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IMPACT OF SANITARY MEASURES ON EXPORTS OF FISHERY PRODUCTS FROM INDIA: THE CASE OF KERALA

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

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Fish and fishery products represent a major export success story, now representing the largest single agricultural and food export and accounting for around three percent of total merchandise trade. The state of Kerala has traditionally been an important fish producer, especially for shrimp, cuttlefish and squid. Major export markets include the European Union, Japan, United States and, more recently, China. Whilst exports have increased significantly over the last three decades, since the late 1980s exporters have faced on-going challenges associated with stricter food safety standards in major export markets, most notably the US and, in particular, EU. Whilst the Indian government was quite proactive in implementing the reforms necessary to comply with the EU's requirements in the mid-1990s, this did not prevent the imposition of restrictions on exports in 1997. Subsequently, the Indian government implemented a series of rigorous controls and achieved full compliance and harmonization with the EU's standards in a matter of months! Whilst the cost of the required changes to government controls and levels of hygiene in the processing sector have been considerable, the benefits in terms of continued access to EU markets have also been significant. Further, a number of exporters that were proactive in upgrading their hygiene controls have benefited and are leading the consolidation of the processing sector. A particular feature of the Kerala fish and fishery products supply chain is the pre-processing sector which has traditionally undertaken cleaning and peeling of raw materials. This structure and *modus operandi* of sector has been changed significantly by the EU's hygiene standards and, more particularly, how the Indian government has responded. The Kerala fish and fishery products sector illustrates the importance of both the government and private sector and the need to implement appropriate responses to evolving food safety standards.

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 *et al.*, 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. Developing countries have shifted from being net importers offish and fishery products

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

to large net exporters over the last 30 years. Thus, developing country annual export revenue from fish and fishery products totalled over US$20 billion through the late 1990s, exceeding the combined value of meat, dairy product, cereals, vegetable, fruit, sugar, coffee, tobacco and oilseed exports in 1997 (Delgado *et al.*, 2003).

One of the major challenges facing exporters offish 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 (see for example Henson and Mitullah, 2004; Henson *et al,* 2000; Rahman, 2001; Musonda and Mbowe, 2001; UNEP, 2001a; 2001b; Zaramba, 2002). The costs of compliance with these requirements can be high (see for example Cato, I'm, Cato and Lima dos Santos, 1998a; 1998b) in some cases prohibitively so, and the resultant impact on the structure and *modus operandi* of supply chains can have significant economic and social consequences. In many cases this reflects the fact that investment in up grading of supply chains and/or regulatory systems has not been made in line with the expansion of exports. At the same time, however, time 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

This study focuses on fish and fishery products from India, and more specially 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 laced on-going challenges in meeting evolving food safety requirements, especially in the EU, and a period during which exports were restricted due to non-compliance. The specific aims of the study are as follows:

- To identify the food safety and other standards faced by suppliers of fish and fishery products in their major export markets, predominantly relating to regulatory and customer requirements.
- To assess the impact of food safety and other standards on the level and direction of exports offish and fishery products from Kerala.
- To identify and assess the strategies which both the government and exporters have employed in order to comply with food safety and other market requirements.
- To identify and quantify the costs incurred by the government and exporters in complying with food safety and other standards in major export markets.
- To identify the constraints impeding compliance with food safety and other standards in major export markets.
- To 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.
- To identify areas where 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 Keralan 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

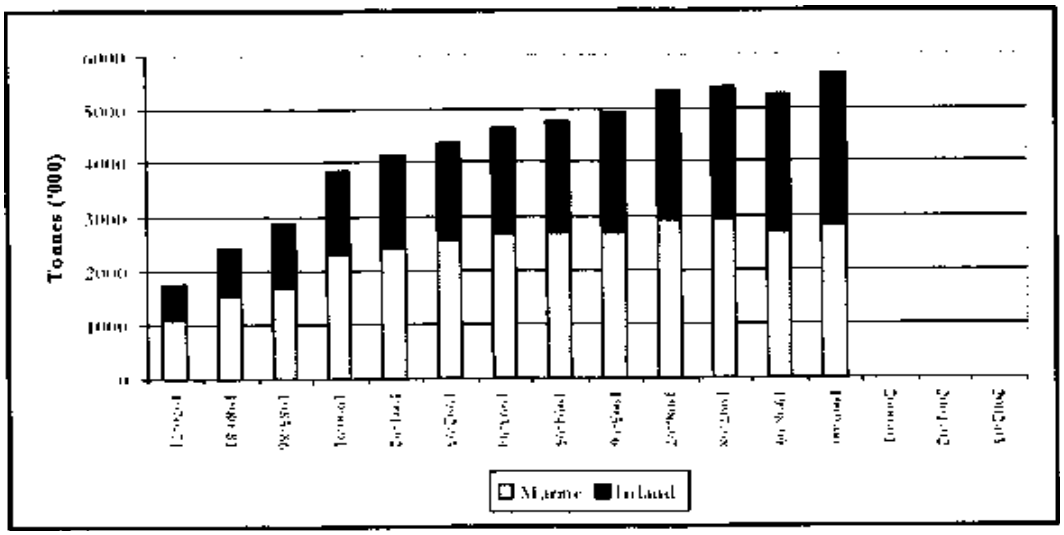
fishery products have been up-dated in line with export market requirements. This has necessitated significant investment through the supply chain which has led to rationalization and consolidation of processing capacity. The major beneficiaries have been exporters that have been able to access the necessary capital and/or foresaw these trends and had already made investments 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, Vietnam, Thailand and other major exporters.

The paper is structured as follows. It starts by providing an overview of fish and fishery products exports from India as a whole before focusing in on the fish and fishery products sector in Kerala. The food safety and other technical requirements facing exporters of fish and fishery products are then reviewed. The remainder of the paper then 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 pre-processing 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, an important distinction is made between marine and freshwater production. The former consists of capture fisheries based along the 8129 km coastline which encompasses an Exclusive Economic Zone (EEZ) of 2.02 million km'. Freshwater production comprises capture fisheries from rivers and lakes as well as 2.86 million hectares of aquaculture production. Both sectors, but in particular aquaculture production, have exhibited high rates of growth over the last thirty years. Thus, from 1970-71 to 1999-00 total fish landings in India increased by over 220 percent from 1.76 million tonnes to 5.66 million tonnes (Figure 2.1). Over this same period, the contribution of inland fisheries, of which much is aquaculture production, increased from 38 percent to 50 percent.

Figure 2.1. Volume of fish landings in India, 1970-71 to 2002-03:



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. Through 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. Thus whilst 48 percent of the landed fish entered formal markets in 1961, this had increased to 71 percent by 1966. Freezing and canning were first introduced in the early 1960s, although they grew slowly at first. However, through the 1970s these became mainstream activities, both reflecting and stimulating the growth in fish production. Fish and fishery product exports from India grew steadily through the period 1960 to 1990 at an average rate of around 10 percent per annum from 16,542 tonnes to 133,653 tonnes (Figure 2.2). Even more rapid expansion occurred in the 1990s with exports more than tripling to over '140.000 tonnes 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 2.3). However, in real (constant 1995 prices) terms, the value of exports was largely unchanged over this period; whilst export volumes increased this was offset by a decline in the unit value of the exported commodities in real terms.

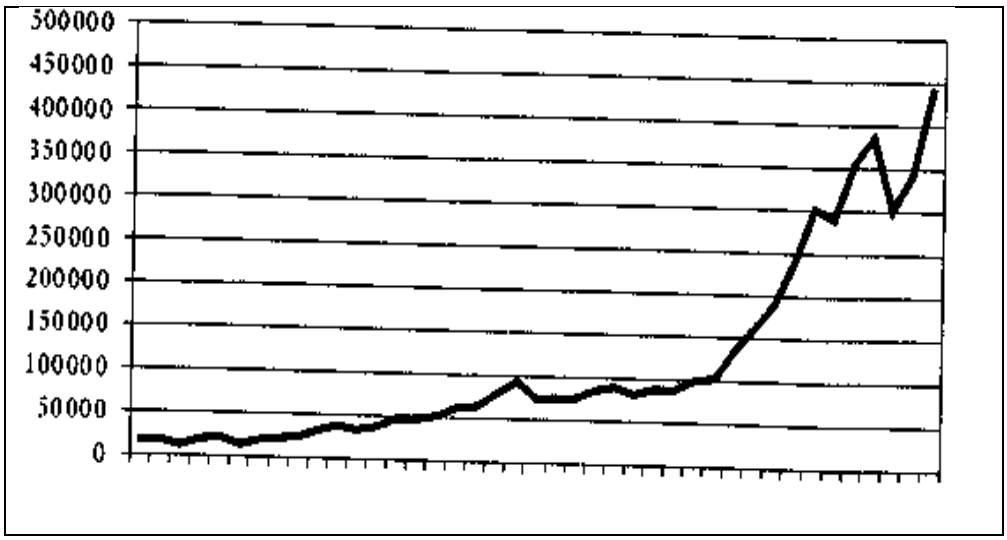
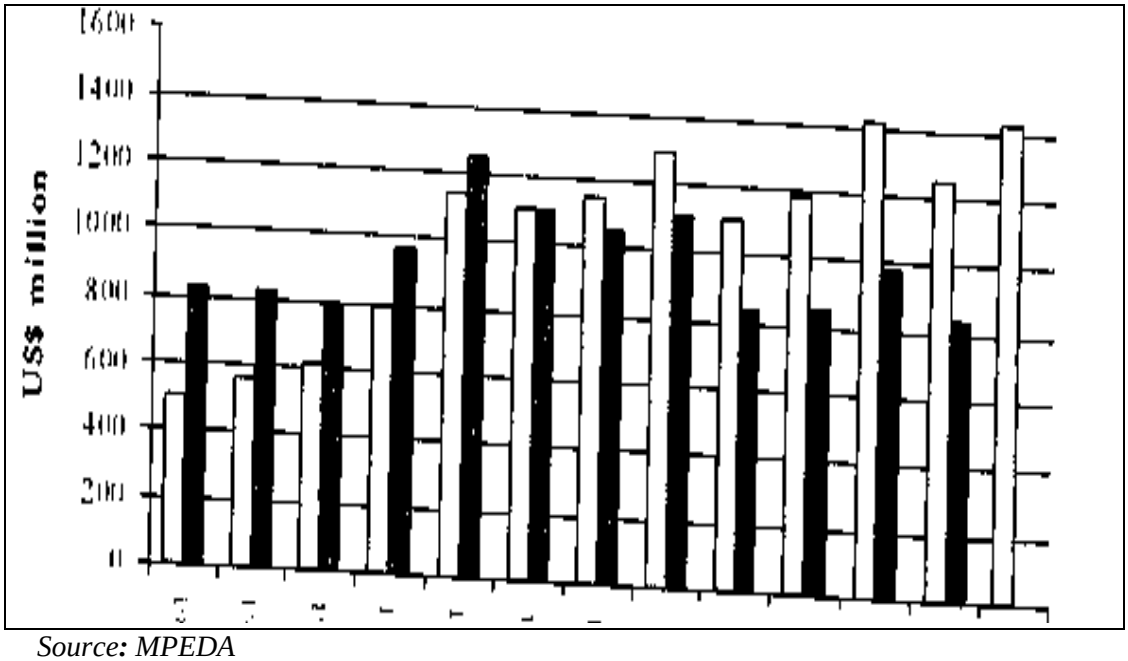


Figure 2.2. Evolution of fish and fishery product exports from India, 1960 to 2000:

Source: MPEDA

Figure 2.3. Value of fish and fishery product exports from India, 1990-91 to 2002-03:



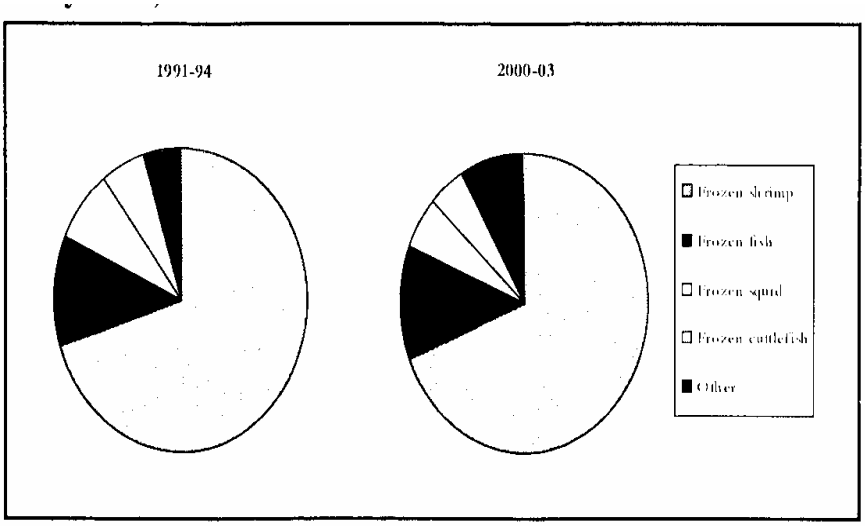
Source: MPEDA

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

Figure 2.4 details the composition of fish and fishery product exports from India

over the period 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 around 65 to 70 percent. Other significant exports include frozen fin fish, accounting for 12 to 13 percent of exports by value and squid and cuttlefish, accounting for between six and eight percent of exports.

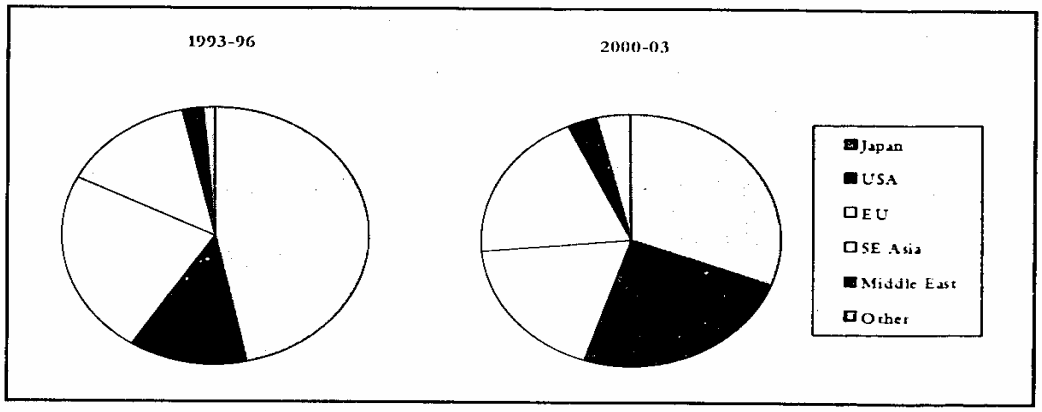
Figure 2.4.Composition of fish and fishery product exports from India by value, 1991-94 and 2000-03



Source: MPEDA

Historically, Indian exports offish and fishery products have been directed at three major markets - Japan, EU and the United States - collectively accounting for around 85 percent by value (Figure 2.5). Of this, 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 South East Asia have emerged as important markets accounting for over 20 percent of exports in 2002-03. Indeed, certain exporters (especially in Kerala) have focused on China as an emerging market for fish and fishery products. Further, 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 through this period as a whole, remaining at around 20 to 25 percent

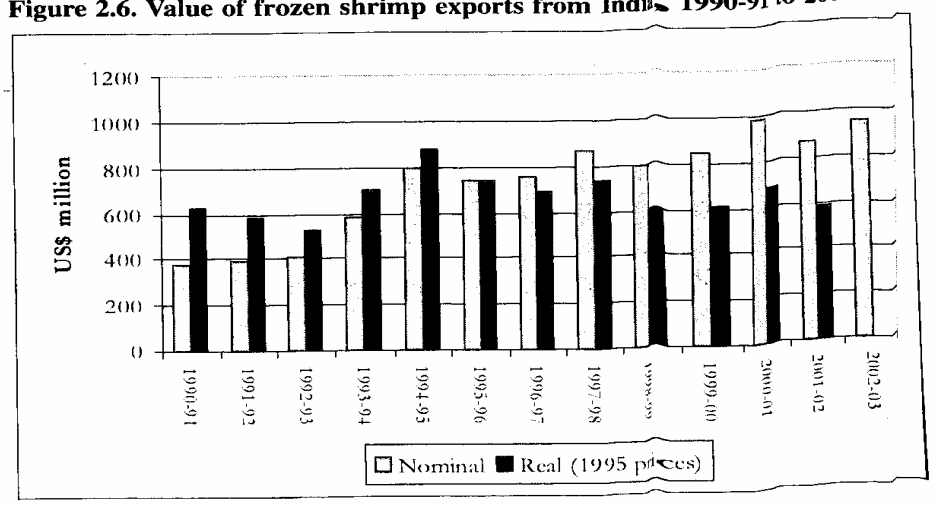
Figure 2.5. Destination of fish and fishery product exports from India by value, 1993-96 and 2000-03:



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 around 150 percent from US$395.98 million to US$985 million (Figure 2.6). 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$684 million in 2000-01 as the drop in unit export value outpaced the increase in volumes.

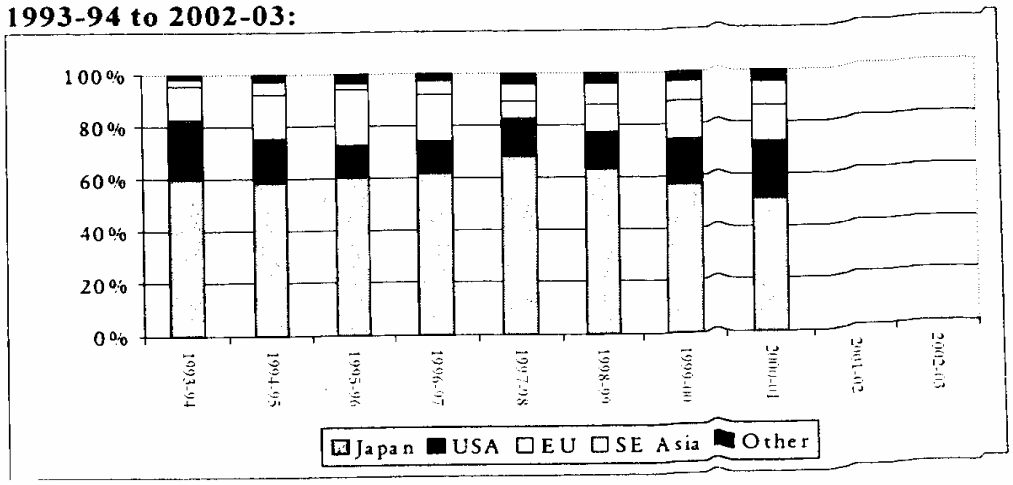
Figure 2.6. Value of frozen shrimp exports from India 1990-91 to 2002-03



Source: MPEDA

Whilst Japan's share in India's shrimp exports declined from 60 percent in 1993-94 to51 percent in 2000-01, it remains the country's main export market (Figure 2.7). Over this same period, exports to the US declined from 22 percent in 1993-94 to around 13 percent in 1996-97, recovering to reach 22 percent again in 2000-01. Exports to the EU expanded from 13 percent by value in 1993-94 to 21 percent in 1995-96, but then collapsed to six percent in 1997-98 reflecting the restrictions imposed by the European Commission (see below). Exports subsequently recovered to around 14 percent through 1999-01.

Figure 2.7. Destination of frozen shrimp exports from India, 1993-94 to 2002-03:



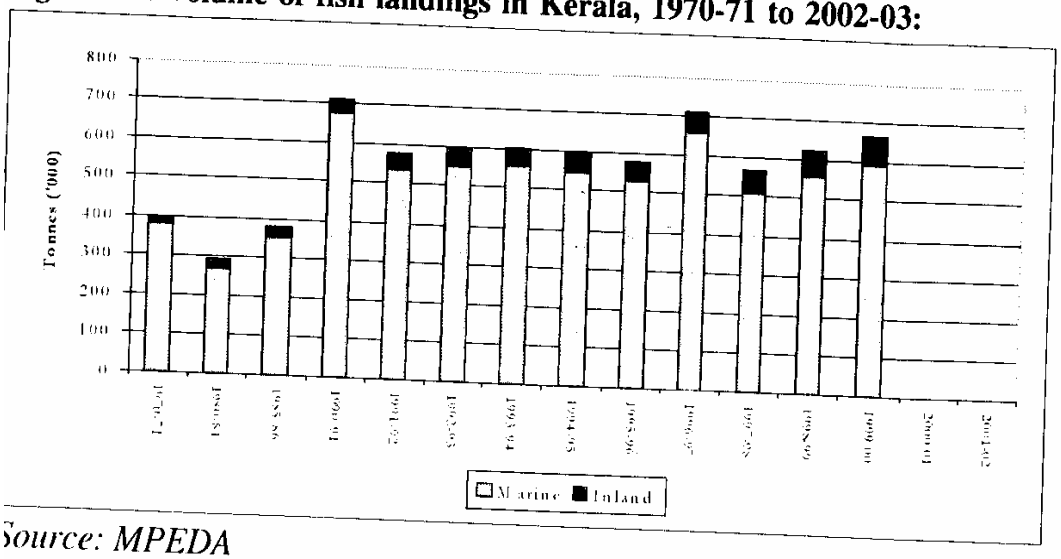
Source: MPEDA

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 has typically accounted for 85 to 90 percent of total exports by volume. Although IQF only accounts for around 10 percent of exports, it is more important in the case of the EU and United States, for which it can account for 15-18 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).

1. THE FISH AND FISHERY PRODUCT SUPPLY CHAIN IN KERALA:

Historically, Kerala accounted for between 20 to 25 percent of fish landings in India (Figure 3.1), although its contribution has declined over time to reach around 12 percent in 1999-00. The Keralan fisheries have always been dominated by marine capture production. Whilst aquaculture production has gained in importance, it still only accounted for 11 percent of Keralan fish landings in 1999-00. The one sub-sector in which Kerala continues to dominate, however, is shrimp for which it continues to account for 35 to 40 percent of total national landings. Reflecting the limited development of aquaculture in Kerala, most is from marine capture. In turn, Kerala is the major producer of frozen shrimp in India, accounting for around 42 percent of national production.

Figure 3.1. Volume of fish landings in Kerala, 1970-71 to 2002-03:

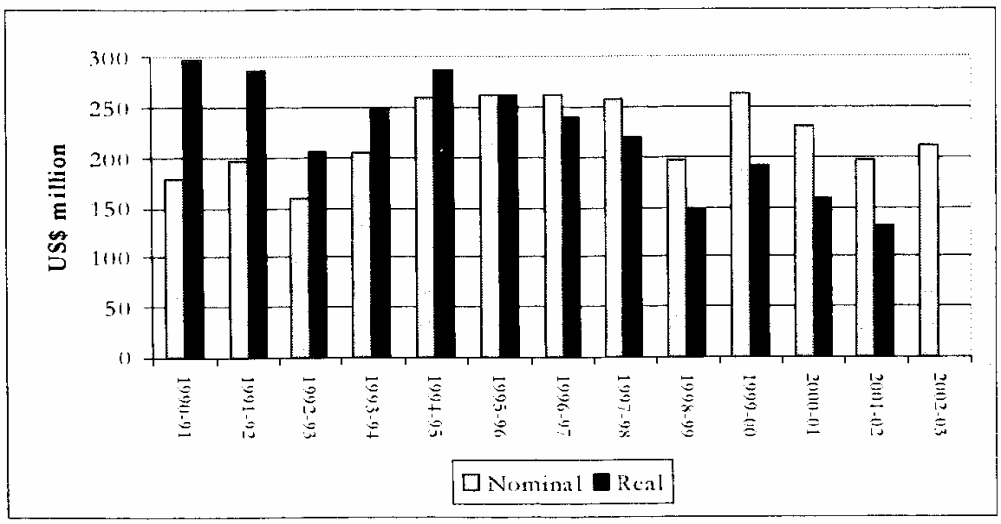


Source: MPEDA

Cochin is the major fisheries port in Kerala and typically accounts for over 90 percent of state-wise exports. Over the period 1990-91 to 2002-03, exports from Cochin only increased around 10 percent with significant year-on-year variations (Figure 3.2). This was significantly below the rates of growth experienced across the nation as a whole and, as a consequence, Keralan exports declined as a proportion of Indian fish and fishery product exports as a whole, from around 30 percent in 1990-91 to around 20 percent in 2002-03. Further, this is in sharp contrast to the mid-1970s when Kerala accounted for over 50 percent of Indian fish and fishery product exports!

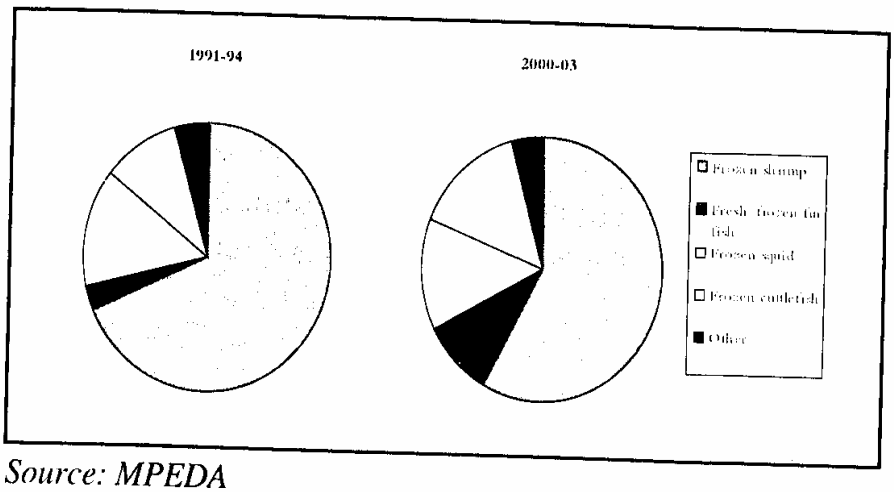
Whilst frozen shrimp continues to dominate fish and fishery products exports from Kerala, cuttlefish and squid have taken on greater importance through the 1990s. Thus, in 1991-92 frozen shrimp accounted for 76 percent of exports by value, whereas frozen squid and cuttlefish accounted for only 11 percent and six percent respectively (Figure 3.3). 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 to 13 percent. Frozen fish exports have also increased dramatically, including Ribbonfish and various other species, from two percent in 1991-92 to nine percent in 2000-01. Currently Kerala accounts for around 48 percent of all froze n squid and cuttlefish exports from India and only 13 persent of frozen shrimp exports!

Figure 3.2. Value of fish and fishery product exports from Cochin, 1990-91 to 2002-03:



Source: MPEDA

Figure 3.3.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 to 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 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 3.4 details the supply chain for fish and fishery products, including fin fish,

crustaceans (for example shrimp) and cephalopods (for example squid, cuttlefish and octopus) in India. 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 pre-processing or processing facilities. This supply chain will not be discussed in detail here as it is of relatively minor importance in the Keralan context. Marine capture takes place using both modern trawlers that can fish up tol80 kilometers from the shore and traditional craft, that can be either motorized or non-motorized, which go no further out than two or three kilometers. The 1992 census suggests that around 633,000 people in Kerala were directly engaged in fishing (Table ?), with a further 227,000 engaged in activities related to fishing, including family members engaged in fishing operations, marketing, net repair etc. Indeed, fishing is considered a central element of the Keralan economy and crucial to the livelihood of many poorer members of society!

Table 3.1. Fisher population in Kerala, 1992:

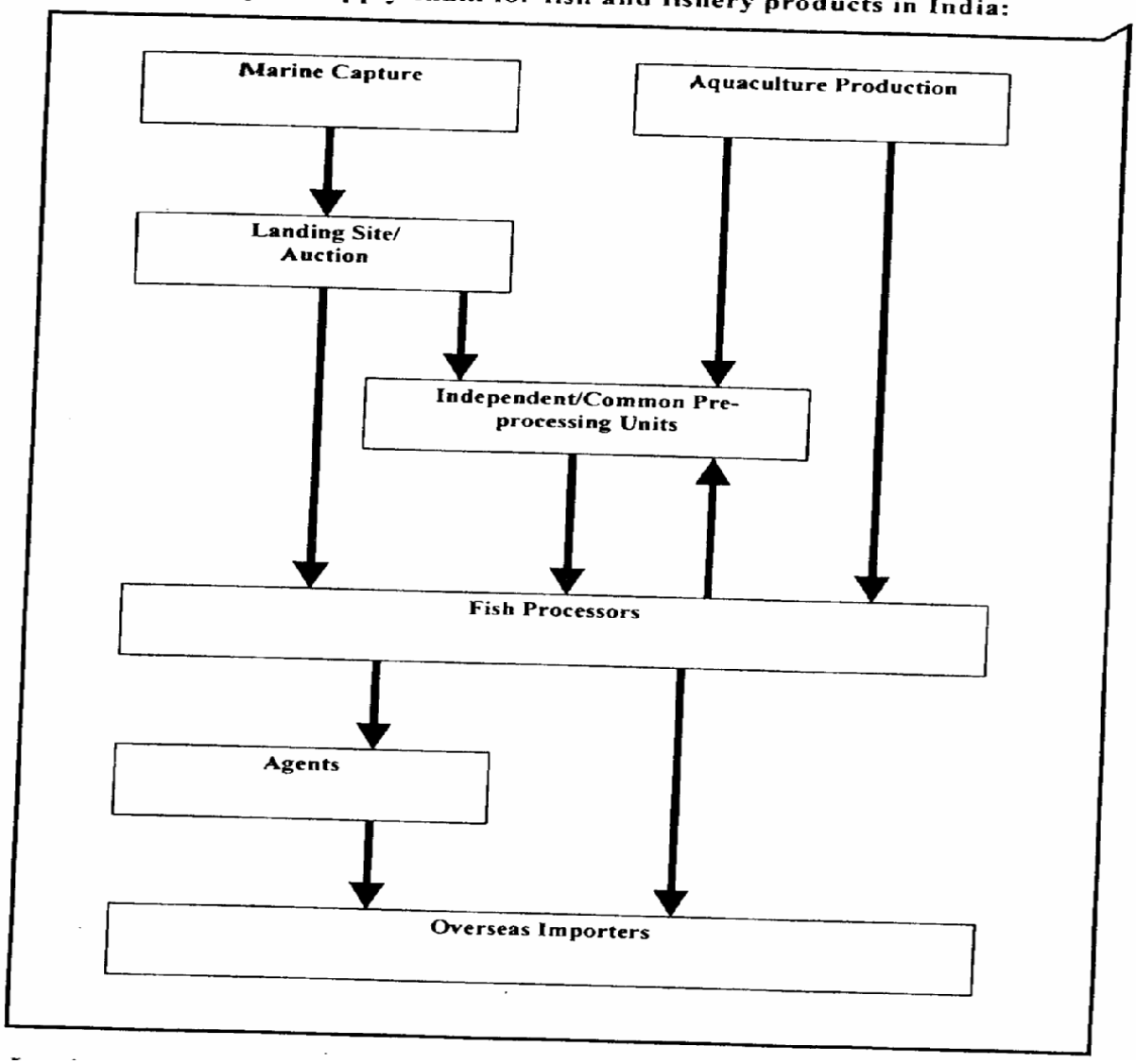
Population	Number
Fisher population:	632.900
Men	*197,800*
Women	*197.000*
Children	*238,100*
Family members engaged in fishing operations:	
Full-time	109,900
Part-time	27,500
Family members engaged in fishing-related activities:	
Marketing	25,400
Repair of fishing nets	13,500
Processing	8,100
Other activities	42,600

Source: Yacoob (1994): Rajasenan (2001).

At registered landing sites fish is auctioned through agents that 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 a commission basis. The landed catch generally consists of mixed species and agents sort it into fish for the local and domestic markets and by species.

[2] There is also fresh water capture although this is insignificant within the context of the export supply chain.

Figure 3.4. Export supply chain for fish and fishery products in India:



In the case of cephalopods and crustaceans, the processing sector consists of two distinct operations that can be undertaken by independently at separate sites or in integrated operations. Preprocessing involves cleaning and de-shelling 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, pre-processing 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 pre-processors for preparation on a contract basis. In others, the pre-processor purchases the raw material and sells it to the processor in the prepared state.

Most pre-processors 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. Pre-processors 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 their pre-processing or processing unit. Some, however, employ their own buyers that are based at landing centres. 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 others they 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 they export directly to their home market, often for further processing. Further, 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 are subject to change over time in response to emerging problems, advances in scientific knowledge, consumer concerns, political pressure etc. 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 in particular that have raised challenges for exports of fish and fishery products from India in general, and Kerala in particular.

4.1. 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, US and Japan. 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 etc.), 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

[3] Directive 91/493/EEC.

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

other quality indicators.[5] These parameters are subject to minimum levels of sampling and testing in order 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 -1) 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]

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 they comply with these requirements. The European Commission 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. Further, 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 which 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 Commission 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

[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.

border (see below). These are published in Part I of the list of approved countries. Countries for which these procedures have not been completed but where 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 programme of physical checks to ensure the product still complies with regulatory requirements as certified on the accompanying veterinary health certificate.[10] [11] These must cover at least one percent of the items in a consignment from a minimum of two to a maximum often items. However, these checks can be less frequent under certain conditions. Examples include where products originate in a Third Country offering satisfactory health guarantees as regards checks at the point of origin, where products come from establishments on a list drawn up in accordance with EU rules and/or have undergone Community or national inspection, and/or where import certificates have been issued for the products concerned. All products are subject to more 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, 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 offish and fishery products to the United States were based on physical examination .it the border. This was primarily directed towards substances that would cause the consignment to be adulterated under US law. Whilst border inspection remains an integral element of US food safety controls, more recent rules require that importers be proactive in ensuring consignments comply with US regulatory requirements.

Processors of fish and fishery products are required to comply with general

[8]Initially, the deadline for countries to achieve Part I status was 31 December 1996. However, this has been extended on four occasions and

[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 imports were produced and marketed under conditions that were least as 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 amongst importers) that different procedures and/or testing methods are employed at port of entry between Member States. This has led to the phenomenon of 'part shopping whereby importers focus on ports of entry that have or at least are perceived to have, less strict procedures.

[12] Directive 92/894/EEC

requirements relating to the structure of premises, equipment and product and process controls, which mandate the application of Good Manufacturing Practice (GMP)[13]. Further, as of December 1997, legislation governing the processing and importing offish and fishery products requires that processors maintain Sanitation Standard Operating Procedures (SOP), including written sanitation records, and implement HACCP.[14] Imports offish and fishery products must comply with the same requirements. Further, 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. Firstly, the product can be obtained from a country that has a Memorandum of Understanding (MOU) with the US Food and Drugs 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 Canada, Chile, South Korea, Australia, New Zealand, Norway, China, Thailand Japan, Iceland and the EU have agreed or are negotiating an MOU with the FDA.

Alternatively, the importer can have written verification procedures for ensuring that imported fish and fishery products have been processed in accordance with US regulatory requirements. There are two components to this. Firstly, product specifications designed to ensure that the product is not adulterated, as defined by US legislation. Secondly, '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 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) 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 being processed in accordance with US regulatory requirements; 5) periodic testing of the imported product and maintaining a written assurance from the processor that the imported product is being processed in accordance with US regulatory requirements: and 6) other verification measures that provide an equivalent level of assurance of compliance with US regulatory requirements.

Importers are entitled to utilise 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

[13] 21 CFR 110
[14] 21 CFR 123.

regulatory requirements. In the absence of such evidence it is assumed that the product is adulterated and entry at the border is denied. 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 does not provide 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 inspection to ensure that imports meet the same standards as domestic products. Importers are required lo 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[15]. In some instances a product is detained automatically at the border without physical examination. This is based on past history and/or other information indicating the product may not comply with US regulatory requirements. Where 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. 2003). These 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.

There are 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 coli forms, *Salmonellae* and *Staphylococcus aureus.*

All food imports 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 of time. Inspectors undertake document examinations and inspection. Inspection is risk-based according to, for example, records of previous non-compliance. Further, some products are subject to monitoring inspection based on levels of imports and previous record of non-compliance. When a consignment is subject to inspection by a

[15] The US is also currently enacting controls on bio-security that will require importers to have a named agent in the US and to provide prior notification of consignments prior to their arrival at the port of entry.

public agency in the exporting country and a report is provided, inspection at the Japanese border may be waived. In the case of frozen foods, the Japanese Frozen Foods Inspection Corporation (JFFIC) is authorised by the Ministry of Health, Labour and Welfare to undertake inspections.

4.2. Antibiotics:

In 2001, residues of antibiotics emerged as a major problem for fish and fishery products exports to the EU, in particular shrimp. In the use of a range of substances that have a hormonal or thyrostatic action in aquaculture production is prohibited except for therapeutic purposes.[16] EU legislation prohibits the sale of animals that have been administered such substances or where, in the case of therapeutic use, minimum withdrawal periods have not been complied with. Imports of fish and fishery products that do not comply with these requirements are not permitted. Common procedures for the monitoring of substances and residues in fish and fishery products have been established in the EU[17]. Further, harmonized maximum residue levels (MRLs) have been established for veterinary drugs.[18] In the case of antibiotics such as Chloramphenicol and Nitrofurans these 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 also extended to other products, for example eggs and egg products in the case of India, meat and meat products in the case of China and poultry and poultry products in the case of Brazil. The European Commission responded by imposing restrictions on exports of shrimp from a number of countries. Over the period 2001 to 2003, Vietnam, Thailand, Indonesia and Myanmar were subject to mandatory border testing of shrimp for Chloramphenicol and/or Nitrofurans for periods of up to 10 months.[19] In the case of Myanmar, there restrictions are still in place. China was first subject to mandatory border testing in September 2001. Following an inspection visit by the European Commission, an absolute ban on exports was applied on 31 January 2003 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. Further, 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! This has mainly been an issue with exports to the EU, although is also emerging as a concern in the United States.

4.3. Heavy metals and other environmental contaminants:

[16] Directive 96/23/EC.
[17] Directive 96/23/EC.
[18] Regulation 90/23 77/EC.

[19] In the case of Thailand, these requirements also applied to poultry meat. In the case of shrimp, the requirement for mandatory, border testing was replaced with a requirement for Health certificates issued by the Thai government after a period of seven months. This later requirement was eventually removed in June 2003

The EU lays down limits on levels of heavy metals and other environmental contaminants that can be present in fish and fishery products. In general, levels are not permitted such that dietary intake is likely to exceed acceptable daily or weekly intake for humans.[20] Member States are required to implement a monitoring system to check the level of contamination of fish and fishery products, both produced domestically and imported. More specifically, the EU has published maximum levels for lead (0.5mg/kg in crustaceans and l mg/Kg in cephalopods), cadmium (0.5mg/kg in crustaceans and l mg/Kg in cephalopods) and mercury (0.5mg/kg in crustaceans for fish and fishery products).[21] Currently, the US only has a specific tolerance for methyl mercury in fish (l ppm).

In 2001, the EU established a maximum level for dioxins in fish and fishery products of 4pg/g fresh weight.[22] Subsequently, in 2002, a stricter action level of l ng/Kg was established in addition to this maximum level.[23] This aims to bring about pro-active efforts to reduce levels of contamination, highlighting cases where 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 currently has specific tolerances for dioxins.

4.4. Other requirements:

Fish and fishery products are subject to a range of further food safety requirements in particular markets. For example, *Vibrio paraheamolyticus* is a pathogen native to warm waters and is 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 *V. 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 *V. paraheamolyticus.* In 2001, the Standing Committee on Measures Relating to Public Health (SCVMP) criticized the practice of judging the quality offish and fishery products on the basis of should not judge fish on basis of *V. paraheamolyticus* alone with no account of virulence.[24] The US currently 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 2002 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.[25] The rationale is that, in the event of a bioterrorism incident, registration information will

[20] Directive 91/493/EC.
[21] Regulation 2001/466/EC.
[22] Regulation 2001/2375/EC.
[23] Regulation 2002/201/EC.

[24] SCVMRP (2001). Opinion on *Vibrio vulnificus* and *Vibrio parahaemolytieus* in Raw and Undercooked Seafood. European Commission. Brussels.

[25] With a deadline of 12 December 2003.

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 in order to determine the need for inspection.

The Public Health Security and Bioterrorism Preparedness and Response 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 this will enable the US government to trace back any item of food implicated in bioterrorism through the supply chain. Information to be recorded includes the firm's name and a named responsible individual within that firm and their 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, exporters are aware that they are impending and beginning to implement the required record-keeping systems.

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 occur in US waters and requires that US shrimp trawlers use turtle excluder devices (TEDs) in their nets when fishing in areas where there is a significant likelihood of encountering sea turtles. In 1989, this was extended to shrimp imports. Shrimp harvested with technology that may 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 where there was no risk of threat to these species of turtle.[26] In practice, this meant that countries having an) of the five protected species of turtle in their coastal waters had to impose similar requirements on their fishing industry as 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. Interestingly, Kerala is not a natural habitat for any of these species and actually gains some competitive advantage over other supply regions, including 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 can be used on packaging. Further, official quality grades may be applied, for example, Japan requires that fish and fishery products are free of shell and other fragments. These are frequently augmented by (he

[26] In 1997, India. Pakistan. Malaysia 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, it was determined that the US applied these measures in a discriminatory manner: it gave certain countries (especially in the Caribbean) longer periods in which to comply and 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 registered a complaint to the original panel.

specifications of individual customers and can lay down a range of organoleptic and other parameters.

5. EXPERIENCES WITH FOOD SAFETY CONTROLS IN INDIA'S MAJOR EXPORT MARKETS:

This section aims to provide a general overview of the experiences of Indian exporters of fish and fishery products, and in particular exporters in Kerala, in view of the recent evolution of food safety and quality practices. In particular, it discusses the related impacts on border rejections and on trade flows where there is an obvious linkage between (he two, for example the prohibition of fish and fishery product exports from India to the EU during 1997. Particular attention is given to the experiences of Keralan exporters.

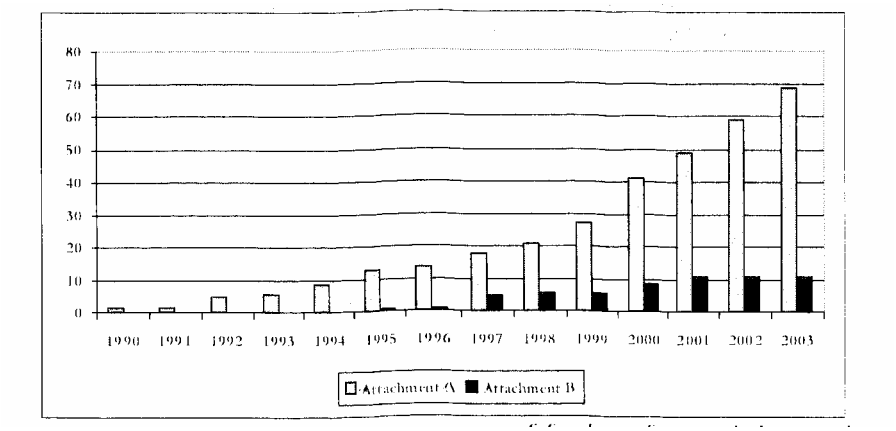
5.2. General hygiene requirements:

Historically, India has faced a number of challenges meeting hygiene requirements for fish and fishery products in its major export markets, in particular the US and EU. 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. Through the 1980s and early 1990s, the major source of problems for Indian exporters was the US. Since, the mid-1990s, however, attention has switched to the EU. Until very recently little or no problems were experienced in the Japanese market, although in the last year or two a major issue has arisen not related to food safety, but quality.

Through 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 an import alert was imposed on all shipments. In January 1980, a certification program was agreed between the FDA and the Indian government through which an agreed list of exporters exempt from automatic detention was established. This operated through 1981, but was abandoned in 1982 because of high rates of violation by certified exporters, which continued through 1993 and 1994. Subsequently, the FDA established its own registry of firms that were exempt from automatic detention based on their history of compliance established through border inspection. So-called Attachment A lists exporters of fresh and frozen shrimp and Attachment B 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 over the period 1991 to 2003 is detailed in Figure 5.1.

The importance of achieving Attachment A or B status becomes very clear when talking with exporters. 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 in order to achieve this because of small export volumes. Reflecting this, a number of exporters without Attachment A or B status have chosen to not export to the US.

Figure 5.1. Number of exporters included in Attachment A and Attachment B:

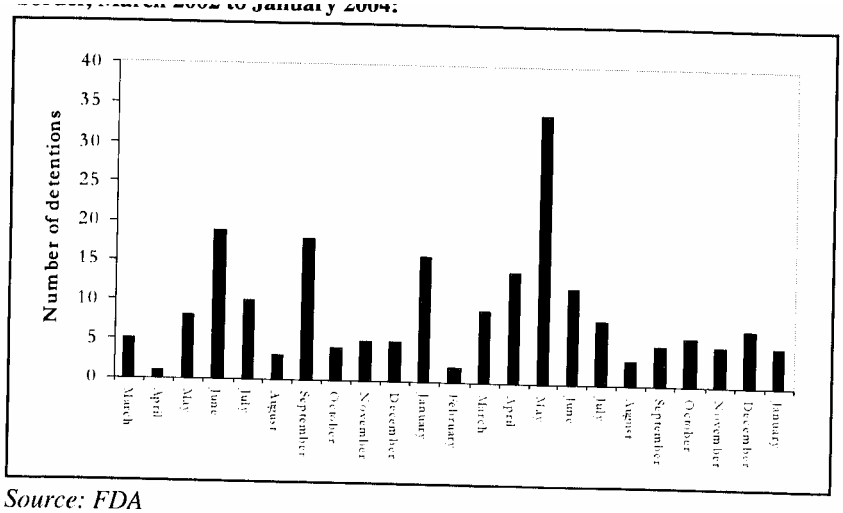


Note: Attachment A refers to exporters of fresh or frozen shrimp and Attachment B to exporters of cooked shrimp.
Source: FDA

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 to be refused entry each month (Figure 5.2). Major reasons for rejection are filth and *salmonella,* indicating the continued importance of general hygiene controls in accessing US markets. More general labelling issues are also an issue but account for a small proportion of total rejections.

Since the mid-1990s, the major concern has been compliance with the EU's requirements for hygiene throughout the fish supply chain. 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. Further, 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).

Figure 5.2. Number of detentions of Indian fish and fishery products at the US border, March 2002 to January 2004:



Source: FDA

Despite these efforts to implement regulatory reforms, inspections undertaken by the European Commission in April 1997 identified significant non-compliances, 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 the inspections, the Commission was sceptical that the large number of plants (347) that were included on the list of approved facilities provided by the IEC could all meet EU requirements and voiced their 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 were motivated by the detection *of Salmonella* in consignments through border testing in certain Member States. Following this, in May 1997 the Commission banned exports of fresh crustaceans and cephalopods and imposed border testing for *Salmonella* and *Vibrio* spp. for frozen products.[27] In July 1997 the requirement for border testing was further directed towards the detection, in particular, of *Vibrio cholerae* and *Vibrio parahaemolytictis.*[28] 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 15th September 1997.[29]

Over the period August to November 1997. the Indian government made great efforts to reform its food safety controls and achieve compliance with EU requirements (see Section 6). Thus, when the European Commission undertook further inspections in November 1997 it considered 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

[27] Decision 97/334/EC.

[28] Decision 97/590/EC

[29] Decision 97/515 EC revised by Decision 97/553/ /EC.

December 1997[30] and India was added to List I of fully harmonized countries.[31] India had gone from a position where 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 a further 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, although these were subsequently 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) Further, 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 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 required that they have prescribed quality control procedures in place. At the end of the 1980s, however, non-voluntary inspection became almost a 'bad ward' and there was a strong business lobby for the liberalization of these requirements. Subsequently, in 1991 inspection and certification by the EIC became voluntary where 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 5.1). Further, in many of the plants where IPQC had been established, systems of quality control began to break down at the very time when new hygiene requirements were being introduced by the EU!

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. A further inspection visit is expected in the near future; indeed the Indian government is encouraging the US authorities to come. This surely reflects the confidence the Government now has in the food safety controls that have been put in place!

Like for the US, exports offish and fishery products from India are subject to relatively high rates of border rejections in the EU, even though its List I status entitles it to lower rates of border inspection (Figure 5.3). 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 5.2). Whilst Salmonella was a major issue in 1998, rates of rejection have declined in line with the implementation of stricter controls in processing facilities, to be replaced by antibiotics and bacterial inhibitors through 2002 and 2003 (see below).

[30]Decision 97/876/EC.

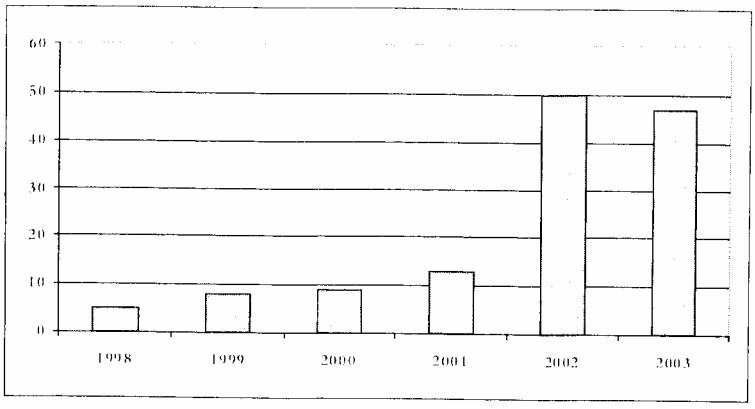
[31] Decision 97/877/EC

Table 5.1 Consignments of fish and fishery products inspected by EIA Cochin, 1990-91 to 2001-02:

Year	CWI		IPQC	
	Number	Value Rs (Lakhs)	Number	Value Rs (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: FDA

Figure 5.3. Number of consignments of Indian fish and fishery products rejected at the EU border, 1998-2003:



Source: EIC/European Commission

5.3. Antibiotic residues and bacterial inhibitors:

Recently, India was subject to high rates of border rejections because of antibiotics and bacterial inhibitors with 27 and 22 consignments rejected in 2002 and 2003 respectively. However, the European Commission has not imposed the same border testing requirements as suffered by some its major competitors. In part this reflects the fact that the rate of border rejections has been lower than for some of India's major competitors, most notably China.Thailand and Vietnam. Further, the Indian government responded to the emergence of these rejections by prohibiting the use of antibiotics and other pharmacologically-active substances in aquaculture, fearing that a ban might result in a similar manner to China if decisive action was not taken.

Currently, however, it does not have the capacity to test to the level of the equipment employed in many EU Member States.

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.

5.4. Heavy metals and environmental contaminants:

Whilst 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, which were subsequently revised in July 2002. Likewise it specified a maximum level for dioxins in April 2003 that is equivalent to that in the ITI (4pg/g fresh weight). The one problem it faces, however, is testing capacity. In the case of dioxins, for example, existing equipment can only test to 4ug/g fresh weight!

Table 5.2. Keralan detentions offish and fishery products at the EU border, 1997-2003

Year	*Salmonella*	Aerobic Mesophiles	*Vibrio Cholerae*	*Vibrio Cholerae* Non-o I	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: EIA

5.5. Quality and other problems[3233]:

Whilst food safety controls have not emerged as an issue with 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-mouldy" smell has been experienced with around 10 percent of cultured shrimps originating in India, and particularly one region of Andhra Pradesh. It 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.

5.6. Impact on fish and fishery product exports:

Without an econometric analysis, which is beyond the scope of the current paper, it is difficult to ascertain with any certainty the precise ways in which these food safety and trade issues have affected exports offish and fishery products from India. On the one hand, whilst there have been clear events that have impacted exports, for example the ban on exports to the EU in 1997, 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, there are various other factors that have influenced the competition that Indian exporters have faced from other countries, most notably Thailand, China and Vietnam. In part, food safety controls have also had an influence in this respect; over the period 2001-2003 all of these countries have faced restrictions on exports to the EU, for example, related to residues of antibiotics. However, national government policies, broader changes in production costs etc. have undoubtedly also been important. That having been said, 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 the restrictions on exports to the EU in 1997 related to microbial contamination and quality problems related to "muddyb Mouldy' smell with exports to Japan through 2002-2004.

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

[32] Marine capture of shrimp along the coast of Kerala has not been adversely affected In 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 are found along the Keralan shoreline. Further, traditional capture methods are still quite widely applied and these fall outside the purview of the requirements.

[33] 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. Whilst exporters with their own officers or established agents in the US may have faced few problems, these are generally the exception rather than the rule. Certainly, at the time fieldwork was under-taken in India. June 2003. The majority of exporters had not registered with the FDA and there were concerns about the impact of this requirement in particular, on their ability to continue to access US markets.

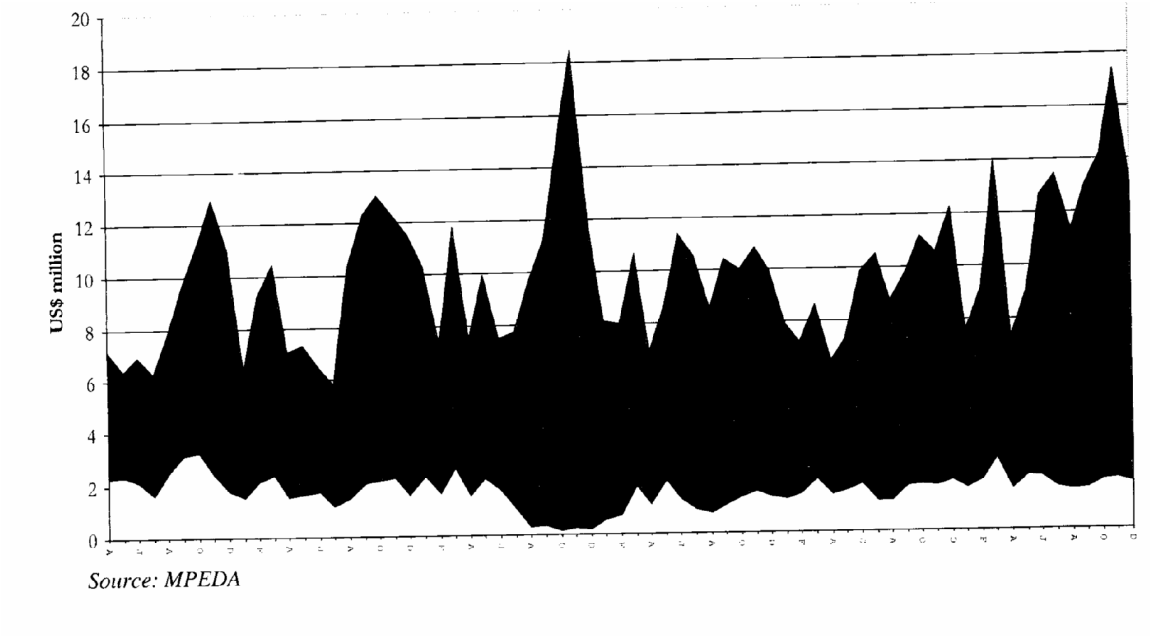
1997 was a decline in the value of exports to the EU both from Kerala and India as a whole. Thus, Indian exports offish and fishery exports declined from US$221 million in 1996-97 to US$114 million in 1997-98 (Figure 5.4). Exports of shrimp in particular, declined from US$137 million in 1996-97 to US$54 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 offish 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 towards 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 offish and fishery products in 1997-98 compared with 62.6 percent in 1996-97. Likewise, the contribution of exports to South East 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 1999-00 and US$137 million in 2000-01. Keralan 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. Overall, exports of fish and fishery product from India through 1998-99 and 1999-00 were, however, actually lower in 1997-98. This 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. This makes it even more difficult to isolate out the impact on trade. It is clearly evident, however, that fish and fishery product exports to Japan have declined markedly in recent years. Whilst Indian exports were valued at US$563 million in 2000-01, they declined to US$383 million in 2001-02 and US$317 million in 2002-03. Thus, Japan's share of exports declined from around 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 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, in a similar manner to during the period of restriction on exports to the EU.

Figure 5.4. Value of fish and fishery products exports from India, 1995-2001:



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, it has provided financial and other forms of support to the fish processing sector in its efforts to up-grade food safely controls. This section reviews each of these initiatives in turn.

6.1. 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 EITs 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, whilst India implemented these legislative reforms as early as 1995, this 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. Indeed, 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 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 pre-shipment inspection and certification of designated export commodities. It has a staff of around 1,000, including 300 inspectors, laboratory analysts and other technical personnel. The EIC establishes overall policy on inspection and certification services in India and provides strategic controls across the country. Its powers are including the notification of commodities for which export inspection and certification is required, setting of standards and specifying the form of quality control and/or inspection to be out in place. Inspection functions themselves are performed by five regional Export Inspection Authorities (EIAs). In the case of Kerala this 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, for 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, around 29 percent were in Kerala (Table 6.1).

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 offish and fishery product processing facilities wishing to be EU-approved in November 2001. These additional requirements include mandatory integrated pre-processing 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 go beyond EU standards, reflecting the risk adversity 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 EU-approved processing facilities in India, around 44 percent were in Kerala in 2001-02 (Table 6.1)

Table 6.1. Number of export-approved fish and fishery product plants:

Year	Kerala			India		
	EU	Non-EU	Total	EU	Non-EU	Total
1999-00	49	69	118	96	251	347
2000-01	44	53	97	192	108	300
2001-02	52	51	103	119	236	355
2002-03	53			129		
2003-04	53			136		

Source: EIC

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 IEA. If the factory is determined to be to the required standard it is put forward by the IEA to an Inter-Departmental Panel (IDB) involving 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 IEC for two years.

Once a plant has been approved for export, the EIA implements a system of inspection that focuses resources on those plants that are performing less well in terms of hygiene standards and those which are EU-approved[34]. 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 offish processing operations are tinder the control of the approved facility or that any separate operations pre approved independently. In the case of the Keralan fish processing sector the main issues here relate to ice production and pre-processing. Traditionally, most processors have purchased shrimp, squid and cuttlefish from independent pre-processors or have had pre-processing undertaken by independent operators under contract. Likewise, many purchased ice from independent ice plants. In view of the results of EU inspection of independent pre-processing units and skeptical about the ability of fish processors to maintain control over such operations, in 1997 the IEC mandated that all pre-processing, and also ice production, be integrated into EU-approved processing facilities. Indeed, EIA

[34] Non-EU approved plants are subject to a standard level of inspection of once per month, whereas EU-approved facilities are initially inspected even' 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 a further six months, inspections decline to once every two months. Plants that continue to comply for a further six months are place on the lowest inspection frequency - once every three months. Supervisory visits are undertaken by the Deputy-Director of the regional EIA even' three months inspections frequencies of two weeks or monthly, and ever six months with inspection frequencies of every' two or three months. Whenever a complaint is made against a processing facility, the plant returns to an inspection frequency of every two weeks for a minimum of six months.

stipulate a maximum daily output for each EU-approved facility on the basis of (amongst other things) the installed pre-processing and ice production capacity. In October 2001, procedures were published for the approval of independent pre-processing and ice production units, although none have been inspected and certified by the IEC 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 who is responsible for monitoring regulatory developments and sending information back to New Delhi.[35] Interesting, however, whilst MPEDA has an office in both New York and Tokyo, it does not yet have an office in Brussels! This information (lows to the Ministry of Commerce and Industry from which it is distributed to the IEC and MPEDA, who pass it on to local EI As and the SEAL[36] .The EIC is currently making efforts to further improve its monitoring of emerging issues, through the creation of a computerized database on regulatory requirements in India's main export markets.

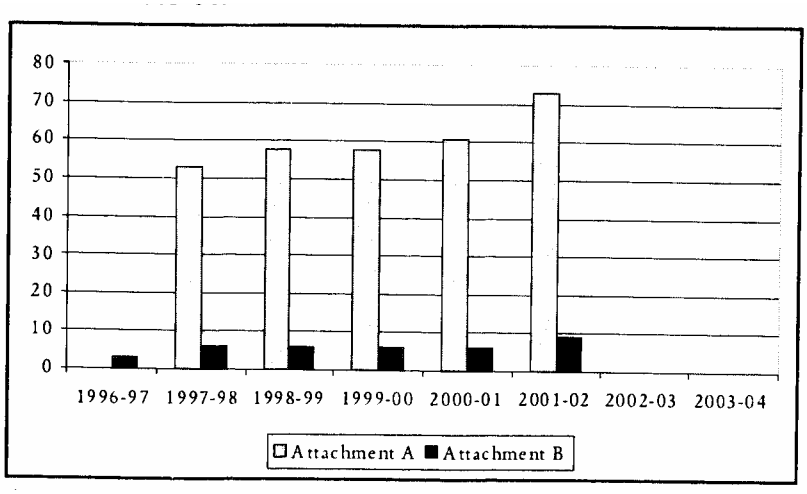
The Indian government has also implemented rather elaborate procedures to address the problems associated with border rejections, most notably in the EU. It is concerned that high rates of rejection associated with a particular issue can result in the implementation of protective measures by the European Commission, as occurred in India itself in 1997 and with China in 2001. Thus, if an alert is issued by an EU Member State through the European Commission, the Ministry of Commerce and industry, IEC and MPEDA are notified through the Indian embassy in Brussels. In the case of the US, conversely, there is no automatic route through which information of border detentions is collected and communicated back to New Delhi. Again, this reflects the focus of attention and resources within the Indian government on the major "problem' market on a day-to-day basis, namely the EU.

Quality-related issues are referred to the Regional Standardizing Committee on Quality Complaints (RSCQC) to identify if 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 two weeks for a minimum period of six months. Further, in the case of exports to the EU, ten consignments from the plant are subject to inspection and verification by the EIA, selected at the rate of one consignment in every four. In the case of exports to other markets, inspection is undertaken until five clear consignments are achieved. For complaints related to residues, three day's production is tested. There is no requirement for monitoring visits. The number of plants 'on alert over the period 1996-97 to 2003-04 is given in Figure 6.1.

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

[36] As an example. EU Regulation 178/2002 laying 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 March.

Figure 6.1. Number of fish and fishery processing facilities 'on alert' 1996-7 to 2003-04:



Source: MPEDA

As an example of the decisive action taken by the IEC in the case of EU border detentions, on 21 September 2002 five 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. Further, all other facilities with single rejections were subject to CWI; this encompassed a further 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 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 the inventory held by these five facilities was permitted to be exported to non-EU destinations under CWI. Further, they were permitted to produce and export marine fish (except shrimp) to non-EU destinations under CWI. On 17th October, all restrictions were removed.

The inspection and laboratory testing (see below) regime implemented by the EIC to monitor EU-approved plants imposes a not inconsiderable burden on regional EIAs. It is estimated that the cost per plant is around $6,444/ annum (Table 6.2). This implies a total annual cost for IEA Cochin of monitoring EU-approved plants in Kerala of around $341,000 in 2003-04, and a cost for all of India of around $876,000 (Figure 6.2). As a proportion of the value of exports to the EU, this is rather miniscule at around 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 offish and fishery products to the activities of EIA Cochin, related inspection fees accounted for around 69 percent of total income in 2001-02. EIA Cochin, however, had an operating deficit of almost $ 138,000 in 2002-03 and there are some concerns regarding its sustainability, given current levels of funding, in the medium-term.

Table 6.2. Estimated annual cost of approval and monitoring of a single EU-approved fish and fishery product processing establishment, 2003:

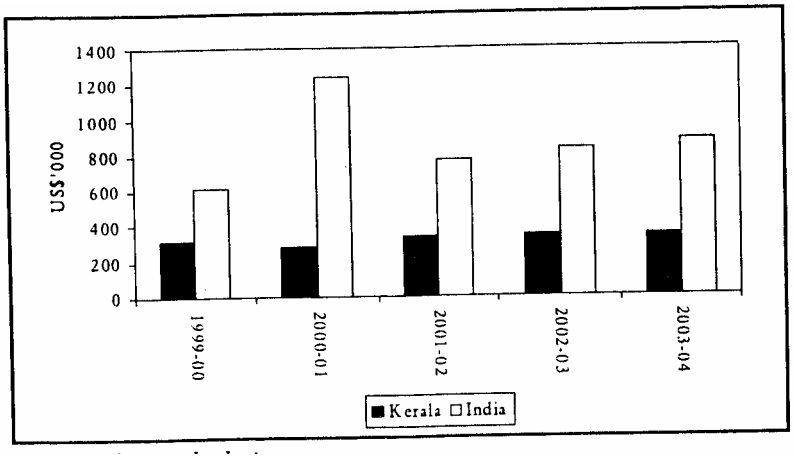
Activity	Elements	Estimated Cost (US$)
Approval	Processing and desk audit	20.6
	Assessment of establishment by SAT and TDP	205.7
	Approval certification	41.1
	Total:	267.4
	Annual cost	133.7
Monitoring of Establishment	Fortnightly inspection by EIA officer	43.2
	Testing of samples taken by EIA officer	169.7
	Annual cost	5110.1
Testing samples	Quarterly monitoring of environmental contaminants	822.9
	intra/Intcr 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

6.3. Laboratory testing capacity:

The laboratory facilities operated by IEA Cochin were relatively small until the up-scaling 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 reflecting 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 was further exacerbated by a voluntary retirement scheme in 1994 through which there was a loss of labour, expertise and experience.

Figure 6.2. Estimated total cost of approval and monitoring of EU-approved fish and fishery product processing establishments, 1999-00 to 2003-04:



Source: Own calculation.

Considerable investment has been made in the up-grading of 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, up-grades of the IEA Cochin's main laboratory have involved an investment of around US$64,657. However, this laboratory has severe space constraints and land has been acquired for a new facility that will be built in the next one to two years. Further, following the recommendations of the European Commission's inspections in April 1997, all five of the laboratories operated by EIA Cochin are process accredited and participate in inter-laboratory comparisons. A quality manual has been drafted for these facilities and the EIA Cochin is currently working towards accreditation by the National Board for the Accreditation of Laboratories (NBAL).

The MPEDA laboratory in Cochin has recently installed new HPLC-MS/MS equipment in order to perform laboratory analysis of antibiotics residues, at a cost of around $280,000. However, this was still not operational in mid-2003 because of a lack of appropriately trained technicians. The ultimate aim is to have nine laboratories nationwide that are equipped in this way, some of which may be operated by other agencies under a Memorandum of Understanding with MPEDA.

In addition to laboratories operated by the EIA and MPEDA, there are three private laboratories in Cochin that play an important role in bolstering analytical capacity in the State. These are utilized by processing facilities for routine tests, for example of water and ice, and for certain residues prior to export. For example, these laboratories are offering less sophisticated tests for antibiotic residues, although these do not provide the required level of sensitivity.

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; Indeed, they are caught up in a seemingly continuous process of equipment up-grade and staff training to keep on top of emerging issues. This is particularly an issue 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 in order to prevent border detentions. Recently, funding has been approved by the European Commission for EIC projects related to certification, accreditation and related issues, totalling Euro million. These include laboratory accreditation, organic certification. CE marking, risk analysis studies etc.

6.4. 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 include subsidy programs for the up-grading of processing facilities and training of managers and workers through the fish and fishery products supply chain. Clearly, MPEDA recognizes the importance of enhancing food safely controls as part of its mandate to promote fish and fishery products exports from India.

MPEDA operates a subsidy scheme to assist fish processing facilities in establishing quality control laboratories. The subsidy is at the rate of 50 percent of the cost subject to a maximum of Rs 50,000 per unit. MPEDA also offers subsidies for the establishment of integrated pre-processing facilities. This amounts to 50 percent of the cost, to a maximum of Rs l.5 million per unit. In 1999-00, a further subsidy to cover the cost of renovation/ modification was introduced equal to 45 percent of the cost, with a maximum of Rs l.35 million. The amounts disbursed under this program and the numbers of processing units supported over the period 1996-97 to 2003-04 are summarized in Table 6.3. In 1996-97, a one-off program of support for pre-processing facilities to purchase stainless steel tables was also offered. This supported 11 pre-processing units through the disbursement of $12,730.

MPEDA also provides and supports a number of training programs, both in general quality control procedures and HACCP. Over the period 1996-97 to 2001-02, 29,110 fishers, 20,363 pre-processing workers and 15,745 processing workers received basic quality control and hygiene training. More generally, MPEDA provides advice to both pre-processing and processing facilities on deficiencies in their hygiene controls.

Table 6.3. Support for up-grading and/or installation of laboratory and in-house pre-processing facilities in fish processing plants, 1996-97 to 2003-04:

Year	Support for QC Laboratories		In-House Pre-Processing Facilities	
	Units	Cost	Units	Cost
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				
2003-04				
TOTAL				

6.5. Up-grading of landing facilities:

The one area in which the Indian government has failed to take decisive action to enhance hygiene controls is at landing centers. Despite the fact that the EU has highlighted this as an area of weakness on multiple occasions, and there are concerns that this could be a major issue when the European Commission next undertakes an inspection mission, hygiene standards have remained largely unchanged. In part this 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 centre is the responsibility of the Cochin Port Trust. Further, exports account for a relatively small (although not insignificant) proportion of the total landed catch handled at each centre, meaning 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 this is considered impractical since it would, in effect, bring a halt to exports. Instead the EIC and MPEDA have resorted to the provision of advice and supported proposals for the development of alternative facilities that are under the direct control offish and fishery product exporters (see below).

Funding is being made available, however, for the up-grading of 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 up-graded 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. Further, they are paid to a consolidated fund at the slate 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 the up-grading of 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 installed insulated hold as a demonstration project. More generally, there has been a major campaign over some time for the use of ice on fishing boats and this practice is now almost universal.

6.6. Promotion of good production practices:

MPEDA has also been working with the fish and fishery products sector in order to establish and promote codes of good practice as a means to address emerging food safety and quality issues in India's major export markets. In the case of antibiotic use in aquaculture production of shrimp, MPEDA has made efforts to support the ban on non-therapeutic use introduced in 2000. This has involved the monitoring of usage levels, information dissemination and training. Field campaigns have been organized in major production areas involving meetings with farmers and hatchery operators. Consultants have also been screened to ensure they provide the correct advice and support services to farmers. Brochures and leaflets have also been produced. One of the major problems in aquaculture production of shrimp, and a reason for the therapeutic use of antibiotics, is the disease White Spot. A voluntary code of good practice has been produced for hatcheries aiming to control this disease. Further, laboratories have been established that provide a testing service to farmers when buying new stock seed.

MPEDA is also promoting good practice as a means to address the problem with muddy-mouldy smell that is having a serious impact on exports of shrimp to Japan. This includes the regular cleaning of ponds, holding of shrimp in fresh water for two or three days prior to harvesting etc. This project is being undertaken jointly with the Network of Aquaculture Centres in Asia-Pacific (NACA) through a collective of 54 fanners that 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.

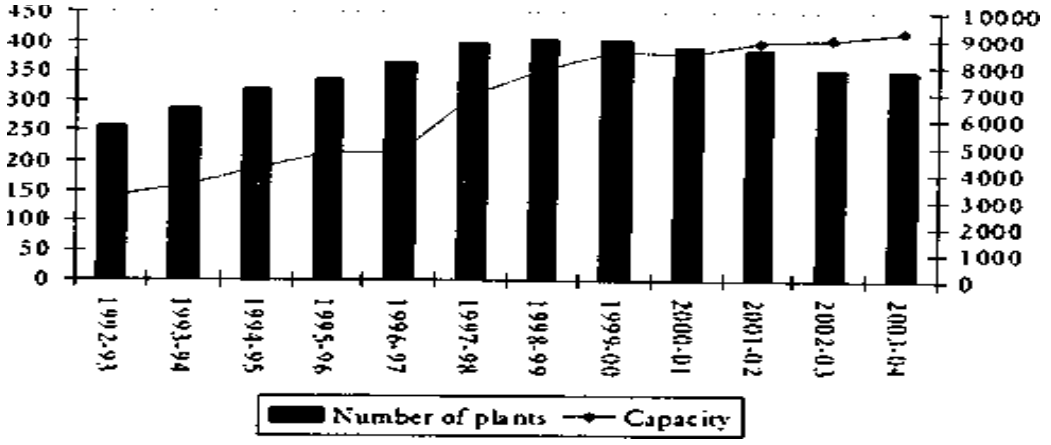
7. IMPACT ON THE FISH PROCESSING SECTOR:

7.1. 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, furthermore, these facilities traditionally purchased raw material in the pre-processed slate. Products have traditionally been block form, although an increasing number of plants have installed capacity to manufacture Individually Quick Frozen (IQF) products. In most cases there is very little value-addition. Indeed much of the product exported to the EU and (to a lesser extent) the US, is further processed and packaged before sale to the final consumer. Most of the 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 growing shift towards consolidated businesses that operate multiple plants.

Over the period 1992-93 to 2003-04, the number of freezing plants registered with MPEDA increased by 34 percent from 258 to 352 (Figure 7.1). Over the same period, however, installed capacity expanded by 195 percent from 3,150 tonnes per day to 9,296 tonnes per day, reflecting investment in larger facilities. Thus, average plant size more than doubled from 12.2 tonnes per day to 26.4 tonnes per day. The availability of raw materials throughout much of the year has, however, not kept pace with this expansion and the sector overall is estimated to operate at less than 33 percent of capacity.

Figure 7.1. Freezing plants registered by MPEDA, 1992-93 to 1002-04:



Source: MPEDA.

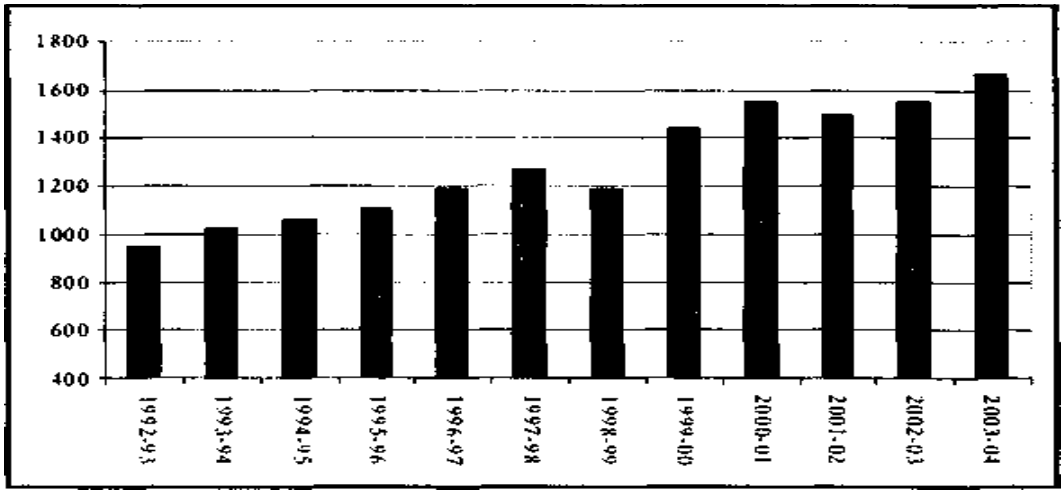
The fish and fishery products processing sector is almost entirely export-oriented, with very little product making its way into local markets. Exports are quite highly concentrated, for example with the top five processors in Kerala accounting for around 20 percent of exports and the top ten around 34 percent. Whilst there has been no appreciable change in the level of concentration over (lie period 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 7.2). There was, however, an appreciable decline during 1997-98 when restrictions were applied on exports to the EU. This illustrates the low barriers to entry and exit at this end of the supply chain.

7.3. Up-grading of hygiene standards in the fish processing sector:

Whilst the processing sector expanded rapidly through the 1990s, it is evident that 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), yet existing facilities had not been upgraded, and even many new plants were not compliant with, for example, EU requirements. Today, much of the processing sector acknowledges that improvements were long overdue and, indeed, since the EU applied restriction on exports in 1997, standards of hygiene have shifted to an entirely different level. The costs of achieving this, however, have been considerable due, in a large part, to the protracted period of time in which these improvements had to be made and the strictness of the controls applied by the IEC in a bid to bring this about. At the same lime, however, it is evident that industry perceptions of the changes they are required to make have tended to 'amplify" the task leading to rather inflated estimates of time and cost.

Figure 7.2. Freezing plants and exporters registered by MPEDA, 1992-93 to 2003-04:



Source: MPEDA.

The changes required to be made in order to comply with these varied significantly between fish processing plants. Table 7.1 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 in order to install pre-processing facilities or worker changing rooms, or to ensure a unidirectional flow of material in order to prevent cross-contamination between raw and processed materials. Further, often the general fabric of the facility required up-grading with the replacement of floors so that they drained and could be easily cleaned, lighting, ceilings etc. Many plants also had to install ice-making and laboratory facilities, up-grade 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, metal tables etc.

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.[37] 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[38]. This does not include the value of lost production for plants that had to close during renovations; it is evident that many plants had to curtail production at some point in the process of up-grading hygiene standards and in cases where major construction work was required this extended across a number of months. Using the weighted mean cost, a very rough estimate of the non-recurring 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,

[37] 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.

[38] Here the mean is weighted according to the volume of production of each processing plant.

suggesting an overall cost across the sector of US$13,540,092. This represents around 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. It should be noted that these rather high numbers, to a large extent, reflect the very specific characteristics of the fish processing sector in Kerala, namely the historic use of independent pre-processing facilities (see Section 8). From interviews with fish processing companies it is apparent that the installation of integrated pre-processing facilities was the most significant costs of compliance with the EU's requirements, as implemented by the IEC.

Processing plants also had to implement significant changes to their operational procedures. The majority had not implemented HACCP, and was required to establish the necessary plans, control procedures and documentation systems. Further, 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, record-keeping, on – going staff training, maintenance of worker medical records etc. To undertake these tasks, new technical and supervisory staff has had to be employed and/or better qualified (and more expensive) personnel were needed. Monitoring fees paid to the EIA have also increased singnificantly. Further, the costs of pre-processing have had to be internalized within the processing plant; it is evident that these are significantly greater than purchasing ready pre-processed raw material from independent facilities. Across the surveyed processing plants, the resultant increase in production costs ranged from five percent to 15 percent with a weighted and unweighted mean of 11.7 percent and 10.3 percent respectively[39]. From the in-depth interviews with fish processors, again it is apparent that the majority of these costs are associated with the EIC's requirement to have integrated pre-processing.

[39] Here the mean is weighted according to the volume of production of each processing plant.

Table 7.1. Costs of compliance with hygiene requirements for EU-approval:

Up-Grade	Plant						
	Cluster 1			Cluster 2			
	11	12	14	5	7	8	10
Pre-processing 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	US$205.700	US$450.000	US$411.400	US$205.700	US$246,900	US$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 continued. Costs of compliance with hygiene requirements for EU-approval:

Up-Grade	Plant						
	Cluster 2		Cluster 3				Cluster 4
	11	13	6	9	3	2	4
Pre-processing 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	US$514,300	US$51,400	US$82,300	US$406,700	US$442,300	US$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

Examining the surveyed processing plants as a whole it is possible to define four distinct clusters according to their nonrecurring and recurring costs of compliance, size of operation, capacity utilization and prevailing hygiene standards. This throws some light on the determinants of the costs of compliance with enhanced hygiene requirements in the processing sector. **Cluster 1** consists of facilities that vary in size but 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 non-recurring 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 amongst 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 pre-processing 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 that are paid on a commission basis. Many 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 transports the fish themselves and in others this 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 cleaning of holds in an attempt to enhance hygiene controls. However, because of the major competition between processors for raw material, the fishers wanted a commitment from the company that it would buy their entire catch and these arrangements failed.

Whilst the costs of these improvements have undoubtedly been significant, a number of processors have highlighted the benefits they have achieved. In particular, many have recorded lower microbial counts on their end products, contributing not only to food safety but also lower levels of spoilage. Further, some recognise that they now have greater control of the entire production processes 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 period, enabling them to take advantage of daily gluts in supply.

7.4. On-going 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 has not meant that food safety problems have gone away altogether. Indeed, food safety issues are a day-today 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 to be exported to alternative markets.

Many exporters have experience of 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 at least one experience of border rejection. In some cases the rejected consignment is 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 enforcement officials in the EU without them being 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 to US$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 between EU Member States. Further, 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 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 test themselves for antibiotic residues.

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

Exporters to the US generally report fewer problems than experienced in EU markets, although a number have had experiences of 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 in order to achieve a record of compliance. At the same time, however, they faced a greater risk during this period of a rejection! 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 IEC reported food safety-related problems. However, they 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 around $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, they experience very few problems. More recently, however, significant problems have been experienced with the so-called 'muddy-mouldy' smell associated with shrimp from aquaculture production. This has reduced levels of exports to Japan dramatically and although this has been partially offset by increased exports to the EU, has arguably had a bigger impact on trade volumes than the ban on exports to the EU in 1997.

7.5. Impacts on the exporting sector:

Whilst it is evident that the up-grading of hygiene standards has imposed considerable non-recurring and recurring costs on the fish processing sector, 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 whilst operating at low levels of capacity and making little or no profit. In many cases this was exacerbated by the amount of time taken for EU-approval to be granted (in extreme case (6-8 months) once improvements had been completed. Further, processors who could not obtain loans were forced to draw on their working capital. Such companies are now facing shortages of funds for the purchase of raw materials. In extreme cases they have become reliant on credit from their procurement agents, at a five to 10 percent premium on raw material prices, or have had to cease production altogether.

The impact of the need to improve hygiene standards on fish processors must, however, be placed within the context of wider challenges lacing 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 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, there have been significant increases in the cost of electricity and water in Kerala since the late 1990s that, in themselves, have increased production costs significantly. Labour 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 between the EU, US and Japan. Further, a number have increased sales to 'less challenging' markets such as China, Middle East and Singapore. Others have attempted diversify their business or relied on their other activities; a number of the larger fish processors also operate in the hotel, travel, shipping and construction

sectors, for example, as well as 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 off altogether!

Whilst the costs of compliance with these enhanced food safety requirements have undoubtedly imposed a significant burden on fish processors, it is also evident that some of the major players in the sector have gained. In particular, there is evidence that the processors which already had high standards of hygiene or made improvements earlier, benefited from premium prices whilst the number of EU-approved facilities was limited. As the number of EU-approved plants has increased margins, and thus profitability, has declined. Raw material prices have also increased as competition has enhanced between processors. Further, these plants were able to repay their debts at an earlier stage and offset these against greater returns. Very few of the facilities that delayed compliance are performing well, struggling to repay loans whilst operating under conditions of low margins and/or struggling to pull together the working capital in order to source raw material.

It is estimated that over 60 processing units have ceased operating over the last two years. Indeed, even some of the larger exporters have closed facilities or sold them off. It is likely that this process of consolidation will continue into the future. It is recognized that this needs to happen in order that the installed processing capacity better reflect the availability of raw materials. Further, there is the emergence of perhaps five or six major exporters that are coming to dominate the sector through the purchase of assets of other processors. These typically have interests outside of the fish processing sector or support from foreign capital. Within another five years it is expected that there will be fewer than 50 fish processors/exporters in Kerala!

Many processors say they would have gone into a different business if they 'knew what they know now'. However, at the point in time when these stricter hygiene requirements were imposed, they had little or no choice but to make the investments necessary to comply. As a non-approved facility, and in particular a non EU-approved facility, both their plant and their business were nearly worthless! In order to retain their business and at least recoup some of the investment that had been made in their facility, they had to invest still further in order to meet the required standard. Many of these businesses are now in a position where they are breaking even at best and many of which are likely to close over the next few years.

7.6. Collective action:

As well as their individual efforts to enhance hygiene standards, fish processors have acted collectively through the Seafood Exporters Association of India (SEAI). The SEAI has a membership of 357 exporters, each of which pay a base fee of Rs l0, 000 and Rs 250 or Rs 400 per 25 or 40 feet container respectively. It has a head office in Cochin and regional offices around India. Historically, its 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, it 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 ten pre-processing units linked to common water, ice

and effluent facilities. This aims to be a 'model' concept for the development of further 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. Construction started in 2000 and the facility was expected to be operational at the end of 2003. The total cost is $1.98 million. On the initiative of MIDCON and the SEAI, nine major exporters have established Seafood Park (India) Ltd in conjunction with MIDCOM. This subsidiary company will operate the facility and lease the pre-processing units to these exporters.

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

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

With a view to addressing the quality problems associated with shrimp from aquaculture being experienced with exports to Japan and also more general concerns reacting to food safety requirements in the EU and US, the SEAI (in collaboration with MPEDA) has proposed 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 and issuing of code numbers, and use of bar coding linked to computerized tracking. Currently, this is still at the planning stage, although is expected to be implemented in the near future.

8. IMPACT ON THE PRE-PROCESSING SECTOR:

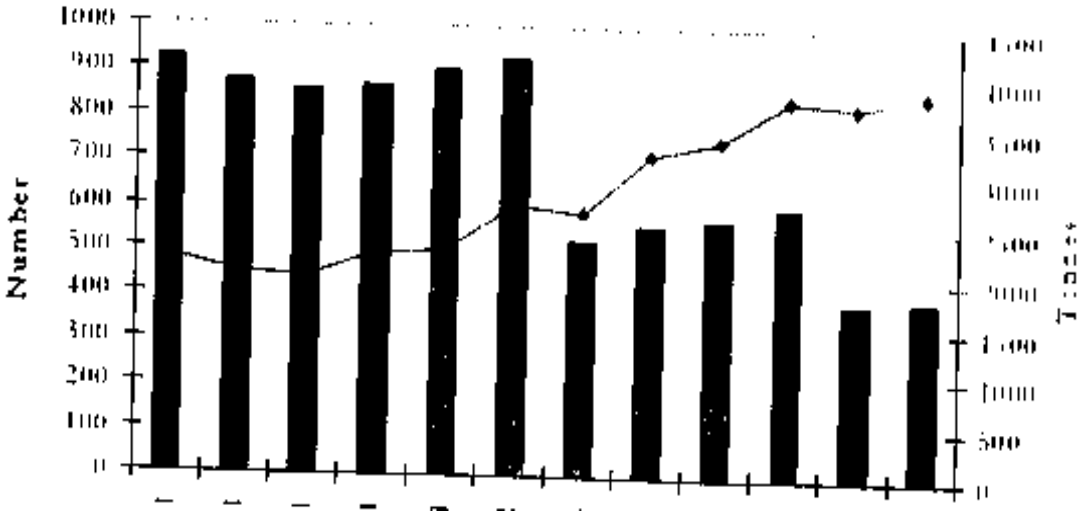
8.1. Role of the pre-processing sector in Kerala:

A particular characteristic of the fish and fishery products sector in Kerala is the role of the pre-processing sector. In much of the rest of India, pre-processing of crustaceans and cephalopods, including de-shelling and cleaning, is integrated into processing operations. In Kerala (and also West Bengal), however, this has historically been undertaken by independent pre-processing facilities that supply pre-processed materials to processing plants or pre-process under contract. Thus, in 1997-98 there were 931 independent pre-processors registered with MPEDA. Indeed, in the Keralan context, processing facilities have typically been little more than freezer plants that assemble, freeze and package shrimp, squid, cuttlefish and certain fish in bulk.

The independent pre-processing sector has played an important role in the economics of the Keralan 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 pre-processing. Preprocessing is an extremely labour-intensive operation that is dependent on access to a supply of labour that not only has the required skills, but is also flexible in order to cope with the significant variations in supplies of raw material both from day-to-day and by season. In Kerala, labour unions have traditionally been very strong and there are strict controls on labour contracts, which have posed significant challenges for the management or pre-processing operations. The processing sector has been largely isolated from these issues by the existence of the independent pre-processing sector.

Figure 8.1. Peeling sheds registered by MPEDA, I992-93 to 2003-04:



Source: MPEDA.

8.2. Up-grading of hygiene standards in the pre-processing sector:

Attempts to up-grade standards of hygiene date back to the 1970s. Although it accounted for a relatively small percentage of total output, until the late 1980s, home pre-processing 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 IEC and MPEDA attempted to eradicate this practice, recognizing the potentially serious hygiene issues. In 1997, the IEC's introduction of IPQC in the processing sector led to the inspection and approval of pre-processing facilities and moves by some fish processing plants to integrate preprocessing into their facilities. For the various reasons described above, however, in the Keralan context independent pre-processing remained the norm until the mid to late 1990s.

The European Commission had voiced serious concerns relating lo hygiene controls in pre-processing. Indeed, the Indian government recognized the considerable control problems associated with separate (whether physically and/or administratively) pre-processing and processing operations. Thus, in 1997-98 the IEC prohibited the use of independent pre-processors in the case of EU-approved facilities in 1997. Non-EU approved processing plants were, however, permitted to continue using independent

pre-processors on an interim basis. This immediately resulted in the closure of 406 facilities, a decline of 44 percent (Figure 8.1). Indeed, the initial objective of MPEDA and the IEC was to eradicate the independent pre-processing sector altogether. It soon became obvious, however, that there was insufficient installed pre-processing capacity in Kerala and that the forced internalization of pre-processing 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 pre-processing facilities by the IEC. Non-EU approved facilities were only permitted to source from approved pre-processors. Whilst EU-approved facilities were also permitted to utilize approved pre-processors, by this time most facilities interested in exporting to the EU had already installed their own preprocessing capacity. This 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. Indeed, to date around 125 pre-processing units have been approved by the IEC, all of which are linked to processing facilities or under their direct control.

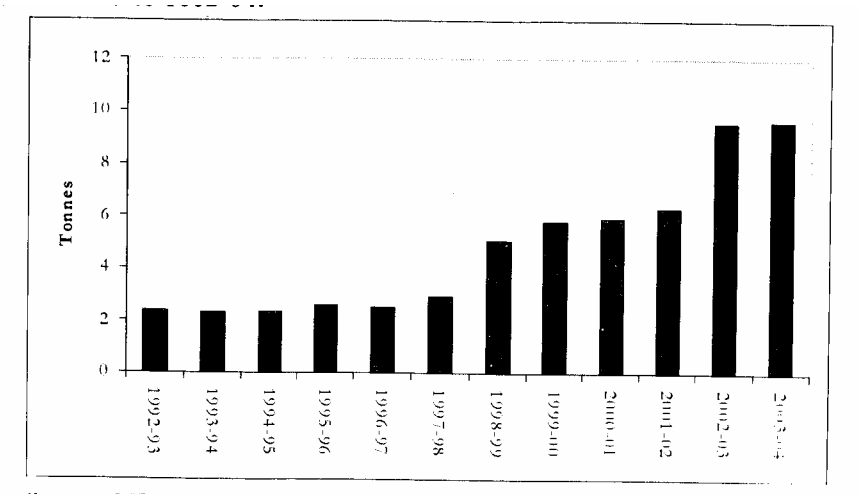
Whilst the number of pre-processing facilities declined 57 per cent over the period 1997-98 to 2003-04, installed capacity actually increased 42 percent from 2,700 tonnes per day to 3,860 tonnes per day (Figure 8.1). Thus, the main impact of the regulation of the sector by the EIC was to force the closure of pre-processing facilities, yet any new or up-graded facilities were typically larger. Consequently, average plant size increased from 2.9 tonnes per day in 1997-98 to 9.6 tonnes per day in 2003-04 (Figure 8.2).

In order to assess the impact of up-grading food safety controls on the pre-processing sector, a survey (n=201) of independent pre-processing plants was undertaken during the period August to September 2003. This yielded detailed information on the structure of the sector and, of most relevance here, the efforts made to up-grade hygiene controls.

Of the surveyed pre-processing 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 MPKDA-regislcred pic-processing facilities (401), suggests that there were actually around 490 pre-processing operations in 2003-04. Most pre-processing facilities are owned and operated by single shed owners. Only I 7 percent oft la-surveyed facilities are owned by multiple shed owners; of these, eight percent operate two shed, eight percent operate three sheds, and only one percent operating four or more sheds. Only two percent of preprocessing facility owners also operated a fish processing plant, emphasising the continued separation of these operations. Most facilities make little use of family labour. Virtually all labour is typically employed on a casual basis, the majority of which (68%) is women.

Around 70 percent of the surveyed pre-processing facilities sourced raw material directly from landing sites. A further 12 percent sourced raw materials through agents. These facilities then sold on the finished product to processing plants. Only 17 percent pre-processed raw materials supplied by processing plants on a commission basis. Most of the surveyed facilities supplied around two processing plants, including many of the major exporters. In many cases they had supplied these same plants for a number of years.

Figure 8.2. Average capacity of peeling sheds registered by MPEDA, 1992-93 to 1002-04

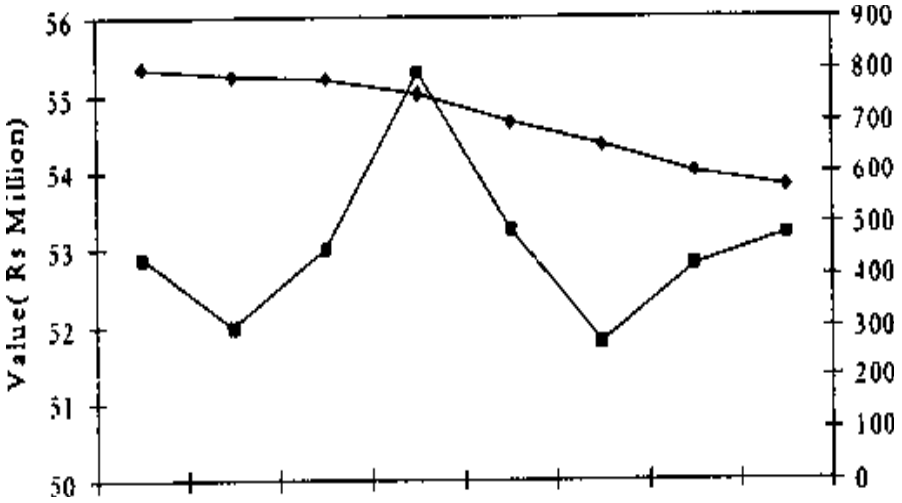


Source: MPEDA.

The mean annual turnover of the surveyed pre-processing facilities was virtually the same in 2002 (Rs 53.2 million) as in 1995 (Rs 52.9 million), although most had experienced much higher sales over the period 1997-98 when exports of shrimp from Kerala showed a sudden jump (Figure 8.3). In Real terms, however, turnover was actually 35 percent lower in 2002 at Rs 34.1 million. Over this same period, the mean volume of output declined 29 percent from 805 tonnes per annum to 574 tonnes per annum. Thus the mean unit value of output actually increased 41 percent from 1995 to 2002. Even in real terms it only declined 9.5 percent.

The survey results suggest that most pre-processing facilities are operating significantly below their capacity and that this situation has worsened in recent years. Thus, the mean operating capacity of the surveyed facilities was currently 66 percent, compared with 85 percent in 1995. Further, whilst around 85 percent were currently operating at less than 50 percent capacity, this compares to only 25 percent in 1995. One of the main reasons is the lack of working capital. Typically, pre-processors 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 that consignment. This is compounded by the lack of storage facilities and especially cool rooms and dependency on independent ice-making facilities.

Figure: 8.3. Mean volume and value of shrimps peeled by independent pre-processing facilities, 1995-2002:



The capacity utilization and working schedule of the pre-processing facilities has led, in turn, to a change in labour 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 that live in the vicinity of the facility. Amongst the surveyed pre-processing facilities. 98 percent employed labour on a casual basis, 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 pre-processing facilities ranged from two to 39 years, with a mean of 18 years. Thus, whilst there are some now facilities, most are older and some are extremely dated, an important issue in the context of both the need and attempts to up-grade hygiene standards. Table 8.1 details the basic hygiene facilities that the surveyed facilities had in place currently and in 1995. Further, respondents were asked to identify the major improvements they had made in order to up-grade their hygiene standards. These included general maintenance and renovation of the physical facility, as well the construction of toilets and changing rooms, installation of hand washing basins and an electricity supply, and purchase of tables. Around 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 pre-processing facilities; indeed 99 percent of respondents had made at least some improvements since 1995. Whilst only 13 percent of facilities had undertaken pre-processing on table in 1995, this had increased lo 59 percent in 2003. Around 96 percent of facilities now cooled the pre-processed product when delivering to customers. However, contrary to expectations, the sub-contracting of pre-processing had actually increased, reflecting perhaps the economic hardships being experienced by the

sub-sector. At the time of the survey, 24 percent of facilities used sub-contractors, whilst around 10 percent utilised home peel-ers. This compares with 1995, when only 18 percent of facilities used sub-contactors and only 5 percent utilized home peelers. Clearly, there remain some very important concerns about control over hygiene in the sub-sector, especially with respect to home peeling.

Table 8.1. Improvements to independent pre-processing 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

The survey indicated very important changes in the practices employed by pre-processing facilities; indeed 99 percent of respondents had made at least some improvements since 1995. Whilst only 13 percent of facilities had undertaken pre-processing on table in 1995, this had increased to 59 percent in 2003. Around 96 percent of facilities now cooled the pre-processed product when delivering to customers. However, contrary to expectations, the sub-contracting of pre-processing had actually increased, reflecting perhaps the economic hardships being experienced by the sub-sector. At the time of the survey, 24 percent of facilities used sub-contractors, whilst around 10 percent utilised home peelers. This compares with 1995, when only 18 percent of facilities used sub-contactors and only 5 percent utilized home peelers. Clearly, there remain some very important concerns about control over hygiene in the sub-sector, especially with respect to home peeling.

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%) had been inspected by MPEDA at some time, whilst 70 percent had been inspected since 2001. Further, around 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 pre-processing facilities that were not registered with MPEDA, accounting for around 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 that had received hygiene training from the Government of Kerala who acknowledged the need for facilities to be improved and 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 further 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 pre-processing facilities had been put in place quickly and with limited disruption. The mean time taken was around two weeks, with a maximum of eight weeks. Only 15 percent of facilities had shut down during the improvements. The cost of the improvements ranged from US$152 to US$14,400, with a mean of US$1,203. This suggests that the total cost of hygiene improvements by registered pre-processing facilities has been around US$481,382. Taking account of non-registered facilities, this estimate increases to US$590,413. As a proportion of turnover, the cost of these improvements ranged from 0.01 to 3.43 percent, with a mean of 0.15 percent. Around 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 cost of production. Around 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 five percent.

Some pre-processing facilities have been provided with training and advice for the up-grading of hygiene standards by major fish exporters. In general, there have been long-term and close relations between the pre-processors and exporters. The exporters have sent their quality control staff to suggest changes in the structure of the pre-processing facilities and their production procedures. Further, in some cases they have recommended that workers undergo medical checks and 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 pre-processing plant with foreign buyers. At the same time, however, these same exporters are sourcing from pre-processing facilities that have made little or no improvements and where they have not provided the same level of advice and support. Indeed, concerns were expressed by a number of respondents that had made improvements in their hygiene practices, that they are being placed at a competitive disadvantage by the continued use of non-improved facilities by the major fish processors. Suggestions were made that exporters are using the facilities they have supported 'for show', whilst 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 is made from filtered and is delivered on demand. Many pre-processing 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 lo 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 sub-sector are obvious!

9. CONCLUSIONS AND FUTURE DIRECTIONS:

Fish production has increased rapidly over the last thirty 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 around three percent of total merchandise trade. Kerala accounts for around 12 percent of total fish landings. In the case of shrimp, however, it is the dominant producer, accounting for 35 to 40 percent of national landings. Keralan 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 Keralan 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 shrimp were purchased by pre-processors that performed cleaning and peeling and sold onto processors that froze and packed the product. The existence of a pre-processing sector is a distinct feature of the Keralan fish and fishery products sector. It is estimated that around 850,000 people are directly dependent on fish capture, processing and related activities in the state.

In recent years, exporters offish 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, 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 US and EU. It is these requirements that this case study has focused on.

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 Japan, US and EU. In Japan, border inspection remains the predominant form of food safety controls for fish and fishery products. Few specific regulations have been established for fish and fishery products, rather importers have to comply with general requirements that food products are safe as well as 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 equivalent standards to domestic facilities, including the implementation of HACCP. Whilst the US requires that the importer take steps to ensure imports meet regulatory requirements, in the EU this is the responsibility of a 'Competent Authority' in the exporting country. In practice, this requires not only that the exporter complies with EU regulatory requirements, but that

the exporting country government has regulations and procedures in place in order to certify compliance.

Although there are common themes running through the food safety controls implemented by these countries, in particular the US and EU, there are significant differences in specific requirements; as one exporter in Kerala remarked "the devil is in the detail". Further, in extreme cases there may be a direct conflict between the requirements of different markets. More broadly, however, exporters wanting to maintain access to all of these markets (most of which 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, these 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 actually did) apply different standards and control measures to exporters focusing on different markets.

Beyond the basic hygiene requirements laid down by India's major trading partners, exporters face a seemingly continuous flow 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 its major competitors. Further issues include limits on heavy metals and other environmental contaminants and on *V. parahaemolyticus.* Across all of these concerns if is clear that the EU imposes significantly stricter controls than either the US or Japan. It is also evident, however, that antibiotics are emerging as an issue in the US; perhaps the EU is an indicator of the food safety controls that will be required in all industrialized country markets in the future?

The Indian fish and fishery product sector in general has faced significant challenges meeting emerging food safety requirements in two of its major exports markets, namely US and EU. These challenges have been particularly pronounced in Kerala which is more dependent on EU and US markets than the rest of India and which is dominated by exports of crustaceans and cephalopods. Historically, these problems mainly related to US exports, but through the 1990s the 'EU's food safety requirements, both related to general hygiene controls and limits on antibiotics and both 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.

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) suggest that there are many areas where Indian standards diverge from those established by Codex Alimentarius, for example relating to food additives, pesticide residues and other chemical contaminants. However, and rather 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. Whilst 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, historically 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 paper.

In assessing the effects of food safety and (to a lesser extent) quality requirements it must be recognized that perceptions of the impact on 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 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. Whilst acknowledging the importance of making Attachment A or B, many exporters may simply have forgotten (or indeed may not have been in business at the time) the problems the fish and fishery products sector went through with accessing US markets in the early 1990s!

The Indian government recognized the need to revise its controls on hygiene in fish and fishery products at a relatively early stage, certainly compared to many other developing countries, although the reforms it put in place were not sufficient to meet the requirements of the European Commission[40] Thus, although it was quite proactive in addressing the change in the regulatory landscape in a major export market this was not sufficient to prevent restrictions 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 the EU's directive on hygiene for fish and fishery products seriously and/or underestimated the reforms that were necessary. However, at the same time, the government's efforts have at times been checked by pressure from exporters to not impose overly restrictive requirements on a sector that was already facing acute competitive pressures from China, Thailand and Vietnam.

Faced with restrictions on exports of fish and fishery products to the EU, 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. Thus, following a rather critical inspection report from the European Commission, 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 in shrimp during 2002, the Indian government was swift in imposing strict controls on antibiotic use. It is evident that these actions have imposed considerable costs on the processing sector, as is discussed further below. At the same time, however, they have undoubtedly been critical in maintaining market access and in preventing further restrictions being imposed, as has happened, for example in the case of China and Thailand.

Recognizing the potential impact on the fish processing sector and the constraints it faced in achieving compliance, the Indian government has differentiated the standards that exporters must meet in supplying the EU and other overseas markets. Thus, for

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

example, exporters to non-EU markets were granted a longer period of time to integrate preprocessing operations and/or to source from approved independent pre-processors. This was a pragmatic strategy that focused attention on maintaining access to EU markets, whilst sustaining pressure for the up-grading of standards across the processing sector as a whole.

The Indian government has reformed its regulatory systems in order lo facilitate effective regulation offish processing facilities and to enable effective responses to emerging issues. Indeed, at an early stage 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 IEC already had systems of process and product certification these 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 fish processing sector as a whole, it is evident that hygiene standards did not keep pace with the expansion of exports or the evolution of food safety requirements in industrialized country markets. This is despite the fact that food safety standards have been an ongoing for exporters since the 1980s, first with respect to the US and then the EU. Indeed, the response by most exporters has been reactive, only making the necessary investments and changes to their hygiene controls when it is absolutely necessary. At the same time, however, more progressive exporters have been proactive in up-grading their food safety controls especially when investing in new processing plants or up-grading their existing facilities. Whilst even these processors had to make further 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, the level of investment made in to comply with the EU's hygiene standards for fish and fishery products in Kerala has been considerable, amounting to US$13.5 million. However, whilst this has 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, overall it only represents 1.7 percent of the value of exports over the three years prior to the imposition of new controls by the Indian government. Further, 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 Keralan context, the imposition of stricter food safety standards by the EU, and more particularly the consequent controls implemented by the Indian government, has perhaps had the greatest impact on the pre-processing sector. The shift to integrated pre-processing by EU-approved processing facilities undoubtedly led to the closure of a significant number of independent pre-processing 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 pre-processing sector has made considerable investment in order to up-grade their food safety standards, amounting to US$481,000. Indeed, 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 IEA had still not approved any independent pre-processing facilities for export, perhaps reflecting the view that integrated pre-processing was preferable? The valuable role played by the pre-processing sector, however, is clear from the fact that many processors, including those that are EU-approved, still procure from them, although they are no longer permitted to do so!

It is evident that the dominant trend in the fish processing sector in India as a whole, and in Kerala in particular, over the next few years will be both consolidation and concentration. Over the next five to ten years, five or six major companies will come to dominate the sector, each of which is likely to operate multiple plants. These plants will be linked to pre-processing facilities that, whilst 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, yet these are likely to focus on less challenging markets, (for example China and the Middle East) and more minor products.

At the current time, the dominant competitive pressures in the sectors are high food safety standards (for the EU and EU markets) or high quality standards (for Japanese markets) combined with low production costs. Indeed, a number of processors have installed faster and more efficient freezers to reduce electricity costs. Under such conditions, the profitability offish processors is being squeezed, particularly given ever more vigorous competition from countries such as 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. Further, attempts are being made to undertake higher levels of processing, for example breading, rather than supplying product that is then processed in overseas markets. Simultaneously, the need to establish long-term relations with key customers in export markets is being recognized.

Whilst the Keralan fish and fishery products sector presents a positive case of efforts to comply with stricter food safety requirements in export markets, there are remaining challenges. 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. Indeed, scarcity and irregularity of supply of raw material is a significant problem for the sector, such that many facilities are operating at less than 50 percent capacity whilst attempting to repay loans taken out to finance their hygiene improvements. One of the key challenges is bringing 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' wider a field, including neighboring states, and even through the importation of raw material from other countries (notably Bangladesh) on re-export terms. Further, the SEAI is fostering the development of landing facilities that are dedicated to exports and have

the required facilities, including ice machines, potable water etc.

A key lesson from this case study is that food safety and quality requirements continually evolve over time and that the most successful exporters are those that can meet these requirements in a manner that acts to their competitive advantage. To date this has meant moving first. In the future rather more sophisticated responses are likely to be needed in order for processors to not only compete successfully with one another, but also with their overseas competitors. The 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 the back of efforts to enhance standards in the industry as a whole, whilst not imposing inordinate costs of compliance on exporters that are struggling to survive.

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