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Impact of Sanitary Measures on Exports of Fishery Products from India: The Case of Kerala

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Agriculture and Rural Development Discussion Papers is an informal series produced by the Agriculture and Rural Development Department of the World Bank. These papers raise concepts and issues for discussion in the broader development community and describe ongoing research and/or implementation experiences from the Bank.

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Foreword

Food and agricultural trade is the vital link in the mutual dependency of the global trade system and developing countries. Developing countries derive a substantial portion of their income from food and agricultural trade. The emergence of food safety and agricultural health issues and the related tightening of market requirements form challenges to further growth of the mutual gains due to the lack of technical and financial capacities of many developing economies.

As part of a joint program between the World Bank's Agriculture and Rural Development Department (ARD) and International Trade Department (PRMTR), a survey on the Cost of Compliance of exporting developing countries was undertaken. The survey was focused on the supply chains of high-value food products (horticulture, fish, meat, spices, and nuts). The study quantified the costs incurred by both the public and private sectors; identified the coping strategies employed by the various stakeholders in the supply chains; determined the constraints that hinder compliance; examined the structural changes in the supply chain resulting from compliance with the safety standards; and evaluated the impact of these standards on small-scale enterprises and producers. The survey included Ethiopia (animal products), India (fish and spices), Jamaica (nontraditional agricultural exports), Kenya (fish and horticulture), Latin America Southern Cone (animal products), Morocco (fruits and vegetables), Nicaragua (shrimp), Senegal (fish and groundnuts), and Thailand (shrimp and horticulture).

This working paper is one of a series of such case studies that examined the strategies and costs of compliance of the various stakeholders in developing countries with international agro-food standards. This paper was prepared by Spencer Henson (University of Guelph, Canada), Mohammed Saqib (Rajiv Gandhi Institute for Contemporary Studies, India), and D. Rajasenan (Cochin University of Science and Technology, India).

A complementary perspective is provided by the companion series of buyer surveys involving representative importers, brokers, retailers, and distributors in the European Union, Japan, and the United States. This series, in turn, discusses the buyers' perception of the strengths and weaknesses of their suppliers and describes the assistance and/or interventions offered by the buyers to their developing country suppliers.

The findings and conclusions derived from these country studies are discussed in a synthesis report that seeks to identify possible points of intervention by the World Bank and other donor agencies and to determine the types of technical assistance that would be most efficient and appropriate. It is hoped that the experiences of these exporter and importer countries will provide useful insights to practitioners in the field, and to national and international policymakers in both the public and private sectors.

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Acronyms and Abbreviations

ASIDA	Assistance to States for Infrastructure Development for Export
CFU	colony-forming unit
CIFT	Central Institute for Fisheries Technology
CUTS	Consumer Unity & Trust Society
CWI	Consignment-Wise Inspection
EC	European Commission
EEZ	Exclusive Economic Zone
EIA	Export Inspection Authority
EIC	Export Inspection Council
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDA	United States Food and Drug Administration
FOB	free on board
FSMSC	Food Safety Management Systems-Based Certification
GAP	Good Aquaculture Practice
GATT	General Agreement on Tariffs and Trade
GMP	Good Manufacturing Practice
ha	hectare(s)
HACCP	Hazard Analysis and Critical Control Point
HPLC-MS/MS	High Performance Liquid Chromatography/Mass Spectrometry/Mass Spectrometry
IDP	Inter-Departmental Panel
IPQC	In-Process Quality Control
IQF	Individually Quick Frozen
JETRO	Japan External Trade Organization
JFFIC	Japanese Frozen Foods Inspection Corporation
kg	kilogram
KIFRA	Kerala Industrial Infrastructure Development Corporation
km	kilometer
LC	Letter of Credit
LOD	limit of determination
MIDCON	Marine Products Infrastructure Development Corporation (Private) Ltd.
MOU	Memorandum of Understanding
MPEDA	Marine Products Exports Development Authority
MRL	maximum residue level
MT	metric ton
NACA	Network of Aquaculture Centres in Asia-Pacific
NABL	National Accreditation Board for Testing and Calibration Laboratories
ng	nanogram
pg	picogram
ppm	parts per million
Rs	Rupees (Indian currency)
RSCQC	Regional Standardizing Committee on Quality Complaints
SCVMP	Standing Committee on Measures Relating to Public Health
SEAI	Seafood Exporters Association of India
SSOP	Sanitation Standard Operating Procedures

TED	turtle excluder device
UNEP	United Nations Environment Programme

1. Introduction

Global production of fish and fishery products has more than doubled since 1970, reflecting an increase in capture and, in particular, aquaculture production (Delgado and others 2003). Alongside this trend has been a shift in the composition of fisheries production away from industrialized countries and toward developing countries. Aside from China, which has become the world's single largest fish producer,[1] production of food fish in other developing countries has doubled since the mid-1970s, while production in industrialized countries has remained virtually unchanged. This shift in capture fisheries and/or aquaculture has created a major source of export revenue and a welcome contrast to the cyclical decline in markets for many traditional commodities. Over the last 30 years, developing countries have shifted from being net importers of fish and fishery products to becoming large net exporters. In fact, developing countries' annual export revenue from fish and fishery products totaled over US$20 billion through the late 1990s; and in 1997 exceeding the combined value of their meat, dairy, cereal, vegetable, fruit, sugar, coffee, tobacco and oilseed exports (Delgado and others 2003).

One of the major challenges facing exporters of fish and fishery products in developing countries is progressively stricter food safety requirements in major industrialized countries. Previous studies suggest that exporters in a number of developing countries have experienced problems complying with these requirements (Henson and Mitullah 2004, Henson and others 2000, Rahman 2001, Musonda and Mbowe 2001, UNEP 2001a and 2001b, Zaramba 2002). The costs of compliance with these requirements can be high (Cato 1998, Cato and Lima dos Santos 1998), in some cases, prohibitively so. The resultant impact on the structure and *modus operandi* of supply chains can have significant economic and social consequences for developing countries. In many cases, this impact reflects the fact that investment in upgrading supply chains and/or regulatory systems has not been correlated with the expansion of exports. On the other hand, there can be very positive returns in terms of continued and/or expanded access to high-value markets for those exporters that are able to comply

Focus

This study focuses on fish and fishery products from India, especially the state of Kerala. The main means of fish and fishery production in Kerala is marine capture, with exports dominated by frozen shrimp, cuttlefish, and squid. As in the rest of India, exporters have faced ongoing challenges in meeting evolving food safety requirements, especially in the EU, and a period during which exports were restricted due to noncompliance. The specific aims of this study are to:

- Identify the food safety and other standards faced by suppliers of fish and fishery products in their major export markets, predominantly those relating to regulatory and customer requirements.
- Assess the impact of food safety and other standards on the level and direction of exports of fish and fishery products from Kerala.
- Identify and assess the strategies that both the government and exporters have employed to comply with food safety and other market requirements.
- Identify and quantify the costs incurred by the government and exporters in complying with food safety and other standards in major export markets.

[1] Although questions have been raised regarding the reliability of production figures for China, with suggestions of over-estimation since the mid-1990s.

- Identify the constraints impeding compliance with food safety and other standards in major export markets.
- Assess the impact of food safety and other requirements in major export markets on the structure and modus operandi of the supply chain for fish and fishery products in Kerala.
- Identify areas in which technical or other assistance might facilitate compliance with food safety and other requirements in major export markets for fish and fishery products from Kerala, as well as India as a whole.

The case of fish and fishery product exports from Kerala provides a manageable case study that throws light on the challenges faced by exporters in India as a whole. At the same time, it highlights the particular challenges faced by the Kerala fish and fishery products sector that reflect the distinct manner in which it has evolved. Largely, Indian regulatory controls on hygiene in the production and processing of fish and fishery products have been updated in line with export market requirements. This updating has necessitated significant investment through the supply chain that has rationalized and consolidated processing capacity. The major beneficiaries have been exporters that have been able to access the necessary capital and/or foresaw these trends and had already invested in enhanced food safety controls. At the same time, the manner in which the processing sector is organized has been fundamentally restructured. Overlaid on these regulatory pressures has been more intense competition in international markets from China, Thailand, Vietnam, and other major exporters.

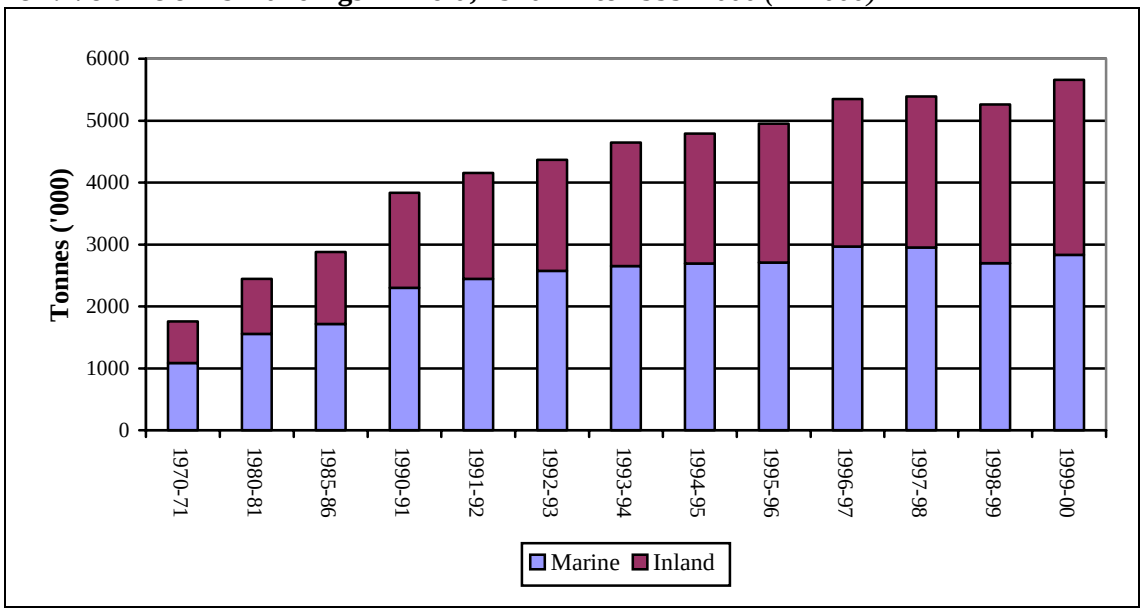
Structure of Study

This study provides an overview of fish and fishery products exports from India as a whole before focusing on the fish and fishery products sector in Kerala. The food safety and other technical requirements facing Indian exporters of fish and fishery products are then reviewed. The remainder of the study explores experiences with food safety controls, in particular across Kerala's major export markets, examining the efforts made by the Indian government and the impact on the processing sector as a whole and the preprocessing sector in particular. Finally, the remaining challenges faced by the fish and fishery products sector in Kerala as well as India as a whole are assessed in the context of the manner in which both the government and exporters have responded to changes in food safety and other requirements in major export markets.

2. Fish and Fishery Product Exports from India

In discussing the fish and fishery products sector in India, this study makes an important distinction between marine and freshwater production. The former consists of capture fisheries based along India's 8,129 km coastline, which encompasses an Exclusive Economic Zone (EEZ) of 2.02 million km^2. Freshwater production comprises capture fisheries from rivers and lakes as well as 2.86 million hectares (ha) of aquaculture production. Both sectors, but in particular aquaculture production, have exhibited high rates of growth over the last 30 years. From1970–71 to 1999–2000, total fish landings in India increased by over 220 percent from 1.76 million MT to 5.66 million MT (figure 1). Over these same 3 decades, the contribution of inland fisheries, of which much is aquaculture production, increased from 38 percent to 50 percent.

Figure 1. Volume of fish landings in India, 1970–71 to 1999–2000 *(MT 000)*

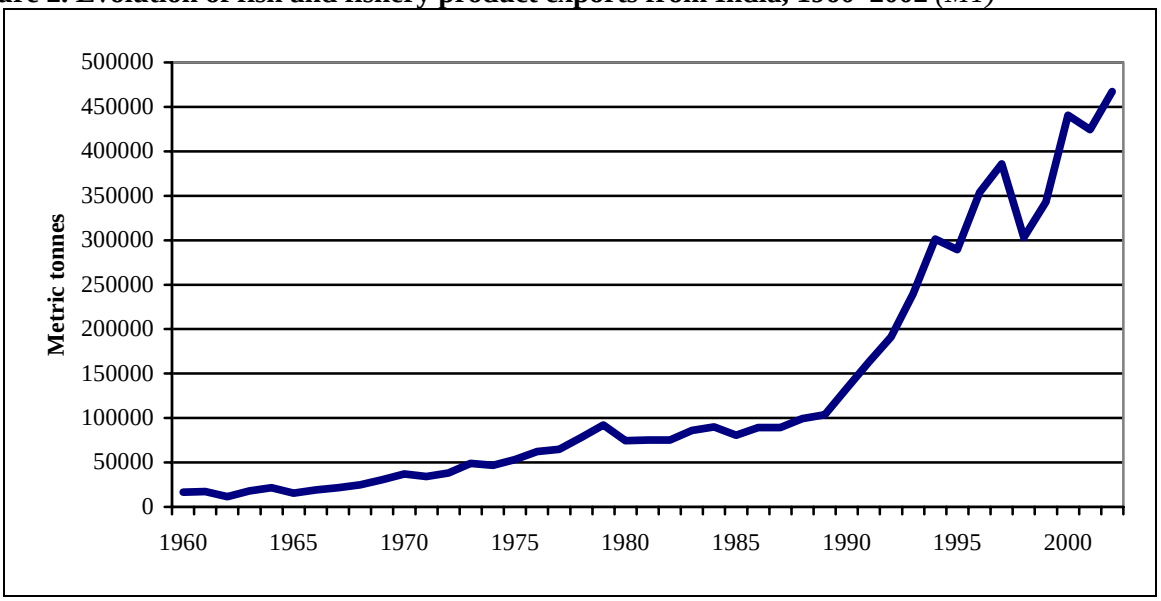


Source: MPEDA.

The development of fish and fishery product exports from India has gone hand-in-hand with the evolution of the fish processing sector. Historically, fish was dried or cured following traditional practices and sold locally. During the 1960s and 1970s, however, there was a rapid transformation as fish was marketed more widely, initially within India itself and then to export markets. While 48 percent of the landed fish entered formal markets in 1961, this figure increased to 71 percent by 1966. Freezing and canning were first introduced in the early 1960s. They grew slowly at first, but during the 1970s, they became mainstream activities, both reflecting and stimulating the growth in fish production.

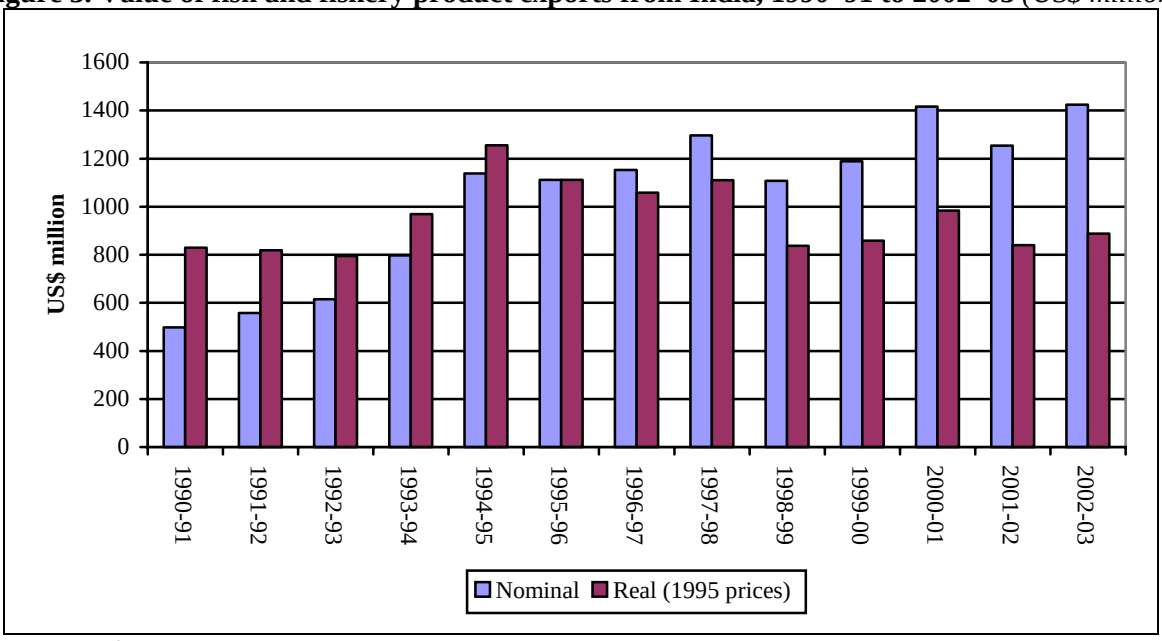
Fish and fishery product exports from India grew steadily from 1960 to 1990 at an average rate of 10 percent per annum, or from 16,542 MT to 133,653 MT (figure 2). Even more rapid expansion occurred in the 1990s, when exports more than tripled to over 465,000 MT per annum. In value terms, growth in exports was equally dramatic from US$498 million in 1990–91 to US$1,416 million in 2000–01 (figure 3). However, in real (constant 1995 prices) terms, the value of exports was largely unchanged over this period. Although export *volumes increased*, this increase was offset by a *decline in the unit value* of the exported commodities in real terms.

Figure 2. Evolution of fish and fishery product exports from India, 1960–2002 *(MT)*



Source: MPEDA.

Figure 3. Value of fish and fishery product exports from India, 1990–91 to 2002–03 *(US$ million)*



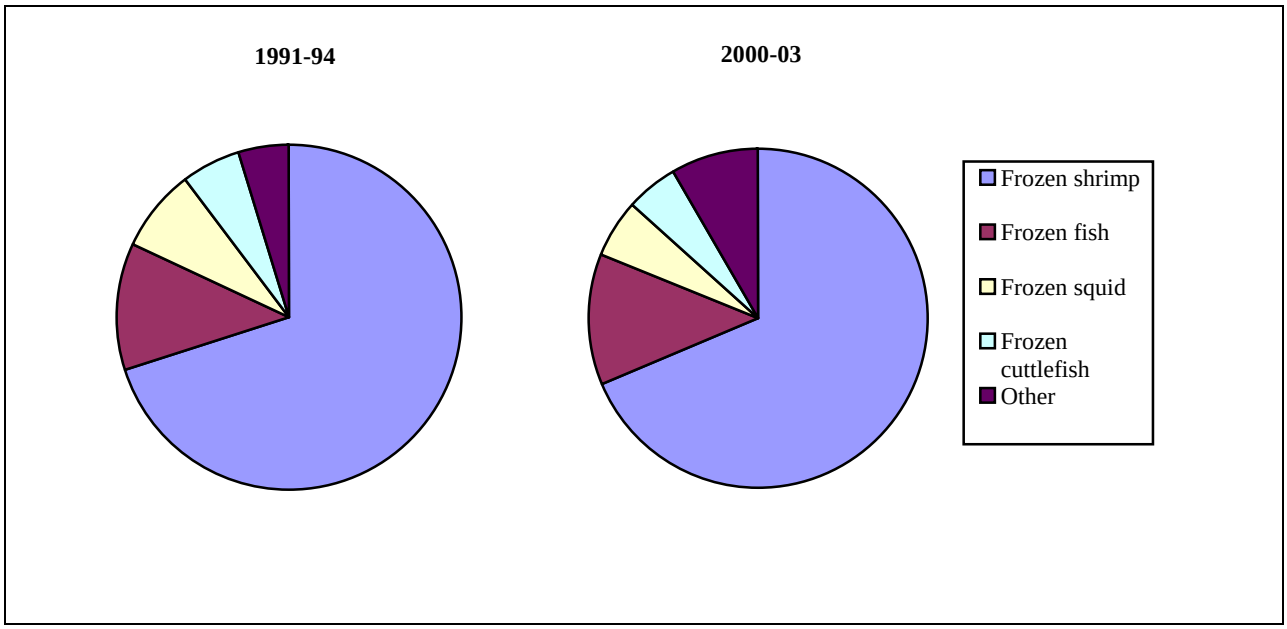
Source: MPEDA.

Fish and fishery product exports are the largest component of India's agricultural and food exports, accounting for approximately 20 percent of the total in 2001–02. The growth in exports of fish and fishery products outpaced the overall exports of agricultural and food products from 1990–91 to 2001–02. Over this same period, the contribution of fish and fishery product to total merchandise exports remained constant at approximately 3 percent.

Figure 4 details the composition of fish and fishery product exports from India from 1991–92 to 2003–04. Throughout this period, although the volume of frozen shrimp exports has declined as a proportion of

total fish and fishery product exports, by value its share has remained steady at approximately 65 percent to 70 percent. Other significant exports include frozen fin fish, accounting for 12 percent to 13 percent of exports by value, and squid and cuttlefish, accounting for between 6 percent and 8 percent of exports.

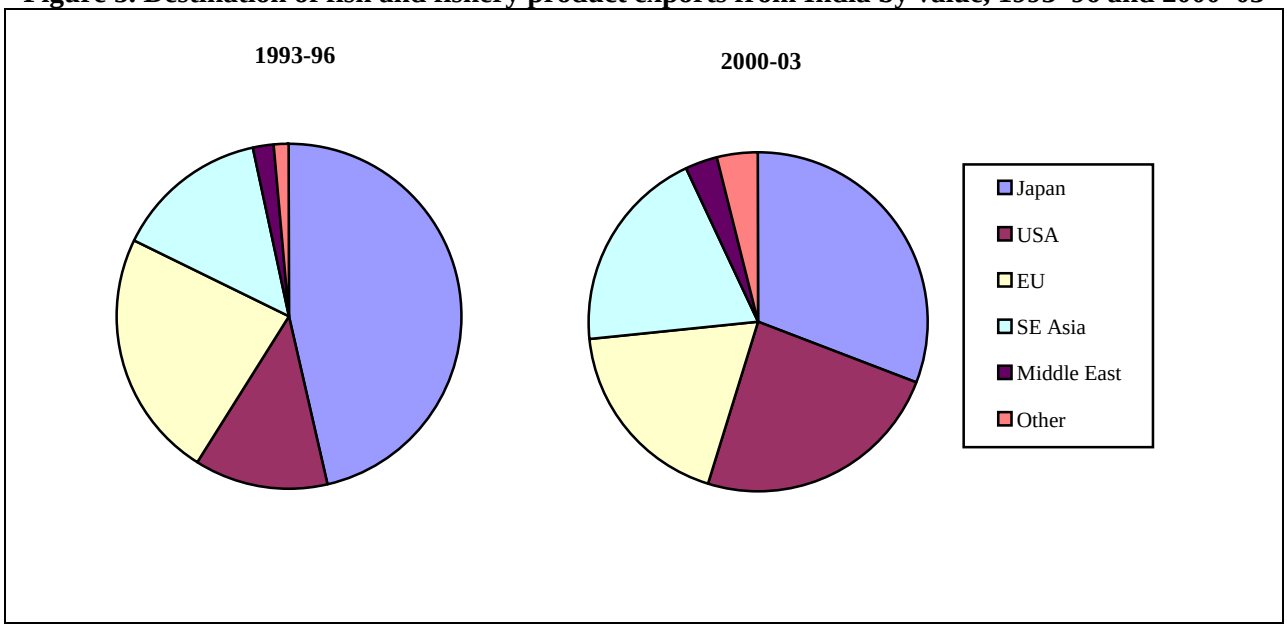
Figure 4.Composition of fish and fishery product exports from India by value, 1991–94 and 2000–03



Source: MPEDA.

Historically, Indian exports of fish and fishery products have been directed at 3 major markets: the European Union (EU), Japan, and the United States, which collectively account for approximately 85 percent by value (figure 5). Of this figure, Japan alone typically accounted for over 45 percent. Through the 1990s, however, there were significant changes in the destination of Indian exports. Most notably, China and (to a lesser extent) other parts of Southeast Asia have emerged as important markets that account for over 20 percent of Indian exports in 2002–03. Indeed, certain exporters (especially in Kerala) have focused on China as an emerging market for fish and fishery products. Furthermore, the importance of the United States has increased from 12 percent of exports by value in 1993–94 to 29 percent in 2002–03. Over the same period, exports to Japan declined from 47 percent to 22 percent. Exports to the EU did not change significantly during this period, remaining at approximately 20 percent to 25 percent.

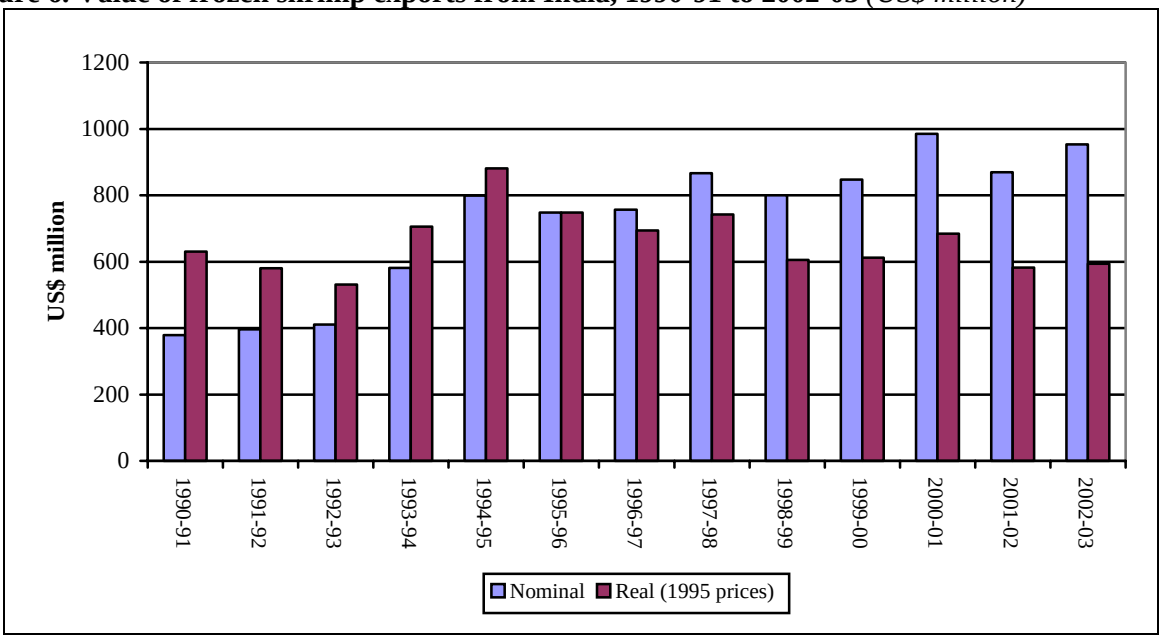
Figure 5. Destination of fish and fishery product exports from India by value, 1993–96 and 2000–03



Source: MPEDA.

As described above, Indian exports of fish and fishery products are dominated by frozen shrimp. Over the period 1991–92 to 2000–01, the value of shrimp exports increased by approximately 150 percent from US$395.98 million to US$985 million (figure 6). In real (constant 1985 prices), however, the value of exports increased through the period 1990–91 to 1994–95 from US$630 million to US$881 million, but then declined to US$594 million in 2002–03 as the drop in unit export value outpaced the increase in volumes.

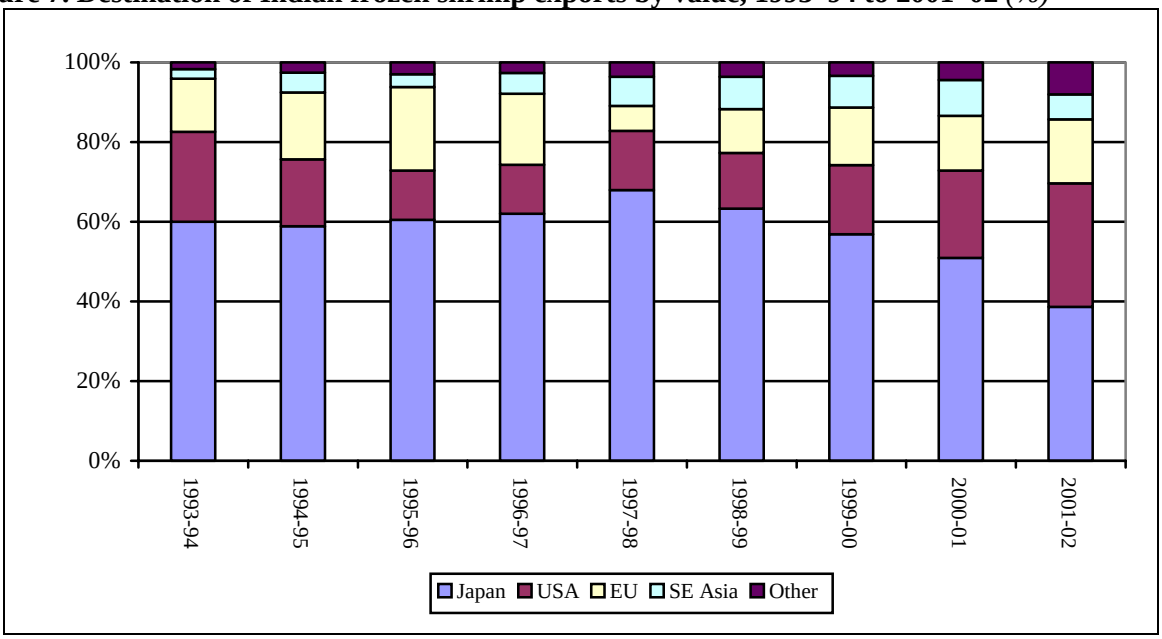
Figure 6. Value of frozen shrimp exports from India, 1990-91 to 2002-03 *(US$ million)*



Source: MPEDA.

While Japan's share in India's shrimp exports declined from 60 percent in 1993–94 to 39 percent in 2001–02, Japan remains the country's main export market (figure 7). Over this same period, exports to the US declined from 22 percent in 1993–94 to approximately 13 percent in 1996–97, recovering to reach 31 percent again in 2001–02. Exports to the EU expanded from 13 percent by value in 1993–94 to 21 percent in 1995–96, but then collapsed to 6 percent in 1997–98 reflecting the restrictions imposed by the European Commission (see below). Exports subsequently recovered to approximately 14 percent through 1999–02.

Figure 7. Destination of Indian frozen shrimp exports by value, 1993–94 to 2001–02 *(%)*



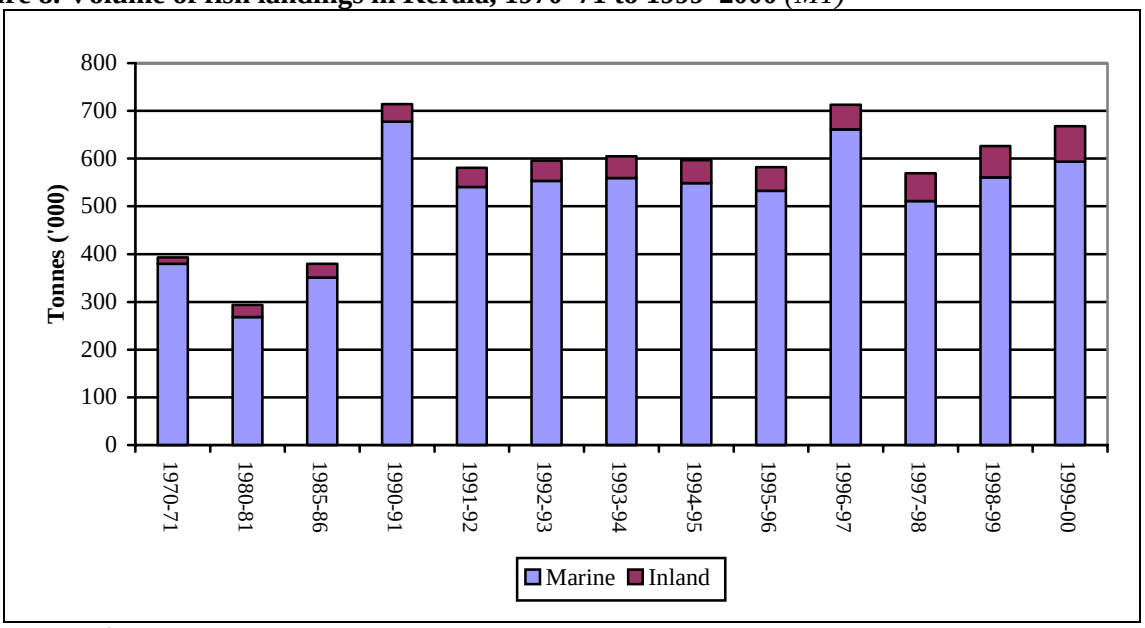
Source: MPEDA.

Exports of frozen shrimp are in two main forms, block frozen and Individually Quick Frozen (IQF). Through the period 1993–94 to 2001–02, block frozen typically accounted for 85 percent to 90 percent of total exports by volume. Although IQF accounts for approximately only 10 percent of exports, IQF is more important for the EU and United States, for which it can account for 15 percent–18 percent of total frozen shrimp exports. There are also significant differences in the unit value of frozen shrimp exports across India's three major export markets. Japan and the US have the highest unit values at US$10.9/kg and US$8.6/kg respectively; larger shrimp (for example, Black Eye shrimp) are major exports to these markets. Exports to the EU are dominated by smaller salad shrimp, for which unit values are lower (US$6.2/kg).

3. Fish and Fishery Product Supply Chain in Kerala

Historically, Kerala accounted for between 20 percent to 25 percent of fish landings in India, although Kerala's contribution declined over time to reach approximately 12 percent in 1999–00 (figure 8). The Kerala fisheries have always been dominated by marine capture production. While aquaculture production has gained in importance, it still accounted for only 11 percent of Kerala fish landings in 1999–00. The one subsector in which Kerala continues to dominate, however, is shrimp, for which it continues to account for 35 percent to 40 percent of total national landings. Reflecting the limited development of aquaculture in Kerala, most of this amount is from marine capture. In turn, Kerala is the major producer of frozen shrimp in India, accounting for approximately 42 percent of national production.

Figure 8. Volume of fish landings in Kerala, 1970–71 to 1999–2000 *(MT)*

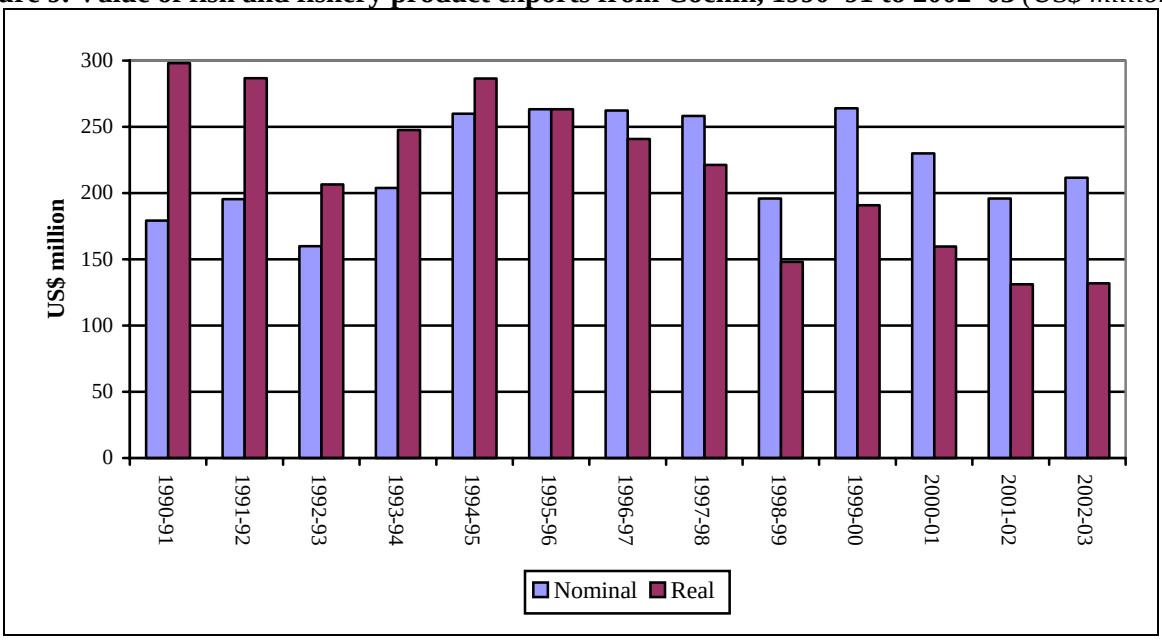


Source: MPEDA.

Cochin is the major fisheries port in Kerala and typically accounts for over 90 percent of state-wide exports. Over the period 1990–91 to 2002–03, exports from Cochin increased approximately only 10 percent with significant year-on-year variations (figure 9). This rate of growth was significantly below those experienced across the nation as a whole. As a consequence, Kerala exports declined as a proportion of Indian fish and fishery product exports as a whole from approximately 30 percent in 1990–91 to approximately 20 percent in 2002–03. Furthermore, this smaller share is in sharp contrast to the mid-1970s, when Kerala accounted for over 50 percent of Indian fish and fishery product exports.

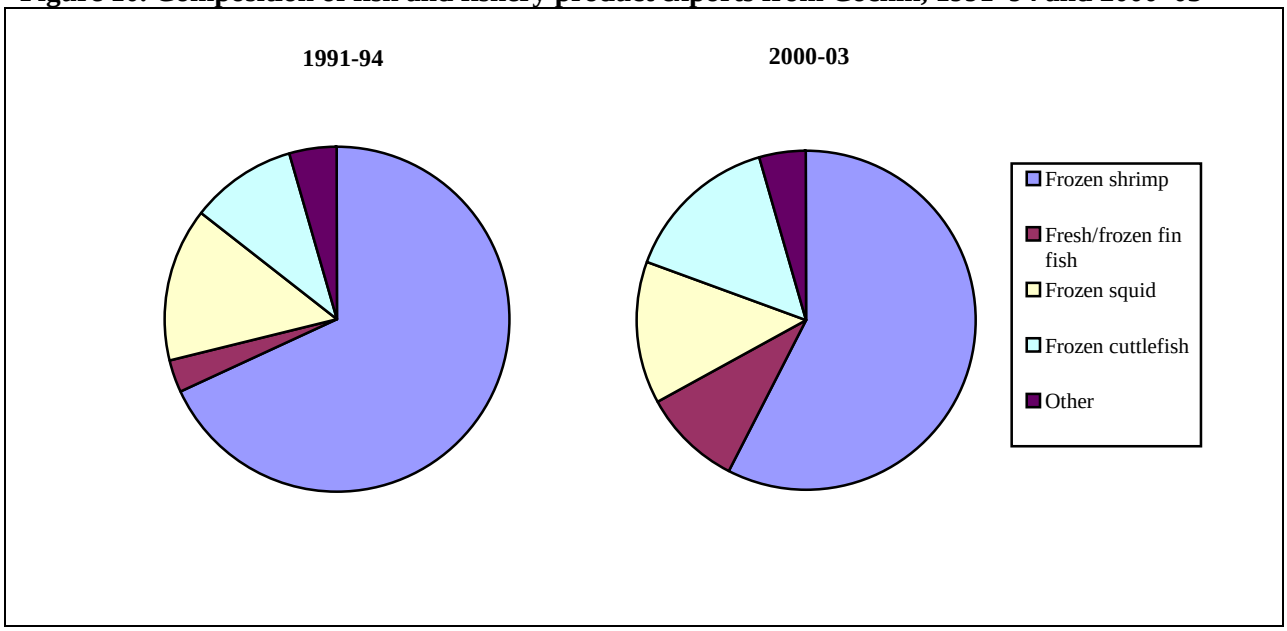
While frozen shrimp continues to dominate fish and fishery products exports from Kerala, cuttlefish and squid have taken on greater importance through the 1990s. In 1991–92 frozen shrimp accounted for 76 percent of exports by value, whereas frozen squid and cuttlefish accounted for only 11 percent and 6 percent respectively (figure 10). However, by 2000–01 frozen shrimp exports had declined to 58 percent by value; frozen cuttlefish exports have increased to 15 percent; and frozen squid increased to 13 percent. Frozen fish exports have also increased dramatically, including Ribbonfish and various other species, from 2 percent in 1991–92 to 9 percent in 2000–01. Currently, Kerala accounts for approximately 48 percent of all frozen squid and cuttlefish exports from India and only 13 percent of frozen shrimp exports.

Figure 9. Value of fish and fishery product exports from Cochin, 1990–91 to 2002–03 *(US$ million)*



Source: MPEDA.

Figure 10. Composition of fish and fishery product exports from Cochin, 1991–94 and 2000–03



Source: MPEDA.

The destination of fish and fishery product exports from Kerala is somewhat different compared to that of India as a whole. Traditionally, Kerala's major market has been the EU, which accounted for 49 percent of exports in 1995–96 by value. Despite the problems fish processors have faced meeting EU hygiene requirements, it still accounted for 37 percent of exports in 2000–01. Correspondingly, Japan has always been a less important market, accounting for 19 percent of exports by value in 1994–95, with little change over the period to 2000–01. Likewise, the importance of the US market has changed little, accounting for 17 percent to 20 percent of exports by value throughout the period 1994–95 to 2000–01. The one major

change over this period, however, has been the emergence of China as a significant market, most notably for frozen fish. By 2000–01, China accounted for 11 percent of exports by value.

Figure 11 details the supply chain in India for fish and fishery products, including fin fish, crustaceans (for example, shrimp), and cephalopods (for example, squid, cuttlefish, and octopus). Raw materials originate from either marine capture or aquaculture production.[2] In the former case, the fish are landed at registered sites by individual fishing boats. Typically, the products of aquaculture are purchased directly from farmers and/or produced under contract to fish preprocessing or processing facilities. This supply chain will not be discussed in detail here as it is of relatively minor importance in the Kerala context.

Marine capture takes place using both modern trawlers, which can fish up to180 kilometers (km) from the shore, and traditional craft, which can be either motorized or non-motorized and go no farther out than two or three km. The 1992 census suggests that approximately 633,000 people in Kerala were directly engaged in fishing (table 1), with an additional 227,000 engaged in activities related to fishing, including family members engaged in fishing operations, marketing, and net repair. Indeed, fishing is considered a central element of the Kerala economy and crucial to the livelihood of many poorer members of society.

Table 1. Fisher population in Kerala, 1992

Population	*Number*
Fisher population:	632,900
Men	197,800
Women	197,000
Children	238,100
Family members engaged in fishing operations:	
Full-time	109,900
Part-time	27,500
Family members engaged in fishing-related activities:	
Marketing	25,400
Repair of fishing nets	13,500
Processing	8,100
Other activities	42,600

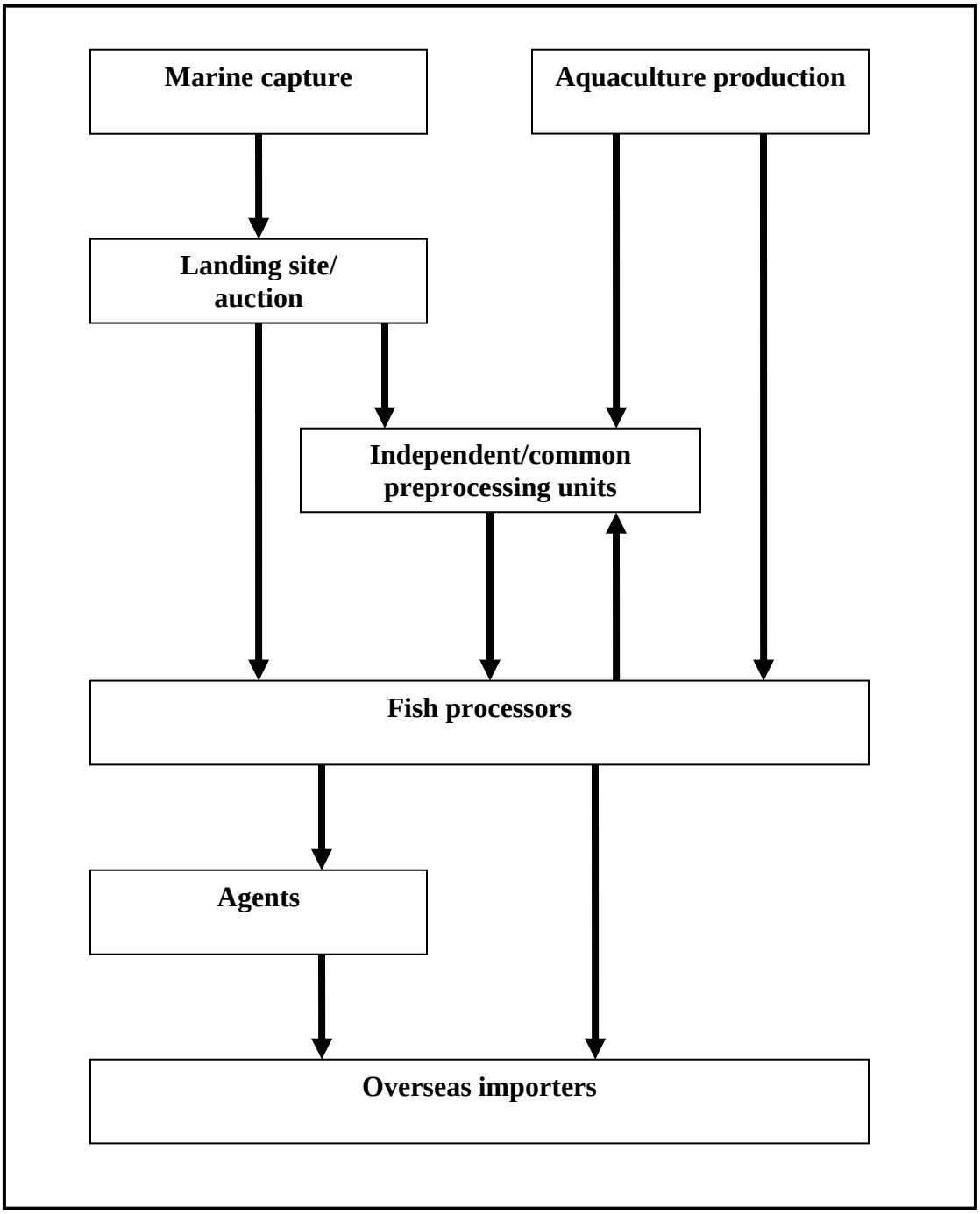
Source: Yacoob 1994, Rajasenan 2001.

At registered landing sites, fish is auctioned through agents who act on behalf of fishing boats. Landings sites are generally publicly owned and managed by port trusts or town/city authorities. These agents are paid on commission. The landed catch generally consists of mixed species, and agents sort it into fish for the local and domestic markets and by species.

In the case of cephalopods and crustaceans, the processing sector consists of two distinct operations that can be undertaken independently at separate sites or in integrated operations. Preprocessing involves cleaning and deshelling the raw material before proceeding to processing proper, where the product is sorted and then further processed: frozen cooked or uncooked, dried or canned. Over time, freezing has become the dominant processing method. Throughout most of India, these operations are undertaken in integrated operations, often at a single facility. In Kerala and (to a lesser extent) West Bengal, however, preprocessing has traditionally been undertaken by separate facilities that are operated as independent businesses. The pre-prepared raw material is then supplied to processing plants for further preparation and freezing. In some cases, processors supply raw material to preprocessors for preparation on a contract basis. In others, the preprocessor purchases the raw material and sells it to the processor in the prepared state.

[2] There is also freshwater capture, although it is insignificant within the context of the export supply chain.

Figure 11. Export supply chain for fish and fishery products in India



Source: Authors.

Most preprocessors or processors source raw material from landing sites through their own agents at landing sites. In some cases, they collect the raw material from landing sites in their own vehicles; in others, the agent delivers to their facility. These agents are paid on a commission basis. Preprocessors and/or processors will typically source through two or three agents to ensure security of supply. The buyer takes ownership of the raw material upon delivery and acceptance at his/her preprocessing or

processing unit. Some processors, however, employ their own buyers who are based at landing centers. In this case, the raw material becomes their property immediately it is purchased at the landing site.

Fish processing facilities have traditionally been focused almost entirely on export markets. They supply buyers in overseas markets or through agents based in India. In some cases, these agents act on behalf of particular buyers and may be dedicated to a single buyer. In other cases, agents purchase for general export to a range of buyers, perhaps in more than one country market. There are a few examples of foreign investment in the fish processing sector in India, in which case these investors export directly to their home markets, often for further processing. Furthermore, some Indian fish processors have established offices in their major export markets that deal directly with overseas customers.

4. Food Safety Requirements Faced by the Indian Fish and Fishery Product Sector

As a relatively "high-risk" food, fish and fishery products are subject to a range of food safety requirements related to general hygiene and specific microbiological and chemical contaminants. These requirements are subject to change over time in response to emerging problems, advances in scientific knowledge, consumer concerns, and political pressures. Overlying these food safety controls are a range of quality requirements related to the end product itself and the ways in which it is produced, for protection against environmental damage. More recently, a broad framework of measures has been implemented by the US against threats of bioterrorism. This section focuses on issues that have raised challenges for exports of fish and fishery products from India in general, and Kerala in particular.

General Hygiene Requirements

This section, in turn, reviews the hygiene requirements related to fish and fishery products in each of India's major export markets, namely EU, Japan, and US. Particular attention is given to the EU as the market for which particular problems have occurred related to changes in hygiene requirements.

European Union

The EU lays down harmonized requirements governing hygiene in the capture, processing, transportation, and storage of fish and fishery products (Globefish 2000).[3] EU legislation lays down detailed requirements regarding the landing of fish, structure of wholesale and auction markets and processing facilities (for example, construction of walls and floors, lighting, refrigeration, ventilation, staff hygiene), processing operations, transportation, storage, packaging, checks on finished products (including visual, organoleptic, chemical, and microbiological parameters), laboratories,[4] and water quality. In the case of water quality, for example, parameters are specific for microbial pathogens, chemical contaminants, radioactivity, and various other quality indicators.[5] These parameters are subject to minimum levels of sampling and testing to monitor and confirm compliance.

More generally, the EU requires that fish processing facilities undertake "own checks."[6] Key elements of these requirements include (1) identification of critical points in the processing establishment on the basis of the manufacturing process used; (2) establishment and implementation of methods for monitoring and checking such critical points; (3) taking samples for analysis in an approved laboratory for the purposes of checking, cleaning, and disinfection methods and checking compliance with the standards established by the Directive; and (4) keeping a written record of these controls for at least two years. More specifically, "own checks" refers to all actions aimed at ensuring and demonstrating compliance with standards laid down by EU legislation in accordance with the general principles of Hazard Analysis and Critical Control Point (HACCP).[7]

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[3] Directive 91/493/EEC.

[4] Reference is made to EN45001 standards, although lesser requirements are specified for laboratories internal to processing establishments.

[5] Directive 98/83/EC.

[6] HACCP is a system of process control based on the identification of "critical control points" that affect the safety of the end product and the implementation of controls at each of these points. For further information, see, for example, Mortimore and Wallace 2000.

[7] Directive 94/356/EC.

Processing plants are inspected and approved on an individual basis by a specified "Competent Authority" in the country of origin, whether an EU Member State or a Third Country, to ensure that they comply with these requirements. The European Commission (EC) undertakes checks to ensure that the Competent Authority undertakes this task in a satisfactory manner and to ensure provisions of the Directive are complied with.

Imports from Third Countries are required to comply with requirements that are at least equivalent to those of the EU. Furthermore, specific import conditions are established according to the particular health situation of that country, taking account of (1) legislation of the country; (2) organization of the Competent Authority and of inspection services, the powers of such services and the supervision to which they are subject, and their facilities for effectively verifying the implementation of legislation in force; (3) actual health conditions during the production, storage, and transport of fish and fishery products; and (4) assurance which the country can give on compliance with EU standards.

The Commission generally undertakes inspections for the purposes of determining local health conditions and establishing specific import conditions for the country concerned. These typically include procedures for obtaining a health certificate that must accompany all consignments exported to the EU, requirements for marks identifying the establishment from which a consignment is derived, and establishing a list of approved establishments and auction or wholesale markets that meet EU standards. Only establishments approved by the Competent Authority are permitted to export to the EU. The Competent Authority provides the EC with a list of approved establishments and this is subsequently published in the *Official Journal of the European Communities*.

Countries for which the European Commission has approved local requirements as being at least equivalent to those in the EU and for which specific import requirements have been established are subject to reduced physical inspection at the border (see next paragraph). These are published in Part I of the list of approved countries. Countries for which these procedures have not been completed but for which assurances have been given that requirements are at least equivalent to those in the EU are permitted to export until the end of 2005.[8] Consignments must be accompanied by a health certification but are not subject to reduced physical checks at the border. These are published in Part II of the list of approved countries.[9]

Imports to the EU are also subject to a systematic program of physical checks to ensure that the product still complies with regulatory requirements as certified on the accompanying veterinary health certificate.[10, 11] These checks must cover at least 1 percent of the items in a consignment from a minimum of 2 to a maximum of 10 items. However, these checks can be less frequent under certain conditions. Examples include cases in which (1) products originate in a Third Country, which offers satisfactory health guarantees as regard checks at the point of origin, (2) products come from establishments on a list drawn up in accordance with EU rules and/or have undergone Community or national inspection, and/or (3) import certificates have been issued for the products concerned. All products are subject to more

[8] The original deadline for countries to achieve Part I status was 31 December 1996. However, the deadline has been extended on 4 occasions and currently expires on 31 December 2005 (Decision 2003/912/EC).

[9] Until 31 January 1999, exports were permitted to individual EU Member States on a bilateral basis (Decision 98/419/EC). The Member State was responsible for ensuring that imports were produced and marketed under conditions that were least equivalent to those in the EU. These were included in Annex II to the list of approved countries.

[10] Decision 94/360/EC amended by 99/609/EC.

[11] However, it is widely recognized (for example, among importers) that different Member States employ different procedures and/or testing methods at their ports of entry. This discrepancy has led to the phenomenon of "port shopping," whereby importers focus on ports of entry that have, or at least are perceived to have, less strict procedures.

extensive checks if there is evidence of potential violation of EU requirements and/or an immediate threat to animal or public health.

Where the Commission identifies zoonoses or other diseases liable to present a serious threat to animal or public health, especially in light of veterinary inspections or checks at the border, a variety of measures can be adopted.[12] For example, imports can be suspended from all or part of the country concerned and, where appropriate, the Third Country of transit. Or special conditions can be established for products coming from all or part of the Third Country, and/or requirements can be laid down for appropriate checks, which may include specifically looking for risks to public or animal health and increased frequency of physical checks.

United States

Until the mid- to late-1990s, food safety controls on imports of fish and fishery products to the United States were based on physical examination at the border. These examinations were directed primarily toward substances that would cause the consignment to be adulterated under US law. While border inspection remains an integral element of US food safety controls, more recent rules require that importers be proactive in ensuring that consignments comply with US regulatory requirements.[13]

Processors of fish and fishery products are required to comply with general requirements relating to the structure of premises, equipment, and product and process controls that mandate the application of Good Manufacturing Practice (GMP).[14] Furthermore, as of December 1997, legislation governing the processing and importing of fish and fishery products requires that processors maintain Sanitation Standard Operating Procedures (SSOP), including written sanitation records, and implement HACCP.[15] Imports of fish and fishery products must comply with the same requirements. In addition, US importers are required to take "affirmative steps" to ensure this is the case.

Under this legislation, importers have a responsibility to verify that the fish and fishery products they are importing comply with US regulatory requirements. There are two main ways in which this can be achieved. First, the product can be obtained from a country that has a Memorandum of Understanding (MOU) with the US Food and Drug Administration (FDA), which documents the equivalency or compliance of that country's inspection system for fish and fishery products with US requirements. In such cases, the importer's responsibilities are automatically fulfilled. Currently Australia, Canada, Chile, China, the EU, Iceland, Japan, New Zealand, Norway, South Korea, and Thailand have agreed or are negotiating an MOU with the FDA.

Alternatively, the importer can have written verification procedures to ensure that imported fish and fishery products have been processed in accordance with US regulatory requirements. There are two components to this: (1) product specifications designed to ensure that the product is not adulterated, as defined by US legislation, and (2) "affirmative steps" to verify that the product has been processed in accordance with US regulatory requirements. The steps that an importer must take are not mandated, but examples include (1) obtaining HACCP and sanitation monitoring records from the foreign processor to ensure that US regulatory requirements have been satisfied; (2) obtaining a continuing or lot-by-lot certificate from an appropriate foreign government inspection authority or competent third party certifying that the imported fish or fishery product is or was processed in accordance with US regulatory requirements; (3) making regular inspections of the foreign processor's facilities to ensure that the imported product is processed in accordance with US regulatory requirements; (4) maintaining a copy of the processor's HACCP plan and a written assurance from the processor that the imported product is

[12] Directive 92/894/EEC.
[13] See 2005 comprehensive survey of US buyers' requirements by Lamb, Velez, and Barclay.
[14] 21 CFR 110.
[15] 21 CFR 123.

being processed in accordance with US regulatory requirements; (5) periodically testing the imported product and maintaining a written assurance from the processor that the imported product is being processed in accordance with US regulatory requirements; or (6) requiring and maintaining other verification measures that provide an equivalent level of assurance of compliance with US regulatory requirements.

Importers are entitled to use a competent third party to assist with or perform these verification procedures, including preparation of the importer's verification procedures. However, in all cases, records must be kept that document the performance and results of the affirmative steps taken. Thus, there must be evidence that all imported fish and fishery products have been processed under conditions that are equivalent to US regulatory requirements. In the absence of such evidence, the FDA assumes that the product is adulterated and denies entry at the border. Inspection authorities in some countries are issuing lists of processors that are in "good standing" and are considered to be processing in accordance with US requirements. Importing from processors on these lists is one way of meeting the requirement to take "affirmative steps." However, this "good standing list" is not a guarantee of compliance, and importers must be confident that they will be considered credible by the FDA.

The US maintains a system of border inspections to ensure that imports meet the same standards as domestic products. Importers are required to file an entry notice and an entry bond with the US Customs Service pending a decision regarding the admissibility of the product. FDA is notified by Customs of the arrival of a consignment and makes a decision as to the article's admissibility based on a check of documentation and physical or other forms of inspection.[16] In some instances, a product is detained automatically at the border without physical examination. Such a detention is based on past history and/or other information indicating that the product may not comply with US regulatory requirements. For cases in which noncompliance is widespread, for example, across a product category or imports from an entire country, all consignments may be detained.

Japan

Imports of fish and fishery products to Japan must comply with the provisions of both the Food Sanitation Law and the Quarantine Law (Globefish 1998, JETRO 200(3). These laws lay down general requirements that prohibit the import and sale of products that are (1) rotten, decomposed, or immature such that they are unfit for human consumption; (2) contain or are suspected to contain toxic or injurious substances; (3) contaminated with or suspected to be contaminated with pathogenic micro-organisms; and/or (4) may injure human health due to lack of cleanliness, addition of extraneous substances, or any other cause.

Japan has limited requirements that relate specifically to fish and fishery products. Imports require a health certificate from the relevant government agent in the country of origin that specifies the species and area of collection. Marine products from cholera-infected areas are subject to automatic border inspection. Maximum levels for microbiological contaminants are specified for frozen fish. For example, uncooked frozen fish must have a maximum plate count of 300,000/gram and zero coliforms, *salmonellae*, and *Staphylococcus aureus*.

All food imports to Japan require prior notification to Food Sanitation Inspectors at quarantine stations. However, a planned import system is in place for regular imports whereby a plan of consignments is submitted and prior notification waived for a specified period. Inspectors undertake document examinations and inspection. Inspection is risk based according to, for example, records of previous noncompliance. Furthermore, some products are subject to monitoring inspection based on levels of imports and previous record of noncompliance. When a consignment is subject to inspection by a public agency in the exporting country and a report is provided, inspection at the Japanese border may be waived.

[16] The US is also enacting controls on biosecurity that will require importers to have a named agent in the US and to provide prior notification of any consignment prior to its arrival at the port of entry.

In the case of frozen foods, the Japanese Frozen Foods Inspection Corporation (JFFIC) is authorized by the Ministry of Health, Labor and Welfare to undertake inspections.

Antibiotics

In 2001 residues of antibiotics emerged as a major problem for fish and fishery products exports to the EU, particularly shrimp. In the EU, the use of a range of substances that have a hormonal or thyrostatic action in aquaculture production is prohibited except for therapeutic purposes.[17] EU legislation prohibits the sale of animals that have been administered such substances or, in the case of therapeutic use, the minimum withdrawal periods have not been observed. Imports of fish and fishery products that do not comply with these requirements are not permitted. Common procedures to monitor substances and residues in fish and fishery products have been established in the EU.[18] Furthermore, harmonized maximum residue levels (MRLs) have been established for veterinary drugs.[19] Antibiotics such as Chloramphenicol and Nitrofurans have been set at the limit of determination (LOD). It is prohibited to administer such substances to animals except for therapeutic purposes.

A number of countries faced multiple detentions due to the detection of residues of Chloramphenicol and Nitrofurans. This problem extended to other products, such as eggs and egg products from India, meat and meat products from China, and poultry and poultry products from Brazil. The European Commission responded by imposing restrictions on exports of shrimp from a number of countries. During 2001 to 2003, the EC subjected Indonesia, Myanmar, Thailand, and Vietnam to mandatory border testing of shrimp for Chloramphenicol and/or Nitrofurans for up to 10 months.[20] In the case of Myanmar, these restrictions are still in place. China was first subjected to mandatory border testing in September 2001. Following an inspection visit by the European Commission, on 31 January 2003, an absolute ban on exports was applied, which is still in force.

Although the majority of shrimp exported from Kerala are marine capture, for which antibiotics are not normally an issue, some exporters also handle larger species, for example, black tiger, which are produced through aquaculture, predominantly in Andhra Pradesh. Furthermore, residues have been detected through border checks in the EU even in marine capture shrimp, forcing controls on antibiotics onto the agenda of all exporters. Antibiotics have been an issue mainly with exports to the EU, although they are also emerging as a concern in the United States.

Heavy Metals and Other Environmental Contaminants

The EU limits levels of heavy metals and other environmental contaminants that can be present in fish and fishery products. In general, levels are disallowed if dietary intake would likely exceed acceptable daily or weekly intake for humans.[21] Member States are required to implement a monitoring system to check the level of contamination of fish and fishery products, produced both domestically and imported. Specifically, the EU has published maximum levels for lead (0.5mg/kg in crustaceans and 1mg/kg in cephalopods), cadmium (0.5mg/kg in crustaceans and 1mg/kg in cephalopods), and mercury (0.5mg/kg in

[17] Directive 96/22/EC.
[18] Directive 96/23/EC.
[19] Regulation 90/2377/EC.
[20] In Thailand, these EC requirements also applied to poultry. In the case of Thai shrimp, the requirement for mandatory border testing was replaced with a requirement for health certificates issued by the Thai government after seven months. This later requirement was removed in June 2003.
[21] Directive 91/493/EC.

crustaceans for fish and fishery products).[22] Only the US has a specific tolerance for methyl mercury in fish (1ppm).

In 2001 the EU established a maximum level for dioxins in fish and fishery products of 4pg/g fresh weight.[23] In 2002 a lower action level of 1ng/kg was established in addition to this maximum level.[24] This later level aims to bring about proactive efforts to reduce levels of contamination, highlighting cases in which action is needed. Where either the maximum or action levels are exceeded, Member States are instructed to initiate checks to identify sources of contamination and take measures to reduce levels. Where national background levels of dioxins are especially high, Member States are permitted to set stricter action levels. Neither Japan nor the US has specific tolerances for dioxins.

Other Requirements

Fish and fishery products are subject to a range of additional food safety requirements in particular markets. For example, *Vibrio paraheamolyticus* is a pathogen native to warm waters and known to be present in fish and fishery products produced or captured in certain areas of the world. The EU does not lay down harmonized maximum levels for *Vibrio paraheamolyticus* in fish and fishery products, although some Member States have established their own guidelines. For example, both the UK and the Netherlands have established <100 CFU/g as a guideline for "acceptable" levels of *Vibrio paraheamolyticus*. In 2001 the Standing Committee on Measures Relating to Public Health (SCVMP) criticized the practice of judging the quality of fish and fishery products on the basis of the presence of *Vibrio paraheamolyticus* alone with no account of virulence.[25] The US applies an action level of 10,000/g, which is significantly greater than in EU Member States.

The US Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (the so-called Bioterrorism Act) requires that both domestic and foreign facilities that process, pack, or store food for human or animal consumption in the US are registered with the FDA.[26] The rationale is that, in the event of a bioterrorism incident, registration information will enable the FDA to determine the location and source of any threat. In the case of foreign facilities, a US agent must be designated who is physically present in the US. Imports from facilities that are not registered are liable to detention at the US border. The act further requires that the FDA be informed prior to the arrival of imported food shipments. In the case of arrivals by sea, the notice period is eight hours. This information is to be used to review shipments prior to arrival to determine the need for inspection.

The act also requires that domestic and foreign suppliers maintain records of the immediate source from which they receive a consignment of food and the immediate subsequent recipient of any consignment. The rationale is that these records will enable the US government to trace back through the supply chain any item of food implicated in bioterrorism. Information to be recorded includes the firm's name, a named responsible individual within that firm, and his/her address and contact details; type of food; date received and/or released; lot number or other identifier; quantity; type of packaging; and name, address and contact name and details of the transporter. At the current time, the final rule has not been established relating to this requirement, and it is not certain when these requirements will come into effect. However,

[22] Regulation 2001/466/EC.
[23] Regulation 2001/2375/EC.
[24] Regulation 2002/201/EC.
[25] SCVMRP 2001.
[26] With a deadline of 12 December 2003.

exporters are aware that these rules are impending and are beginning to implement the required record-keeping systems. [27]

Exports of shrimp to the US are subject to strict environmental protection controls aimed at conservation of marine turtles. The US Endangered Species Act of 1973 lists as endangered or threatened the five species of sea turtles that travel in US waters and requires that US shrimp trawlers use turtle excluder devices (TEDs) in their nets when fishing in areas in which there is a significant likelihood of encountering sea turtles. In 1989 using TEDs was extended to shrimp imports. Shrimp harvested with technology that could adversely affect these species of sea turtles were prohibited from being imported to the US unless the exporting country was certified as having a regulatory program requiring the use of TEDs or with which there was no risk of threat to these species of turtle.[28] In practice, this meant that countries having any of the five protected species of turtle in their coastal waters had to impose similar requirements on their fishing industries as those applied to US shrimp trawlers if they wanted to be certified to export to the US. In practice, this meant the compulsory use of TEDs. [29] Interestingly, Kerala is not a natural habitat for any of these species and actually gains some competitive advantage over other supply regions—other parts of India and Thailand, for example—from these requirements.

Finally, fish and fishery products are also subject to a range of quality standards and other requirements. For example, both the EU and US maintain official lists of recognized names for fish species that must be used on packaging. Furthermore, official quality grades may be applied. For example, Japan requires that fish and fishery products are free of shell and other fragments. These requirements frequently are augmented by the specifications of individual customers, which can lay down a range of organoleptic and other parameters.

[27] At the current time, it is difficult to assess with any certainty the impact of the US measures related to bioterrorism on fish and fishery products from India. While exporters with their own officers or established agents in the US may have faced few problems, they are generally the exception rather than the rule. Certainly, in June 2003, the time that the fieldwork for this study was undertaken in India, the majority of Indian exporters had not registered with the FDA and they were concerned about the impact of this requirement, in particular, on their ability to continue to access US markets.

[28] In 1997 India, Malaysia, Pakistan, and Thailand launched an official complaint against the US requirements through the WTO. The WTO ruled that countries have the right to take trade action to protect the environment and that the US requirements were not illegitimate under the GATT. However, the WTO also determined that the US applied these measures in a discriminatory manner, so the WTO gave certain countries (especially in the Caribbean) longer periods in which to comply as well as technical and financial assistance. Such preferential treatment was not afforded any of the four complainants. The US subsequently revised its requirements, which were found to be compliant with WTO obligations when Malaysia has registered a complaint to the original panel.

[29] Marine capture of shrimp along the coast of Kerala has not been adversely affected by US requirements relating to the use of TEDs. The Indian government has mandated the fitting of TEDs to trawlers in all areas, although none of the species of turtle covered by US legislation is found along the Kerala shoreline. In any case, traditional capture methods are still quite widely applied, and these fall outside the purview of the requirements.

5. Experiences with Food Safety Controls in India's Major Export Markets

This section provides an overview of the experiences of Indian exporters of fish and fishery products, particularly exporters in Kerala, in response to the recent evolution of food safety and quality practices. Specifically, it discusses the impacts on border rejections and on trade flows in cases of an obvious linkage between the two, for example, the prohibition of fish and fishery product exports from India to the EU during 1997.

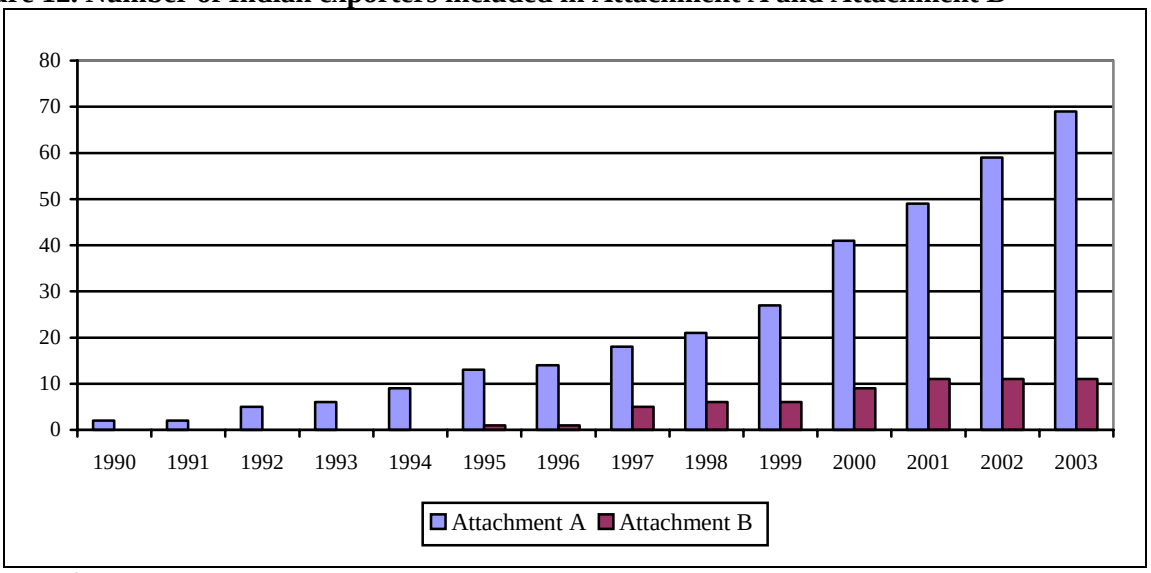
General Hygiene Requirements

Historically, India has faced a number of challenges meeting hygiene requirements for fish and fishery products in its major export markets, especially the EU and US. Over time, however, there has been a switch in the market, which at any time is acting as the major catalyst for change in food safety controls in India. Throughout the 1980s and early 1990s, the major source of problems for Indian exporters was the US. Since, the mid-1990s, however, their attention has switched to the EU. Until very recently, little or no problems were experienced in the Japanese market. However, in the last year or two, a major issue has arisen related not to food safety but to quality.

During the late 1980s, Indian exports of shrimp to the US were subject to high rates of border detention related to filth and/or decomposition. In 1979 the US imposed an import alert on all shipments. In January 1980, a certification program was agreed between the FDA and the Indian government that established an agreed list of exporters exempt from automatic detention. This program operated two years, through 1981, but was abandoned in 1982 because of high rates of violation by certified exporters, which continued for over a decade through 1993 and 1994. Subsequently**,** the FDA established its own registry of firms that were exempt from automatic detention based on their histories of compliance established through border inspections. The so-called Attachment A lists exporters of fresh and frozen shrimp, and Attachment B lists exporters of "higher risk" cooked shrimp that are not subject to further processing before consumption. The number of exporters achieving Attachment A or B status from 1991 to 2003 is detailed in figure 12.

When talking with exporters, one quickly understands the importance of achieving Attachment A or B status. The fact that an exporter is exempt from automatic border detention is a major selling point with potential US buyers. Indeed, many importers are reluctant to purchase from Indian exporters that are subject to automatic detention because of the additional costs and delays at the border, and the heightened risk of rejection. Thus, many exporters are caught in a vicious circle: not being able to attract customers because they do not have Attachment A or B status, but being unable to establish the record of compliance to achieve this status because of small export volumes. Reflecting this, a number of exporters without Attachment A or B status have chosen not to export to the US.

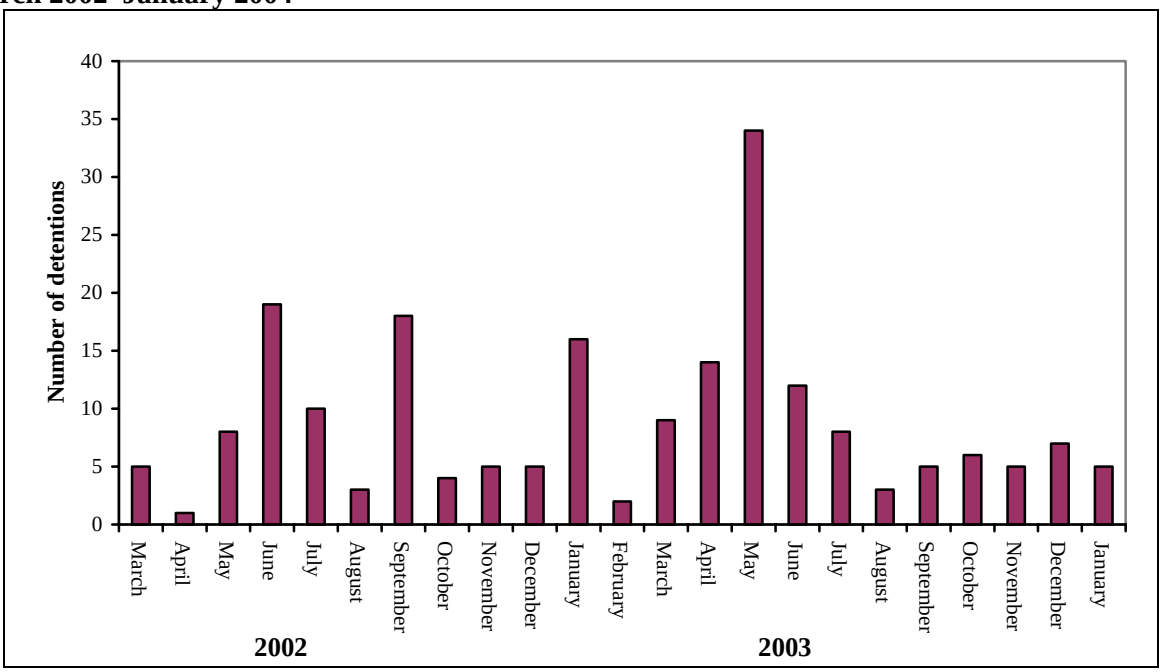
Figure 12. Number of Indian exporters included in Attachment A and Attachment B



Source: FDA.
Note: Attachment A refers to exporters of fresh or frozen shrimp; Attachment B refers to exporters of cooked shrimp.

All exporters to the US, whether having Attachment A or B status or not, are subject to minimum levels of border inspection. Rejection levels remain significant; it is not unusual for 10 or 15 consignments from India to be refused entry each month (figure 13). Major reasons for rejection are filth and *salmonella*, indicating the continued importance of general hygiene controls to accessing US markets. More general labeling issues are also an issue but account for a small proportion of total rejections.

Figure 13. Number of detentions of Indian fish and fishery products at the US border, March 2002–January 2004



Source: FDA.

Since the mid-1990s, the major concern has been compliance with the EU's requirements for hygiene throughout the fish supply chain, alongside the US requirements for HACCP to be implemented in fish processing facilities. Compared to many developing countries, the Indian government made efforts relatively early to comply with these requirements. New legislation implementing the required controls, and largely based on Directive 91/493/EC, was drafted in 1994 and passed into law in August 1995 through the Export of Fresh, Frozen and Processed Fish and Fishery Products (Quality Control, Inspection and Monitoring) Rules, 1995. Furthermore, specific procedures were laid down within the purview of this legislation for the approval of processing facilities for export to the EU. The Export Inspection Council (EIC) was designated the Competent Authority, with inspection and export certification undertaken by the five regional Export Inspection Authorities (EIAs).

In 1996 MPEDA put in place a "HACCP Cell" to assist the Indian fish and fishery products sector industry in the effective implementation of HACCP. The Cell's major activities include:

- Organizing training programs in HACCP basic principles and auditing for technical personnel and related departments in processing facilities
- Assisting processing establishments in the preparation and certification of HACCP manuals and certification of HACCP compliance
- Inviting consultants and officials from, for example, the FDA, FAO, and EC to update knowledge on HACCP and strengthen the technical base of MPEDA and the fish and fishery products sector
- Training MPEDA technical personnel in India and abroad on various aspects of HACCP, including HACCP auditing.

This initiative marked the first proactive move by the Indian government to enhance food safety controls in the fish and fishery products sector. Arguably, the initiative was mainly motivated by the impending requirement for HACCP to be implemented in facilities exporting to the US, but it also formed the basis of efforts to bring about compliance with EU regulations.

Despite these efforts to implement regulatory reforms, inspections by the European Commission in April 1997 identified significant noncompliances, especially related to standards of hygiene, in processing facilities that had been approved by the Indian Export Inspection Council (EIC) for export to the EU. Even before these inspections, the Commission was skeptical that the large number of plants (347) that were included on the list of approved facilities provided by the EIC all could meet EU requirements, and the EC voiced its concerns to the Indian government. Indeed, the inspections were undertaken within the context of existing concerns about the efficacy of hygiene controls on fish and fishery products in India that had been motivated by the detection of *salmonella* in consignments through border testing in certain Member States. Following the April 1997 inspections, in May 1997 the Commission banned Indian exports of fresh crustaceans and cephalopods and imposed border testing for *salmonella* and *Vibrio* spp. for frozen products.[30] In July 1997 the requirement for border testing was further directed toward the detection, in particular, of *Vibrio cholerae* and *Vibrio parahaemolyticus*.[31] Subsequently, in view of the results of the inspection visit and the continued detection of *salmonella*, all exports of fish and fishery products from India were banned in August 1997, although consignments that had already left India were permitted to be imported until 15 September 1997.[32]

[30] Decision 97/334/EC.
[31] Decision 97/590/EC.
[32] Decision 97/515/EC revised by Decision 97/553/EC.

From August to November 1997, the Indian government made great efforts to reform its food safety controls and achieve compliance with EU requirements (section (6). Thus, when the European Commission undertook additional inspections in November 1997, it adjudged that the controls that were in place to be equivalent to EU legislation. Subsequently, the ban on exports of fish and fishery products was lifted in December 1997,[33] and India was added to List I of fully harmonized countries.[34] India had gone from a position in which exports of fish and fishery products were prohibited to full compliance with EU requirements and List I status in only six months. The European Commission undertook an additional inspection visit to confirm that these controls were being implemented, the results of which were positive.

The problems faced by India are rather ironic, in that the government had established quite elaborate food safety controls for agricultural and food exports in the 1980s, but these controls were liberalized in 1991 under pressure to diminish the regulatory burden on export industries. All fish processing facilities, regardless of whether they exported or not, were required (and still are) to be registered and licensed by the Marine Products Exports Development Authority (MPEDA) Furthermore, facilities that exported were under the control of the EIC, which operated a dual system of Consignment-Wise Inspection (CWI) and In-Process Quality Control (IPQC). Under CWI, consignments of designated products, including fish and fishery products, were required to be inspected by the EIA prior to export. Alternatively, plants could implement a certified system of IPQC, with only random spot-checks at the rate of 1 in 10 consignments by the EIA. This system required that these plants have prescribed quality control procedures in place. At the end of the 1980s, however, nonvoluntary inspection became almost a "bad word," and there was a strong business lobby for the liberalization of these requirements. Subsequently, in 1991 inspection and certification by the EIC became voluntary when written confirmation that this was not required by a foreign buyer was furnished. The immediate decline in the number of consignments certified by EIA Cochin under either the CWI or IPQC systems was apparent (table 2). In addition, in many of the plants in which IPQC had been established, systems of quality control began to break down at the very time that new hygiene requirements were being introduced by the EU.

Table 2. Consignments of fish and fishery products inspected by EIA Cochin, 1990–91 to 2001–02

Year	*CWI*		*IPQC*	
	Number	*Value (Rs, in Lakhs)*	*Number*	*Value (Rs, in Lakhs)*
1990–91	14,635	7,843	4,752	10,504
1991–92	15,815	9,609	7,342	18,740
1992–93	4,216	2,996	2,563	6,299
1993–94	327	278	407	955
1994–95	6	56	-	-
1995–96	41	-	27	0.3
1996–97	*	*	*	*
1997–98	795	739.	4,491	73,824
1998–99	127	763	5,051	79,716
1999–00	-	448	0	0
2000–01	79	-	0	0
2001–02	16	1.02	0	0

Source: EIC.
Note: * = not available.

The US FDA undertook an inspection visit to India in 2000. During this visit, some 30 processing facilities were audited. No major nonconformities were identified. An additional inspection visit is

[33] Decision 97/876/EC.
[34] Decision 97/877/EC.

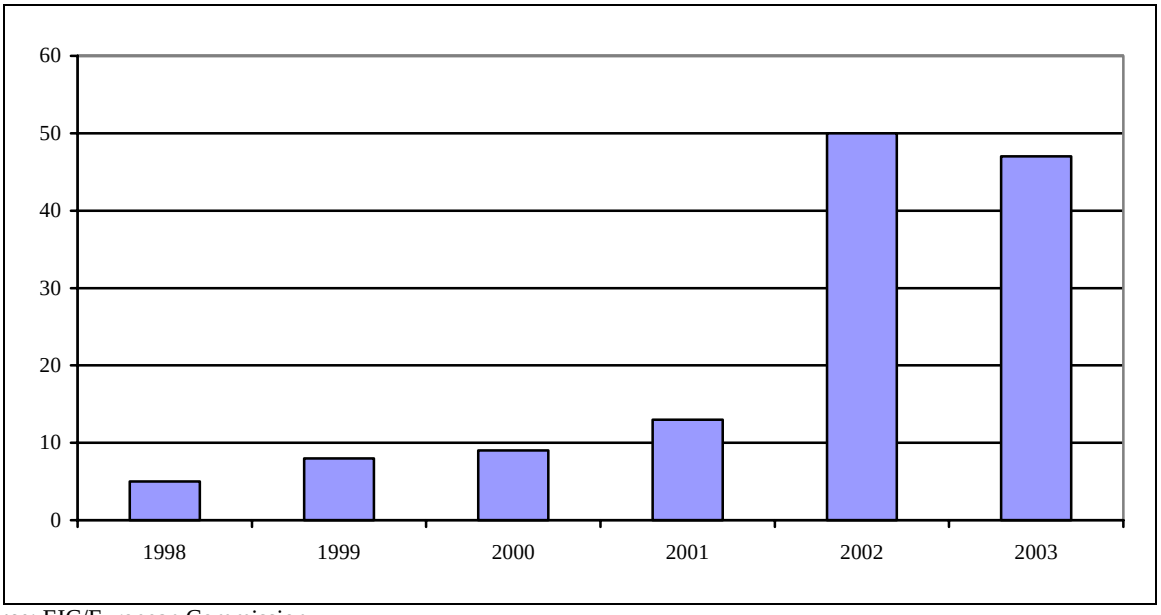
expected in the near future; indeed, the Indian government is encouraging the US authorities to come**.** India's invitation surely reflects the government's confidence in the food safety controls that have been put in place.

As happened in the US, exports of fish and fishery products from India are subject to relatively high rates of border rejections in the EU, even though India's List I status entitles it to lower rates of border inspection (figure 14). Indeed, rates of border rejections have increased over time. Recent rejections, however, are only infrequently related to broader hygiene uses, such as salmonella. Rather, new concerns have arisen related in particular to residues of antibiotics (table 3). While salmonella was a major issue in 1998, rates of rejection have declined in line with the implementation of stricter controls in processing facilities. Antibiotics and bacterial inhibitors became the prominent concerns through 2002 and 2004.

Antibiotic Residues and Bacterial Inhibitors

In 2002 and 2003, India was subject to high rates of EU border rejections because of antibiotics and bacterial inhibitors, with 27 and 22 consignments rejected, respectively. However, the European Commission has not imposed the same border testing requirements on India as suffered by some of India's major competitors. In part this differential reflects the fact that India's rate of border rejections has been lower than some of its major competitors, most notably, China, Thailand, and Vietnam. Furthermore, the Indian government responded to the emergence of the 2002 and 2003 rejections by prohibiting the use of antibiotics and other pharmacologically active substances in aquaculture, fearing that a ban might result in an outcome similar to China's if decisive action were not taken. Currently, however, India does not have the capacity to test to the level of the equipment employed in many EU Member States.

Figure 14. Number of consignments of Indian fish and fishery products rejected at the EU border, 1998–2003



Source: EIC/European Commission.

A related problem is the number of detentions relating to bacterial inhibitors, which encompasses such substances as antibiotics, preservatives, and chlorine. These detentions have mainly occurred in Italy and Spain. The Indian government has expressed concerns that consignments are being rejected on this basis without positive identification of the substance involved and whether it is prohibited.

Table 3. Kerala detentions of fish and fishery products at the EU border, 1997–2003

Year	*Salmonella*	*Aerobic mesophiles*	*Vibrio cholerae*	*Vibrio cholerae non-01*	*Vibrio parahaemolyticus*	*Faecal streptococci*	*S. Aureus*	*Antibiotic residues*	*Bacterial inhibitors*	*Heavy metals*	*Total*
1997	10	1	2	1	1	1	0	0	0	0	10
1998	0	0	1	0	1	0	0	0	0	0	2
1999	3	0	0	0	0	0	0	0	0	0	9
2000	2	0	1	0	0	0	1	0	0	0	4
2001	3	3	0	1	2	0	0	0	0	0	3
2002	4	1	1	1	1	0	0	5	9	0	22
2003	1	1	1	1	1	0	0	6	4	1	16

Source: EIC.

Heavy Metals and Environmental Contaminants

While Indian exporters have not faced major problems with limits on heavy metals and other environmental contaminants, for example, through high rates of border rejection, these are widely acknowledged to be an emerging issue particularly for exports to the EU. Thus, in August 2001 the Indian government established maximum levels for mercury, cadmium, lead, arsenic, nickel and chromium as well as a number of pesticides and other contaminants in fish and fishery products. These levels were revised down in July 2002. Likewise, in April 2003 the government specified a maximum level for dioxins that is equivalent to that of the EU (4pg/g fresh weight). The one problem India faces, however, is testing capacity. In the case of dioxins, for example, existing equipment can only test to 4ug/g fresh weight.

Quality and Other Problems

While food safety controls have not emerged as an issue with India's exports of fish and fishery products to Japan, recently, major problems have developed related to the quality of shrimp from aquaculture production. As a direct result, exports of shrimp to Japan have collapsed. Specifically, a "muddy-moldy" smell has been experienced with approximately 10 percent of cultured shrimps originating in India, particularly one region of Andhra Pradesh. The smell results from naturally occurring compounds such as geosmin and methyllisoborneol, which are metabolic by-products of blue-green algae (cyanophytes) and bacteria (actinomycetes). The smell emerges when the shrimp are cooked and cannot be detected in the raw product. This problem has been experienced in Thailand in the past and has been traced to poor husbandry practices whereby ponds are not cleaned regularly and waste materials build up, leading to algal bloom.

Impact on Fish and Fishery Product Exports

Without an econometric analysis, which is beyond the scope of the current study, it is difficult to ascertain with any certainty the precise ways in which these food safety and trade issues have affected exports of fish and fishery products from India. On the one hand, while there have been discrete events that clearly have impacted exports, for example, EU's 1997 ban on India's exports, Indian competitiveness overall has been influenced by the costs and other impacts more generally of implementing enhanced food

hygiene and other food safety controls. On the other hand, there are various other factors that have influenced the competition that Indian exporters have faced from other countries, notably China, Thailand, and Vietnam. In part, food safety controls have also had an influence in this respect. From 2001–2003, all of these countries have faced restrictions on exports to the EU, such as restrictions related to residues of antibiotics. However, national government policies and broader changes in production costs have undoubtedly also been important. Nevertheless, it is worthwhile examining the ways in which Indian exports of fish and fishery products have evolved when food safety or quality problems have emerged. In particular, this study will examine the EU's 1997 restrictions on imports related to microbial contamination and quality problems that caused a "muddy-moldy" smell. These restrictions resulted in a decline in India's exports to Japan through 2002 and 2004.

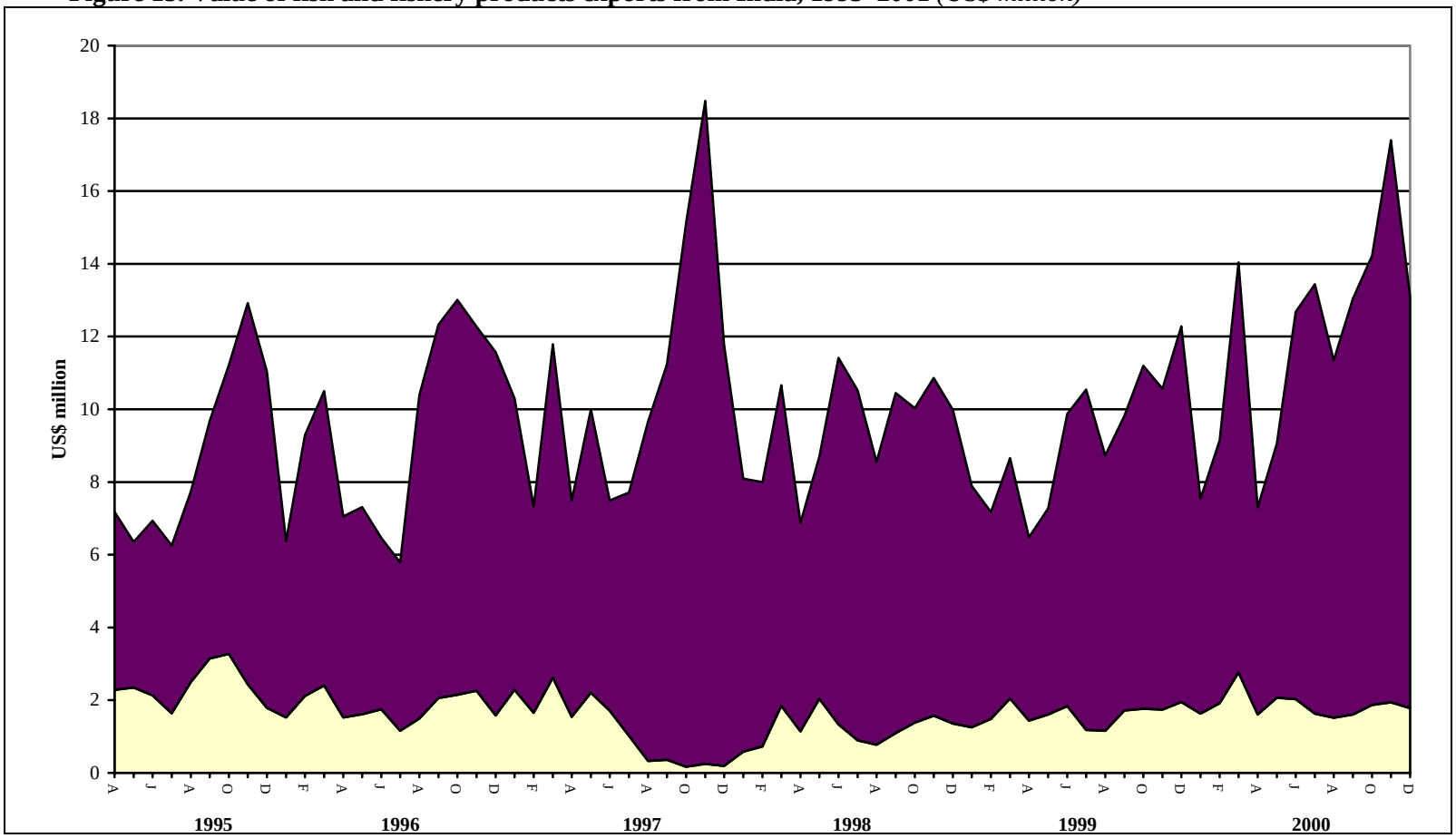
Perhaps not surprisingly, the direct impact of the testing requirements and then ban on exports imposed by the European Commission over the period May to December 1997 was a decline in the value of exports to the EU both from Kerala and India as a whole. Thus, Indian exports of fish and fishery exports declined from US$221 million in 1996–97 to US$114 million in 1997–98 (figure 15). Exports of shrimp, in particular, declined from US$137 million in 1996–97 to US$54 million in 1997–98. Likewise, exports of fish and fishery products from Kerala declined from US$96 million in 1996–97 to US$51 million in 1997–98.

Despite the loss of EU markets, over the period 1997–98, exports of fish and fishery products actually increased; the decline in exports to the EU was more than offset by increased exports to other countries. Thus, total fish and fishery product exports expanded from US$1,153 million in 1996–97 to US$1,296 million in 1997–98. In real (constant 1995 prices) terms, exports also increased from US$1,058 million in 1996–97 to US$1,109 million in 1997–98. Indeed, there was a sharp hike in exports to non–EU countries toward the end of 1997, which overshadowed the drop in trade with the EU. In particular, exports increased to Japan and South Asia. Thus, Japan accounted for 67.9 percent of exports of fish and fishery products in 1997–98 compared with 62.6 percent in 1996–97. Likewise, the contribution of exports to Southeast Asia increased from 4.3 percent in 1996–97 to 7.3 percent in 1997–98.

Following the removal of restrictions imposed by the European Commission in December 1998 and the recognition of hygiene controls in India as equivalent to those in the EU, exports to that market began to recover. Thus, Indian fish and fishery exports to the EU valued US$161 million in 1998–99 and US$210 million in 1999–00. Exports to the EU reached US$225 million, finally exceeding their pre–1997 level, in 2000–01. Likewise, exports of shrimp increased to US$89 million in 1998–99, US$121 million in 1999–2000 and US$137 million in 2000–01. Kerala exports of fish and fishery products to the EU recovered more rapidly, increasing to US$66 million in 1998–99 and US$97 million in 1999–00. However, overall, exports of fish and fishery product from India through 1998–99 and 1999–00 were actually lower in 1997–98. This decline suggests, perhaps, that the period in which restrictions were applied by the EU fortuitously coincided with a sudden and not sustained surge in global demand.

The quality problems experienced with exports of aquaculture–produced shrimp to Japan evolved gradually over time and have been more protracted than the restriction on exports to the EU. The gradual and long-term impact of these problems makes it even more difficult to isolate the impact on trade. It is evident, however, that fish and fishery product exports to Japan have declined markedly in recent years. While Indian exports were valued at US$563 million in 2000–01, they declined to US$383 million in 2001–02 and US317 million in 2002–03. Thus, Japan's share of exports declined from approximately 50 percent in 1998–99 to 40 percent in 2000–01, 30 percent in 2001–02 and 22 percent in 2002–03. Likewise, exports of shrimp to Japan declined from US$563 million in 2000–01 to US$338 million in 2001–02 and US$317 million in 2002–03. It is not clear, however, that this quality problem had a significant impact on overall exports; the value of exports was actually higher in 2000–01 and 2001–02 than in 1999–00. Clearly, exporters were able to divert to other markets, as they had done during the period of restriction on exports to the EU.

Figure 15. Value of fish and fishery products exports from India, 1995–2001 *(US$ million)*



Source: MPEDA.

6. Government Initiatives to Address Food Safety and Quality Concerns

In response to the evolving food safety and quality standards for fish and fishery products in its major export markets and, in particular, the specific safety and quality-related problems that exporters have faced, the Indian government has implemented a series of regulatory reforms and made infrastructural investments. At the same time, the government has provided financial and other forms of support to the fish processing sector in its efforts to upgrade food safety controls. This section reviews each of these initiatives in turn.

Regulatory Controls

As described in section 5, the Indian government has implemented a series of regulatory reforms in response to the evolution of food safety standards in its major export markets, most particularly, the EU. Thus, for example, India has largely harmonized its regulations related to hygiene through the export supply chain for fish and fishery products with the EU's Directive 91/493/EC. However, these reforms in themselves represent a minor element of the ways in which the Indian government and the fish and fishery products sector has responded to the challenges posed by the emergence of stricter food safety requirements. Indeed, while India implemented these legislative reforms as early as 1995, they did not prevent a ban being imposed by the European Commission in 1997 because of concerns about the efficacy of hygiene controls in the fish and fishery products processing sector. It is evident that the necessary monitoring and enforcement measures by the Indian government were not put in place until the loss of EU markets forced them to act. Since that time, however, it is also evident that quite rigorous and strict controls have been put in place that could be considered to impose rather onerous requirements on the processing sector.

The Export Inspection Council (EIC) is an autonomous body under the Ministry of Commerce and Industry of the Government of India. Established in 1964, it is charged with preshipment inspection and certification of designated export commodities. The EIC has a staff of approximately 1,000, including 300 inspectors, laboratory analysts, and other technical personnel. The council establishes overall policy on inspection and certification services in India and provides strategic controls across the country. Its powers include the notification of commodities for which export inspection and certification is required, setting standards, and specifying the form of quality control and/or inspection to be put in place. Inspection functions themselves are performed by five regional Export Inspection Authorities (EIAs). In the case of Kerala, inspection is the responsibility of EIA Cochin. In 1997 the EIC was designated as the Competent Authority for the purpose of approving fish processing plants for export to the EU (as well as other destinations) and for providing the necessary certification of product consignments. Each EIA has laboratory facilities, four of which have capacity to perform the full range of tests required.

As described above, fish and fishery products, along with a long list of other designated commodities, were subject to compulsory inspection by an EIA until the end of 1991, when the system was liberalized. As part of the reform of India's standards for hygiene in fish and fishery products in 1995, fish and fishery products were again subject to compulsory inspection and certification. Initially, the EIC invoked the existing IPQC system, causing an immediate jump in the number of certified processing facilities. However, in 1999 a more comprehensive Food Safety Management Systems-Based certification (FSMSC) was introduced, not only for fish and fishery products but also eggs and egg products and milk and dairy products, for which India

would like to obtain approval to export to the EU. Fish processors wishing to export must be certified under this system. Of the certified plants in 2001–02, approximately 29 percent were in Kerala.

Within the FSMSC system, additional requirements were laid down for processing plants wishing to export to the EU (see below). Indeed, the EIC established a specific scheme for the approval and monitoring of fish and fishery product processing facilities wishing to be EU approved in November 2001. These additional requirements include mandatory integrated preprocessing and ice production and specific limits on the daily output of processing facilities based on water treatment, ice production, and freezing capacity. More intensive inspection is also applied to EU-approved facilities. In certain cases, these requirements actually surpass EU standards, reflecting the risk aversion of the Indian government and its interpretation of the practicality of implementing effective hygiene controls in the Indian context. The fact that non-EU-approved plants have been subject to lower standards also reflects the quite considerable costs and changes in operating procedures required by many plants to become EU compliant. Of the 124 EU-approved processing facilities in India, approximately 44 percent were in Kerala in 2002–03.

When the EU undertook inspection of facilities that had been approved by the Indian government for export to the EU, it identified serious deficiencies. Subsequently, the EIC implemented a rather complex process of factory approval that provides a system of checks and balances. Under this system, a factory applies for approval and then is inspected by the regional EIA. If the factory is determined to be to the required standard, it is put forward by the EIA to an Inter-Departmental Panel (IDP), which comprises representatives of the Marine Products Development Authority (MPEDA), Central Institute for Fisheries Technology (CIFT), and Seafood Exporters Association of India (SEAI). Subsequently, the facility is audited by a Supervisory Audit Team consisting of a senior CIFT scientist and the Director of MPEDA. If the facility is deemed to meet the specific requirements, it is recommended for approval by the EIC for two years.

Once a plant has been approved for export, the EIA implements a system of inspection that focuses resources on any plant that is performing less well in terms of hygiene standards and those that are EU approved.[35] The cost is covered by a monitoring fee equal to 0.2 percent of the FOB value of exports.

The EU requires that all elements of fish processing operations are under the control of the approved facility or that any separate operations are approved independently. In the case of the Kerala fish processing sector, the main issues relate to ice production and preprocessing. Traditionally, most processors have purchased shrimp, squid, and cuttlefish from independent preprocessors or have had preprocessing undertaken by independent operators under contract. Likewise, many purchased ice from independent ice plants. In view of the results of EU inspection of independent preprocessing units and skeptical about the ability of fish processors to maintain control over such operations, in 1997 the EIC mandated that all preprocessing, and also ice production, be integrated into EU-approved processing facilities. EIA stipulated a maximum

[35] Non-EU-approved plants are subject to a standard inspection level of once per month, whereas EU-approved facilities initially are inspected every two weeks. Subsequently, EU-approved facilities that maintain compliance are subject to incremental declines in inspection frequency. After one year, the level of inspection declines to monthly. If the plant continues to comply for an additional 6 months, inspections decline to once every 2 months. Plants that continue to comply for an additional 6 months are place on the lowest inspection frequency: once every 3 months. Supervisory visits are undertaken by the Deputy-Director of the regional EIA every 3 months with inspections frequencies of 2 weeks or monthly, and every 6 months with inspection frequencies of every 2 or 3 months**.** Whenever a complaint is made against a processing facility, the plant returns to an inspection frequency of every 2 weeks for a minimum of 6 months.

daily output for each EU-approved facility on the basis of (among other things) the installed preprocessing and ice production capacity. In October 2001 procedures were published for the approval of independent preprocessing and ice production units, although none has been inspected and certified by the EIC to date**.** This issue is discussed further in section 8.

In view of the rapid evolution of food safety requirements in the EU, the Indian government has clearly learned the importance of effective flow of information on new legislation. There is an agricultural advisor in the Indian embassy in Brussels, headquarters of the EU, who is responsible for monitoring the EU's regulatory developments and sending information back to New Delhi.[36] Interestingly, however, while MPEDA has an office in both New York and Tokyo, it does not yet have an office in Brussels, where fisheries issues are dealt with by the Indian embassy. The information from the EU flows to the Ministry of Commerce and Industry, from which it is distributed to the EIC and MPEDA, which pass it on to local EIAs and the SEAI.[37] The EIC is making efforts to improve its monitoring of emerging issues through the creation of a computerized database on the regulatory requirements of India's main export markets.

The Indian government has also implemented rather elaborate procedures to address the problems associated with border rejections, most notably in the EU. India is concerned that high rates of rejection associated with a particular issue can result in the implementation of protective measures by the European Commission, as occurred against India itself in 1997 and against China in 2001. Thus, if an alert is issued by an EU Member State through the European Commission, India's Ministry of Commerce and Industry, EIC, and MPEDA are notified through the Indian embassy in Brussels. Conversely, such a system through which information on border detentions is collected and communicated back to New Delhi has not evolved in the US. This absence reflects the Indian government's focus of attention and resources on the major "problem" market on a day-to-day basis, namely, the EU.

Quality-related issues vis a vis *any* importing country are referred to the Regional Standardizing Committee on Quality Complaints (RSCQC) to identify whether testing is required to identify and address the problem. In the case of food safety issues, the exporting plant is put "on alert" and visited within one week by an EIA inspector or the IDP to undertake an assessment. Subsequently, the plant is subject to inspection every 2 weeks for a minimum period of 6 months. Furthermore, in the case of exports to the EU, 10 consignments from the plant are subject to inspection and verification by the EIA, selected at the rate of 1 consignment in every 4. For exports to other markets, inspections are done until 5 clear consignments are achieved. For complaints related to residues, 3 days' production is tested. There is no requirement for monitoring visits. The number of plants "on alert" over the period 1996–97 to 2002–03 is given in figure 16.

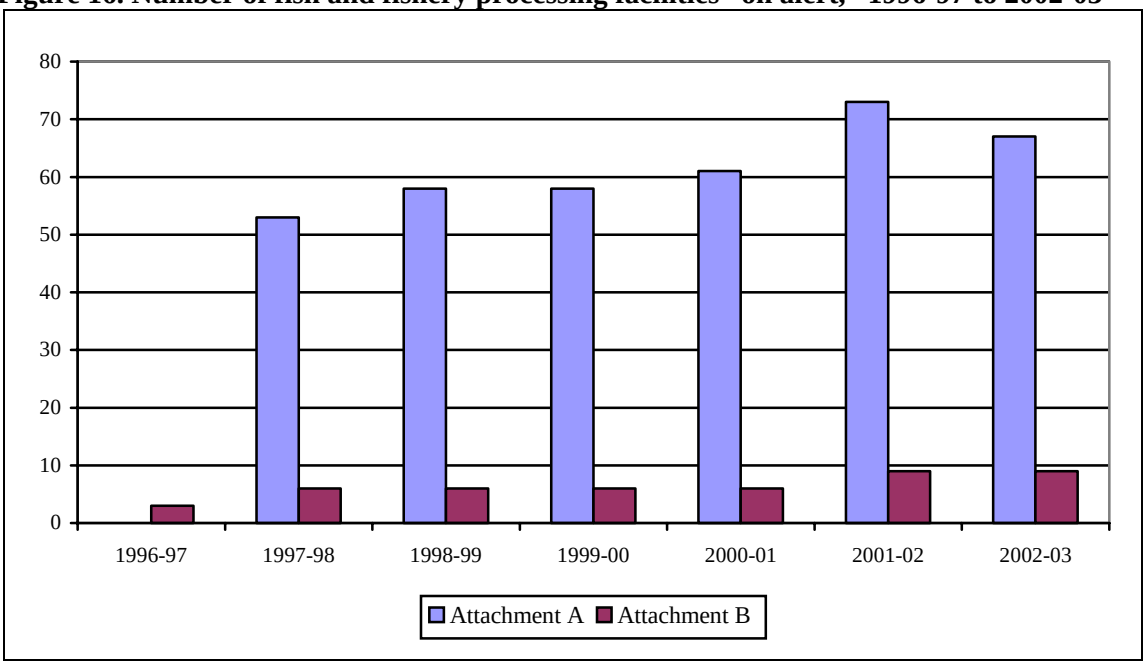
As an example of the decisive action taken by the EIC in response to EU border detentions, on 21 September 2002, 5 processing establishments were required to stop production because of multiple detentions related to antibiotic residues. These included some of the largest exporters of fish and fishery products in India. Furthermore, all other facilities with single rejections were subject to CWI; this requirement encompassed an additional 17 units across India. In this case, the Indian government was attempting to prevent restrictions being put in place by the European Commission as had occurred with a number of India's major trading partners. The EIC is of the

[36] MPEDA has made a request to the Ministry of Commerce and Industry for an office in Brussels although funding has not been allocated to date.

[37] As an example, EU Regulation 178/2002, which lays down general requirements and procedures for safety in the EU, was issued on 28 January 2002. It arrived at the Indian embassy in Brussels on 15 February and reached the EIC on 7 March. The SEAI obtained a copy on 9 March.

view that, when problems occur, it is imperative that the Indian government shows it is taking action. The exporters subject to these restrictions, however, were far from happy and lobbied for their removal. Thus, on 11 October 2002, the inventory held by these 5 facilities was permitted to be exported to non-EU destinations under CWI. Furthermore, the 5 processors were permitted to produce and export marine fish (except shrimp) to non-EU destinations under CWI. On 17 October, all restrictions were removed.

Figure 16. Number of fish and fishery processing facilities "on alert," 1996-97 to 2002-03



Source: MPEDA.

The inspection and laboratory testing regime (see next section) implemented by the EIC to monitor EU-approved plants imposes a not inconsiderable burden on regional EIAs. The estimated cost per plant is US$6,444/annum (table 4). This cost implies a total annual cost for EIA Cochin of monitoring EU-approved plants in Kerala of approximately US$341,000 in 2003–04, and a cost for all of India of approximately US$876,000 (figure 17). As a proportion of the value of exports to the EU, this cost is rather miniscule at approximately 0.3 percent. However, the income of EIA Cochin, for example, has declined in both nominal and real terms over the period 1991–92 to 2002–03, despite the considerable increase in inspection and other activities associated with the approval of EU (and to a lesser extent non–EU) processing facilities since 1997. Indeed, reflecting the increased importance of fish and fishery products to the activities of EIA Cochin, related inspection fees accounted for approximately 69 percent of total income in 2001–02. EIA Cochin, however, had an operating deficit of almost US$138,000 in 2002–03, and, given current levels of funding, there are concerns regarding its sustainability in the medium term.

Table 4. Estimated annual cost of approval and monitoring of a single EU-approved fish and fishery product processing establishment, 2003 *(US$)*

Activity	*Elements*	*Estimated cost (US$)*
Approval	Processing and desk audit	20.6
	Assessment of establishment	205.7
	Approval certification	41.1
	Total:	267.4
	Annual cost	133.7
Monitoring of establishment	Fortnightly inspection by EIA officer	43.2
	Testing of samples taken by EIA officer	169.7
	Annual cost	5110.1
Testing samples	Quarterly monitoring of environmental contaminants	822.9
	Intra-/inter-laboratory comparison	212.9
	Annual cost	1035.8
Supervisory checks	Quarterly supervisory visit	41.1
	Annual cost	164.6
Total		**6,444.1**

Source: EIA Cochin

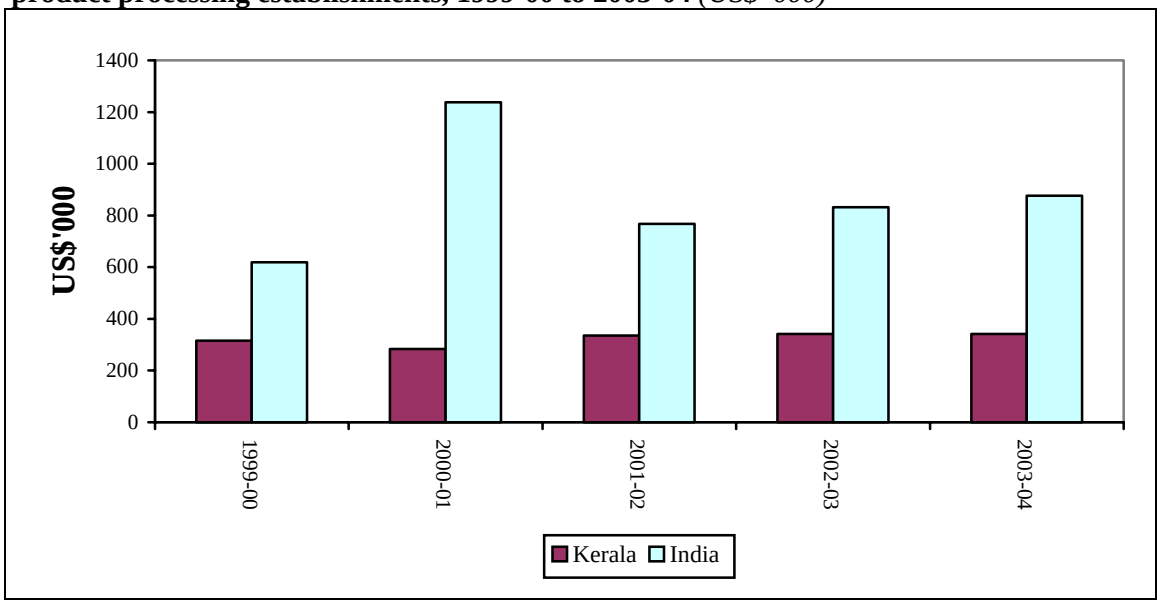
Laboratory Testing Capacity

The laboratory facilities operated by EIA Cochin were relatively small until the upscaling required to comply with EU requirements in the mid- to late 1990s. Indeed, there had been a significant decline in capacity through the mid-1990s that reflected the reduced demand for laboratory testing following liberalization of the CWI and IPQC systems in 1991. Thus, the number of samples tested by EIA Cochin declined from 33,396 in 1990–91 to a low of 224 in 1993–94. This huge drop was exacerbated by a voluntary retirement scheme in 1994 through which there was a loss of labor, expertise, and experience.

Considerable investment has been made in upgrading laboratory facilities, aimed in particular at the ability to perform the full range of microbiological and chemical tests required to comply with EU requirements. Thus, the total number of tests undertaken of fishery product samples by EIA Cochin increased from 4,203 in 1995–96 to 24,637 in 2001–02. To date, upgrades of the EIA Cochin's main laboratory have involved an investment of approximately US$64,657. However, because this laboratory has severe space constraints, land has been acquired and construction started of a new facility. Furthermore, following the recommendations of the European Commission's inspections in April 1997, all 5 of the laboratories operated by EIA Cochin are process accredited and participate in interlaboratory comparisons. A quality manual has been drafted for these facilities, and EIA Cochin is working toward accreditation by the National Accreditation Board for Testing and Calibration Laboratories (NABL).

The MPEDA laboratory in Cochin recently installed new HPLC-MS/MS equipment to perform laboratory analysis of antibiotics residues, at a cost of approximately $280,000. However, the operation of this equipment was delayed by a lack of appropriately trained technicians. The ultimate goal is to have 9 laboratories nationwide that are equipped in this way, some of which may be operated by other agencies under a Memorandum of Understanding with MPEDA.

Figure 17. Estimated total cost of approval and monitoring of EU-approved fish and fishery product processing establishments, 1999-00 to 2003-04 *(US$ 000)*



Source: Own calculations.

In addition to laboratories operated by the EIA and MPEDA, there are 3 private laboratories in Cochin that play an important role in bolstering the State's analytical capacity. These private laboratories are used by processing facilities for routine tests, for example, of water and ice, and for certain residues prior to export. While these laboratories do offer tests for antibiotic residues, these tests are less sophisticated than those undertaken by EIA and MPEDA and do not provide the required level of sensitivity for export.

Despite these upgrades in both facilities and procedures, both EIA Cochin and MPEDA are unable to perform all of the tests for residues and contaminants required, especially for exports to the EU. In fact, they are caught up in a seemingly continuous process of equipment upgrade and staff training to keep on top of emerging issues. Keeping up with current requirements is an issue particularly for contaminants for which the limit is set at the LOD. As new testing equipment is installed in export markets, previously undetectable residues become an issue, and the regulatory authorities in India must themselves upgrade their testing capacity to prevent border detentions. Recently, funding totaling €8 million has been approved by the European Commission for EIC projects related to certification, accreditation, and related issues. These projects include laboratory accreditation, organic certification, accredited systems for the award of CE marks (for the export of electronic equipment to the EU**),** and risk analysis studies.

Support to the Fish Processing Sector

MPEDA has implemented various programs to support improvements in hygienic controls and other food safety practices in the fish processing sector. These programs include subsidy programs to upgrade processing facilities and train managers and workers through the fish and fishery products supply chain. Each is described in turn below. Clearly, MPEDA recognizes the importance of enhancing food safety controls as part of its mandate to promote fish and fishery products exports from India.

MPEDA operates a range of subsidy schemes to assist fish processing facilities in upgrading their facilities to comply with stricter hygiene requirements (tables 5a–5d). Most of these schemes

offer a maximum subsidy of 25 percent of the cost with a maximum subsidy ceiling. Since 1996 these subsidies have covered the installation of flake, chip, and tube ice-making machines; upgrading of deficient cold storage; and installation of generator units as a back-ups in the case of power failure. In 1999 these schemes were extended to cover the purchase of insulated fish boxes and, in 2000, the upgrading of chill rooms and installation of water and effluent treatment facilities. The total cost of subsidies to upgrade processing facilities over the period 1996–97 to 2002–03 was approximately US$1.8 million.

MPEDA's subsidy programs also cover the costs of establishing quality control laboratories (table 5e). The subsidy is at the rate of 50 percent of the cost subject to a maximum of Rs50,000 per unit. MPEDA also offers subsidies to establish integrated preprocessing facilities (table 5e). This subsidy amounts to 50 percent of the cost, to a maximum of Rs1.5 million per unit. In 1999–2000, an additional subsidy to cover the cost of renovation/modification was introduced equal to 45 percent of the cost, to a maximum of Rs1.35 million. The amounts disbursed under this program and the numbers of processing units supported from 1996-97 to 2003-04 are summarized in table 5e. In 1996–97, a one-off program of support for preprocessing facilities to purchase stainless steel tables was also offered. This program supported 11 preprocessing units through the disbursement of US$12,730. The total cost of subsidies to establish integrated preprocessing facilities over the period 1996–97 to 2002–03 was approximately US$3.7 million.

Table 5a. Support to upgrade fish processing plants, 1996-97 to 2002–03 *(US$)*

Year	*Ice-making facilities*		*Cold storage facilities*	
	Units	*Cost (US$)*	*Units*	*Cost (US$)*
1996-97	9	25,400	2	3,979
1997-98	8	22,031	5	10,327
1998-99	21	84,006	5	8,944
1999-00	27	114,412	2	3,484
2000-01	27	112,011	4	6,675
2001-02	52	201,967	2	9,007
2002-03	23	94,960	4	13,351
Total	**167**	**654,786**	**24**	**55,767**

Table 5b. Support to upgrade fish processing plants, 1996–97 to 2002–03 *(US$)*

Year	*Insulated fish boxes*		*Generator sets*	
	Units	*Cost (US$)*	*Units*	*Cost (US$)*
1996-97	-		16	18,062
1997-98	-		13	33,872
1998-99	-		9	26,952
1999-00	52	45,361	10	43,688
2000-01	57	41,898	17	78,724
2001-02	72	60,081	23	97,423
2002-03	88	60,399	23	86,340
Total	**269**	**207,740**	**111**	**385,061**

Table 5c. Support to upgrade fish processing plants, 2000–01 to 2002–03 *(US$)*

Year	*Chill rooms*		*Water purification facilities*	
	Units	*Cost (US$)*	*Units*	*Cost (US$)*
2000-01	22	81,883	14	43,946
2001-02	20	81,634	48	103,950
2002-03	20	87,389	23	54,495
Total	**62**	**250,907**	**85**	**202,391**

Table 5d. Support to upgrade fish processing plants, 2000–01 to 2002–03 *(US$)*

Year	*Effluent treatment plants*		*Refrigerated trucks/containers*	
	Units	*Cost (US$)*	*Units*	*Cost (US$)*
1996–97	-	-	4	22,493
1997–98	-	-	0	0
1998–99	-	-	0	0
1999–00	-	-	0	0
2000–01	15	115,260	1	7,788
2001–02	23	165,748	14	97,190
2002–03	27	540,732	12	79,922
Total	**65**	**821,740**	**31**	**207,393**

Table 5e. Support to upgrade fish processing plants, 1996–97 to 2002–03 *(US$)*

Year	*QC laboratories*		*In-house preprocessing facilities*	
	Units	*Cost (US$)*	*Units*	*Cost (US$)*
1996–97	7	*	4	81,534
1997–98	17	22,435	7	202,269
1998–99	12	13,936	6	159,334
1999–00	18	20,880	24	463,500
2000–01	14	15,576	36	677,050
2001–02	30	31,047	55	876,234
2002–03	13	17,095	64	1,186,278
Total	**111**	**120,969**	**196**	**3,646,199**

Source (for tables 5a–5e)*:* MPEDA.
Note: * = missing data.

Interest subsidies also have been provided on investments to upgrade processing facilities (table 6). From 1996–97 to 2002–03, the associated investment by MPEDA totaled approximately US$1.2 million.

Table 6. Interest subsidy scheme to upgrade processing plants, 1999–2000 to 2002–03 *(US$)*

Year	*Units*	*Cost (US$)*
1999–00	11	57,763
2000–01	25	404,321
2001–02	56	477,133
2002–03	42	282,123
Total	**124**	**1,221,341**

Source: MPEDA.

MPEDA also provides and supports a number of training programs, both in general quality control procedures and HACCP. From 1996–97 to 2001–02, 29,110 fishers, 20,363 preprocessing workers, and 15,745 processing workers received basic quality control and hygiene training.

More generally, MPEDA provides advice to both preprocessing and processing facilities on deficiencies in their hygiene controls.

Upgrading Landing Facilities

The one area in which the Indian government has failed to take decisive action to enhance hygiene controls is at landing centers. On multiple occasions, the EU has highlighted them as an area of weakness, and there are concerns that they could be a major issue when the European Commission next undertakes an inspection mission. Despite these facts, hygiene standards at landing centers have remained largely unchanged. In part, this lack of action reflects the fact that, in practice, the EIC and MPEDA have very little direct control over these facilities. In the case of Cochin, for example, the landing center is the responsibility of the Cochin Port Trust. Furthermore, exports account for a relatively small (although not insignificant) proportion of the total landed catch handled at each center, meaning that there is little impetus for investment in enhanced facilities. In theory, as the Competent Authority, the EIC—through EIA Cochin—could enforce higher standards, but doing so is considered impractical since it would, in effect, halt exports. Instead, the EIC and MPEDA have resorted to the provision of advice and supported proposals to develop alternative facilities that are under the direct control of fish and fishery product exporters (see below).

However, funding is being made available to upgrade landing sites in Kerala. The Ministry of Commerce and Industry, through the Assistance to States for Infrastructure Development for Export (ASIDA), has allocated funds to Kerala, Andhra Pradesh, and other states. In Kerala, Munamba port is being upgraded as a pilot project. A problem faced with all ports, however, is maintenance once these improvements have been made. Typically, user fees are low and inadequate to cover operating costs. In addition, they are paid to a consolidated fund at the state level rather than to the operating budget of the ports themselves. MPEDA has suggested that these fees be enhanced and retained at each landing site.

Besides upgrading landing facilities, efforts have been made to improve handling practices on fishing boats. For example, MPEDA has provided a subsidy for a limited number of boats to purchase plastic boxes and install an insulated hold as a demonstration project. More generally, there has been a major campaign in India (and in Kerala in particular) over some time for the use of ice on fishing boats, and this practice is now almost universal.

Promotion of Good Production Practices

MPEDA has also been working with the fish and fishery products sector to establish and promote codes of good practice to address emerging food safety and quality issues in India's major export markets. To address antibiotic use in aquaculture production of shrimp, MPEDA has made efforts to support the 2000 ban on nontherapeutic use. These efforts have involved monitoring usage levels, disseminating information, and training. Field campaigns have been organized by MPEDA in major production areas involving meetings with farmers and hatchery operators. MPEDA has also screened consultants to ensure that they provide the correct advice and support services to farmers and distribute information in the form of brochures and leaflets. One of the major problems in aquaculture production of shrimp, and a reason for the therapeutic use of antibiotics, is White Spot disease. MPEDA has produced a voluntary code of good practice for hatcheries to control this disease and established a testing service available to farmers when they buy new stock seed.

MPEDA is also promoting good practice to address the muddy-moldy smell that is having a serious impact on exports of shrimp to Japan. Good practice includes regularly cleaning ponds and holding shrimp in fresh water for two or three days prior to harvesting. This project is being undertaken jointly with the Network of Aquaculture Centres in Asia-Pacific (NACA) through a collective of 54 farmers who are acting as a demonstration for other producers. Work is also proceeding on a Good Aquaculture Practice (GAP) manual based on the responsible shrimp farming practices defined by FAO.

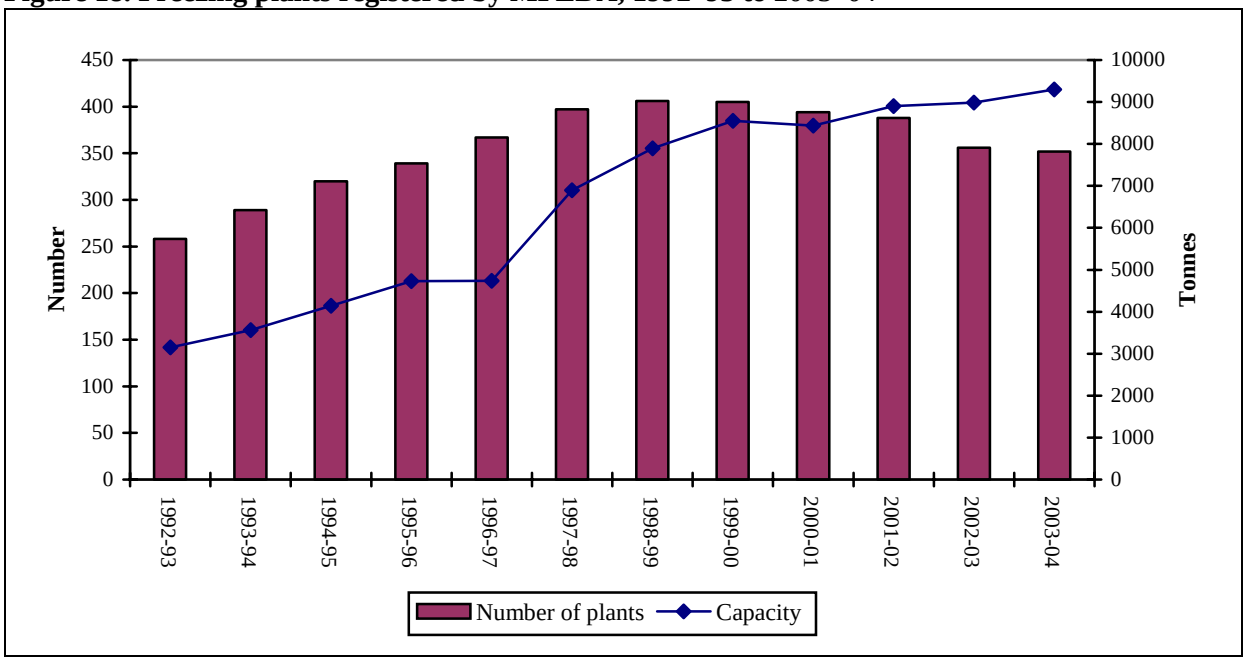
7. Impact of Food Safety Requirements on the Fish Processing Sector

Characteristics of the Fish Processing Sector

As described above, the fish processing sector consists of little more than facilities that peel and clean, in some cases cook, and then freeze crustaceans (in particular shrimp), cephalopods, and fish that are exported in bulk. In Kerala and West Bengal, these facilities traditionally purchased raw material in the preprocessed state. Products have traditionally been frozen in block form, although an increasing number of plants have installed capacity to manufacture Individually Quick Frozen (IQF) products. In most cases, Indian processing facilities add little value before export. Indeed, much of the product exported to the EU and (to a lesser extent) the US, is further processed and packaged in the importing country before sale to the final consumer. Most of the Indian businesses in this sector are family-owned, with very few limited liability companies. Only two or three companies have any foreign investment. The majority operate only one freezer plant, although there is a shift toward consolidated businesses that operate multiple plants.

From 1992–93 to 2003–04, the number of freezing plants registered with MPEDA increased by 34 percent from 258 to 352 (figure 18). Over the same period, however, total processing capacity in the sector expanded by 195 percent from 3,150 tons per day to 9,296 tons per day, reflecting investment in larger facilities. Thus, average plant capacity more than doubled from 12.2 tons per day to 26.4 tons per day. The availability of raw materials throughout much of the year has not kept pace with this expansion, however, and the sector overall is estimated to operate at less than 33 percent of capacity.

Figure 18. Freezing plants registered by MPEDA, 1992–93 to 2003–04



Source: MPEDA.

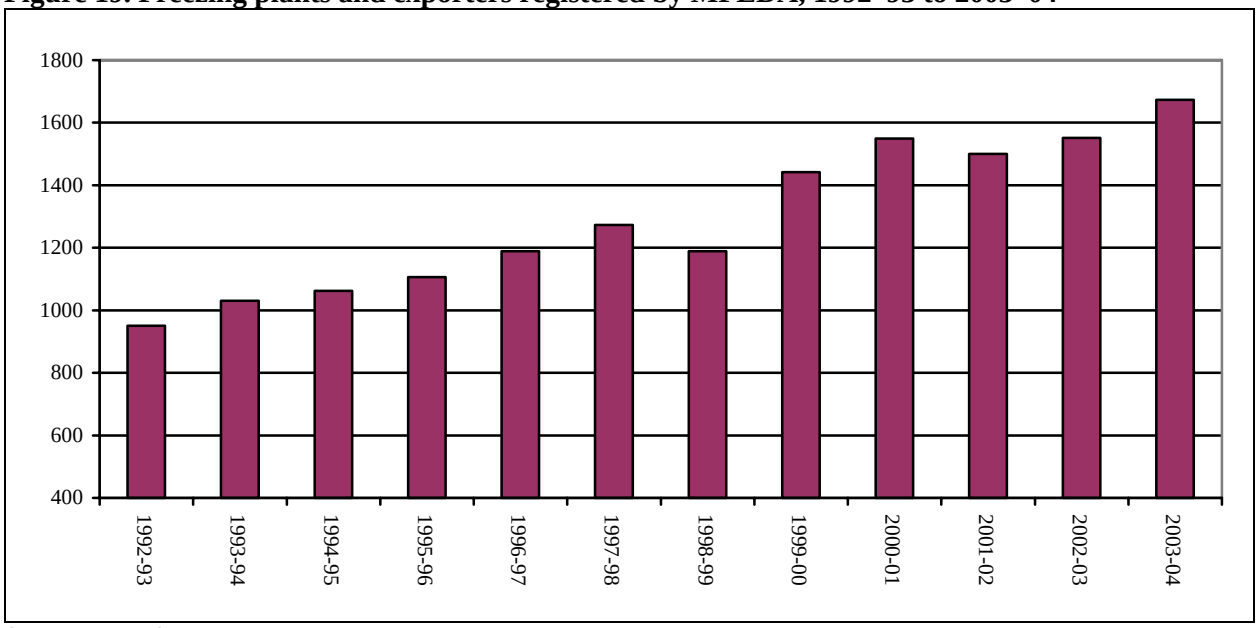
The fish and fishery products processing sector is almost entirely export-oriented, with very little product making its way onto local markets. Exports are quite highly concentrated. For example, the top 5 processors in Kerala account for approximately 20 percent of exports; and the top 10, approximately 34 percent. While there was no appreciable change in the level of concentration from 1996–97 to 2003–04, the sector is extremely dynamic, with changes over this period and from year to year in the importance of individual companies within overall exports.

Many fish and fishery products processors export via local agents, the number of which has increased in line with the processing sector. Some also export directly through their offices in major overseas markets. Thus, the number of exporters registered with MPEDA increased from 951 in 1996–97 to 1,673 in 2003–04 (figure 19). There was, however, an appreciable decline during 1997–98, when restrictions were applied on exports to the EU. This overall climb illustrates the low barriers to entry and exit at the processing end of the supply chain.

Upgrading Hygiene Standards in the Fish Processing Sector

While the processing sector expanded rapidly through the 1990s, hygiene controls did not keep pace with emerging requirements in India's major export markets. Some new facilities were established that had high standards of hygiene (in particular those opened by some of the larger exporters), but existing facilities were not upgraded. Even many of the new plants were not compliant with, for example, EU requirements. Today, much of the processing sector acknowledges that improvements were long overdue, and since the EU restricted Indian exports in 1997, standards of hygiene have shifted to an entirely different level. The costs of upgrading hygiene, however, have been considerable due, in a large part, to the protracted period over which these improvements had to be made and the strictness of the controls applied by the EIC in a bid to bring this about. At the same time, it is evident that industry's perceptions of the changes that it is required to make have tended to "amplify" the task or, at least, have generated rather inflated estimates of the time and cost required**.**

Figure 19. Freezing plants and exporters registered by MPEDA, 1992–93 to 2003–04



Source: MPEDA.

The changes required to comply with the hygiene requirements varied significantly among fish processing plants. Table 7 provides a summary of these changes based on in-depth interviews with 14 plants. In extreme cases, plants had to be extended and/or the entire layout needed to be changed, for example, to install preprocessing facilities or worker changing rooms, or to ensure a unidirectional flow of material to prevent cross-contamination between raw and processed materials. In addition, often the general fabric of the facility required upgrading with the replacement of floors so that they drained and could be easily cleaned, lighting, and ceilings. Many plants also had to install ice-making and laboratory facilities, upgrade their fresh and/or waste water treatment, and increase chill room capacity. In such cases, costs of compliance were generally highest. Across virtually all plants, a plethora of less onerous changes had to be made including the installation of air curtains and/or air conditioning, foot baths, wash basins with foot-operated taps, thermographs and purchase of new utensils, staff uniforms, and metal tables.

Across the surveyed plants, costs of compliance ranged from US$51,400 to US$514,300, with an unweighted and weighted mean of US$302,600 and US$265,492, respectively.[38] As a proportion of turnover in a single year (1997–98), these costs ranged from 2.5 percent to 22.5 percent, with an unweighted and weighted mean of 9.3 percent and 7.6 percent, respectively.[39] These figures do not include the value of lost production for plants that had to close during renovations. Many plants had to curtail production at some point during upgrading hygiene standards. When major construction work was required, limited production extended across a number of months.

Using the weighted mean cost, a very rough estimate of the nonrecurring costs of compliance with EU hygiene standards for fish and fishery products can be derived. In 2001 there were 51 EU-approved facilities in Kerala, suggesting an overall cost across the sector of US$13,540,092. This amount represents approximately 1.7 percent of the value of exports from Cochin over the three years (1994–95 to 1996–97) prior to the initial implementation of these investments. These rather high numbers reflect, to a large extent, the very specific characteristics of the fish processing sector in Kerala, namely, the historic use of independent preprocessing facilities (section 8). From interviews with fish processing companies the authors learned that *the installation of integrated preprocessing facilities was the most significant cost of compliance with the EU's requirements*, as implemented by the EIC.

Processing plants also had to implement significant changes to their operational procedures. The majority had not implemented HACCP. These plants were required to establish the necessary plans, control procedures, and documentation systems. Furthermore, cleaning, maintenance, and rodent and pest control procedures had to be enhanced. In many cases, quite extensive programs of worker training had to be undertaken. The cost of implementing these new procedures has, in many cases, been considerable including laboratory analysis, record-keeping, ongoing staff training, and maintenance of worker medical records. To undertake these tasks, new technical and supervisory staff have had to be employed, and/or better qualified (and more expensive) personnel were needed. Monitoring fees paid to the EIA have also increased significantly. In addition, the costs of preprocessing have had to be internalized within each processing plant. These costs are significantly greater than purchasing ready preprocessed raw material from independent facilities. Across the surveyed processing plants, the resultant increase in production costs ranged from 5 percent to 15 percent, with a weighted and unweighted mean of 11.7 percent and 10.3 percent respectively.[40] From the in-depth interviews with fish processors, again it is

[38] Here the mean is weighted according to the volume of production of each processing plant. The weighted mean is lower because a number of smaller plants had relatively high costs of compliance.
[39] Here the mean is weighted according to the volume of production of each processing plant.
[40] Here the mean is weighted according to the volume of production of each processing plant.

apparent that the majority of these costs are associated with the EIC's requirement to have integrated preprocessing.

Table 7. Costs of compliance with hygiene requirements for EU approval

Upgrade	*Plant*						
	Cluster 1			*Cluster 2*			
	1	*12*	*14*	*5*	*7*	*8*	*10*
Preprocessing facility	✓	✓	✓	✓	✓	✓	✓
Air cushion	✓	✓	✓	✓	✓	✓	✓
General construction	✓	✓	✓		✓	✓	✓
Air conditioning	✓	✓	✓	✓	✓	✓	
Ice plant	✓	✓	✓	✓	✓	✓	✓
Chill room	✓	✓	✓		✓	✓	✓
Laboratory facilities	✓			✓	✓	✓	✓
Water tank(s)	✓	✓	✓	✓	✓	✓	
Changing rooms	✓	✓	✓	✓	✓	✓	✓
Washrooms	✓	✓	✓	✓	✓	✓	✓
Water treatment plant	✓	✓	✓		✓	✓	
Tables	✓	✓	✓	✓		✓	✓
Effluent treatment plant	✓				✓	✓	
Thermographs	✓			✓	✓	✓	✓
HACCP	✓			✓	✓	✓	
Total Cost (US$)	102,900	205,700	450,000	411,400	205,700	246,900	411,400
Cost as % turnover	12.5	6.9	22.5	2.5	10.0	15.0	10.0
Production costs (%)	12	12	15	9	12	15	15
Capacity utilization (%)	50	50	45	35	40	30	30

Table 7 *contd.* **Costs of compliance with hygiene requirements for EU-approval**

Upgrade	*Plant*						
	Cluster 2		*Cluster 3*				*Cluster 4*
	11	*13*	*6*	*9*	*3*	*2*	*4*
Preprocessing facility	✓	✓		✓	✓	✓	✓
Air cushion	✓	✓	✓	✓	✓	✓	✓
General construction	✓	✓		✓			✓
Air conditioning	✓	✓	✓	✓	✓	✓	✓
Ice plant	✓	✓	✓	✓	✓	✓	✓
Chill room	✓	✓		✓	✓	✓	✓
Laboratory facilities	✓			✓			
Water tank(s)		✓	✓	✓	✓	✓	✓
Changing rooms	✓	✓	✓	✓	✓	✓	✓
Washrooms	✓	✓	✓	✓	✓	✓	✓
Water treatment plant	✓	✓		✓	✓	✓	
Tables	✓	✓		✓	✓	✓	
Effluent treatment plant				✓	✓	✓	✓
Thermographs	✓		✓	✓	✓	✓	✓
HACCP	✓		✓	✓			
Total Cost (US$)	400,000	514,300	51,400	82,300	406,700	442,300	305,600
Cost as % turnover	6.0	20.6	4.5	4.0	6.0	3.5	Closed
Production costs (%)	17	14	7	4	5	5	15
Capacity utilization (%)	35	35	45	60	45	50	Closed

Source: Survey results.

Examining the surveyed processing plants as a whole, it is possible to define 4 distinct clusters according to their nonrecurring and recurring costs of compliance, size of operation, capacity utilization, and prevailing hygiene standards. This categorization throws light on the determinants of the costs of compliance with enhanced hygiene requirements in the processing sector. *Cluster 1* comprises facilities that vary in size but that all have low levels of capacity utilization and relatively high additional production costs associated with enhanced hygiene controls. Overall, prevailing hygiene standards in these facilities was relatively low, as is reflected in generally high nonrecurring costs of compliance. *Cluster 2* includes both smaller and larger plants that have low levels of capacity utilization and high additional production costs. Prevailing hygiene standards among these plants was variable. *Cluster 3* consists of the largest plants that already had relatively good hygiene standards. These plants have high levels of capacity utilization with respect to the sector as a whole and relatively low additional costs of production associated with the enhancement of hygiene controls. Finally, *Cluster 4* consists of the sole firm that had ceased production.

Related to the integration of preprocessing into processing facilities, new procedures have been employed for the procurement of raw material. Fish processors now purchase directly from landing sites through independent agents who are paid on a commission basis. Many processors also employ supervisors at landing sites to check quality and prices. However, the final acceptance/rejection of raw materials occurs at the factory, at which point the agent is paid. In some cases, the factory itself transports the fish; in other cases, transport is the responsibility of the agent. Regardless, most processors provide ice that has been produced in their own facility. To the extent possible, many processors attempt to buy from a set pool of fishing boats. However, attempts to have direct links with fishers have generally failed. One major exporter provided ice and steam cleaned holds to enhance hygiene controls. However, because of the major competition among processors for raw material, the fishers wanted a commitment from the company that it would buy their entire catch, and these arrangements failed.

While the costs of hygiene improvements have undoubtedly been significant, a number of processors have highlighted the resultant benefits. In particular, many have recorded lower microbial counts on their end products, contributing not only to food safety but also lower levels of spoilage. Furthermore, some processors recognize that they now have greater control of the entire production process and expect to be able to enhance efficiency in the medium term. With their enhanced chill room capacity, which was one of the parameters used by the EIA in establishing allowable plant capacity, processors have also been able to store raw materials for longer periods, enabling them to take advantage of daily gluts in supply.

Ongoing Food Safety and Quality-Related Problems

The improvements made by the fish processing sector in Kerala mean that hygiene standards today are much improved and broadly in line with EU requirements. Yet, this compliance has not meant that food safety problems have gone away altogether. Indeed, food safety issues are a day-to-day challenge for fish and fishery product exporters, especially in the case of exports to the EU and US. Even infrequent border detentions and rejections enhance the risk of doing business. Thus, exporters continuously need to balance the risks and associated costs in deciding the type and quantity of products they will export to alternative markets.

Many exporters have experienced border detentions in the EU. Indeed, the risk of rejection has become a normal part of doing business in these markets. Thus, there is a standard clause in the Letter of Credit (LC) used by EU buyers stating that payment is “subject to health inspection at the EU port of entry.” Overall, therefore, the EU is regarded as the highest risk market. Border

detentions relate both to longstanding issues (such as *salmonella*) and new issues (most notably antibiotic residues, bacterial inhibitors, and *Vibrio parahaemolyticus*). Indeed, all of the major exporters interviewed had had at least one experience of border rejection. In some cases, the rejected consignment was redirected to other markets, for example, the Middle East or the United States. However, a number of exporters complained that their rejected consignments had been destroyed by EU enforcement officials without the exporters having been given the option to re-export. Estimates of the cost of a rejected consignment–including freight, storage, customs clearance, and interest on working capital–range from US$10,000–15,000.

The impact of border detentions on fish exporters is heightened by both the Rapid Alert system operated by the EU and the "On Alert" procedures employed by the EIC. When a consignment is detained at one port of entry to the EU, the exporter involved is subject to heightened inspection in all Member States. It can take a considerable period of time to be removed from the list, and the number of consignments required to be clear before the exporter is removed varies among EU Member States. Furthermore, any detentions result in heightened levels of CWI and monitoring of processing facilities by the EIA. In 2002, five processing establishments were closed altogether due to multiple rejections relating to antibiotic residues.

Many EU buyers are aware of the risk of border rejection and have implemented strategies to minimize their own risk of an interruption in supply. A number of major buyers, for example, UK fish processors and supermarkets, visit their suppliers in Kerala and undertake hygiene audits. Some have local agents that undertake periodic inspections and inspect consignments before they are dispatched. Many agents and/or their buyers require tests to be undertaken in local private laboratories, for example, those operated by SGS or Lloyds, for organoleptic and bacteriological parameters. Recently, a number of customers have also required tests for antibiotic residues. Some of the larger exporters have purchased kits to themselves test for antibiotic residues.

The risks of exporting to the EU are exacerbated by the payment terms typically applied by buyers. Whereas Japanese and US customers pay on receipt of the consignment, EU buyers typically take 90 to 120 days to pay. Thus, the working capital requirements associated with supplying EU markets are considerable. In addition, many exporters express concerns that buyers "find" problems in consignments even when they have passed border inspection if these buyers are facing problems of over-supply.

Exporters to the US generally report fewer problems than experienced in EU markets, although a number have experienced border rejections, most notably due to filth, decomposition, or *salmonella*. The biggest issue for exporters is achieving Attachment A or B status such that they are subject to lower levels of border inspection. A number of exporters reported sending multiple consignments that they hoped would be inspected to achieve a record of compliance. At the same time, however, they faced a greater risk of a rejection during this period. Exporters that had been included in Attachment A or B reported a competitive advantage because of the greater willingness of buyers to deal with them. In general, few US buyers undertake inspections of exporter facilities, and, where they do, typically focus on very general conditions rather than the specifics of quality control procedures.

In the case of Japan, virtually none of the interviewed exporters, MPEDA, or the EIC reported food-safety-related problems. However, these interviewees did highlight significant issues related to product quality. Over the longer term, Japanese buyers have imposed very strict requirements related to freshness and foreign matter. Indeed, some exporters have installed processing tables with lights (at a cost of approximately US$5,000) as a means to eradicate pieces of shell and other foreign matter. In general, once an exporter has built up trust and confidence with a Japanese buyer, that exporter experiences very few problems. More recently, however, significant

problems have been experienced with the “muddy-moldy” smell associated with shrimp from aquaculture production. This smell has reduced levels of exports to Japan dramatically, and although this reduction has been partially offset by increased exports to the EU, the smell has arguably had a bigger impact on trade volumes than the ban on exports to the EU in 1997.

Serious Impacts on the Exporting Sector

As described, the upgrading of hygiene standards has imposed considerable nonrecurring and recurring costs on the fish processing sector. However, the impact on individual exporters has varied enormously. In particular, many companies that needed to borrow money (often at very high interest rates) to fund these improvements have faced repayments while operating at low levels of capacity and making little or no profit. In many cases, the cost of this borrowing was exacerbated by the amount of time taken for EU to grant approval (in extreme cases, 6–8 months) once improvements had been completed. Processors who could not obtain loans were forced to draw on their working capital. Such companies are facing shortages of funds to purchase raw materials. In extreme cases, they have become reliant on credit from their procurement agents, at a 5 to 10 percent premium on raw material prices, or have had to cease production.

The impacts on fish processors of the need to improve hygiene standards must, however, be placed within the context of wider challenges facing the sector. On the one hand, installed capacity in the fish processing sector significantly exceeds the availability of raw materials through most of the year. Over time and in the face of competition from China, Thailand, Vietnam, and other countries, the economics of the sector in India has increasingly been characterized by high volumes and low margins. Indeed, levels of value-added are very low, particularly in comparison with countries such as Thailand. On the other hand, significant increases in the cost of electricity and water in Kerala since the late 1990s have increased production costs significantly. Labor costs have also increased as a result of the strength of unions in the state.

As a result of the problems faced with exports, in particular to the EU, many processors have made efforts to spread their risks by diversifying their market base among the EU, Japan, and US. Furthermore, a number have increased sales to “less challenging” markets such as China, the Middle East, and Singapore. Others have attempted to diversify their businesses or relied on their other activities; for instance, a number of the larger fish processors also operate in the hotel, travel, shipping and construction sectors as well as in other food product sectors. It is widely recognized in the fish processing sector that, for smaller exporters, a spate of two or three rejections can kill a company.

Despite the costs of compliance with these enhanced food safety requirements, some major players in the sector have gained. In particular, the processors that already had high standards of hygiene or had made improvements earlier benefited from premium prices while the number of EU-approved facilities was limited. As the number of EU-approved plants has increased, margins, and thus profitability, have declined. Raw material prices have also increased as competition among processors has heightened. Furthermore, these plants that were first to upgrade were able to repay their debts at an earlier stage and offset the related cost against greater returns. In contrast, very few of the facilities that delayed compliance are performing well. They are struggling to repay loans while operating under conditions of low margins and/or struggling to pull together the working capital to source raw material.

It is estimated that, over the last 2 years, more than 60 processing units have ceased operating. Even some of the larger exporters have closed facilities or sold them off. This consolidation is likely to continue. The Indian Government and the Seafood Exporters Association of India (SEAI)

recognize that further consolidation needs to take place so that the installed processing capacity will better reflect the availability of raw materials. Furthermore, perhaps 5 or 6 major exporters are coming to dominate the sector through the purchase of the assets of other processors. These 5 or 6 typically have interests outside of the fish processing sector, in other words, additional sources of capital, or support from foreign capital. Within 5 years, it is not unrealistic to expect that there will be fewer than 50 fish processors/exporters in Kerala.

Many processors say that they would have gone into a different business if they "[had known] what they know now." However, at the point in time that these stricter hygiene requirements were imposed, the processors had little or no choice but to make the investments necessary to comply. As nonapproved facilities, and in particular as non-EU-approved facilities, their plants and their businesses were nearly worthless. To retain their businesses and at least recoup some of the investment that they had made in their facilities, they had to invest still more to meet the required standards. Many of these businesses are now in the position in which they are breaking even at best, and many are likely to close over the next few years.

Collective Action

As well as their individual efforts to enhance hygiene standards, fish processors have acted collectively through the SEAI. The SEAI has a membership of 357 exporters, each of which pays a base fee of Rs10,000 plus Rs250 or Rs400 per 25 or 40 feet container respectively. It has a head office in Cochin and regional offices around India. Historically, SEAI's major role was to represent represents the interests of fish and fishery product exporters, especially in relations with both the Indian and state governments. More recently, however, the association has become directly involved in the development of food safety capacity in collaboration with the government.

Currently, a major infrastructure project is being established in Aroor (close to Cochin) that will provide 10 preprocessing units linked to common water, ice, and effluent facilities. This aims to be a "model" concept for the development of additional facilities in Kerala. The facility has been funded by the Governments of India and Kerala through MPEDA and the Kerala Industrial Infrastructure Development Corporation (KIFRA). The shareholding is equally shared between the two governments, with the Marine Products Infrastructure Development Corporation (Private) Ltd. (MIDCON) as the holding company. The total cost was US$1.98 million**.** At the initiative of MIDCON and the SEAI, 9 major exporters established Seafood Park (India) Ltd. in conjunction with MIDCOM. This subsidiary company operates the facility and leases the preprocessing units to these exporters**.**

Seafood Park also includes modern laboratory facilities that have the capacity to undertake the full range of microbial and chemical tests required by exporters, including dioxins and antibiotic residues. The laboratory cost US$308,600 to construct and equip. The technicians who operate the laboratory were sent for training well before the equipment was installed so as not to delay the opening of the facility. The intention is for the laboratory to be approved by the EIC and NABL**.**

The SEAI also proposed an export cluster with new landing facilities, water and ice supply, and effluent treatment to improve standards of hygiene in the landing of raw material. Construction started in 2004 with funding through the Government of India and the World Bank. This cluster will provide facilities for 30 to 35 processors over the next 5 years.

To address the quality problems associated with shrimp from aquaculture being experienced with exports to Japan as well as more general concerns in response to food safety requirements in the EU and US, the SEAI (in collaboration with MPEDA) is implementing a system of traceability of end products back to sources of raw material. In the case of aquaculture, this will involve the

registration of farms, issuing of code numbers, and use of bar coding linked to computerized tracking.

8. Impact of Food Safety Requirements on the Preprocessing Sector

Role of the Preprocessing Sector in Kerala

A particular characteristic of the fish and fishery products sector in Kerala is the role of the preprocessing sector. In much of the rest of India, preprocessing of crustaceans and cephalopods, including deshelling and cleaning, is integrated into processing operations. In contrast, historically, in Kerala (and West Bengal), preprocessing has been undertaken by independent preprocessing facilities that supply preprocessed materials to processing plants or preprocess under contract. In 1997–98 there were 931 independent preprocessors registered with MPEDA. Kerala processing facilities typically have been little more than freezer plants that assemble, freeze, and package shrimp, squid, cuttlefish, and certain fish in bulk.

The independent preprocessing sector has played an important role in the economics of the Kerala fish and fishery products sector, absorbing much of the risk associated with fluctuations in raw material prices and carrying the significant fixed and variable costs associated with preprocessing. Preprocessing is an extremely labor-intensive operation that is dependent on access to a labor supply that not only has the required skills but also is flexible enough to cope with the significant variations in supplies of raw material both from day to day and season to season. In Kerala, labor unions have traditionally been very strong, and there are strict controls on labor contracts that have posed significant challenges for the management of preprocessing operations. The processing sector has been largely insulated from these labor issues by the existence of the independent preprocessing sector.

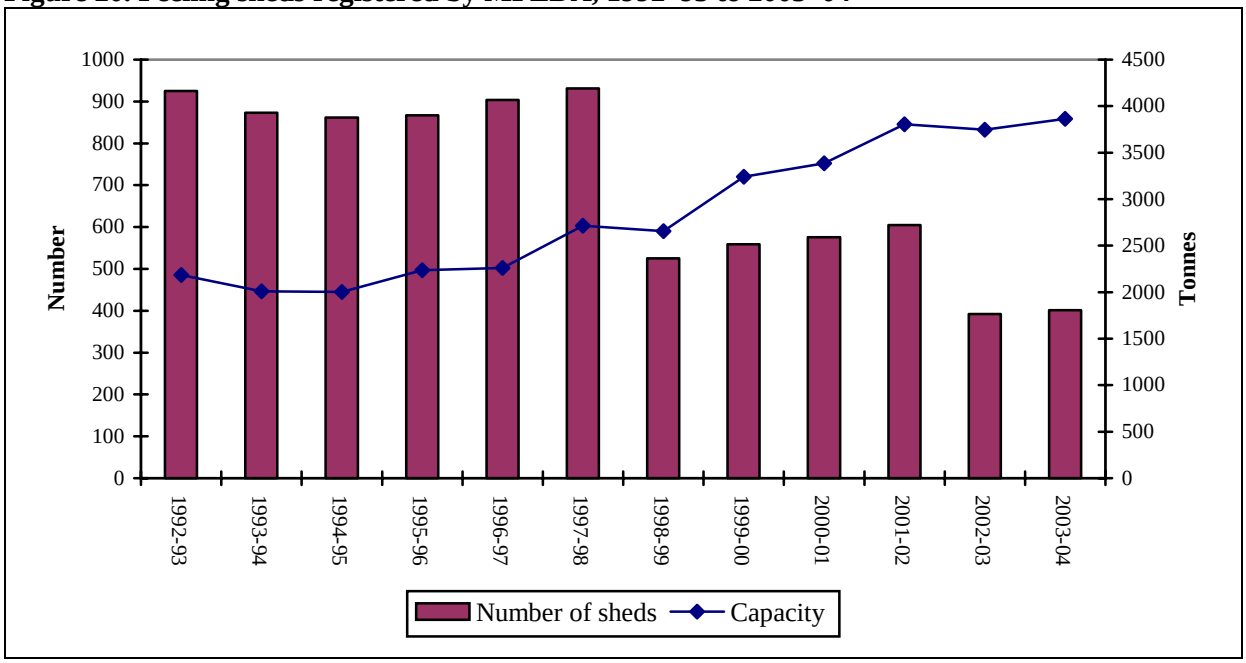
Upgrading Hygiene Standards in the Preprocessing Sector

Attempts to upgrade standards of hygiene date back to the 1970s. Although it accounted for a relatively small percentage of total output, until the late 1980s home preprocessing was common in Kerala. Women, many of whom were Muslim and could not take other forms of paid employment, collected the raw material and peeled it in their own home on a piece-rate basis. From an early stage, both the EIC and MPEDA attempted to eradicate this practice, recognizing the potentially serious hygiene issues. In 1997 the EIC's introduction of IPQC in the processing sector led to the inspection and approval of preprocessing facilities and moves by some fish processing plants to integrate preprocessing into their facilities. However, for the reasons described above, in Kerala independent preprocessing remained the norm until the mid- to late 1990s.

The European Commission voiced serious concerns relating to hygiene controls in preprocessing. The Indian government also recognized the considerable control problems associated with separate (whether physically and/or administratively) preprocessing and processing operations. Thus, in 1997–98 the EIC prohibited the use of independent preprocessors in the case of EU-approved facilities. However, non-EU-approved processing plants were permitted to continue using independent preprocessors on an interim basis. This prohibition immediately resulted in the closure of 406 facilities, a decline of 44 percent (figure 20). Indeed, the initial objective of MPEDA and the EIC was to eradicate the independent preprocessing sector altogether. It soon became obvious, however, that there was insufficient installed preprocessing capacity in Kerala and that the forced internalization of preprocessing would have adverse consequences on the

performance of the sector. Thus, in October 2001 procedures were put in place for the inspection and approval of independent preprocessing facilities by the EIC. Non-EU-approved facilities were permitted to source only from approved preprocessors. While EU-approved facilities were also permitted to use approved preprocessors, by this time, most facilities interested in exporting to the EU had already installed their own preprocessing capacity. These requirements induced further rationalization of the preprocessing sector with a decline in the number of facilities from 605 in 2001–02 to 392 in 2002–03. To date, approximately 125 preprocessing units have been approved by the EIC, all of which are linked to processing facilities under their direct control.

Figure 20. Peeling sheds registered by MPEDA, 1992–93 to 2003–04



Source: MPEDA.

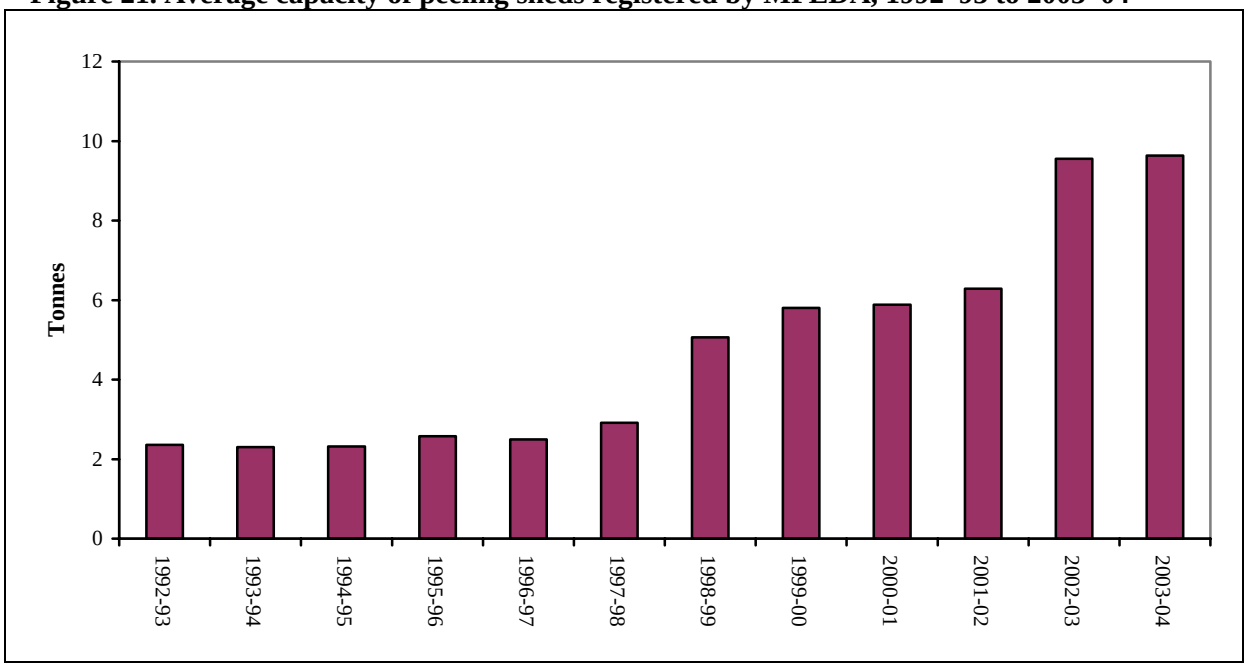
While the number of preprocessing facilities declined 57 percent from 1997–98 to 2003–04, installed capacity actually increased 42 percent from 2,700 tons per day to 3,860 tons per day during that period (figure 21). Therefore, the main impact of the regulation of the sector by the EIC was to force the closure of preprocessing facilities. However, any new or upgraded preprocessing facilities typically were larger. Consequently, the average preprocessing plant capacity increased from 2.9 tons per day in 1997–98 to 9.6 tons per day in 2003–04 (figure 21).

To assess the impact of upgrading food safety controls on the preprocessing sector, a survey (n = 201) of independent preprocessing plants was undertaken from August to September 2003. This survey yielded detailed information on the structure of the sector and, of most relevance here, the efforts made to upgrade hygiene controls.

Of the surveyed preprocessing facilities, 22.4 percent were not registered with MPEDA, suggesting that the actual number of facilities in India is significantly greater than reported above. Applying this result as a weighting factor to the number of MPEDA-registered preprocessing facilities (401) suggests that there were actually approximately 490 preprocessing operations in 2003–04. Most preprocessing facilities are owned and operated by single-shed owners. Only 17 percent of the surveyed facilities are owned by multiple-shed owners. Of these, 8 percent operate 2 sheds, 8 percent operate 3 sheds, and only 1 percent operate 4 or more sheds. Only two percent

of preprocessing facility owners also operated a fish processing plant, which fact emphasizes the continued separation of these operations in Kerala. Most facilities make little use of family labor. Virtually all laborers—the majority of whom (68 percent) are women—are employed on a casual basis. Approximately 70 percent of the surveyed preprocessing facilities sourced raw material directly from landing sites. An additional 12 percent sourced raw materials through agents. All of these facilities then sold their finished product to processing plants. Only 17 percent preprocessed raw materials supplied by processing plants on a commission basis. Most of the surveyed facilities supplied approximately two processing plants, including many of the major exporters. In many cases, they had supplied these same plants for a number of years.

Figure 21. Average capacity of peeling sheds registered by MPEDA, 1992–93 to 2003–04



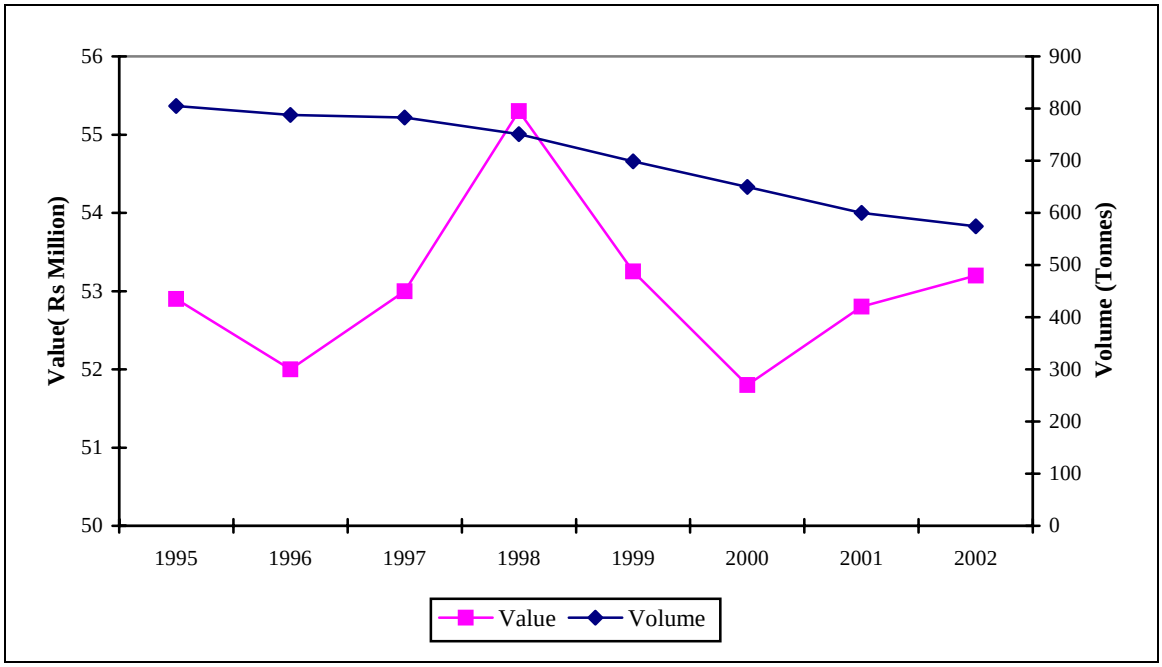
Source: MPEDA.

The mean annual turnover of the surveyed preprocessing facilities was virtually the same in 2002 (Rs53.2 million) as in 1995 (Rs52.9 million), although most had experienced much higher sales in 1997–98, when exports of shrimp from Kerala showed a sudden jump (figure 22). In real terms, however, turnover was actually 35 percent lower in 2002 at Rs34.1 million than in 1995. Over this same period (1995–2002), the mean volume of output declined 29 percent from 805 tons per annum to 574 tons per annum. Thus, the mean unit value of output actually increased 41 percent from 1995 to 2002. Even in real terms, it declined only 9.5 percent.

The survey results suggest that most preprocessing facilities are operating significantly below their capacities and that this situation has worsened in recent years. The mean operating capacity of the surveyed facilities was 66 percent in 2003, compared with 85 percent in 1995. Furthermore, approximately 85 percent were operating at less than 50 percent capacity in 2003. This large percentage compares to only 25 percent working at less than 50 percent capacity in 1995. One of the main causes is the lack of working capital. Typically, preprocessors purchase and prepare a consignment of shrimp, squid, or cuttlefish for a customer, but do not purchase the next lot of raw material until they have sold and been paid for the first consignment. This pattern is compounded

by the lack of storage facilities, especially cool rooms, and dependency on independent ice-making facilities.

Figure 22. Mean volume and value of shrimps peeled by independent preprocessing facilities, 1995–2002



Source: Survey results.

The capacity utilization and working schedule of the preprocessing facilities has led, in turn, to a change in labor practices. During idle times, workers will either remain in the changing/rest rooms at the facility or return home. Thus, there has been increased reliance on casual and part-time workers, most of whom are women who live in the vicinity of the facility. Among the surveyed preprocessing facilities, 98 percent employed labor on a casual basis in 2003, compared with 93 percent in 1995. This trend has occurred despite the need to have a better trained and more controlled workforce as part of improvements in hygiene controls.

The age of the surveyed preprocessing facilities ranged from 2 to 39 years, with a mean of 18 years. Thus, while there are some new facilities, most are older, and some are extremely dated - an important issue in the context of both the need and attempts to upgrade hygiene standards. Table 8 details the basic hygiene facilities that the surveyed facilities had in place in 2003 and in 1995. Furthermore, respondents were asked to identify the major improvements that they had made to upgrade their hygiene standards. These included general maintenance and renovation of the physical facility, as well as the construction of toilets and changing rooms, installation of hand washing basins and an electricity supply, and purchase of tables. Approximately 73 percent had provided hygiene training for their workers. However, the majority still did not have ice-making facilities, air conditioning and/or cooling, and cold storage. *Only 3 percent owned a thermometer*.

The survey indicated very important changes in the practices employed by preprocessing facilities: 99 percent of respondents had made at least some improvements since 1995. While only 13 percent of facilities had undertaken preprocessing on tables in 1995, the number increased to 59

percent in 2003. Approximately 96 percent of facilities now cooled the preprocessed product when delivering to customers. However, contrary to expectations, sub-contracting the preprocessing had increased, reflecting perhaps the economic hardships being experienced by the subsector. At the time of the survey, 24 percent of facilities used subcontractors, while approximately 10 percent used home peelers. These figures are compared with 1995, when only 18 percent of facilities used subcontactors and only 5 percent used home peelers. Clearly, there remain some very important concerns about control over hygiene in the subsector, especially with respect to home peeling.

Table 8. Improvements to independent preprocessing plants, 1995 and 2003

Infrastructure	*% of plants having*	
	2003	*1995*
Toilet	98.0	50.3
Running water	100.0	93.4
Electricity	100.0	77.7
Changing rooms	75.1	35.0
Cold store	40.8	7.1
Metal tables	70.6	12.2
Wooden tables	44.8	17.9
Ice-making facilities	18.9	9.7
Hand-washing basins	90.5	69.5
Thermometer(s)	3.0	4.1
Plastic storage boxes	97.5	82.7
Air conditioning/cooling	6.5	0.0
Staff uniforms/clothing	24.4	1.0

Source: Survey results.

Respondents to the survey were asked why they had made these improvements to their hygiene standards and practices. The most widely cited reasons were the demands or recommendations of customers, the need to improve hygiene to improve their business and/or ensure quality, and the requirements of MPEDA. The vast majority of facilities (86 percent) had been inspected by MPEDA at some time, while 70 percent had been inspected since 2001. Furthermore, approximately 64 percent indicated that the MPEDA inspection had required changes to be made to their hygiene standards. However, it is also clear that many of these improvements had been induced as much (if not more) by the demands of the market place in which these facilities were operating.

Many of the preprocessing facilities that were not registered with MPEDA, accounting for approximately 22 percent of the total sample, made informal comments about the disadvantages of being registered. Registration was perceived to bring with it control by MPEDA inspectors and numerous instructions to improve standards. Such views were even held by operators who had received hygiene training from the Government of Kerala, who acknowledged the need for facilities to be improved, and who had even made changes under their own impetus.

At the time of the survey, 96 percent were satisfied with their current hygiene standards and practices, although most did recognize that additional improvements were needed. In many cases, however, respondents highlighted a range of constraints that were likely to act as barriers to the further enhancement of their hygiene standards. These included lack of finance and the low profitability of the preprocessing sector, particularly in the light of an inadequate and irregular supply of raw materials.

Most of the improvements made by the preprocessing facilities had been put in place quickly and with limited disruption. The mean time taken was approximately 2 weeks, with a maximum of 8 weeks. Only 15 percent of facilities had shut down during the improvements. The cost of the improvements ranged from US$152–14,400, with a mean of US$1,203. This range suggests that the total cost of hygiene improvements by registered preprocessing facilities has been approximately US$481,382. Taking account of nonregistered facilities, this estimate increases to US$590,413. As a proportion of turnover, the cost of these improvements ranged from 0.01 percent to 3.43 percent, with a mean of 0.15 percent. Approximately 54 percent of the surveyed facilities had borrowed money to at least partially fund these improvements. Respondents were also asked about the impact of improvements in hygiene practices and controls on their costs of production. Approximately 90 percent indicated that their production costs had not changed. Of the 10 percent of respondents indicating that their production costs had increased, most indicated a rise of less then 5 percent.

Some preprocessing facilities have been provided with training and advice for the upgrading of hygiene standards by major fish exporters. In general, there have been long-term and close relations between the preprocessors and exporters. The exporters have sent their quality control staff to suggest changes in the structure of the preprocessing facilities and their production procedures. Furthermore, in some cases, they have recommended that workers undergo medical checks and have arranged for doctors to visit the facility. Following these improvements, exporters have generally established contracts with the facilities subject to the strict recommended hygiene practices being observed. In at least one case, an exporter visited a preprocessing plant with foreign buyers. At the same time, however, these same exporters are sourcing from preprocessing facilities that have made little or no improvements and to which the former have not provided the same level of advice and support. Indeed, concerns were expressed by a number of respondents who had made improvements in their hygiene practices that they are being placed at a competitive disadvantage by the continued use of nonimproved facilities by the major fish processors. Suggestions were made that exporters are using the facilities that they have supported “for show,” while continuing to source most of their raw materials from other preprocessors.

Perhaps one of the most important remaining weaknesses in the preprocessing sector relates to ice. The majority of the surveyed preprocessing facilities continue to purchase block ice from independent plants over which they have no control. Most of the year, this ice is made from filtered water and is delivered on demand. Many preprocessing operators consider it uneconomic to install their own ice-making facilities, especially in view of their prevailing level of operating capacity. During the high season, however, they can face problems obtaining ice made from water that has been filtered and are forced to purchase the ice that is normally supplied to fishing boats, which is unfiltered. In extreme cases it is even difficult to obtain ice made with potable water. The consequences for standards of hygiene in the subsector are obvious.

9. Conclusions and Future Directions

Fish production has increased rapidly over the last 30 years, including both capture production and, to a greater extent, aquaculture. Simultaneously, the fish supply chain has evolved driven, in part, by the rapid growth in fish and fishery products exports. In particular, fish processing has been transformed from a largely artisanal activity to include large-scale industrial processing facilities. Today, fish and fishery products are India's largest single agricultural and food export and account for approximately 3 percent of total merchandise trade. Kerala accounts for approximately 12 percent of total fish landings. In the case of shrimp, however, it is the dominant producer, accounting for 35 percent to 40 percent of national landings. Kerala fish and fishery product exports are dominated by frozen shrimp, cuttlefish, squid, and certain species of fin fish. Traditionally, the EU was the major export market with significant exports also to Japan and the US, although these markets have been less important than for India as a whole. Recently, China has emerged as a significant fourth market, most notably for frozen fish.

The Kerala fish supply chain is dominated by marine capture, involving both motorized trawlers and traditional craft. Fish are landed at registered sites and sold under auction. Traditionally, shrimp, cuttlefish, and squid were purchased by preprocessors that performed cleaning and peeling and sold to processors that froze and packed the product. The existence of a preprocessing sector is a distinct feature of the Kerala fish and fishery products sector. It is estimated that approximately 850,000 people in the state are directly dependent on fish capture, processing, and related activities.

In recent years, exporters of fish and fishery products in Kerala, as in India as a whole, have faced a number of challenges, especially in industrialized country markets for shrimp. As shrimp has become increasingly "commodified," there has been intense price pressure among the exporters, further fuelled by lower production costs in countries such as China, Thailand, and Vietnam. Overlaid on these general market conditions has been the imposition of stricter food safety and other standards, most notably in the EU and US. This case study has focused on these requirements.

There are considerable differences in the specific food safety requirements and the associated conformity assessment procedures applied to fish and fishery product imports in the main markets served by India, namely, EU, Japan, and US. In Japan, border inspection remains the predominant form of food safety control for fish and fishery products. Few specific regulations have been established for fish and fishery products. Rather, importers must comply with general requirements that food products are safe as well as with some limits relating to levels of microbiological contamination of the final product. In both the US and EU, imports of fish and fishery products must be processed in facilities that have standards equivalent to domestic facilities', including the implementation of HACCP. While the US requires that the importer take steps to ensure that imports meet regulatory requirements, in the EU this assurance is the responsibility of a "Competent Authority" in the exporting country. In practice, this responsibility requires not only that the exporter comply with EU regulatory requirements but also that the exporting country government have regulations and procedures in place to certify compliance.

Although there are common themes running through the food safety controls implemented by these countries, in particular the EU and US, there are significant differences in specific requirements. As one exporter in Kerala remarked, "The devil is in the detail." In extreme cases, there may be direct conflicts among the requirements of different markets. More broadly,

however, exporters wanting to maintain access to all of these markets (which most exporters do) have little choice but to implement the strictest elements across the individual country requirements. Thus, the EU is undoubtedly the predominant driver behind the food safety controls being implemented in India. Nevertheless, these controls must be examined within the context of the requirements of Japan and (in particular) the US. Alternatively, in certain cases, the Indian government may be able to (and did) apply different standards and control measures to exporters that focus on different markets.

Beyond the basic hygiene requirements laid down by India's major trading partners, exporters face a seemingly continuous flow of emerging issues, most of which originally come to light through border detentions. Currently, controls on residues of antibiotics in the EU are a major concern, not only for India but for its major competitors. Additional issues include limits on heavy metals and other environmental contaminants and on *Vibrio parahaemolyticus*. For all of these concerns, it is clear that the EU imposes significantly stricter controls than either Japan or the US. However, it is also evident that antibiotics are emerging as an issue in the US. The EU's requirements, perhaps, are an indicator of the food safety controls that will be required in all industrialized country markets in the future.

The significant challenges for the Indian fish and fishery product sector in meeting emerging food safety requirements in the EU and US have been particularly pronounced in Kerala. Kerala is more dependent on EU and US markets than the rest of India, and the state is dominated by exports of crustaceans and cephalopods. Historically, these problems mainly related to US exports. However, through the 1990s the EU's food safety requirements related to general hygiene controls and limits on antibiotics, as well as biological and chemical contaminants, have emerged as the dominant challenge. In turn, the EU has undoubtedly become the dominant driving force behind the upgrading of food safety controls within the fish and fishery products sector in both Kerala and India in general.

The challenges faced by the fish and fishery products sector reflect, at least in part, the failure to upgrade legislative and other elements of the food safety system across India in line with developments in both international standards and requirements in major export markets. Indeed, Dhingu (2002) suggests that there are many areas in which Indian standards diverge from those established by Codex Alimentarius. Examples of divergent Indian standards relate to food additives, pesticide residues, and other chemical contaminants. Ironically, the quite rigorous food safety controls, at least within a developing country context, implemented for agricultural and food exports by the Indian government were allowed to wane as a result of liberalization in the early 1990s. While this existing institutional framework may have enabled the Indian government eventually to bring about changes in food safety controls quite rapidly, it did not prevent exports to the EU being banned on the grounds of microbiological contamination.

In the case of Japan, India's major export market in recent years, food safety controls have not been an issue. However, very recently, major quality problems have emerged that have resulted in significant declines in the volume and value of exports. Arguably, this issue alone has caused as much, if not greater, damage to the Indian shrimp sector as the food safety problems that are the major focus of this study.

In assessing the effects of food safety and (to a lesser extent) quality requirements, perceptions of the impact on the ability to access export markets are an important element of the equation. Exporters may be deterred from attempting to export to a particular market simply because they believe the costs and/or risks are too high. Certainly, the widespread perception in India is that the EU has the strictest food safety requirements, followed by the US, with Japan a distant third. In part, this perception may reflect the fact that the EU's requirements are both more recent and are

evolving rapidly, keeping them at the front of peoples' minds. While acknowledging the importance of qualifying for Attachment A or B, many exporters may simply have forgotten (or may not have been in business at the time) the problems experienced by the fish and fishery products sector in accessing US markets in the early 1990s.

Compared to many other developing countries, the Indian government recognized the need to revise its controls on hygiene in fish and fishery products at a relatively early stage. Even so, the reforms it put in place were not sufficient to meet the requirements of the European Commission.[41] Thus, although the Indian government was quite proactive in addressing the change in the regulatory landscape in a major export market, its efforts were not sufficient to prevent restrictions from being applied on exports to the EU during 1997. In part, there are indications that both the Indian government and the fish processing sector did not take seriously the EU's directive on hygiene for fish and fishery products and/or underestimated the reforms that were necessary. On the other hand, the government's efforts at times were checked by pressure from exporters not to impose overly restrictive requirements on a sector that was facing acute competitive pressures from China, Thailand, and Vietnam.

Faced with restrictions on exports of fish and fishery products to the EU in 1997, the Indian government responded rapidly with the imposition of quite onerous requirements that were designed to demonstrate that it was able and willing to comply by the end of 1997**.** Following a rather critical inspection report from the European Commission in 1997**,** India had fully complied with EU requirements and made List I status within a matter of months. Similarly, when residues of antibiotics and bacterial inhibitors were detected by EU authorities in shrimp during 2002, the Indian government was swift in imposing strict controls on antibiotic use. These actions have imposed considerable costs on the processing sector, as is discussed below. At the same time, these controls have undoubtedly been critical in maintaining market access and in preventing additional restrictions from being imposed, as has happened, for example, to China and Thailand.

Recognizing the potential impact on the fish processing sector and the constraints that it faced in achieving compliance, the Indian government has differentiated the standards that exporters must meet in supplying the EU and other overseas markets. Exporters to non-EU markets were granted a longer time to integrate preprocessing operations and/or to source from approved independent preprocessors. This pragmatic strategy focused attention on maintaining access to EU markets while sustaining pressure for the upgrading of standards across the processing sector as a whole.

The Indian government has reformed its regulatory systems to facilitate effective regulation of fish processing facilities and to enable effective responses to emerging issues. In the early stages, in particular 1995 to 1997, its efforts were hampered by the lack of clearly defined responsibilities, for example between MPEDA and the EIC, which needed to be addressed before more widespread reforms were implemented. Significant investments have also been made in inspection and laboratory testing capacity. Although the EIC had systems of process and product certification, they had been deregulated in the early 1990s, and subsequently the associated capacity of the IEAs had declined considerably. Nevertheless, these existing controls provided an effective foundation on which to comply with the EU's requirements, as is evident from the speed at which compliance was eventually achieved once the European Commission had highlighted the prevailing deficiencies.

Across the Indian fish processing sector as a whole, hygiene standards did not keep pace with the expansion of exports or the evolution of food safety requirements in industrialized country

[41] Compare the response by the Indian government, for example, to that of the Government of Kenya (Henson and Mitullah 2004).

markets. This lag occurred despite the fact that food safety standards have been an ongoing issue for exporters since the 1980s, first with respect to the US and then the EU. Instead, the response by most exporters has been reactive, making only the necessary investments and changes to their hygiene controls when absolutely necessary. Simultaneously, however, more progressive exporters have proactively upgraded their food safety controls, especially when investing in new processing plants or upgrading their existing facilities. While even these processors had to make additional changes to comply with the EU's requirements, the levels of investment required have generally been lower. A number of these exporters are coming to dominate the sector, mainly though the acquisition of processing capacity from their under-performing competitors**.**

To date, in Kerala, the level of investment made to comply with the EU's hygiene standards for fish and fishery products has been considerable, amounting to US$13.5 million. This investment undoubtedly imposed great hardship on many processors, in particular, those that were already operating at low levels of capacity, and a number of have had subsequently left the sector. However, overall this investment represents only 1.7 percent of the value of exports over the three years prior to the imposition of new controls by the Indian government. In addition, for those processors that have managed to comply, the benefits in terms of continued market access are considerable. Indeed, the fact that Indian exporters have not faced the restrictions imposed on their Chinese and Thai competitors through 2002 and 2003 may have been a source of competitive advantage related to the stricter food safety standards being imposed by the EU.

In the Kerala context, the imposition of stricter food safety standards by the EU and, more particularly, the consequent controls implemented by the Indian government have had perhaps the greatest impact on the preprocessing sector. The shift to integrated preprocessing by EU-approved processing facilities undoubtedly led to the closure of a significant number of independent preprocessing operations. At the same time, however, installed capacity has actually increased, reflecting the consolidation of the sector alongside the implementation of stricter hygiene standards.

The preprocessing sector has made considerable investment to upgrade their food safety standards, amounting to US$481,000. Previously, the prevailing standards of hygiene in many facilities were rudimentary at best. Some even lacked toilets, running water, and electricity. By mid-2003, however, the EIA had still not approved any independent preprocessing facilities for export, perhaps reflecting the view that integrated preprocessing was preferable. Nevertheless, the valuable role played by the preprocessing sector is clear from the fact that many processors (including those that are EU approved) still procure from them even though they are no longer permitted to do so.

It is evident that *the dominant trend over the next few years in the fish processing sector in India as a whole, and in Kerala in particular, will be both consolidation and concentration*. Over the next 5 to 10 years, 5 or 6 major companies will come to dominate the sector, each of which is likely to operate multiple plants. These plants will be linked to preprocessing facilities that, while separate, will be operated or at least controlled by the processors themselves, for example, within facilities such as Seafood Park. Some smaller exporters will continue to operate but are likely to focus on less challenging markets, (for example, China and the Middle East) and on more minor products.

At the current time, the dominant competitive pressures in the sectors are high food safety standards (for the EU and US markets) or high quality standards (for Japanese markets) combined with low production costs. A number of processors have installed faster and more efficient freezers to reduce electricity costs. Under such conditions, the profitability of fish processors is being squeezed, particularly given the ever more vigorous competition from, among others, China,

Thailand, and Vietnam. Thus, a number of processors are exploring ways in which greater value can be added, for example, through shifts away from block freezing to IQF, custom processing for specific customers, and packaging in retail packs accompanied by branding. Attempts also are being made to undertake higher levels of processing, for example, breading, rather than supplying product that is then processed in overseas markets. Simultaneously, processors are recognizing the necessity to establish long-term relations with key customers in export markets.

While the Kerala fish and fishery products sector presents a positive case of efforts to comply with stricter food safety requirements in export markets, challenges remain. In particular, there have been only limited improvements in handling practices in the capture and marketing of fish. More generally, there is a need to improve the efficiency of raw material procurement, preferably through the development of relations with specific boats, whether directly or through agents. Scarcity and irregularity of supply of raw material are significant problems for the sector, so much so that many facilities are operating at less than 50 percent capacity while attempting to repay loans taken out to finance their hygiene improvements. One of the key hygiene challenges is to bring about greater discipline on fishing boats and at landing sites when the purchases by processors may account for a relatively small proportion of the total catch and there are lucrative local markets for other products. Thus, larger processing facilities are beginning to source from a wider geographical area, including neighboring states, and even through the importation of raw material from other countries (notably Bangladesh) on re-export terms. Furthermore, the SEAI is fostering the development of landing facilities that are dedicated to exports and have the required facilities, including ice machines and potable water.

Key lessons from this case study are that food safety and quality requirements continually evolve, and that the most successful exporters meet these requirements in a manner that acts to their competitive advantage. To date, this *manner* has meant moving first. In the future, rather more sophisticated responses are likely to be needed for processors to compete successfully not only with one another but also with their overseas competitors. *The Indian government has a key role to play in this respect: applying strict food safety controls where necessary to prevent "rogue" exporters from free-riding on efforts to enhance standards in the industry as a whole, while not imposing inordinate costs of compliance on exporters that are struggling to survive.*

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