program in which Bangladesh received a World Bank loan of \$1.76 billion over the period 1979–96 (UNEP 1999b). Under the program, policies that had limited trade were replaced with new policies that encouraged exports. The changes created an environment in which private investments in shrimp culture, shrimp processing, and shrimp exports flourished.

Shrimp now accounts for almost 91 percent of fish exports from Bangladesh (FAO 2002b). It is

generally agreed, however, that this rapid expansion has had considerable environmental costs. The area under shrimp culture tripled in 10 years, from the mid-1980s to the mid-1990s, covering 130,000 hectares by 1999 (UNEP 1999a). In the process, mangroves have been removed and replaced by coastal ponds. The ponds have increased the salinity of adjacent land, jeopardizing its future productivity.

The costs of restoration would likely be very high. Disappearing mangroves have deprived the marine ecosystem of valuable habitat and nursery areas for fish reproduction. In addition, sustainable shrimp farming is threatened by its reliance on the collection of wild shrimp fry, which are then “grown out” to appropriate sizes for export, a practice that threatens the sustainability of wild shrimp stocks as well. Disease sometimes breaks out in shrimp ponds and may spread to the wild shrimp population. Finally, the feed for cultured shrimp is based on fish meal, which is produced from fully used, if not overused, stocks of anchovies, herring, menhaden, and sardines.

Recognizing the negative externalities caused by shrimp culture in Bangladesh, the U.N. Environment Programme (UNEP) recommended that effective environmental policies with proper enforcement should be implemented to ensure that trade liberalization did not lead to externalities that reduced overall welfare (UNEP 1999a).

Thailand is the world's largest producer of shrimp, with approximately 23,413 farms covering an area of 72,663 hectares (in 1996) (FAO 2000). By 2000, Thailand was exporting 249,638 metric tons of shrimp, valued at some \$2.7 billion, to the world market. Shrimp production in India, Indonesia, and Vietnam combined equal what Thailand produces in export value. The same environmental issues highlighted for Bangladesh apply to Thailand—satisfying the huge export market for cultivated shrimp has led to significant environmental damage.

The Shrimp Industry in Madagascar

Madagascar's shrimp industry is the country's leading foreign exchange earner. Exports grew from \$20 million in 1980 to \$102 million in 1999 and now account for 7 percent of gross domestic product (GDP). Approximately one-half of the shrimp produced are from capture fisheries, the other half

from aquaculture. The industry provides direct employment for approximately 53,000 people and indirectly for another 30,000 people (World Bank 2003).

In the shrimp capture industry, there are three types of fisheries: traditional, artisanal, and industrial. The bulk of employment occurs in traditional fisheries, in which fishers have no motorized equipment. Entry into the fishery is open; no license is required. Most of the catch of traditional fishermen is consumed domestically. Production was about 3,400 tons in 2000 (World Bank 2003).

The cost of the license required to ply the artisanal fisheries depends on the power of the fishing boat's motor. Most artisanal boats belong to a company rather than being individually owned. Industrial trawlers that fish in Madagascar's waters are mostly foreign owned and have processing facilities on board. In 2000, approximately 8,200 tons of shrimp were captured by artisanal and industrial fisheries, which directly employed some 10,500 people. Virtually all of the shrimp captured in these two fisheries are exported, with France and Japan being the primary markets (World Bank 2003).

Industrial Products

Developing countries are important exporters and importers of fish meal. Fishmeal and oil are derived from small, wild-caught pelagic fish such as capelin from the North Atlantic, anchovies from the South

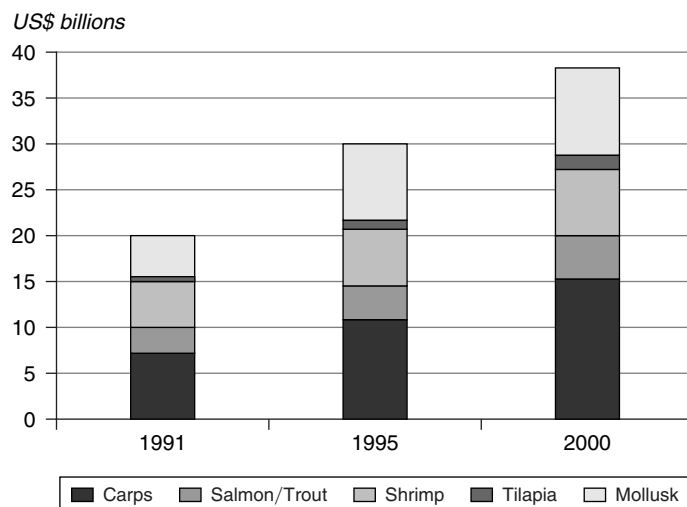
Pacific, and other species such as menhaden and herring found around the globe. In processing the fish are cooked, pressed, dried, and milled. The dry remainder is fishmeal; oil is extracted from pressing.

Fishmeal and fish oil, used in animal feeds (for both terrestrial livestock and aquacultured fish) but not for human consumption, are industrial products. Demand for fish meal from the farmed fish industry has increased dramatically in the last 20 years. Growing poultry and pig industries in China and Southeast Asia also create strong demand for fish meal.

The primary producer of fish meal has long been Latin America, with a total of 2.8 million tons produced in 1997 and an annual growth rate of 1.7 percent between 1985–97 (Delgado and others 2003). Much of that production, from Chile and Peru, is susceptible to the vagaries of El Niño. The most heavily exploited fish is the Peruvian anchoveta (figure 15.3). World production in 1997 was 6.1 million tons, with the balance after Latin America made up primarily by China, Southeast Asia, Japan, and the European Union.

If world markets and production do not change substantially over the next 17 years, fish meal prices are projected to rise by 18 percent (Delgado and others 2003). Conversely, if aquaculture expands by 50 percent, then the price of fish meal will increase by 42 percent. Greater efficiency in the use of fish meal in animal feed could push prices down. In the

FIGURE 15.3 World Aquaculture Production by Value, 1991–2000



Source: FAO. Fishstat Database.

worst-case scenario, in which the world experiences an ecological collapse in fisheries yielding fishmeal and oil, the price will rise by 134 percent (Delgado and others 2003). Any of these potential price changes would dramatically affect livestock production in developing countries.

International Markets

Fish is one of the most traded food commodities in the world. The value of world imports of fish products was \$60 billion in 2000, greater than international trade in many agricultural products (figure 15.4). The most valuable component of seafood trade is shrimp, with world trade in 2000 valued at more than \$10 billion (FAO 2002b).

A myriad of issues underlies fisheries and aquaculture production. Capture fisheries still supply the majority of fish production, but fully 60 percent of the world's fisheries are already being fished at or over capacity (Grainger and Garcia 1996). Even with the establishment of 200-mile exclusive economic zones (EEZs) in 1977, which brought one-third of the world's oceans under the jurisdiction of coastal states, most fisheries management plans have not achieved their stated goal of maintaining sustainable fisheries. Many countries, mostly developing, do not have management policies or lack resources to enforce them.

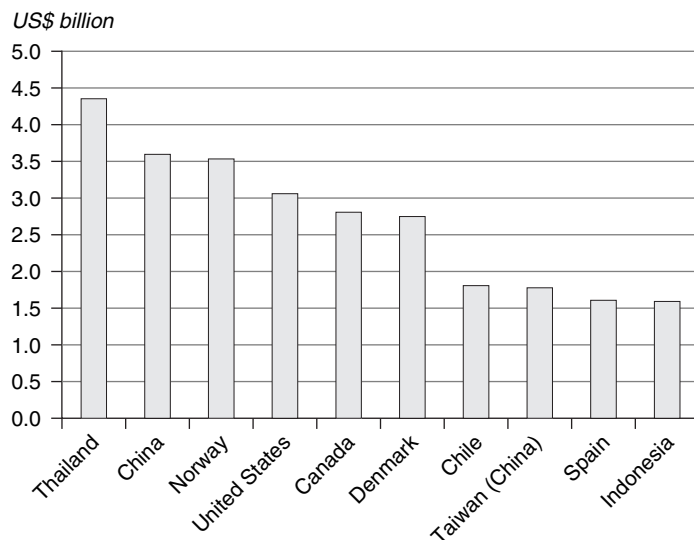
Fish and fish products have not always been major internationally traded products. Several influences led to the rapid expansion in international trade beginning in 1975. Certainly the passing of the International Law of the Sea and the institution of the 200-mile EEZ in 1977 had a large impact. The establishment of the EEZs effectively created importers out of countries, such as Japan, with very large distant water fleets, and created exporters out of those countries, such as the United States, that had large marine resources and relatively low domestic demand.

The most important trade commodities in order of their value in 2000 are shrimp (\$10.8 billion), salmon and trout (\$5.2 billion), tuna (\$4.8 billion), groundfish (\$4.4 billion), crabs and lobsters (\$3.8 billion), mollusks (\$2.8 billion), cephalopods (\$2.7 billion), fish meal (\$2.1 billion), small pelagics (\$1.6 billion), large pelagics (\$1.1 billion) and flatfish (\$1.1 billion) (Anderson 2003).

Thailand is the world's top exporter of food fish in the world, followed by China, Norway, and the United States (see figure 15.4). Seventy-four percent of Africa's exports are destined for the European Union, while exports from Central and South America go primarily to the United States, Canada, and the European Union.

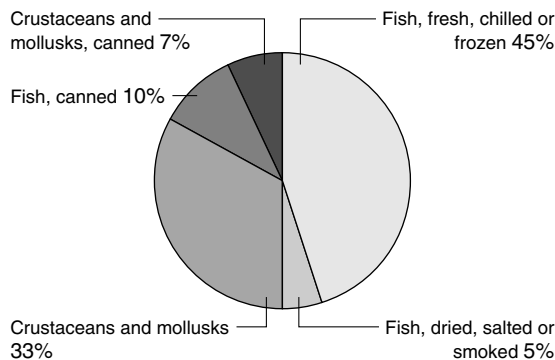
The major importing nations are the European Union (\$19.5 billion), Japan (\$15.5 billion), and the

FIGURE 15.4 Food Fish Exports by Top Countries, 2000



Source: FAO 2002b.

FIGURE 15.5 World Food Fish Exports by Value of Major Commodity Group, 2000



Source: FAO 2002b.

United States (\$10.4 billion). Within the European Union, imports go to Spain (\$3.35 billion), France (\$3.0 billion), Italy (\$2.5 billion), Germany (\$2.3 billion), the United Kingdom (\$2.2 billion), and Denmark (\$1.8 billion) (FAO 2002b).

Crustaceans account for 19 percent of the weight of exports but 33 percent of the value. Finfish, by contrast, contribute 63 percent of volume but only 45 percent of value (figure 15.5). The most widely traded processed seafood products are items such as canned tuna, canned crab and lobster meats, canned herring and sardines, roe (such as caviar), shelled and deveined shrimp, and dried or salted finfish.

Significant reexporting occurs in the world seafood markets. Thailand, for example, imports a significant amount of the world's tuna catches, processes it into cans, and then exports it. Similarly, China is a major reprocessing market for U.S. and Norwegian seafood.

For low-income, food-deficit countries, exports are far larger in value than imports. When fish meal and oil are excluded from export values, the picture changes only slightly, since their value is not high and many of these countries do not participate in fish meal or fish oil production. Among the developing countries that rely on exports of seafood as a primary source for export earnings are the Maldives, Mozambique, Peru, Senegal, and Sierra Leone (FAO 2002b). Thus, reductions in the stocks of fish in developing countries because of poor management have the potential to jeopardize the food supply while reducing household incomes and export earnings.

Institutional Influences on International Trade in Fishery Products

Even though most caught, farmed, and traded fish are clearly food products, no fish is included in the WTO Uruguay Round Agreement on Agriculture (URAA). The concern among some nations is that fishing as an industry involves not only market access, but also *resource access* on a scale unprecedented in other areas of agriculture. Therefore, negotiations regarding trade liberalization for fish have proceeded far differently from those on agricultural commodities.

Tariffs on fish products, in contrast to those on agricultural products, have been reduced with every successive trade round. And international agreements on sanitary and phytosanitary measures, technical barriers to trade, antidumping, rules of origin, import licensing, and safeguards have all been applied to trade in fish. Subsidies in the fishing industry fall under the GATT (General Agreement on Tariffs and Trade) Agreement on Subsidies, whereas in agriculture they fall under the URAA.

This section of the chapter discussed the domestic and international policies and institutions most relevant to global trade in fish and fish products. The domestic policy interventions are fisheries management policies, fishing subsidies, and trade barriers, including tariffs, technical barriers to trade, sanitary and phytosanitary measures, and antidumping and countervailing measures.

Fisheries Management Policies

To fully understand the impact of trade liberalization on fishery products, one first must understand the factors influencing supply. The impacts of trade liberalization will differ depending on several factors, including production method (capture or aquaculture) and domestic fisheries management policies.

Fish in capture fisheries belong to a common pool. Before 1977 jurisdiction of most nations over fishing grounds extended only 12 nautical miles from shore. Expansion to 200-mile EEZs was discussed and agreed to in 1977 by nations at the Third Law of the Sea Convention (UNCLOS-III, 1973–1982) (Hannesson 1996). EEZs cover 40 percent of the world's oceans and 90 percent of its living marine resources (Deere 2000).

UNCLOS assigns the exclusive right to coastal states to manage and exploit marine living resources and to regulate fisheries resources through a comprehensive management system. There is considerable debate over the effectiveness with which coastal nations have managed their EEZs with respect to the sustainability of production. Creating an EEZ does not remove the common-pool property of the resource; it simply redistributes the use of the resource to new (domestic) market entrants. Many nations, especially developed nations, encouraged expansion of the domestic fleet to increase the national capacity to catch fish that foreign nations would have caught in the past. Catches quickly grew as the number and size of fishing boats increased. In ensuing years, however, supplies in many fisheries decreased drastically as fish stocks were reduced beyond the sustainable limit and the remaining fish became harder to find.

An often-quoted statistic is that fully 60 percent of the world's major fisheries resources are already being exploited at or above capacity (Grainger and Garcia 1996). Fish stocks in OECD (Organisation for Economic Co-operation and Development) countries, in particular, have been subject to large fishing pressure over the years and are mostly overfished (OECD 2003b). The problem derives not from a lack of regulations per se, but rather from a lack of effective regulations.

In a fishery where there is no restriction on entry into fishing, the management system (or lack of it) is referred to as *open access*. It is well known from economic theory and experience that open access will lead to overexploitation of the fish stock, as individual fishermen have little incentive to restrain their fishing efforts to promote a sustainable fishery, because the fish forgone by one fisherman will simply be captured by someone else (box 15.1). Most fisheries in the United States and European Union operate under some form of limited access or limited harvest.

Management policies can be categorized as being either an input or output control. Input controls, the oldest type of fishery management tool, are designed to limit either the number of people fishing or the efficiency of fishing (National Research Council 1999). Input controls generally lead to inefficient outcomes. They raise the cost of fishing but generally do not reduce effort or capacity.

Output controls are designed to limit directly the volume of the catch from a given fishery. The critical necessity for this form of management is the ability to monitor the catch. In some fisheries, managers may have personnel at the dockside to count the number (or weight) of fish caught as they are landed. In other cases, on-board observers may monitor the catch. In either case, once the total allowable catch (TAC) is reached, the fishery is generally closed for the season.

Management by TAC has at least three shortcomings. First, it induces fishers to compete to catch as much as possible before the TAC is reached. Second, as fishers become more intensively capitalized, the TAC is reached in a shorter time, leading to a backlog of fish for processors that pushes down fishermen's prices and reduces product quality. Third, idle vessels may move to fish in another fishery, leading to overcapitalization in yet additional fisheries (Conrad 1999).

The management systems of fisheries have caused vexing trade and environment issues, and several cases have landed before dispute panels discussions with the WTO and format GATT. The disputes below (drawn from Robb 2001) were directly related to fisheries management policies.

- *Canada v. U.S.*—Prohibition of Imports of Tuna and Tuna Products from Canada, 1982.
- *Canada v U.S.*—Measures Affecting Exports of Unprocessed Herring and Salmon, 1988.
- *Mexico v. U.S.*—Restrictions on Imports of Tuna (Tuna/Dolphin I), 1991.
- *European Economic Community and Netherlands v. U.S.*—Restrictions on Imports of Tuna (Tuna/Dolphin II), 1994.
- *India, Malaysia, Pakistan, and Thailand v. U.S.*—Import Prohibitions of Certain Shrimp and Shrimp Products—1998.

Because of poor management and other factors, the status of fish stocks worldwide is alarming. The implications of trade liberalization for capture fisheries are many, but the most obvious implication is that the current level of catches from capture fisheries is unsustainable. Should trade liberalization provide incentives to fishermen to catch even more fish, it would simply speed up the overfishing and depletion process, leading to unsustainable international markets as well. This is not to say that further

BOX 15.1 Impacts of Trade Liberalization in Uganda's Fishing Industry

Economywide liberalization and reforms in Uganda's trade regimes have made the fisheries industry one of the country's most important in terms of employment and export earnings. The fisheries sector is Uganda's second-largest national export producer, with export values growing from \$1.4 million in 1990 to \$78 million by 2001 (UNEP 2002a). More than 1 million workers are directly engaged in harvesting, transporting, processing, distributing, and marketing fish (UNEP 1999b).

With success have come problems common to fishing industries elsewhere. Uganda's fish come from the country's many lakes and rivers. Current legislation allows open access to lake fishing. There are relatively few restrictions on who may fish, and few technical measures to control fishing mortality. Poor data make it difficult to determine the amount of fish that can be taken without depleting the stocks beyond a sustainable level, particularly in Lake Victoria, which borders not only Uganda but also Kenya and Tanzania. Thus it has been difficult to establish harvest limits. The U.N. Environment Programme recommends that Uganda should determine the level of fish stocks it currently has, establish a total allowable catch that is in line with sustainable harvests in each of the major water bodies, and implement an individual transferable quota system.

Overfishing is not the only problem in Uganda. According to UNEP, unsustainable fish-

ing practices are on the rise, as the catch of native fish has declined. For example, exotic species are being introduced to lakes and rivers. In another example, poisons are being used, illegally, to stun the fish, bringing them to the surface, making them easy to scoop up in nets. The poisoning has led the European Union to impose a ban on fish exports from Uganda due to food safety concerns.

Other issues related to food safety include a lack of refrigeration facilities to preserve fish after harvest. Transportation to processing facilities is made difficult and slow by poor road conditions, further degrading the quality and safety of the fish prior to processing.

Other environmental concerns include effluent pollution from fish-processing industries. Raw, untreated waste is dumped directly into the very rivers and lakes from which the fish are being pulled, contaminating the environments for tomorrow's catch.

Social problems also threaten the fishing industry, as most of the products are destined for export markets, where they fetch higher prices. Much of the local population can afford only fish rejected by processors for the export market. Food security concerns have been raised, as well, as Nile perch feed heavily on freshwater shrimp that are also caught and used as animal feed.

Source: UNEP 1999b.

liberalization should not occur, but rather that overfishing and other externalities must be considered in free-trade discussions.

Fishing Subsidies

The most sensitive issue related to capture fisheries before the WTO Committee on Trade and the Environment (CTE) is fishing subsidies. Subsidies exist in the fishing sector globally and have come to be recognized as having a significant impact on the quantities of fish traded, largely because they lead to unsustainable fishing practices. At the WTO High-Level Symposium on Trade and Environment in March 1999, five WTO member nations (Australia, Iceland, New Zealand, the Philippines, and the United States) submitted a joint statement on the need to eliminate "environmentally damaging and

trade-distorting subsidies" in the fisheries sector (WTO 1999, 2000, 2001). In 2001, at the Fourth Ministerial Conference in Doha, Qatar, the WTO explicitly included fisheries subsidies in the negotiating agenda to improve current discipline on subsidies—this as a result of discussions in the CTE. The Doha Declaration states that the need to "clarify and improve WTO disciplines on fisheries subsidies, taking into the account the importance of this sector to developing countries" (WTO 2003a: 28).

In an excellent review of fisheries subsidies, Schrank (2003: 49) cites three implications.

Three implications are noted: (1) countries that do not subsidize and that restrain total catch to maintain the resource lose the extra catch to countries that subsidize and do not restrain total

catch; (2) competition from subsidized distant water fleets can make it economically unviable for developing countries to develop their own fisheries and therefore to realize the benefits of their own 200-mile zones of fishery jurisdiction; (3) subsidies can contribute to stock depletion, with negative economic, trade, and environmental effects for other countries that have an interest in the stock.

The greatest contrast to agricultural subsidies is the effect noted in Schrank's first point. Fishing subsidies create not only a trade distortion in the markets, but also, in the case of straddling or migratory fish stocks, a negative externality on the nation competing to capture the fish.

The relationship between fisheries subsidies and their environmental and social impacts is obviously complex. According to Hussein Abaza, who heads UNEP's Economics and Trade Branch, "It is becoming clear that developing countries stand to gain a great deal from trade in fisheries products, but only if trade and fisheries policies are reformed to support sustainable management of these resources" (UNEP 2002a). The policy recommendation is simple—eliminate trade and domestic distortions while adopting environmental policies that address overfishing. But the implementation of sound environmental management is the real policy challenge.

Fishing Access

In a form of fishing subsidies, the European Union signed its first fishing access agreement with Senegal in 1979, shortly after nations exercised their rights to the 200-mile EEZ. Since many developing nations with EEZs did not have the capacity to make use of their resources, they opted to sell access to these resources to third parties. The European Union has been predominant in negotiating these agreements on behalf of its member countries and has been paying the access fees.

Most fishing access agreements have been reached between the European Union and African countries and a few other nations. In these access agreements, an amount is negotiated to guarantee access to foreign waters by portions of the EU industrial fishing fleet. During 1999–2000, the European Union had agreements with 20 different

nations for a total value of more than €400 million. The countries with the largest negotiated fees in 2000 were Morocco (€114 million), Mauritania (€54 million, box 15.2), Argentina (€16 million), Angola (€13 million), and Senegal (€12 million) (OECD 2003a). The primary beneficiaries of the access agreements are Spain and France. Portugal, Italy, and Greece have also benefited.

The agreements are very controversial. Fishing access agreements have been seen as a way to reduce capacity in the European Union while securing employment and supplies of fish for the European market (Institute for European Environmental Policy 2002b). On the environmental side, catch limits are either not imposed on the foreign fleets or the limits are not enforced, and so the sustainability of stocks of fish in accessed waters is in doubt in many nations.

Trade Barriers: Tariffs

Tariffs in OECD member countries are important barriers to the developing nations that export to them. But a good deal of South-South trade is also affected by tariffs.¹

Tariffs on seafood in developing countries are generally higher and more transparent than those in OECD countries. The structures of the tariff regimes, however, differ considerably among developing countries. Among developing countries, Thailand has the highest tariff levels on seafood products (60 percent across all product forms), followed by India, whereas Chile and Malaysia generally apply the lowest duty rates. Yet all developing countries for which detailed tariff schedules are available implement transparent tariff structures with all product lines subject only to ad valorem duties.

After the Uruguay Round, average weighted import tariffs on fish products in developed countries were reduced to around 4.5 percent (Lem 2003). This average hides a number of tariff issues, however, including some tariff escalation and tariffs on specific items (such as canned tuna in the United States). The European Union and the Republic of Korea have the highest tariffs (ranging from 4 percent to 33 percent), whereas the United States and Canada have the lowest (0–5 percent) (figure 15.6).

But despite their relatively high tariffs, both Korea and the European Union have very transparent tariff

BOX 15.2 Foreign Fishing Access Agreements Involving Mauritania

The fishing sector in Mauritania accounts for more than 40 percent of exports and about 6 percent of gross domestic product. The only major export items are squid and octopus, with an export value of \$68 million in 2000 (FAO 2002b). Only \$639,000 were fish products exported in processed form and that was for dried, salted, or smoked products. Total fish product exports were \$74 million.

The primary source of earnings from the fishery sector in Mauritania is not from exports but from access fees. The European Union pays for its fleet to fish in Mauritanian waters. In a sense one might say that Mauritania exports its fish resources, while they are still in their habitat, directly to the European Union fishing fleet. Eighty percent of fish in Mauritania, or 450,000 tons, were landed by industrial vessels in 2001 (WWF 2003). A new agreement on fishing access by The European Union was enacted in 2001 and is effective until August 2006. The European Union is paying €430 million, creating access to Mauritanian water for 248 vessels, targeting hake, squid, crawfish, and tuna. The EU vessels are predominately from Spain and France, but also from Italy, Portugal, Greece, the Netherlands, Germany and, to a minor extent, Ireland.

In addition to the access fees, vessel owners are required to pay €29 per ton of catch taken by freezer tuna seiners, and €19 per ton for catches from pelagic fish trawlers. A license fee is also payable, based on tonnage per year in some cases and a flat annual fee for tuna vessels.

In response to critics, the European Union has begun to increase the value of the access payments (for Mauritania up 61 percent over the previous agreement) and to work toward agreements that promote sustainable development of the fisheries in the target nations. To that end, the agreements, by design, allow the Mauritanian authorities to inspect and control fishing activities—requiring a daily log of catches by the foreign vessels and setting up a system of observers on board vessels. These opportunities for Mauritania are not fully taken advantage of. Restricted fishing zones have increased in size. There remain no catch limits.

Determining economic benefits for either party to the agreement is uncertain, as there is little information on catch statistics. However, based on the previous agreement between the European Union and Mauritania, for each euro paid to Mauritania in 1996, the value of the catch was two times greater. In 1997, the value of the catch was three times greater than the cost of access. Little of the access money appears to be utilized to build within Mauritania a domestic infrastructure to nationalize its resources rather than selling foreign access. In addition, reports from nongovernmental organizations, such as the World Wildlife Fund, indicate that the agreements have negative effects on local communities and on sustainable development.

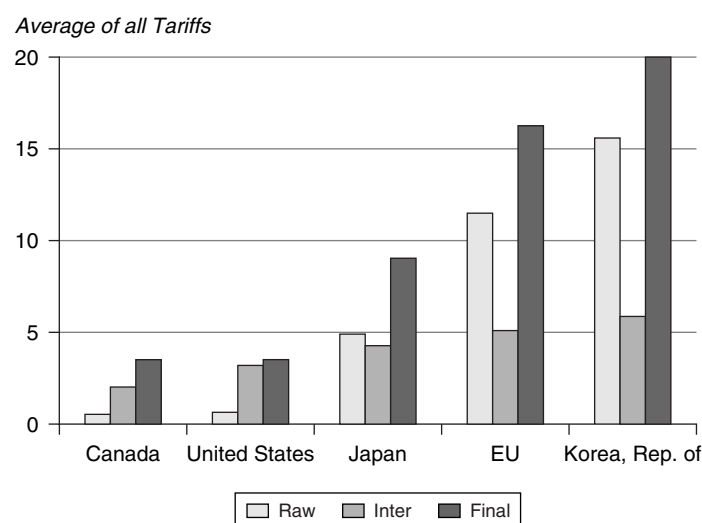
Source: Institute for European Environmental Policy (2002a and b); www.integratedframework.org.

structures. All tariffs applied on seafood products are ad valorem duties. In comparison, Japan and the United States implement more complex tariff structures. In Japan about 20 percent of the tariff lines on intermediate seafood products are either per-unit-specific or compound duties. Similarly, 38 percent of U.S. tariff lines on intermediate seafood products are per-unit-specific or compound. The U.S. tariffs do not seem to be aimed at concealing protection, since their average ad valorem equivalent is only a little more than 2 percent. At the same time, the products that receive tariff protection in the United States, such as canned tuna, are protected only through high ad valorem tariffs.

Most industrial countries offer preferential access to developing countries' seafood exports.

The European Union offers free access to all seafood products from the least-developed countries and partial tariff exemption to most of seafood exports from Africa-Caribbean-Pacific (ACP) countries and other developing countries. The United States grants free access for all developing countries for all seafood products. Japan also grants free access to some seafood imports from the least-developed countries and maintains only one seafood tariff line for other developing countries (table 15.1).

Table 15.1 shows that the trade-weighted tariff averages across the OECD countries exhibit some trade escalation for imports from developing countries and all other countries, but not for the least-developed countries. However, in the context of

FIGURE 15.6 Tariff Structure by Level of Processing, (1998–2001)

Source: WTO IDB database.

TABLE 15.1 Trade-Weighted Tariff Averages for Developing Countries' Fish Product Exports to OECD Countries, by Processing State (percent)

Level of Processing	Least-Developed	Developing	All Other
All	2.5	2.9	3.2
Unprocessed	2.5	2.5	2.5
Fillets	2.8	2.5	2.0
Semi-processed	0.5	1.9	1.4
Processed	1.7	4.3	8.0
Total value (US\$ millions)	437	10,689	21,992

Source: OECD 2003a.

tariffs on agricultural goods, tariffs in seafood products are lower and the level of tariff escalation is very moderate.

Trade Barriers: Technical Barriers

In recent years, there has been a large increase in policies that could potentially come under the heading of technical barriers to trade. Among them are labeling programs and the resultant tracing capability they require. The programs are typically found in developed countries but can have potentially large impacts on developing countries.

Among the labeling programs are ecolabeling, country-of-origin labeling, and other labeling related to the production process, such as "organic."

A great deal of regulatory activity concerning country-of-origin labels is occurring in the United States and European Union. Ecolabeling and organic labeling are voluntary programs, but the WTO is interested in whether such labels constitute a nontariff trade barrier. Currently, these labels are not considered to be trade barriers as long as they are nondiscriminatory (WTO 2003b).

Trade Barriers: Sanitary and Phytosanitary Measures

Import regulations based on hazard-analysis, critical-control-point (HACCP) principles, adopted by many of the major importing nations, are regarded as nontariff barriers by many developing

countries, as the investment required to bring processing plants up to code can be substantial (Filhol 2000). During 1997–98, the European Union imposed bans on the import of seafood from India, Bangladesh, Kenya, Madagascar, Mozambique, Tanzania, and Uganda, citing food safety concerns both in processing and in possible contamination prior to catch in both capture fisheries and aquaculture (Filhol 2000).

For example, most of the fish caught in Kenya are from Lake Victoria; the majority of that catch is Nile perch (FAO 2002b).² Nile perch are also the main export from Kenya, earning about \$50 million annually. Of the 18 fish processing and exporting firms now in Kenya, 10 specialize in Nile perch and 8 in marine products such as shrimp, other crustaceans, and tuna. In 1997 the European Union became concerned about the safety of fish from Kenya when Spain and Italy both banned fish imports because of the presence of salmonella. Some other members of the European Union continued to import from Kenya, but exports declined by 34 percent between 1996 and 1997. In 1998 the European Union banned imports of fish from Kenya because of a cholera outbreak, causing a 66 percent drop in fish exports to the European Union. In 1999 the European Union banned fish from Lake Victoria yet again, this time because of the presence of pesticides, causing another 68 percent decline in fish exports. In 1997 Kenyan exports were \$52 million, in 1998 \$39 million, and in 1999 \$32 million. In 2000 they were back up to \$39 million (FAO 2002a).

In response to the requirement for a HACCP program to export to many nations, Kenya has instituted stringent quality control procedures. The Fisheries Department controls quality through provisions of the Kenya Fisheries Act and the Fish Quality Assurance Regulation of 2000. However, fish quality comes at a cost. There are strict regulations on production, handling, processing, packaging, and transportation of fishery products. In addition, strict regulations govern construction of buildings, equipment, purification tanks, and storage facilities. Costs were incurred to train workers in hygiene related to fish handling. There is also the additional cost of electricity to maintain strict temperature controls. Finally, the cost to fishermen is significant. They must invest in newer boats that have chillers to maintain the quality of caught fish.

Kenya has adapted to the new realities by restricting the number of facilities handling fish to be exported. Only five fishing villages (out of nearly 300) are authorized to handle fish landings. This causes fishermen from elsewhere to incur higher transportation costs to land their catch.

The costs of exporting to nations with strict quality controls are not trivial, but Kenya has had to incur those costs to remain in the international market. As long as Nile perch continues to be in demand in the world market, it is likely that Kenyan producers can more than cover their costs. Should the prices rise too far, however, other white-fleshed fish will become competitive substitutes. The international seafood market in white-fleshed fish is very competitive, particularly now that farmed tilapia and catfish are available in large quantities.

Trade Barriers: Antidumping and Countervailing Measures

As tariff barriers have been relaxed and the aquaculture industry has boomed globally, more and more fishing industries in the United States have found themselves competing with lower-priced imports. Thus, the United States in particular has been quite active in pursuing antidumping and countervailing duty suits against foreign competitors. The United States brought antidumping and countervailing charges against imports of Norwegian farmed salmon in 1990, Chilean farmed salmon in 1997, crawfish from China in 1997, and farmed catfish from Vietnam in 2003. A petition was filed with the U.S. International Trade Commission (USITC) in December 2003 against six exporters of farmed shrimp. Details on several of these cases follow.

Crawfish from China. The imported product was defined as freshwater crawfish tail meat in all its forms, grades, and sizes. China supplied 62 percent of all imports by the United States in 1997 and 92 percent in 2001. U.S. production of crawfish in 1996 was 12.5 million pounds; in 1997, 23 million pounds (U.S. Department of Commerce 1997). Meanwhile imports of crawfish from China were 2.6 million pounds in 1996 and 5.8 million pounds in 1998.³ The average value per pound of imports from China was \$1.85 in 1997, compared with \$5.82 per pound for the domestically produced product. As a result, antidumping duties of

223.01 percent were imposed (USITC 2003b). However, Chinese crawfish continue to dominate imports to the U.S. market, with sales of 8 million pounds in 2001 and 7.5 million pounds in 2002, worth a total of \$38.7 million in 2001 and \$22.2 million in 2002. The ruling was reviewed in 2003, and it was determined that the antidumping duties should remain in place.

Catfish from Vietnam. In 2002, independent processors and the Catfish Farmers of America, a trade association of U.S. catfish farmers and processors, brought a petition to the USITC regarding dumping of frozen catfish fillets into the U.S. market by Vietnam. Catfish farming is the largest aquaculture industry in the United States. Production in 2000 was 150.6 million pounds (USITC 2003a). The primary producing states are Mississippi, Arkansas, Louisiana, and Alabama. Prior to 1999 imports were largely absent from the U.S. market. In 1999, Vietnam exported fewer than 2 million pounds of what the Vietnamese call catfish into the U.S. market. By 2001 that number had increased to 15.9 million pounds. Although the Vietnamese product was successfully labeled and marketed as catfish, the Latin names of the imported species were *Pangasius bocurti*, *Pangasius pangasius*, and *Pangasius micronemus*. American catfish are from the *Ictaluridae* family.

A problem in world markets for fish is that once fish is processed, it is very difficult to determine its species. Some fish marketed as red snapper are not, in fact, red snapper, a high-value fish. Due to many cases of intentional and unintentional fraud in seafood markets, in which consumers were falsely led to believe that they were buying a certain product or confused by the same product being marketed under different names, the U.S. Food and Drug Administration has become more rigorous in its regulations of appropriate names for fish.

Vietnam is now required to label its fish not as catfish, but instead as *basa* and *tra*.¹ However, Vietnamese *basa* and *tra* are still considered similar enough to American catfish to be subject to antidumping measures. Producers have had to pay antidumping duties of between 36.84 percent and 63.88 percent.

Shrimp from some developing countries. As of December 2003, the Southern Shrimp Alliance

(SSA), a group of shrimp harvesters and processors in the United States, filed antidumping petitions with the USITC, alleging that Brazil, China, Ecuador, India, Thailand, and Vietnam were dumping shrimp (primarily farmed) with an approximate annual value of \$2.4 billion into the U.S. market. The SSA is petitioning for tariffs on imports of shrimp from these countries ranging from 30 percent to 267 percent. It argued that “a variety of financial incentives provided by *national governments and international institutions* over a number of years have overstimulated the infrastructure and production of farm-raised shrimp in these countries” (emphasis added) (McGovern 2003). Thus it seems that the investment by organizations such as the World Bank and others in helping build an export industry in some of these countries is perceived to have created unfair subsidies for these shrimp-exporting nations.

Impacts of Trade and Domestic Policy Reforms

The previous section makes clear that the primary trade barriers for capture and aquaculture fisheries are tariffs, countervailing and antidumping measures, and the discriminatory potential of ecolabeling, country-of-origin labeling, and sanitary and phytosanitary measures for seafood safety.

To analyze the impacts of trade liberalization on trade in seafood, particularly on seafood from developing countries, one must distinguish between the impacts of trade liberalization on seafood derived from capture fisheries and on seafood from aquaculture. This is because of their distinct attributes. Capture fisheries are generally ill-managed. As such, changes in trade policies may create changes in welfare that differ between the short and long run because of the sustainability of fish stocks. With respect to the effects of trade liberalization, aquaculture is more similar to agriculture. However, to the extent that aquaculture is dependent on feed derived from capture fisheries or seed stock from wild fisheries, trade liberalization may have a different effect on aquaculture than on agriculture.

Whereas the research literature on markets for fish is extensive (Wessells and Anderson 1992; Kinnucan and Wessells 1997), there has been little empirical analysis of the impacts of trade liberalization through tariff reductions related to fish and

fish products. This is partly because of the complex nature of the global seafood market, partly because of a lack of data, and partly because of a governmental and academic focus diverted away from seafood markets toward the economics of management of capture fisheries. In addition, although nongovernmental organizations and international development agencies have produced many studies on trade liberalization and its impacts on the agricultural sector in developing countries, there is a spectacular lack of quantitative information on the impacts of trade liberalization for developing countries with respect to fish.

The study by Cox, Stubbs, and Davies (2000) is the notable exception. This section begins by discussing its findings on trade liberalization in Asia Pacific Economic Cooperation (APEC) countries.

Trade Liberalization in APEC Countries

Cox, Stubbs, and Davies (2000) investigate the short-run effects of trade liberalization on seafood products in the APEC countries. These countries maintain a tariff and other trade barriers against fish and fish products. With the conclusion of the Uruguay Round, WTO member nations agreed to lower tariff rates. However, the APEC agenda was more ambitious. Under the 1994 Bogor Declaration, APEC made a commitment to fully liberalize all markets by 2020, with 2010 as the deadline for developed countries. This was followed by “early, voluntary sectoral-liberalization” (EVSL) proposals in which nine sectors, including fisheries, would accelerate tariff removals beyond the Bogor Declaration. Rather than having 2010 and 2020 as deadlines for developed and developing countries, respectively, the timeline was moved to December 31, 2005.

Cox, Stubbs, and Davies (2000) developed a simulation model to evaluate the impact of seafood tariff removals under the Bogor Declaration, EVSL, and another scenario wherein only the developed countries in APEC would remove their tariffs while those of developing countries remained the same. The model included all the APEC countries and the rest of the world as sources and destinations. Seafood products were generally grouped together except for a focus on species particularly important to Australia such as tuna, lobsters, and shellfish.

As expected the results show that there would be significant increases in export volumes (and prices) under the Bogor Declaration and the EVSL relative to the baseline. If only the developed countries removed their tariffs, the simulation shows that there would be little difference from the baseline because developed-country tariffs are generally small. The greatest change would occur under the EVSL scenario, at least initially. By 2020 the effects of the Bogor and EVSL agreements would be the same (tables 15.2 and 15.3).

Significant benefits from import tariff reductions accrue to the “Other APEC” countries of Brunei, Indonesia, Malaysia, Mexico, New Zealand, Papua New Guinea, the Philippines, the Russian Federation, Singapore, and Vietnam.

Removing Subsidies in Capture Fisheries

The previous section discussed the types of subsidies found in the fishing sector and the concern of the WTO CTE about fishing subsidies as a potential distorter of trade and contributor to unsustainability of fish stocks around the globe. To analyze the trade impacts of these subsidies, a logical place to begin may be to calculate producer subsidy equivalents (PSEs). According to the OECD, “the PSE is an indicator of the value of the transfers from domestic consumers and taxpayers to the producers resulting from a given set of agricultural policies at a point in time” (FAO 2003).

The PSE also may be useful in assessing the advantages of producer subsidies in the fisheries sector. The complicating factor is management. In agriculture, it is assumed that subsidies are compared to a subsidy-free world characterized by economically efficient allocation of goods at various prices. However, if the fishery is managed under an open-access system, for example, then the subsidy-free world is not economically efficient, because that system does not lead to efficient allocation. To be truly efficient, the subsidies would not exist *and* there would be perfect management of fish stocks so that all negative externalities were incorporated into the price of each fish. PSEs for fisheries products have not been calculated because fish are highly heterogeneous and reference prices to measure market-price support are hard to pin down.

TABLE 15.2 Simulated Changes in the Real Value of World Exports in 1995 Prices
(percent)

Type of Export	Annual Growth in Base (1995–2020)	EVSL		Bogor		Developed APEC Countries	
		2010	2020	2010	2020	2010	2020
<i>Unprocessed</i>							
Tuna	1.3	5.0	4.8	1.5	4.8	1.6	1.5
Other fish	8.2	32.4	28.0	0.4	28.0	−1.9	−1.9
Rock lobster	1.4	1.5	1.5	0.7	1.5	0.7	0.7
Prawns	2.6	11.3	15.5	0.4	15.5	0.4	0.4
Other crustaceans	7.1	38.5	51.2	1.3	51.2	1.3	0.7
Abalone	3.4	20.2	21.9	2.6	21.9	2.6	2.0
Scallops	6.2	15.5	23.5	0.5	23.5	0.6	0.1
Other mollusks	3.9	22.5	23.7	1.3	23.7	1.3	1.4
<i>Processed</i>							
Tuna	2.4	0.4	0.8	0.3	0.8	0.3	0.3
Other fish	4.4	11.7	17.0	2.6	17.0	2.6	1.5
Rock lobster	0.4	0.0	0.0	0.1	0.0	0.1	0.0
Prawns	1.2	0.6	0.7	0.3	0.7	0.3	0.3
Other crustaceans	1.6	0.4	0.4	0.4	0.4	0.4	0.4
Mollusks	3.0	8.4	9.4	4.0	9.4	4.0	3.9
<i>Total</i>	5.1	20.4	24.1	1.0	24.1	0.2	−0.4

Source: Cox, Stubbs, and Davies 2000.

TABLE 15.3 Simulated Benefits from Tariff Reductions, by Country
(percent)

Country	Growth in Base (1995–2020)	EVSL 2010	Bogor 2010	Developed APEC Countries 2010	EVSL and Bogor 2010	Developed APEC Countries 2010
Australia	2.7	0.0	0.1	0.1	0.7	0.1
Canada	2.4	1.9	0.1	0.0	5.9	0.1
Chile/Peru	0.2	0.0	0.0	0.0	0.4	0.0
China	9.1	0.0	0.0	0.0	−0.3	0.0
Hong Kong (China)	4.8	−0.3	0.0	0.0	−1.4	0.1
Japan	1.9	−0.3	−0.2	−0.2	0.0	−0.3
Korea, Rep. of	3.7	1.1	0.1	0.0	2.5	0.0
United States	1.7	0.6	0.0	0.0	2.9	−0.1
Other APEC	4.6	1.0	0.0	−0.1	0.9	−0.2
Total APEC	5.4	0.2	0.0	0.0	0.2	−0.1
Non-APEC	1.8	0.2	0.0	0.0	0.7	0.0
World	4.0	0.2	0.0	0.0	0.4	0.0

Note: These benefits represent changes in the sum of consumer surplus, producer surplus, and import tariff revenue.

Source: Cox, Stubbs, and Davies 2000.

The impact of removing subsidies may be analyzed according to the type of subsidy. For subsidies that lower the costs of production (such as government-paid fishing access fees, low-cost vessel construction loans, and tax exemptions), removal will increase costs of production. A large portion of the world's subsidized fishing fleet is from the European Union, Japan, Russia, China, and other nations that subsidize (Milazzo 1998). A reduction in these subsidies would almost certainly benefit fish stocks—as well as decreasing trade.

Milazzo (1998) provides an excellent summary of the benefits to developing nations of removing subsidies.

- Subsidies that pay for access arrangements support continued operations primarily by European and East Asian distant-water fleets off Africa and in the Western Pacific. These subsidized operations reduce the fishing opportunities available to local fishermen. In most cases, the payments probably do not compensate adequately for the full economic value of the resources.
- There is scattered evidence that subsidized access arrangements are beginning to compromise local food needs.
- The combination of developed countries' subsidies to their distant-water fleets and to their domestic (coastal) fleets minimizes to some extent trade opportunities that should be available to developing countries.
- Fishing subsidies are highly nontransparent in the sense that more than three-quarters of the subsidies are not budgeted, and a good share of budgeted subsidies are controlled by governmental agencies other than those responsible for fisheries.
- Environmentally harmful subsidies outweigh the effect of subsidies that are environmentally benign or positive. Milazzo's estimates show that possibly no more than 5 percent of all subsidies support conservation.

Influence of Management Regime on Effects of Trade Liberalization in Capture Fisheries

An alternative means of looking at impacts of trade liberalization is to assess their implications under different management programs. Rögnvaldur

Hannesson (OECD 2003a) has investigated the effects of liberalizing trade in fish, fishing services, and investments in fishing vessels. Three styles of fisheries management are defined: open access, catch control, and efficient management. As we saw earlier, under open access fishermen are free to respond to prices by increasing or decreasing their catch. Increased prices will invite entry into the fishery by more participants, so that in the long run the fishery will be overfished. Under catch control and efficient management, total supplies are fixed and will not change with changes in prices. This is because a TAC will have been set to guide the fishing effort and guarantee a sustainable fishery. The difference between catch control and efficient management is that the TAC catch control imposes no constraint on each fisherman, who retains the incentive to catch as much as he can, as fast as he can, before the TAC is reached and the fishery closed. Catch control alone is economically inefficient because it allows too many fishermen in the fishery, and the capitalization and effort are too high.

If trade barriers are removed—that is, if fish-importing countries lift their barriers—prices decline in the importing country and rise in the exporting country to a global equilibrium (accounting for transportation costs). What are the impacts of such a development, assuming adequate management measures? Table 15.4 shows the expected outcome.

The “double dividend” refers to the gain in the importing country from getting fish at a lower price and redirecting resources from the domestic fishing industry to higher-value uses. Although there is no reason to assume that both the importing and exporting countries share the same type of management regime, if both have an effective regime then the results will be very similar to the classic outcome of agricultural trade liberalization.

With open access and catch control, under which a change in prices induces increased effort in the exporting country, it is conceivable that a country could end up worse off with trade liberalization (Brander and Taylor 1997a, 1997b, 1998; Hannesson 2000). This is because the total quantity caught in the open-access fishery will increase at first but then decline as the fishery becomes overfished. With a decline in prices resulting from the elimination of import barriers, however, the effort

TABLE 15.4 Effects of Relaxing Trade Barriers

Regime	Fish-Exporting Country			Fish-Importing Country		
	Open Access	Catch Control	Efficient Management	Open Access	Catch Control	Efficient Management
Short-term effects	Increased effort, larger catches, more trade gains from trade	Increased effort, no change in catch, higher profit gains from trade	No change in effort unless higher allowed catch, gains from trade, higher market value of quotas and licenses	Lower effort, smaller catches, more trade, gains from trade	Lower effort, no change in catch, lower profits, gains from trade	No change in effort unless smaller allowed catch, gains from trade, lower market value of quotas and licenses
Long-term effects	Fish stocks decline, catch may decline, possibly loss from trade	Increased investment in fishing boats, no change in catch, small gains from trade	Same as above	Fish stocks recover, catch may increase, double dividend from trade	Reduction of fishing fleets, no change in catch, double dividend from trade	Same as above

Source: OECD 2003a: 170.

in the importing country would be likely to decline, giving fish stocks a chance to recover. This is not necessarily the predicted outcome. Indeed, in many cases, as the price of fish has decreased, fishermen have actually increased their effort to maintain total revenue, at least in the short run.

The results above were premised on two separate stocks of fish—one in the importing country and one in the exporting country. The discussion can be made much more complicated by assuming that several countries share the resource.

Consider the European Union and Uganda as trading partners. Much of Uganda's fisheries products come from Lake Victoria and are exported to the European Union. Uganda has an open-access management regime on Lake Victoria and shares the lake with Kenya and Tanzania. If trade were to be liberalized, the amount traded would increase. Fishing pressure on Lake Victoria and its stock of Nile perch would increase, putting further pressure on the fish stock from both Uganda and Kenya. The price of the fish would rise as fewer and fewer fish were found. Food security would decline as the local community found it increasingly difficult to afford Nile perch. Unless some type of enforcement management regime were set up to limit total catch from the lake, this source of export earnings might be short-lived. Holding all else constant, trade liberalization would deplete stocks in Lake Victoria more quickly than if trade were not liberalized.

Impact of Trade Liberalization in Aquaculture

The implications of trade liberalization in aquaculture would likely be very similar to those in agriculture, because aquaculture shares many of the resource constraints and externalities of agriculture (tables 15.5 and 15.6). Certainly, if tariffs in the European Union, the Republic of Korea, and Japan were reduced, the quantity of aquacultured products sold to those countries would grow.

The concern among many is that increased trade in cultivated shrimp has had a large and negative effect on the environment and that the effect rises with production and exports. The same is true for salmon farming. Chile, Norway, Scotland, Canada, and Ireland are the largest producers of farmed salmon, with Chile and Norway being by far the largest. Environmental groups are concerned not only about pollution but also about effects on the genetic diversity of wild fish from escaped farmed fish that may not be indigenous to the area (Porter 2003).

Both salmon and shrimp production rely on fish meal for feed. Any increase in aquaculture production of either species will have an impact on demand for fish meal. I have already discussed the various issues associated with fish meal production, including the growing concern that the stocks of fish from which fish meal is produced (herring, anchovies, capelin, menhaden) are themselves

TABLE 15.5 Effects of a Rise in the Price of Cultivated Fish on Aquaculture Output and Fisheries Catch If Feed Is Held Constant

Management Regime in Capture Fisheries	Effect on Output in Aquaculture	Effect on Output in Capture Fisheries for Consumption Fish
Open access	Output rise for sufficiently low prices, but as the price of feed fish increases, the stocks will ultimately be exploited beyond MSY ^a , supply of feed falls, and aquaculture output falls	Lower stocks of feed fish lead to less growth of consumption fish. Higher price of consumption fish leads to less supply as stocks are pushed beyond MSY
Capture fisheries for feed fish and consumption fish managed separately	Output rise and flattens out as supply of feed cannot be further augmented	Output of consumption fish falls as the price exceeds a certain level
All capture fisheries managed as a whole	As above, but aquaculture is initiated at a higher price	As above, but output of capture fisheries continues to rise with price longer before starting to fall.

a. Maximum Sustainable Yield.

Source: OECD 2003a: 204.

TABLE 15.6 Effects on Price and Quantities of Market Liberalization: Relaxing Border Measures in the Importing Country
(two-country situation)

	Exporter	Importer
Fishery managed by TAC set without reference to economic factors	Increase price, no change in quantity	Decrease price, no change in quantity
Open access		
a) Stock above MSY	Increase price and quantity	Decrease price and quantity
b) Stock at MSY	Increase price, decrease quantity	Decrease price and quantity
c) Stock less than MSY	Increase price, decrease quantity	Decrease price, increase quantity
Aquaculture		
a) Feed available without significant price rise	Increase price and quantity	Decrease price and quantity
b) Managed fishery for captured feed fish	Increase price and increase or leave unchanged quantity	Decrease price and decrease or leave unchanged quantity
c) Open access fishery for captured feed fish	Same as open access above	Same as open access above

Source: OECD 2003a, page 200.

overfished. Unless effective management of the total catch in those fisheries is instituted, the sustainability of aquaculture may not be possible until an alternative to fish meal is developed.

This section has focused so far on carnivorous fish (salmon and shrimp), and the impact of trade liberalization on the source of feed. However, a large portion of the world's aquaculture produc-

tion consists of herbivores such as carp. Carp contribute significantly to food security in China and other nations, particularly as they tend not to be found on the export market, so trade liberalization is likely to have little impact.

The other face of aquaculture is farmed shellfish, which makes up a good proportion of aquaculture production worldwide. In Thailand

production of green mussels, blood cockle, oysters, and other shellfish doubled from 73,976 million tons in 1988 to 138,202 million tons in 2000 valued at approximately \$47 million (Chalermwat, Szuster, and Flaherty 2003). Because the primary concern with these products is the placement of the farms in unpolluted areas, the WTO Agreement on Sanitary and Phytosanitary Measures is likely to have the largest effect on this sector. Table 15.6 summarizes the discussion in this section.

Conclusions

Global seafood markets are truly international. Production, consumption, imports, and exports cover the globe, just as several species of fish migrate around the globe. Because the global market for fish and fish products has specific dynamics and issues separate from global agriculture, understanding the impacts of trade liberalization on seafood and fishery products requires an understanding of the differentiated markets for the various products.

Key aspects of trade liberalization on global seafood, fish meal, and fish oil markets have emerged from the discussion. Impacts of trade liberalization on the welfare of countries depends critically on the fisheries management systems of the producing countries, since negative externalities in global seafood markets are much larger and more detrimental than those specific to agriculture. Open access, the management regime in many developing countries, invariably leads to overfishing. Any event that raises prices for fish from exporting developing countries creates incentives to fish even more, exacerbating overfishing and leading quickly to collapses in stocks. Even trade liberalization in the aquaculture industries is not immune from the effects of fisheries management regimes to the extent that the feed for that production is derived from a poorly managed capture fishery.

Increased trade in aquacultured products, independent of issues with feed, can lead to increased environmental degradation from conversion of land from benign agricultural use to less benign aquacultural use. Little has so far been done to internalize the negative externalities caused by excess fishing, unintended trapping of other marine life, or water pollution from aquaculture operations.

As stocks in developed countries have declined, their fleets have gone elsewhere to capture fish. The governments of the European Union, for example, have paid several developing countries for access to their fishing territory. While the developing nations gain access fees, enforcement of fish-management policies to limit the catches of the foreign fleets are minimal, resulting in an overfishing of these fish stocks. Thus, developing countries derive a short-term gain by allowing foreign fleets to fish in their waters; that value disappears in the long run.

Removing foreign access from developing countries' waters may not be the complete answer, even though foreign access is usually subsidized by the foreign fleets' governments. Developing countries have fisheries resources within their exclusive economic zones. Removing foreign fleets from those waters is good for the fish stocks, but if the country itself has no means to capture the value of the resource, it gains little else. Two options present themselves under such circumstances: first, to negotiate better access agreements to ensure that the true value of the resource is being paid to the developing country, and, second, to invest in the developing country's fishing capacity so that it can take advantage of its rightful resource. It should go without saying that in either case an effective management system must be put in place to prevent overfishing.

Tariffs in global seafood markets have come down significantly and may no longer be a prime trade barrier, except perhaps in South-South trade. In the United States, as the markets for certain seafood species has become more competitive, industries in the United States have increasingly turned to antidumping and countervailing duty measures to protect themselves from competition from developing countries.

The WTO has the opportunity to use its purview over subsidies through the Agreements on Subsidies and Countervailing Measures to encourage members to drop fishing subsidies and thus to cure the trade distortions caused by the subsidies while encouraging sustainability of fish stocks globally. In addition, from the developing countries' perspective, an important focus in WTO negotiations must be the Agreement on Technical Barriers to Trade and the Agreement on Sanitary and Phytosanitary Measures. The processes by which developed countries impose technical barriers to trade must be

transparent and demonstrably nonarbitrary. Developing countries need resources to assist them to meet current sanitary and phytosanitary measures by building infrastructure that permits them to meet the requirements and training workers to maintain the proper measures.

Finally, international trade in fish and fish products also has an impact on food security. Often the domestic market in exporting developing countries retains only the inferior fish, while the better, more valuable fish are sold abroad. A collapse in the stock of the fish consumed domestically may lead to significant food security problems. Similarly, if fish meal prices were to rise for any reason, the increase would have an impact on the ability of some nations to feed terrestrial livestock.

Everyone has an interest in ensuring that fisheries and aquaculture are managed in a sustainable way. As externalities are internalized into the production process and their value incorporated into the prices of fish products, then it is likely that trade liberalization will bring about a net benefit to trading partners. The distribution of benefits across countries, producers, and consumers can best be judged after effective management measures are in place. That distribution is not easily judged today.

Notes

1. The primary source for the material in this section is Abila 2003.
2. www.st.nmfs.gov/webpls.
3. The Farm Security and Rural Investment Act of 2002 (Farm Bill) states that for the purposes of the Federal Food, Drug, and Cosmetic Act, "the term 'catfish' may only be considered to be a common or usual name (or part thereof) for fish classified within the family *Ictaluridae*" (USITC 2003a).

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