



Issues in Infrastructure for Export of Marine Products from India

G. Raghuram
V. N. Asopa

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G. Raghuram

V. N. Asopa

Indian Institute of Management, Ahmedabad

Abstract

Indian marine products are wanted internationally. There is potential for a higher market share in importing countries. Shrimp contributed 62% by value and 28% by volume of exports in 2002-03. The potential market for marine exports is in value added products (cooked, ready to eat and ready for table), freeze dried shrimps (wherever reduced transportation cost can bring in competitive advantage), surimi and canned fish. While infrastructural requirements are essential in the entire supply chain, the quality of infrastructure in the pre-processing stage is significantly lower than the processing and post-processing stages.

This paper focuses on the scope of improving both quantum and quality of product including the primary product shrimp in the pre-processing stage from farming/harvesting to the processing unit through a whole range of regulatory and infrastructure measures. These include

1. Improving the quality of trawlers and smaller mechanized boats, to enable deep sea fishing
2. Regulating the capture during the spawning period
3. Achieving global standards at fishing harbors, landing centres and auction centres
4. Promoting aquaculture, but in properly zoned areas with a focus on managing an integrated set of activities
5. Licensing of ice factories, monitoring the quality of water they use, and if required, ensuring supply of quality water
6. Facilitating cold chains in both storage and transportation

Marine Exports

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Part I: Market and Supply Scenario

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Executive Summary¹

- Indian marine products are wanted internationally. There is potential for a higher per capita consumption in our importing countries, including Japan and US. There is scope to improve both the quantum and quality of fish including the primary product of shrimp from farming/harvesting to the processing unit through a whole range of regulatory and infrastructural measures like
 - a) Improving quality of boats and trawlers, to enable going deeper into the sea
 - b) Regulating the catch of shrimp during the spawning period
 - c) Improving the landing harbours and auction centers
 - d) Promoting aqua culture, but in properly zoned areas with a focus on managing an integrated set of activities
 - e) Licensing ice factories, monitoring the quality of water they use, and if required, ensuring supply of quality water
 - f) Facilitating cold chains (transportation and storage)
 - g) Focussing on value added products

- The potential market for marine exports is in value added products (cooked, ready to eat and ready for table), freeze dried shrimps (wherever reduced transportation cost can bring in competitive advantage), surimi and canned fish. The surimi business has good margins and potential. Regarding canned fish, India lacks canning technology as per global standards. Growth in the international market would also require an understanding of the competitive and regulatory scenario.

- The supply of marine products can be increased by deep sea exploitation from our Exclusive Economic Zone, which is currently under exploited. We can and should double our target to 6 mt from the current 2.8 mt. (As a comparison, Peru produces 8 mt per annum from marine capture). In aquaculture, we can increase our production from 2 mt to 3 mt. (Excessive aquaculture practice is constrained due to environmental issues).

- Currently, the 5.6 mt of marine production consists of 0.44 mt of exports at a value of Rs 68 billion (Rs 155 per kg), about 1.8 mt of aquaculture for domestic consumption at an industry revenue of Rs 45 billion (Rs 25 per kg) and about 3.36 mt of capture for domestic consumption at an industry revenue of Rs 34 billion (Rs 10 per kg). So, the total marine products industry can be valued at nearly Rs 150 billion.

- Assuming that out of the additional production of a total of 4 mt of marine products, 0.5 mt can be exported (this would be double our current exports) at the average world trade value of US\$ 1 (Rs 45) per kg and the domestic consumption at Rs 10 per kg, the total revenue that can be generated is Rs 57 billion at a very conservative estimate.

- Deep sea exploitation is the future. We need trawlers.

¹ Amongst the innumerable organisations that supported our efforts in the marine exports study and to whom we are indebted, we would like to specially mention and acknowledge MPEDA. We also thank IDFC for sponsoring this study.

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- Water and ice quality in the public domain needs to improve significantly. Standards and certification would be imperative.
- Quality of the smaller mechanised boats needs to improve, with investments in equipment.
- Fishing harbours, landing centers and auction centre need investments to reach a smell free global standard, that signifies clean and deterioration free handling.
- The human resources in this sector need to be invested in, to (i) achieve mind set change in cultural practices and (ii) practice more deep sea fishing.
- Aquaculture is possibly saturated due to the regulatory context, though integrated processing by corporates still holds potential.
- We can aim to be the second player after China in the export (and domestic consumption) markets. In the export market, we can be a high per unit value player.

Part I

Market and Supply Scenario

Marine

1. Marine exports constituted 2.7% by value of total Indian exports during 2002-03 (Exhibit 1.1). While the marine exports grew at a CAGR of 10% since 1998-99, the share of marine exports to total exports has gradually declined from 3.3% to 2.7% over the same period. However, as a share of agricultural exports, marine exports have increased from 18.0% to 20.5% during the same period. The unit value has fluctuated from US\$ 3.36 per kg in 1997-98 to US\$ 3.20 per kg in 2002-03 (Exhibit 1.2). The non-growing trend of these figures reflects that India has not invested in value adding to its marine export basket. However, this is significantly higher than the world export trade value (which also has a declining trend from US\$ 1.3 in 1997 to US\$ 1.1 per kg in 2001 (Exhibit 1.15). The value per kg of marine exports from Thailand was US\$ 0.46 for the ten-month period Jan-Oct, 2003 (Appendix A3.4). Thailand's profile of marine exports is significantly different from India since a lot lower value marine products are exported.
2. In terms of major markets for India, USA and Japan accounted for 26.8% and 21.4% of the total export value in 2002-03. The European Union followed with a 19.4% share and then China at 13.7% (Exhibit 1.3). In terms of quantity, China is the largest market with a 37.5% share, followed by the European Union with 20.4%, USA at 12.6% and Japan at 11.6%. There is thus a wide variance in the unit value of the marine product that is exported to China (US\$ 1.17 per kg) on one hand and USA (US\$ 6.78 per kg) at the other. Another interesting aspect is the decline in importance of Japan as a market (from 49.6% share in 1998-99 to 21.4% shares in 2002-03), while USA has increased in share (from 13.3% in 1998-99 to 26.8% in 2002-03).
3. The value share decline for Japan is a result of both a quantity decline and unit value decline. Similarly, for USA, the value share increase is a result of both a quantity increase and unit value increase. This is a direct outcome of the value addition sensitivity that both these markets have. As far as the Japanese market is concerned, the unit value decline is because the Indian product is losing out to competition from other South East Asian countries, which provide better quality. The share of shrimp in the marine exports to Japan has been more or less around 90%, but with a declining unit value. The unit value of the non-shrimp marine exports has declined more significantly, again due to competition. The share of shrimp in the marine exports to USA has been increasing from about 75% in 1998 to 89% in 2001, with an increasing unit value, which has now reached the same unit value as Japan. This unit value for USA is a result of the increasing share of IQF and cultured shrimp, both of which command a higher price. The following table summarizes this analysis, drawing the unit value information from Exhibit 3 and then shrimp share and unit value of shrimps directly from the MPEDA [MPEDA, 2001].

Year	Japan			USA		
	Unit Value of Marine Exports	Share of Shrimps to Marine Exports	Average Unit Value of Shrimps	Unit Value of Marine Exports	Share of Shrimps to Marine Exports	Average Unit Value of Shrimps
	(US\$ per kg)	(%)	(Rs per kg)	(US\$ per kg)	(%)	(Rs per kg)
1998	8.16	93	421	4.28	75	242
2001	5.90	88	393	6.10	89	361

4. The largest item in the marine exports is shrimp, which accounts for 62% of value and 28% of quantity in 2002-03. Frozen finfish accounts for 15.4% of value and 42.7% of quantity. Frozen cuttlefish and frozen squids are the next two items, accounting for 5.9% and 5.4% of value respectively (Exhibit 1.4). Surimi is an export product, which is increasing in significance. It had a value share of 2.7% (Rs 1600 million) in 2001, which had increased from 0.5% (Rs 250 million) in 1998.
5. While Indian exports have been around 0.44 mt over the past three years, the total fish production has been more than ten times, around 5.7 million tons (Exhibit 1.5). The production of fish has been about equal between marine and inland sources, at around 2.85 mt each. This is a result of a significant thrust by various state governments on inland fishing (primarily aquaculture) and our insufficient exploitation of the marine resources. Fish production is also classified as capture and aquaculture. In India, the capture has been around 3.7 mt, while aquaculture has been about 2.0 million tons (Exhibit 1.6). The entire aquaculture is viewed as inland production. Consequently, we can say that the inland capture production is about 0.85 mt. The growth in total fish production has been at a CAGR of 4%, both during the recent decade (1990-91 to 2000-01) and over the recent 50 years (1950-51 to 2000-01). The CAGR of inland production was 6% over the recent decade and 5% over the recent 50 years.

(Exhibit 1.7) provides the different categories of fish production in India. The significant production categories are marine capture and inland aquaculture.

6. The total world fish production during 2000 and 2001 has been around 130 mt, up from 101 mt in 1992 at a CAGR of 2.8% (Exhibit 1.8). Of this total, the production by capture is 92 mt and by aquaculture is 38 mt. Internationally, aquaculture is also practiced not only in inland sources, but also in the sea as a marine source. Out of the total aquaculture production, 23 mt are from inland sources and 15 mt from marine sources. Out of the total capture production, 9 mt are from inland sources and 83 mt from marine sources. The growth in total fish production has come almost entirely from the growth in aquaculture.

Out of the 130 mt, 49.5 mt were traded internationally during 2001, up from 34.5 mt in 1992, at a CAGR of 4.1%. The share of the trade has increased marginally from 34% to 38% over the same period.

7. Out of the 130 mt of fish production, 99 mt have been used for direct human consumption in 2001 (Exhibit 1.9).
8. The country wise production figures are given for the top ten countries in Exhibit 1.10. In 2001, India ranked third in total marine production, after China and Peru. China alone accounted for 33% of the world production with a total of 42 mt production. China tops the world in both capture and aquaculture based production. In capture production, China is followed by Peru, USA, Japan, Indonesia, Chile and India (Exhibit 1.11). Russia, Thailand and Norway come next. In terms of growth, Peru, USA, Thailand and Norway show saturation, while Japan, Chile and Russia show a decline, leaving only China, Indonesia and India for growth. In aquaculture production, India ranks a distant second, with less than 10% of China's aquaculture production (Exhibit 1.12). Except Japan, the aquaculture production among the top ten producers shows a trend of growth. The value of the aquaculture production shows a significant variation across countries, with Japan topping the list at US\$ 4.23 per kg and China being at the bottom at US\$ 1.01 per kg. India is just above China at US\$ 1.15 per kg. The world average is US\$ 1.47 per kg. India's South East Asian

competitors like Indonesia, Thailand and Vietnam command a value, which is atleast, twice that of India, reflecting the product quality.

In capture, China tops both in marine and inland. China is followed by Peru in marine capture, with India being in the eighth place (Exhibit 1.13). China is followed by India in inland capture (Exhibit 1.14).

In aquaculture, China tops both in marine and inland. China is followed by Japan in marine aquaculture with India being in the fifteenth place (Exhibit 1.15). China is followed by India in inland aquaculture (Exhibit 1.16).

9. The largest exporters were Thailand and China, each having a 7.2% market share in value in 2001 (Exhibit 1.17). India had a 2.2% market share during the same time. The significance of marine exports to total exports was the highest in Iceland (63.0%) followed by Peru (15.9%), Vietnam (11.4%), Chile (11.0%) and Korea (10.5%). Thailand was next at 6.4%. India was at 2.8%.

The largest importers were Japan and USA, having value wise shares of 22.6% and 17.3% respectively (Exhibit 1.18). The EU countries of Spain, France, Italy, Germany and UK came next, though together, they accounted for 23.9%. With other EU countries, this figure would be close to 35%. The highest significance of marine imports to total imports was for Japan at 3.9% share, followed by Spain and Portugal at 2.6% and 2.5% respectively.

The total import value is on CIF basis, while the export value is on FOB basis. This primarily accounts for the difference between the higher import value and the lower export value. A three year average of the difference provides an assessment of the freight and related insurance cost at 8% of the export value of about US\$ 55 billion.

10. USA is currently India's primary market at a 27% value share in 2002-03. However, in terms of total marine imports, India accounted for only 3.8% share in 2002 (Exhibit 1.19). The largest exporter to USA was Canada (20.7%). Thailand (17.1%), China (9%), Vietnam (6.3%), Chile (6.2%), Ecuador (3.9%) and Indonesia (3.9%) followed this.

Japan is India's second biggest market at a 21% value share in 2002-03. However, in terms of total marine imports, India accounted for only 2.6% share in 2002 (Exhibit 1.20). The largest exporter to Japan was China (17.5%). USA (9.7%), Thailand (7.4%), Indonesia (6.7%), Russia (6.4%), Korea (6.1%), Taiwan (5.8%), Chile (4.6%), Norway (4.1%), Vietnam (3.9%), Australia (3.5%) and Canada (3.4%) followed this.

China, which is India's fourth largest market, had a value share of 13.7% in 2002-03. (The quantity share was the highest at 37.51%). (Exhibit 1.21) gives a listing of the countries from which China imported in 2000. There is a discrepancy in the statistics since India is not listed. During 2000, prorating from the financial year figures of MPEDA, the FOB value into China should be of the order of US\$ 168 million, with the CIF value being marginally higher, say US\$ 175 million. This should place India third in position with a share of 9.5%, behind Russia (22.7%) and Peru (21.8%), and above USA (6.8%). There are two interesting aspects of China's imports. The first is that out of 2.5 mt of imports, 1.1 mt is fishmeal for China's growing aquaculture. Peru is the biggest supplier, reportedly at 0.9 million tons. The second is that most of the non-fishmeal imports is for processing and re-export. (Exhibit 1.22) shows the extent of value addition that China derives from its import value of US\$ 1.85 billion

(including fishmeal) to an export value of US\$ 3.83 billion (of primarily the non-fishmeal import).

11. The state wise fish production for 2000-01 is given in (Exhibit 1.23). West Bengal has the highest share at production (18.7%), followed by Gujarat (11.7%), Kerala (11.5%), Andhra Pradesh (10.4%), Maharashtra (9.3%) and Tamil Nadu (8.5%). West Bengal has increased its fish production through sustained support from the state government (Appendix 1). Out of the inland states, Bihar (including Jharkhand) has the highest production, though in terms of inland production West Bengal and Andhra Pradesh are higher. In terms of marine production, Gujarat is the highest, followed closely by Kerala. The production from deep-sea fishing is about 1% of the total marine production (and ½% of the total fish production). With our deep sea trawlers doing 15 tons a day, this amounts to 2000 deep-sea trawler days of fishing. The deep-sea fishing potential in India is highly under-exploited, primarily due to the lack of appropriate technology, professional capabilities and policy drivers.

Shrimp

12. Shrimp exports constituted 62% by value in 2002-03 of total marine exports. (In 2001, when the value share was 69%, the quantity share was 29%). The value share has been marginally declining over the past five years (Exhibit 1.24). Shrimp is the term used for the marine capture while the same product from aquaculture is called prawns, though shrimp is also used to refer this product generically. Within prawns, the term black tiger is used for the product from brackish water while scampi is used for the product from fresh water. Supreme Court has put caps on intensity of shrimp aquaculture and also prohibited new entrants.
13. The contribution of cultured shrimps has been increasing over the years, both in quantity and value (Exhibit 1.25). However, there seems to be a discrepancy in this data since the value share of cultured shrimp is over 99% for 2002-03. MPEDA has not been able to resolve this.

Average aquaculture (prawns) farm price is Rs 320 per kg. At 62% yield after peeling, and a freezing loss of a further 2-3%, the effective price Rs 525 per kg. The processing cost is about Rs 10 per kg. Typical FOB prices for block frozen are in the range of US\$ 12.2-12.5 per kg. The effective margins are almost nil. In this context, the DEPB of 3% of export value (administered by MPEDA) becomes significant.

14. Indian shrimp is well accepted in the Japan (43%) and US (28%) markets, which constitute about 71% in 2001 in terms of value of our shrimp exports. Indian shrimps have a market share of 17% in Japanese imports, and 8% in US imports. The market share in Japan has been declining from 21% in 1998, while in the US, it has fluctuated between 6-8% over the past 10 years. The absolute values have declined for Japan, while they have increased for the US. (Exhibit 1.26).

(Exhibits 1.27) and (Exhibit 1.28) give details on the principal exporters of shrimp into Japan. In 2001, Indonesia topped with a 26% market share in value, followed by India with a 17% market share. In terms of quantity, the shares were 23% and 18% respectively. (Exhibit 1.29) gives the share of imports to the overall domestic consumption in Japan. This figure has been fairly steady at around 90%. (Exhibit 1.30) gives a graphic view of the principal distribution channels of shrimp in Japan.

(Exhibit 1.31) gives the principle exporters of shrimp to the US. In 2001, Thailand had a 34% market share, followed by India with an 8% market share by quantity.

15. The value realization of Indian shrimps is given in (Exhibit 1.32). India has not yet moved up the value chain in terms of products offered. The AFD (accelerated freeze-dried) shrimp fetches a higher value per kg, since it does not have the water content. The major forms in which shrimp is exported are block frozen, followed by IQF (individually quick-frozen). The statistics in this exhibit are not properly stated, since the forms in which cultured shrimp are exported are not presented here.
16. The state wise marine capture shrimp landings are given in (Exhibit 1.33). The total annual tonnage is nearly 0.3 million with Maharashtra, Kerala and Gujarat being the top producers.
17. The state wise aquaculture of both shrimp (brackish water) and scampi (fresh water) is given in (Exhibit 1.34). Andhra Pradesh leads the production, though not in productivity.
18. The state wise brackish water aquaculture production, along with area under culture and the total brackish water area available for culture is given in (Exhibit 1.35). Andhra Pradesh is the leader with over 50% production. West Bengal and Gujarat have high potential in terms of brackish water area, but efforts need to go into developing the aquaculture infrastructure.
19. The productivity of shrimp farming as an aggregate for the country is given in (Exhibit 1.36). The figure has fluctuated over the years, reaching a peak of over 800 kg per hectare in 1994-95 and settling down to over 600 in 200-01. This is due to the Supreme Court regulations, which now stipulate the aquaculture density. Even though this is driven by environmental considerations, the commercial benefit is that we get larger shrimps that fetch better value, though the revenue per hectare may not have gone up.
20. The major aquaculture shrimp producers in the world are given in (Exhibit 1.37). Thailand has a 25% share, followed by China (14%), Indonesia (12%), Ecuador (10%), and then India (9%). Appendix 3 gives details of the production and exports of shrimp in Thailand.
21. Like in agriculture, aquaculture too suffers from small holdings in India. More than 50% of the area under aquaculture is owned by farmers having an area of two hectares or less (Exhibit 1.38). This does not lend itself to economies of scale.
22. There is potential for a higher per capita consumption in our importing countries, including Japan and US. There is scope to improve both the quantum and quality of shrimp from farming/harvesting to the processing unit through a whole range of regulatory and infrastructural measures like
 - h) Improving quality of boats and trawlers, to enable going deeper into the sea
 - i) Regulating the catch of shrimp during the spawning period
 - j) Improving the landing harbours and auction centers
 - k) Promoting aqua culture, but in properly zoned areas with a focus on managing an integrated set of activities
 - l) Licensing ice factories, monitoring the quality of water they use, and if required, ensuring supply of quality water
 - m) Facilitating cold chains (transportation and storage)
 - n) Focussing on value added products

23. The potential market for marine exports is in value added products (cooked, ready to eat and ready for table), freeze dried shrimps (wherever reduced transportation cost can bring in competitive advantage), surimi and canned fish. Growth in the international market would also require an understanding of the competitive and regulatory scenario. (Appendices)

India exported 0.06 mt of Block frozen shrimps worth US\$ 3710 million and 0.01 mt of IQF shrimps worth US\$ 77 million in 2001 (Exhibit 1.39). India exported 236 tons of AFD shrimps worth US\$ 8.2 million in 2001 (Exhibit 1.40). India's export of breaded shrimp and cooked salad shrimp was insignificant.

The raw fish for surimi earlier used to be sold at Rs 1 per kg, often to be dried and sold as low value dried fish for consumption in the coastal areas. Today, it is valued at Rs 10 per kg, as raw material for surimi. With a conversion ratio of 4:1, the effective raw material value becomes Rs 40 per kg. With a marginal addition (expectedly at a maximum of 20%) for extraction and domestic transportation, and with a FOB value at US\$ 1.4 (about Rs 65) per kg, the surimi business has good margins and potential.

Regarding canned fish, India lacks canning technology as per global standards. In India, canning accounted for 0.2% of the total fish catch in 1998 (Exhibit 1.41). From the graph in Exhibit 1.42, the percentage of canning in the world trade amounted to approximately 10% in 1998.

24. The supply of marine products can be increased by deep sea exploitation from our Exclusive Economic Zone, which is currently under exploited. We can and should double our target to 6 mt from the current 2.8 mt. (As a comparison, Peru produces 8 mt per annum from marine capture). In aquaculture, we can increase our production from 2 mt to 3 mt. (Excessive aquaculture practice is constrained due to environmental issues).
25. Currently, the 5.6 mt of marine production consists of 0.44 mt of exports at a value of Rs 68 billion (Rs 155 per kg), about 1.8 mt of aquaculture for domestic consumption at an industry revenue of Rs 45 billion (Rs 25 per kg) and about 3.36 mt of capture for domestic consumption at an industry revenue of Rs 34 billion (Rs 10 per kg). So, the total marine products industry can be valued at nearly Rs 150 billion.

Assuming that out of the additional production of a total of 4 mt of marine products, 0.5 mt can be exported (this would be double our current exports) at the average world trade value of US\$ 1 (Rs 45) per kg and the domestic consumption at Rs 10 per kg, the total revenue that can be generated is Rs 57 billion at a very conservative estimate.

Exhibit 1.1

Share of Marine Exports to Total Exports of India

Year	Marine Exports	Agri Exports	Total Exports*	Share of Marine Exports to Agri Exports	Share of Marine Exports to Total Exports
	(Rs billion)	(Rs billion)	(Rs billion)	(%)	(%)
1998-99	46.27	257.23	1397.52	18.0	3.3
1999-00	51.17	248.87	1590.95	20.6	3.2
2000-01	64.44	272.88	2013.56	23.6	3.2
2001-02	59.57	279.24	2077.44	21.3	2.9
2002-03	67.91	331.26	2530.00	20.5	2.7

* Extracted from CMIE Statistics

Source: Statistics of Marine Products Exports 2001 (www.agricoop.nic.in/stats.htm)

Exhibit 1.2

Variation in Exports by Years in India

Year	Unit	Export	Variation		Unit Value (Rs or US\$ per kg)
			Absolute	(%)	
1997-98	Q (tons)	385818	7619	2.01	
	V (Rs billion)	46.97	5.76	13.98	121.75
	V (US\$ million)	1295.86	143.03	12.41	3.36
1998-99	Q (tons)	302934	-82884	-21.48	
	V (Rs billion)	46.27	-0.71	-1.50	152.73
	V (US\$ million)	1106.91	-188.95	-14.58	3.65
1999-00	Q (tons)	340003	37069	12.24	
	V (Rs billion)	50.96	4.69	10.13	149.87
	V (US\$ million)	1184.23	77.32	6.99	3.49
2000-01	Q (tons)	440473	97443	28.41	
	V (Rs billion)	64.44	13.27	19.12	146.29
	V (US\$ million)	1416.32	227.31	19.12	3.22
2001-02	Q (tons)	424470	-16003	-3.63	
	V (Rs billion)	59.57	-4.87	-7.56	140.36
	V (US\$ million)	1253.35	-16297	-11.51	2.95
2002-03	Q (tons)	439943	15473	3.63	
	V (Rs billion)	67.91	8.33	13.96	154.35
	V (US\$ million)	1406.58	153.23	12.21	3.20

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.3

Major Markets for Indian Exports of Marine Products

Country	Unit	1998-99		1999-00		2000-01		2001-02		2002-03	
		Absolute	(%)	Absolute	(%)	Absolute	(%)	Absolute	(%)	Absolute	(%)
USA	Q (tons)	34472	11.38	36645	10.68	41747	9.48	49041	11.55	55510	12.62
	V (Rs billion)	6.17	13.34	7.75	15.15	11.64	18.07	14.21	23.86	18.19	26.78
	V (US\$ million)	147.68		180.19		255.93		299.05		376.39	
	Unit Value US\$/Kg	4.28		4.92		6.13		6.10		6.78	
Japan	Q (tons)	67277	22.21	66990	19.53	68983	15.66	64905	15.29	51151	11.63
	V (Rs billion)	22.95	49.61	22.73	44.42	25.60	39.73	18.21	30.56	14.52	21.38
	V (US\$ million)	549.16		528.18		562.75		383.07		300.07	
	Unit Value US\$/Kg	8.16		7.88		8.16		5.90		5.87	
European Union	Q (tons)	54261	17.91	65402	19.07	68827	15.63	82895	19.53	89652	20.38
	V (Rs billion)	6.85	14.80	9.06	17.70	10.25	15.91	11.50	19.31	13.17	19.39
	V (US\$ million)	163.78		210.45		225.37		241.97		272.88	
	Unit Value US\$/Kg	3.02		3.22		3.27		2.92		3.04	
China*	Q (tons)			107136	31.23	182771	41.49	134767	31.75	165040	37.51
	V (Rs billion)			5.45	10.65	8.27	12.84	5.97	10.03	9.32	13.72
	V (US\$ million)			126.59		181.86		125.66		193.50	
	Unit Value US\$/Kg			1.18		1.00		0.93		1.17	
South East Asia	Q (tons)	116610	38.49	38297	11.16	40748	9.25	52424	12.35	41399	9.41
	V (Rs billion)	7.66	16.56	3.60	7.04	4.63	7.18	5.39	9.04	5.94	8.75
	V (US\$ million)	183.27		83.70		101.76		113.35		123.02	
	Unit Value US\$/Kg	1.57		2.19		2.50		2.16		2.97	
Middle East	Q (tons)	17274	5.70	12460	3.63	17236	3.91	19159	4.51	17712	4.03
	V (Rs billion)	1.48	3.20	1.09	2.14	1.88	2.92	1.81	3.04	1.88	2.76
	V (US\$ million)	35.40		25.44		41.39		38.10		38.88	
	Unit Value US\$/Kg	2.05		2.04		2.40		1.99		2.20	
Others	Q (tons)	13040	4.30	16101	4.69	20161	4.58	21279	5.01	19479	4.43
	V (Rs billion)	1.15	2.49	1.49	2.90	2.15	3.34	2.48	4.16	4.90	7.22
	V (US\$ million)	27.62		34.54		47.26		52.15		101.84	
	Unit Value US\$/Kg	2.12		2.15		2.34		2.45		5.23	
Total	Q (tons)	302934	100.00	343031	100.00	440473	100.00	424470	100.00	439943	100.00
	V (Rs billion)	46.27	100.00	51.17	100.00	64.43	100.00	59.57	100.00	67.91	100.00
	V (US\$ million)	1106.91		1189.09		1416.32		1253.35		1406.58	
	Unit Value US\$/Kg	3.65		3.47		3.22		2.95		3.20	

* For the year 1998-99, the exports to China are included in South East Asia

Source: MPEDA Annual Reports.

Exhibit 1.4

Item wise Export of Marine Products from India

Item	Unit	1998-99		1999-00		2000-01		2001-02		2002-03	
		Absolute	(%)	Absolute	(%)	Absolute	(%)	Absolute	(%)	Absolute	(%)
Frozen Shrimp	Q (tons)	102484	33.83	110275	32.15	111874	25.40	127709	30.09	123251	28.02
	V (Rs billion)	33.45	72.29	36.43	71.24	44.82	69.55	41.40	69.50	42.35	62.36
	V (US\$ million)	800.22		847.13		985.00		871.03		876.19	
	Unit Value US\$/Kg	7.81		7.68		8.80		6.82		7.11	
Frozen Fin fish	Q (tons)	108556	35.83	131304	38.28	212903	48.34	174976	41.22	187731	42.67
	V (Rs billion)	4.95	10.70	5.37	10.50	8.75	13.58	7.13	11.97	10.45	15.39
	V (US\$ million)	118.43		124.88		192.25		150.04		217.10	
	Unit Value US\$/Kg	1.09		0.95		0.90		0.86		1.16	
Frozen Cuttlefish	Q (tons)	34589	11.42	32799	9.56	33677	7.65	30568	7.20	39768	9.04
	V (Rs billion)	2.73	5.91	2.86	5.59	2.89	4.48	2.80	4.70	4.01	5.90
	V (US\$ million)	65.39		66.52		63.52		58.93		83.01	
	Unit Value US\$/Kg	1.89		2.03		1.89		1.93		2.12	
Frozen Squid	Q (tons)	36088	8.20	39790	9.37	37628	8.54	34918	10.18	32254	10.65
	V (Rs billion)	3.68	5.42	3.30	5.54	3.24	5.03	2.97	5.80	2.69	5.81
	V (US\$ million)	76.36		69.36		71.31		68.97		64.34	
	Unit Value US\$/Kg	2.12		1.74		1.90		1.98		1.99	
Dried items	Q (tons)	7146	1.62	7020	1.65	7511	1.71	6576	1.92	6273	2.07
	V (Rs billion)	2.26	3.33	0.60	1.01	0.70	1.09	0.43	0.84	0.40	0.87
	V (US\$ million)	46.98		12.66		15.39		9.94		9.64	
	Unit Value US\$/Kg	6.57		1.80		2.05		1.51		1.54	
Chilled items	Q (tons)	2987	0.68	3284	0.77	1844	0.42	1678	0.49	2148	0.71
	V (Rs billion)	0.54	0.80	0.64	1.07	0.40	0.62	0.38	0.74	0.47	1.02
	V (US\$ million)	11.17		13.39		8.77		8.83		11.26	
	Unit Value US\$/Kg	3.74		4.08		4.75		5.26		5.24	
Live items	Q (tons)	1900	0.43	1628	0.38	3820	0.87	3088	0.90	2624	0.87
	V (Rs billion)	0.48	0.71	0.41	0.69	0.72	1.12	0.45	0.88	0.29	0.63
	V (US\$ million)	9.84		8.54		15.74		10.45		6.98	
	Unit Value US\$/Kg	5.18		5.24		4.12		3.38		2.66	
Others	Q (tons)	41071	9.34	39495	9.30	31215	7.09	22393	6.53	14006	4.62
	V (Rs billion)	4.14	6.10	3.30	5.54	2.93	4.55	2.25	4.40	1.28	2.77
	V (US\$ million)	85.91		69.40		64.34		52.37		30.65	
	Unit Value US\$/Kg	2.09		1.76		2.06		2.34		2.19	
Total	Q (tons)	439943	100.00	424470	100.00	440473	100.00	343031	100.00	302934	100.00
	V (Rs billion)	67.91	100.00	59.57	100.00	64.44	100.00	51.14	100.00	46.26	100.00
	V (US\$ million)	1406.58		1253.35		1416.32		1189.09		1106.91	
	Unit Value US\$/Kg	3.20		2.95		3.22		3.47		3.65	

Source: MPEDA Annual Reports.

Exhibit 1.5**Fish Production in India**

(million tons)

Year	Marine	Inland	Total
1950-51	0.53	0.22	0.75
1960-61	0.88	0.28	1.16
1970-71	1.09	0.67	1.76
1980-81	1.56	0.89	2.44
1990-91	2.30	1.54	3.84
1991-92	2.45	1.71	4.16
1992-93	2.58	1.79	4.37
1993-94	2.65	2.00	4.64
1994-95	2.69	2.10	4.79
1995-96	2.71	2.24	4.95
1996-97	2.97	2.38	5.35
1997-98	2.95	2.44	5.39
1998-99	2.70	2.57	5.26
1999-2000	2.85	2.82	5.68
2000-01(P)	2.81	2.85	5.66

Source: (<http://agricoop.nic.in/statistics/chap19.1.htm>)**Exhibit 1.6****Fish Production in India**

(million tons)

Year	Capture	Aquaculture	Total
1992	2.84	1.40	4.24
1993	3.06	1.42	4.48
1994	3.26	1.52	4.78
1995	3.27	1.66	4.92
1996	3.45	1.76	5.21
1997	3.52	1.86	5.39
1998	3.37	1.91	5.28
1999	3.47	2.13	5.61
2000	3.74	1.94	5.68
2001	3.76	2.20	5.97

Source: FAO Yearbook 2001

Exhibit 1.7**Fish Production in India**

(tons)

	Capture			Aquaculture		
	2000	2001	% growth	2000	2001	% growth
Inland	955 620	974 710	+2.0%	1 844 236	2 098 447	+13.8%
Marine	2 786 676	2 787 890	+0.0%	97 968	104 183	+6.3%

Source: FAO and Overview of Fish Production, Utilization, Consumption And Trade based on 2001 Data, May 2003.

(www.fao.org)

Exhibit 1.8

World Fisheries Production

(million tons)

Production	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<i>Inland</i>										
Capture	6.2	6.5	6.7	7.3	7.4	7.6	8.0	8.5	8.8	8.7
Aquaculture	9.4	10.5	12.1	14.0	16.0	17.5	18.5	20.2	21.3	22.6
Total inland	15.6	17.0	18.8	21.3	23.4	25.1	26.5	28.7	30.1	31.3
<i>Marine</i>										
Capture	79.3	80.0	84.7	85.0	86.3	86.7	79.5	85.1	86.7	83.7
Aquaculture	6.2	7.3	8.6	10.4	10.8	11.2	12.0	13.3	14.2	15.2
Total marine	85.5	87.3	93.3	95.4	97.1	97.9	91.5	98.4	100.9	98.9
<i>Total</i>										
Total capture	85.5	86.5	91.4	92.3	93.7	94.3	87.5	93.6	95.5	92.4
Total aquaculture	15.6	17.8	20.7	24.4	26.8	28.7	30.5	33.5	35.5	37.8
Total world fisheries	101.2	104.8	112.8	116.7	120.4	122.9	118.1	127.1	130.9	130.2
Total International Trade	34.5	38.9	46.3	44.5	44.1	46.1	38.7	43.0	49.0	49.5
% of Trade	34.1	37.1	41.0	38.1	36.6	37.5	32.7	33.9	37.4	38.0

Source: FAO Yearbook 2001

Exhibit 1.9

World Fisheries Utilization

	Unit	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Human consumption	(million tons)	70.5	74.4	78.3	84.5	88.2	91.5	92.8	94.6	96.2	98.9
Reduction to fish meal and oil	(million tons)	30.7	30.4	34.5	32.2	32.2	31.4	25.3	32.5	34.8	31.3
Population	(billions)	5.4	5.5	5.6	5.7	5.8	5.8	5.9	6.0	6.1	6.2
Per capita food fish supply	(kg)	13.1	13.5	14.0	14.8	15.2	15.8	15.7	15.8	15.8	16.0

Source: FAO Yearbook 2001

Exhibit 1.10

Countrywise Production of Fish

(million tons)

Country	1999			2000			2001		
	Capture	Aquaculture	Total	Capture	Aquaculture	Total	Capture	Aquaculture	Total
China	17.24	22.79	40.03	16.99	24.58	41.57	16.53	26.05	42.58
Peru	8.43	0.01	8.44	10.66	0.01	10.67	7.99	0.01	8.00
India	3.47	2.13	5.60	3.74	1.94	5.68	3.76	2.20	5.97
Japan	5.19	0.76	5.95	4.97	0.76	5.73	4.72	0.80	5.52
USA	4.75	0.48	5.23	4.75	0.43	5.18	4.94	0.46	5.41
Indonesia	3.99	0.75	4.74	4.07	0.79	4.86	4.20	0.86	5.07
Chile	5.05	0.27	5.32	4.30	0.39	4.69	3.80	0.57	4.36
Russian Fed	4.14	0.07	4.21	3.97	0.07	4.04	3.63	0.09	3.72
Thailand	2.95	0.69	3.64	2.91	0.73	3.64	2.88	0.72	3.61
Norway	2.63	0.48	3.11	2.70	0.49	3.19	2.69	0.51	3.20
Other Countries	35.76	5.07	40.83	36.38	5.30	41.68	37.22	5.57	42.79
Total Production	93.60	33.50	127.10	95.44	35.49	130.93	92.36	37.85	130.21

Source: FAO Yearbook 2001

Exhibit 1.11

Countrywise Production of Fish by Capture

(million tons)

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
China	8.32	9.35	10.87	12.56	14.18	15.72	17.23	17.24	16.99	16.53
Peru	7.50	9.00	12.00	8.94	9.52	7.87	4.34	8.43	10.66	7.99
USA	5.19	5.52	5.54	5.22	5.00	4.98	4.71	4.75	4.75	4.94
Japan	7.73	7.25	6.62	5.97	5.93	5.93	5.30	5.19	4.97	4.72
Indonesia	2.89	3.08	3.31	3.51	3.55	3.79	3.96	3.99	4.07	4.20
Chile	6.43	5.95	7.72	7.43	6.69	5.81	3.27	5.05	4.30	3.80
India	2.84	3.06	3.26	3.27	3.45	3.52	3.37	3.47	3.74	3.76
Russian Fed	5.51	4.37	3.71	4.31	4.68	4.66	4.45	4.14	3.97	3.63
Thailand	2.88	2.93	3.02	3.03	3.01	2.90	2.93	2.95	2.91	2.88
Norway	2.43	2.42	2.37	2.52	2.65	2.86	2.86	2.63	2.70	2.69
Other countries	34.07	34.04	33.61	35.53	35.09	36.16	35.17	35.76	36.38	37.22
World Production	85.80	86.97	92.00	92.30	93.75	94.22	87.59	93.60	95.44	92.36

Source: FAO Yearbook 2001

Exhibit 1.12

Countrywise Production of Fish by Aquaculture

(million tons)

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
China	8.26	10.36	12.97	15.86	17.71	19.32	20.80	22.79	24.58	26.05
India	1.40	1.42	1.52	1.66	1.76	1.86	1.91	2.13	1.94	2.20
Indonesia	0.55	0.60	0.60	0.64	0.73	0.66	0.63	0.75	0.79	0.86
Japan	0.82	0.83	0.78	0.82	0.83	0.81	0.77	0.76	0.76	0.80
Thailand	0.37	0.46	0.51	0.56	0.56	0.54	0.59	0.69	0.73	0.72
Bangladesh	0.23	0.24	0.26	0.32	0.38	0.43	0.51	0.62	0.66	0.69
Chile	0.07	0.09	0.12	0.16	0.22	0.27	0.29	0.27	0.39	0.57
Vietnam	0.17	0.18	0.34	0.38	0.41	0.40	0.41	0.47	0.51	0.52
Norway	0.13	0.16	0.22	0.28	0.32	0.37	0.41	0.48	0.49	0.51
USA	0.41	0.42	0.39	0.41	0.39	0.44	0.45	0.48	0.43	0.46
Other Countries	3.01	3.05	3.13	3.29	3.38	3.53	3.75	4.05	4.20	4.46
World Production	15.41	17.81	20.84	24.38	26.69	28.64	30.52	33.50	35.49	37.85

(US\$ billion)

China	9.92	11.34	13.39	15.70	18.27	20.36	21.56	22.63	24.12	26.25
India	1.62	1.68	1.97	1.95	1.87	2.13	2.25	2.51	2.51	2.54
Indonesia	1.81	1.87	1.83	1.95	2.17	2.05	1.81	2.19	2.25	2.40
Japan	3.35	3.81	4.10	4.30	3.89	3.52	3.06	3.37	3.32	3.38
Thailand	1.17	1.49	1.85	1.87	1.90	1.91	1.66	2.10	2.52	2.38
Bangladesh	0.36	0.42	0.47	0.59	0.79	0.86	0.96	1.11	1.16	1.22
Chile	0.27	0.35	0.45	0.56	0.79	0.92	0.97	0.91	1.25	1.73
Vietnam	0.46	0.50	0.79	0.90	0.90	0.94	0.98	0.98	1.09	1.14
Norway	0.63	0.64	0.85	1.03	1.00	1.05	1.15	1.34	1.38	1.02
USA	0.63	0.68	0.70	0.73	0.74	0.77	0.78	0.83	0.83	0.78
Other Countries	8.01	8.02	9.10	9.79	9.95	10.17	10.31	10.81	11.73	12.86
World Production	28.23	30.80	35.51	39.37	42.26	44.68	45.50	48.78	52.15	55.69

(US\$ per kg)

China	1.20	1.09	1.03	0.99	1.03	1.05	1.04	0.99	0.98	1.01
India	1.16	1.18	1.30	1.17	1.06	1.15	1.18	1.18	1.29	1.15
Indonesia	3.29	3.12	3.05	3.05	2.97	3.11	2.87	2.92	2.85	2.79
Japan	4.09	4.59	5.26	5.24	4.69	4.35	3.97	4.43	4.37	4.23
Thailand	3.16	3.24	3.63	3.34	3.39	3.54	2.81	3.04	3.45	3.31
Bangladesh	1.57	1.75	1.81	1.84	2.08	2.00	1.88	1.79	1.76	1.77
Chile	3.86	3.89	3.75	3.50	3.59	3.41	3.34	3.37	3.21	3.04
Vietnam	2.71	2.78	2.32	2.37	2.20	2.35	2.39	2.09	2.14	2.19
Norway	4.85	4.00	3.86	3.68	3.13	2.84	2.80	2.79	2.82	2.00
USA	1.54	1.62	1.79	1.78	1.90	1.75	1.73	1.73	1.93	1.70
Other Countries	2.66	2.63	2.91	2.98	2.94	2.88	2.75	2.67	2.79	2.88
World Production	1.83	1.73	1.70	1.61	1.58	1.56	1.49	1.46	1.47	1.47

Source: FAO Yearbook, 2001

Exhibit 1.13

Countrywise Marine Capture Fish Production

(tons)

Country	2000	2001	%
China	14 754 095	14 379 457	-2.5
Peru	10 626 323	7 950 450	-25.2
USA	4 719 982	4 914 828	4.1
Japan	4 900 800	4 657 798	-5
Indonesia	3 764 479	3 897 270	3.5
Chile	4 300 160	3 797 143	-11.7
Russian Fed.	3 681 167	3 421 893	-7
India	2 786 676	2 787 890	0
Norway	2 702 837	2 686 733	-0.6
Thailand	2 710 073	2 671 339	-1.4
Korea Rep.	1 816 034	1 982 031	9.1
Iceland	1 982 346	1 980 555	-0.1
Philippines	1 741 264	1 809 372	3.9
Denmark	1 533 906	1 510 362	-1.5
Viet Nam	1 280 590	1 321 123	3.2
Mexico	1 208 764	1 306 438	8.1
Malaysia	1 285 696	1 231 287	-4.2
Morocco	895 012	1 082 293	20.9
Spain	1 036 778	1 076 110	3.8
Canada	969 822	1 014 388	4.6
Sub-total	68 696 804	65 478 760	-4.7
Share of Sub-total/ World	79.30%	78.30%	-3.4
World total	86 651 099	83 663 276	

Source: FAO and Overview of Fish Production, Utilization, Consumption And Trade based on 2001 Data, May 2003.

www.fao.org

Exhibit 1.14

Countrywise Inland Capture Fish Production

Country	2000	2001	(tons) %
China	2 233 230	2 149 932	-3.7
India	955 620	974 710	2
Bangladesh	670 465	670 000	-0.1
Cambodia	245 600	360 000	46.6
Indonesia	305 212	306 560	0.4
Egypt	253 470	295 422	16.6
Tanzania, Un. Rep	280 000	283 000	1.1
Myanmar	189 708	235 376	24.1
Uganda	219 356	220 726	0.6
Thailand	201 100	209 977	4.4
Russian Fed.	292 368	206 430	-29.4
Congo, Dem. Rep.	204 503	204 503	0
Brazil	199 159	200 000	0.4
Pakistan	176 468	180 100	2.1
Viet Nam	170 000	170 000	0
Kenya	210 343	156 763	-25.5
Nigeria	132 315	154 175	16.5
Philippines	151 753	135 845	-10.5
Mali	109 870	100 000	-9
Mexico	106 817	92 154	-13.7
Sub-total	7 307 357	7 305 673	0
Share of Sub-total/ World	83.10%	84.00%	-1.1
World total	8 788 721	8 692 758	

Source: FAO and Overview of Fish Production, Utilization, Consumption And Trade based on 2001 Data, May 2003.

(www.fao.org)

Exhibit 1.15

Countrywise Marine Aquaculture Fish Production

Country	2000	2001	(tons) %
China	9 411 306	10 100 513	7.3
Japan	702 179	744 061	6
Chile	390 932	565 045	44.5
Norway	491 284	512 101	4.2
Thailand	460 753	434 597	-5.7
Korea Rep.	279 984	282 314	0.8
Spain	278 626	277 029	-0.6
France	212 558	196 973	-7.3
Italy	164 775	169 919	3.1
UK	142 287	157 826	10.9
Indonesia	140 610	157 705	12.2
Canada	114 934	139 668	21.5
USA	102 464	128 540	25.4
Malaysia	100 889	114 419	13.4
India	97 968	104 183	6.3
Viet Nam	102 333	100 500	-1.8
Taiwan Prov. of China	88 344	96 161	8.8
Greece	92 050	94 032	2.2
Philippines	82 175	85 265	3.8
New Zealand	85 185	75 387	-11.5
Sub-total	13 541 636	14 536 238	7.3
Share of Sub-total/ World	95.30%	95.50%	7.2
TOTAL	14 205 663	15 224 462	

Source: FAO and Overview of Fish Production, Utilization, Consumption And Trade based on 2001 Data, May 2003.

(www.fao.org)

Exhibit 1.16

Countrywise Inland Aquaculture Fish Production

Country	2000	2001	(tons) %
China	15 169 365	15 949 588	5.1
India	1 844 236	2 098 447	13.8
Indonesia	647 890	706 571	9.1
Bangladesh	598 938	627 000	4.7
Viet Nam	408 222	418 000	2.4
Philippines	311 686	349 392	12.1
USA	325 798	332 458	2
Egypt	297 935	312 879	5
Thailand	271 202	289 631	6.8
Taiwan Prov. of China	155 512	201 267	29.4
Brazil	138 156	164 000	18.7
Myanmar	93 948	115 793	23.3
Russian Fed.	73 512	89 519	21.8
Japan	60 645	57 887	-4.5
France	54 212	55 079	1.6
Iran (Islamic Rep. of)	36 500	54 943	50.5
Colombia	50 396	53 000	5.2
Cuba	51 330	52 910	3.1
Lao People's Dem. Rep.	42 066	50 000	18.9
Italy	48 750	48 350	-0.8
Sub-total	20 680 299	22 026 714	6.5
Share of Sub-total/ World	97.20%	97.30%	6.3
TOTAL	21 281 520	22 626 894	

Source: FAO and Overview of Fish Production, Utilization, Consumption And Trade based on 2001 Data, May 2003.

(www.fao.org)

Exhibit 1.17

International Trade in Fishery Commodities by Principal Exporters

Country	1997	1998	1999	2000	2001			
	(US\$ billion)	(US\$ billion)	(US\$ billion)	(US\$ billion)	(US\$ billion)	Share (%)	Share of Fishery Exports to Agri-Exports (%)	Share of Fishery Exports to Total Exports (%)
Thailand	4.33	4.03	4.11	4.37	4.04	7.2	35.2	6.4
China	2.94	2.66	2.96	3.60	4.00	7.2	25.1	1.5
Norway	3.40	3.66	3.76	3.53	3.36	6.0	88.7	5.8
USA	2.85	2.40	2.95	3.06	3.32	5.9	-	-
Canada	2.27	2.27	2.62	2.82	2.80	5.0	13.9	1.1
Denmark	2.65	2.90	2.88	2.76	2.67	4.8	22.5	5.1
Chile	1.78	1.60	1.70	1.78	1.94	3.5	38.0	11.0
Spain	1.47	1.53	1.60	1.60	1.85	3.3	-	-
Taiwan	1.78	1.58	1.70	1.76	1.82	3.3	63.7	1.5
Vietnam	0.76	0.82	0.94	1.48	1.78	3.2	46.7	11.4
Indonesia	1.62	1.63	1.53	1.58	1.53	2.7	26.0	2.3
Russian Fed.	1.36	1.17	1.22	1.39	1.53	2.7	57.8	1.5
Netherlands	1.43	1.36	1.74	1.34	1.42	2.5	4.9	0.6
UK	1.26	1.55	1.43	1.26	1.31	2.3	-	-
Iceland	1.36	1.43	1.38	1.23	1.27	2.3	97.4	63.0
India	1.23	1.05	1.18	1.41	1.24	2.2	19.0	2.8
Korea Rep.	1.38	1.25	1.39	1.39	1.16	2.1	83.7	10.5
Peru	1.34	0.64	0.79	1.13	1.13	2.0	63.7	15.9
Germany	0.98	1.05	0.97	1.10	1.04	1.9	-	-
France	1.10	1.10	1.11	1.10	1.02	1.8	-	-
Other Countries	16.14	15.52	14.72	15.56	15.65	28.0		
World Exports	53.42	51.19	52.68	55.23	55.86	100.0		
World Exports (million tons)	46.08	38.67	43.04	48.98	49.49			
World Exports (US\$/kg)	1.16	1.32	1.22	1.13	1.13			

Source: FAO Yearbooks 1999 and 2001

Exhibit 1.18

International Trade in Fishery Commodities by Principal Importers

Country	1997	1998	1999	2000	2001			
	(US\$ billion)	(US\$ billion)	(US\$ billion)	(US\$ billion)	(US\$ billion)	Share (%)	Share of Fishery Imports to Agri-Imports (%)	Share of Fishery Imports to Total Imports (%)
Japan	15.54	12.83	14.75	15.51	13.45	22.6	28.0	3.9
USA	8.14	8.58	9.41	10.45	10.29	17.3	18.6	0.9
Spain	3.07	3.55	3.29	3.35	3.72	6.3	24.9	2.6
France	3.06	3.51	3.28	2.98	3.06	5.2	11.7	0.9
Italy	2.57	2.81	2.73	2.54	2.72	4.6	11.5	1.2
Germany	2.36	2.62	2.29	2.26	2.35	4.0	6.8	0.5
UK	2.14	2.38	2.28	2.18	2.24	3.8	7.7	0.7
China	1.18	0.99	1.13	1.80	1.79	3.0	-	-
Hong Kong	2.10	1.61	1.59	1.95	1.77	3.0	17.6	0.9
Denmark	1.52	1.70	1.77	1.81	1.74	2.9	-	-
Korea Republic	1.02	0.56	1.14	1.37	1.63	2.7	16.4	1.2
Canada	1.13	1.19	1.34	1.39	1.37	2.3	-	-
Netherlands	1.11	1.23	1.30	1.16	1.23	2.1	-	-
Thailand	0.87	0.83	0.84	0.78	1.02	1.7	-	-
Belgium	0.98	1.06	1.06	1.03	1.00	1.7	6.4	0.6
Portugal	0.75	0.93	1.02	0.86	0.94	1.6	18.9	2.5
Sweden	0.59	0.63	0.72	0.71	0.73	1.2	15.3	1.2
Norway	0.56	0.67	0.61	0.60	0.65	1.1	-	-
Taiwan	0.66	0.48	0.56	0.55	0.53	0.9	-	-
Australia	0.50	0.49	0.49	0.52	0.52	0.9	-	-
Other Countries	6.81	6.41	6.03	6.22	6.63	11.2		
World Imports	56.66	55.08	57.62	60.02	59.40	100.0		

Source: FAO Yearbooks 1999 and 2001

Exhibit 1.19**USA's Fish Imports, 2002**

Country	Value	
	(US\$ million)	(%)
Canada	2150	20.7
Thailand	1780	17.1
China	940	9.0
Vietnam	650	6.3
Chile	640	6.2
Ecuador	400	3.9
Indonesia	400	3.9
India	390	3.8
Mexico	375	3.6
Russia	250	2.4
Brazil	200	1.9
Others	2225	21.4
Total	10400	100.0

Source: USA Bureau of the Census

Exhibit 1.20**Japan's Fish Imports, 2002**

Country	Quantity	Value	
	('000 tons)	(US\$ million)	(%)
China	703.10	2457.92	17.5
USA	407.34	1358.93	9.6
Thailand	258.88	1038.96	7.4
Indonesia	134.37	936.27	6.6
Russian Fed	189.57	896.92	6.4
R Korea	180.82	853.00	6.1
Taiwan	198.72	809.59	5.7
Chile	309.63	641.39	4.6
Norway	254.07	578.85	4.1
Vietnam	97.41	555.19	3.9
Australia	27.49	491.75	3.5
Canada	71.71	483.24	3.4
India	59.06	360.76	2.6
Morocco	53.77	245.84	1.7
Philippines	35.02	166.74	1.2
Peru	221.22	156.27	1.1
Spain	14.77	151.77	1.1
Argentina	47.58	129.34	0.9
N Korea	64.00	115.04	0.8
New Zealand	35.83	113.02	0.8
Other Countries	456.59	1542.61	11.0
Total Imports	3820.95	14083.40	100.0

Source: (www.jfta-or.jp)

Exhibit 1.21**China's Fish Imports, 2000**

Country	Quantity	Value	
	('000 tons)	(US\$ million)	(%)
Russia	576.07	419.16	22.7
Peru	965.65	402.59	21.8
Japan	51.22	146.18	7.9
USA	156.00	125.89	6.8
Canada	36.89	79.74	4.3
EU	47.56	71.68	3.9
Korea	66.06	70.05	3.8
New Zealand	49.09	46.03	2.5
Chile	63.16	45.55	2.5
Thailand	54.91	42.99	2.3
Taiwan	51.28	28.09	1.5
Hong Kong	2.68	4.57	0.2
Others	399.42	367.48	19.9
Total	2520.00	1850.00	100.0

Source: Yang, N. June 2002.

Exhibit 1.22**China's Fish Trade**

Year	Exports		Imports	
	Quantity	Value	Quantity	Value
	(million tons)	(US\$ billion)	(million tons)	(US\$ billion)
1996	0.08	3.30	1.39	1.20
1997	0.92	3.14	1.51	1.22
1998	1.00	2.84	1.14	1.02
1999	1.35	3.14	1.31	1.29
2000	1.53	3.83	2.52	1.85

Source: Yang, N. June 2002.

Exhibit 1.23

State Wise Fish Production in 2000-01

(tons)

States/Uts	2000-01			%
	Marine	Inland	Total	
West Bengal	181000	879230	1060230	18.74
Gujarat	620474	40261	660735	11.68
Kerala	566571	85234	651805	11.52
Andhra Pradesh	182502	407186	589688	10.43
Maharashtra	402838	123266	526104	9.30
Tamil Nadu	367855	113560	481415	8.51
Karnataka	175906	127468	303374	5.36
Orissa	121086	138556	259642	4.59
Bihar	-	222160	222160	3.93
Uttar Pradesh	-	208286	208286	3.68
Assam	-	158620	158620	2.80
Goa	67328	4240	71568	1.27
Punjab	-	52000	52000	0.92
Madhya Pradesh	-	48844	48844	0.86
Pondicherry	38950	4350	43300	0.77
Haryana	-	33040	33040	0.58
Tripura	-	29420	29420	0.52
A & N Islands	27618	66	27684	0.49
Jammu & Kashmir	-	17510	17510	0.31
Daman & Diu	16382	0	16382	0.29
Manipur	-	16050	16050	0.28
Rajasthan	-	12121	12121	0.21
Lakshadweep	12000	0	12000	0.21
Himachal Pradesh	-	7020	7020	0.12
Meghalaya	-	6179	6179	0.11
Nagaland	-	5500	5500	0.10
Delhi	-	3980	3980	0.07
Mizoram	-	2860	2860	0.05
Arunachal Pradesh	-	2500	2500	0.04
Sikkim	-	140	140	0.00
Chandigarh	-	82	82	0.00
D & N Haveli	-	43	43	0.00
Chattisgarh**	-	43386	43386	0.77
Uttaranchal**	-	9074	9074	0.16
Jharkhand**	-	43600	43600	0.77
Deep Sea Fishing @	30000	-	30000	0.53
Total	2810510	2845832	5656342	100.00

** For the period December 2000 to March 2001

@ Estimated

Note: Figures are Provisional.

Source: (<http://agricoop.nic.in/>)

Exhibit 1.24

Share of Shrimp to Total Exports of India

Year	Shrimp Exports	Marine Exports	Total Exports*	Share of Shrimp Exports to Total Marine Exports	Share of Marine Exports to Total Exports	Share of Shrimp Exports to Total Exports
	(Rs billion)	(Rs billion)	(Rs billion)	(%)	(%)	(%)
1998-99	33.45	46.27	1397.52	72.3	3.3	2.4
1999-00	36.45	51.17	1590.95	71.2	3.2	2.3
2000-01	44.82	64.44	2013.56	69.6	3.2	2.2
2001-02	41.40	59.57	2077.44	69.5	2.9	2.0
2002-03	42.35	67.91	2530.00	62.4	2.7	1.7

* Extracted from CMIE Statistics

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.25

Shrimp Exports from India: Contribution of Cultured Shrimps

Year	Total Shrimp Exports		Contribution of Cultured Shrimps				
	Quantity	Value	Production: Live Weight Quantity	Export Quantity	Yield	Export Value	Value Contribution to Exports
	(tons)	(Rs billion)	(tons)	(tons)	(%)	(Rs billion)	(%)
1980-81	51358	2.02	-	-	-	-	-
1990-91	62395	6.63	35500	23075	36.98	3.76	56.77
1991-92	76107	9.66	40000	26000	34.16	5.44	55.81
1992-93	74393	11.80	47000	30550	41.06	7.66	64.93
1993-94	86541	17.70	62000	40300	47.14	12.88	72.79
1994-95	101751	25.10	82850	53853	52.92	18.66	74.35
1995-96	95724	23.56	70573	47922	50.96	15.31	64.09
1996-97	105426	27.01	70686	45945	43.58	16.42	60.80
1997-98	101318	31.40	66868	43454	42.90	20.86	66.42
1998-99	102484	33.44	82634	53712	52.41	25.11	75.07
1999-00	110275	36.45	86000	54000	48.96	27.82	76.32
2000-01	111874	44.82	113700	67144	60.00	38.70	86.35
2001-02	127656	41.32	127170	74826	58.60	35.45	85.80
2002-03*	123251	42.35	145780	85776	69.59	42.08	99.36

* Provisional estimate

Source: (www.mpeda.com)

Exhibit 1.26

Major Markets for Indian Shrimps

Importing Country	1997		1998		1999		2000		2001	
	(Rs billion)	% Share	(Rs billion)	% Share	(Rs billion)	% Share	(Rs billion)	% Share	(Rs billion)	% Share
Japan	20.65	66.4	22.13	65.5	19.83	59.0	23.52	51.9	17.74	43.3
USA	4.65	15.0	4.57	13.5	5.41	16.1	9.97	22.0	11.53	28.1
EU	2.94	9.5	3.05	9.0	4.59	13.7	6.28	13.8	5.68	13.9
Others	2.85	9.2	4.04	12.0	3.79	11.3	5.58	12.3	6.05	14.8
Total	31.09	100.0	33.79	100.0	33.62	100.0	45.35	100.0	41.00	100.0

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.27
Import of Frozen Shrimps into Japan

Country	1997		1998		1999		2000		2001	
	Quantity (‘000 tons)	Value (million US\$)	Quantity (‘000 tons)	Value (million US\$)	Quantity (‘000 tons)	Value (million US\$)	Quantity (‘000 tons)	Value (million US\$)	Quantity (‘000 tons)	Value (million US\$)
Indonesia	57.35	745.40	53.73	657.48	50.62	566.22	49.80	637.21	55.62	581.89
(%)	20.7	24.5	22.5	25.7	20.4	22.8	20.2	23.0	22.7	25.5
India	59.12	607.45	50.41	541.48	52.76	496.10	50.01	544.81	42.99	382.30
(%)	21.4	19.9	21.1	21.1	21.3	20.0	20.3	19.6	17.5	16.7
Vietnam	31.13	242.71	26.71	218.76	30.27	247.32	33.10	304.83	35.68	286.92
(%)	11.2	8.0	11.2	8.5	12.2	10.0	13.4	11.0	14.5	12.6
Thailand	24.10	351.84	17.78	255.77	19.33	248.13	18.66	268.36	20.58	225.33
(%)	8.7	11.6	7.4	10.0	7.8	10.0	7.6	9.7	8.4	9.9
China	15.23	104.94	12.20	78.54	13.67	85.52	16.64	141.45	14.97	109.94
(%)	5.5	3.4	5.1	3.1	5.5	3.4	6.7	5.1	6.1	4.8
Philippines	6.93	90.72	7.38	92.70	7.87	89.05	8.35	100.84	8.44	87.23
(%)	2.5	3.0	3.1	3.6	3.2	3.6	3.4	3.6	3.4	3.8
Australia	6.71	114.12	5.64	78.06	5.78	91.20	5.29	95.22	4.97	71.85
(%)	2.4	3.7	2.4	3.0	2.3	3.7	2.1	3.4	2.0	3.1
Russian	2.61	39.10	4.15	37.85	5.78	53.42	8.01	85.14	9.11	66.69
(%)	0.9	1.3	1.7	1.5	2.3	2.2	3.2	3.1	3.7	2.9
Canada	9.14	73.29	10.28	69.26	10.63	81.90	9.22	71.05	7.81	49.57
(%)	3.3	2.4	4.3	2.7	4.3	3.3	3.7	2.6	3.2	2.2
Greenland	9.54	73.08	10.02	66.37	10.42	80.11	9.85	66.52	3.85	44.51
(%)	3.4	2.4	4.2	2.6	4.2	3.2	4.0	2.4	1.6	1.9
Others	54.97	603.02	40.86	465.00	40.54	442.78	37.91	457.72	41.25	378.88
(%)	19.9	19.8	17.1	18.2	16.4	17.8	15.4	16.5	16.8	16.6
Total	276.82	3045.66	239.15	2561.28	247.68	2481.76	246.82	2773.14	245.27	2285.11
(%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.28**Principal Exporters of Shrimp and Lobsters to Japan**

	1997	1998	1999	2000		2001	
	Volume	Volume	Volume	Volume	Value	Volume	Value
	(tons)	(tons)	(tons)	(tons)	(¥ million)	(tons)	(¥ million)
Indonesia	57,495	54,247	50,688	49,916	68,729	55,778	70,664
India	59,997	51,128	53,430	50,970	59,957	43,593	47,477
Vietnam	31,134	26,711	30,271	33,105	32,766	35,676	34,856
Thailand	24,104	17,783	19,328	18,657	28,870	20,580	27,249
China	15,249	12,198	13,672	16,654	15,248	14,981	13,344
Others	93,410	88,963	91,674	90,264	119,301	85,005	106,863
Total	281,388	251,031	259,062	259,565	324,871	255,613	300,453

Source: JETRO Marketing Guidebook for Major Imported Products, 2002

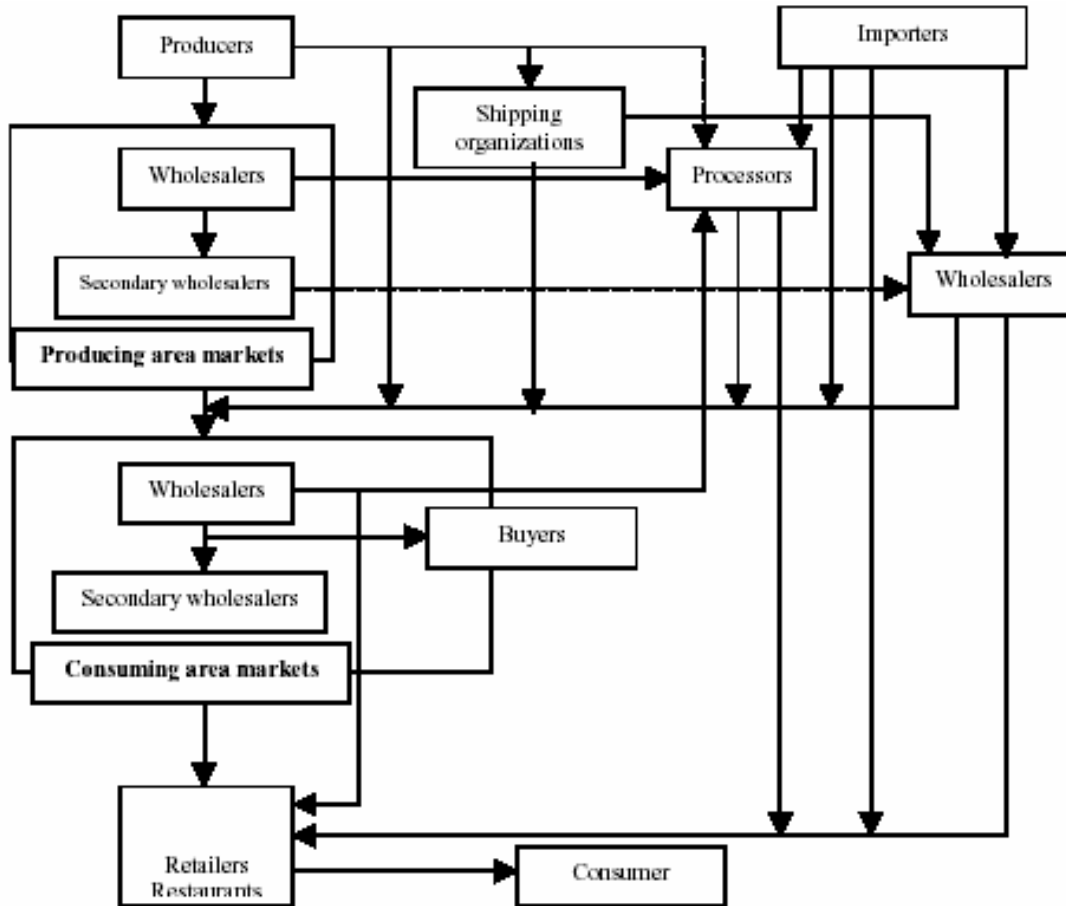
Exhibit 1.29**Shrimp Consumption and Imports' Share in the Japanese Market**

	1996	1997	1998	1999	2000
Domestic catch	31,996	30,367	28,436	28,307	28,589
Imports	304,300	281,389	251,031	259,062	259,565
Domestic market total	336,296	311,453	279,063	287,369	288,104
Imports' share (%)	90.5	90.3	89.8	90.1	90.1

Source: Japan Exports and Imports. Annual Statistics on Fishery and Aqua Culture Production, 2000

Exhibit 1.30

Principal Distribution Channels of Shrimps and Crabs in Japan



Notes:

- 1) Buyers; includes large-scale buyers, food processors, operators from outside the local area, trading company representatives.
- 2) Dotted lines indicate channels used only by domestic products; solid lines indicate channels used by imports.
- 3) Processors also include companies that import in bulk and simply repackage the merchandise for consumer sale or perform other comparable minor processing.

Source: JETRO Marketing Guidebook for Major Imported Products. 2002.

Exhibit 1.31

Import of Shrimps (All Types) into USA

('000 tons)

Importing Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Thailand	54	67	81	78	73	73	92	115	126	136
(%)	20.5	25.5	29.2	28.6	27.7	24.8	30.1	34.6	36.5	34.0
India	18	19	23	18	19	20	20	20	29	33
(%)	6.8	7.2	8.3	6.6	7.2	6.8	6.5	6.0	8.4	8.3
Mexico	14	20	23	33	31	34	35	35	29	30
(%)	5.3	7.6	8.3	12.1	11.7	11.6	11.4	10.5	8.4	7.5
China	49	31	23	15	8	13	7	9	18	28
(%)	18.6	11.8	8.3	5.5	3.0	4.4	2.3	2.7	5.2	7.0
Ecuador	55	49	48	52	44	64	65	50	19	27
(%)	20.8	18.6	17.3	19.0	16.7	21.8	21.2	15.1	5.5	6.8
Indonesia	14	13	11	5	10	13	15	16	17	15
(%)	5.3	4.9	4.0	1.8	3.8	4.4	4.9	4.8	4.9	3.8
Bangladesh	8	10	9	0	9	10	6	9	10	9
(%)	3.0	3.8	3.2	0.0	3.4	3.4	2.0	2.7	2.9	2.3
Republic of Panama	6	6	7	9	9	11	10	8	6	7
(%)	2.3	2.3	2.5	3.3	3.4	3.7	3.3	2.4	1.7	1.8
Brazil	6	4	5	2	1	0	1	NA	NA	NA
(%)	2.3	1.5	1.8	0.7	0.4	0.0	0.3	NA	NA	NA
Others	40	44	47	61	60	56	55	70	91	115
(%)	15.2	16.7	17.0	22.3	22.7	19.0	18.0	21.1	26.4	28.8
Total	264	263	277	273	264	294	306	332	345	400
(%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.32

Value Realization of Indian Shrimps

(Rs per Kg)

Frozen Shrimps	1997			1998			1999			2000			2001		
	Quantity (million Kgs)	Value (Rs billion)	(Rs/Kg)	Quantity (million Kgs)	Value (Rs billion)	(Rs/Kg)	Quantity (million Kgs)	Value (Rs billion)	(Rs/Kg)	Quantity (million Kgs)	Value (Rs billion)	(Rs/Kg)	Quantity (million Kgs)	Value (Rs billion)	(Rs/Kg)
AFD Shrimp	0.227	0.268	1182.01	0.278	0.389	1398.50	0.112	0.170	1510.51	0.206	0.356	1726.51	0.236	0.369	1562.26
Block Frozen Shrimp	81.098	21.158	260.89	68.224	19.108	280.07	70.544	20.362	288.65	86.457	30.325	350.76	61.258	16.695	272.53
Breaded Shrimp	0.002	0.003	199.71	-	-	-	-	-	-	-	-	-	-	-	-
Cooked Salad Shrimp	0.493	0.055	110.68	0.246	0.029	118.26	-	-	-	0.018	0.004	215.63	-	-	-
Cultured Shrimp	16.449	8.031	488.24	24.974	12.863	515.06	25.331	11.744	463.62	23.192	13.015	561.19	47.082	20.455	434.46
IQF Shrimp	8.030	1.583	197.19	7.390	1.395	188.79	7.083	1.348	190.25	7.634	1.649	216.04	12.558	3.485	277.49
Total Shrimp Exports	106.299	31.098		101.112	33.784		103.070	33.624		117.507	45.349		121.134	41.004	

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.33

State Wise Shrimp Landings in India

States	1999			2000		
	Shrimp Landings	Fish Landings	Share of Shrimp to Fish	Shrimp Landings	Fish Landings	Share of Shrimp to Fish
	(tons)	(tons)	(%)	(tons)	(tons)	(%)
Maharashtra	102848	390541	26.33	98257	398078	24.68
Kerala	44706	580753	7.70	69167	614453	11.26
Gujarat	56443	670951	8.41	56500	632119	8.94
Tamil Nadu	23168	363000	6.38	24851	372402	6.67
West Bengal	15337	170700	8.98	17660	186680	9.46
Andhra Pradesh	23728	166482	14.25	7948	166602	4.77
Orissa	9897	125767	7.87	7863	108754	7.23
Karnataka	6929	165653	4.18	5498	115244	4.77
Pondicherry	3923	38590	10.17	4570	39266	11.64
Goa	1622	60075	2.70	2284	64563	3.54
Daman and Diu	527	25167	2.09	804	17050	4.72
Andaman and Nicobar Islands	785	26673	2.94	351	30339	1.16
Lakshadweep	0	13080	0.00	0	10082	0.00
Total	289913	2797432	10.36	295753	2755632	10.73

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.34

State Wise Details of Shrimp and Scampi Culture in India (2001-02)

State	Shrimp			Scampi			Total		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
	(ha)	(tons)	(tons/ha)	(ha)	(tons)	(tons/ha)	(ha)	(tons)	(tons/ha)
Tamil Nadu	2480	4710	1.90	170	140	0.82	2650	4850	1.83
Goa	930	1200	1.29	0	0	0.00	930	1200	1.29
Karnataka	3080	3500	1.14	150	100	0.67	3230	3600	1.11
Orissa	8120	8960	1.10	3100	400	0.13	11220	9360	0.83
Andhra Pradesh	79600	51230	0.64	22340	20910	0.94	101940	72140	0.71
West Bengal	47600	26800	0.56	4020	2270	0.56	51670	29070	0.56
Kerala	14700	5540	0.38	770	200	0.26	15470	5740	0.37
Gujarat	540	680	1.26	1940	70	0.04	2480	750	0.30
Maharashtra	300	320	1.07	4150	140	0.03	4450	460	0.10
Total	157400	102940	0.65	36640	24230	0.66	194040	127170	0.66

Source: (www.mpeda.com)

Exhibit 1.35
Shrimp Farming in India

State	Estimated Brackish Water Area (hectare)		AUC: Area Under Culture (hectare) EP: Estimated Production (Tons)									
			1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01
West Bengal	405000	AUC	39918	34050	34150	34400	34660	42605	42525	45067	41980	45890
		EP	13800	16300	16500	28000	23445	19949	15121	18320	21780	22004
Orissa	31600	AUC	7417	7760	8150	8500	11000	11332	11332	8000	9000	10523
		EP	3800	4300	3300	4800	6000	6808	5000	6000	3400	7660
Andhra Pradesh	150000	AUC	8100	50500	19500	34500	50000	60249	62290	66249	76128	74227
		EP	9700	12800	26000	34000	27140	30577	34075	44856	41655	51055
Tamil Nadu	56000	AUC	480	530	1050	2000	2579	640	670	1700	1882	2596
		EP	700	1100	2000	3000	1092	1129	1197	1847	2940	3873
Pondicherry	800	AUC	-	-	-	-	37	22	22	-	-	-
		EP	-	-	-	-	10	27	20	-	-	-
Kerala	65000	AUC	13145	13400	13860	14100	14657	14658	14595	13180	14470	15495
		EP	9500	9750	11500	12000	9000	8225	7290	7660	7150	7666
Karnataka	8000	AUC	2542	2570	2600	3500	3500	3500	3540	3140	3635	3119
		EP	1100	1150	1500	2500	2050	2300	2640	2690	2890	2823
Goa	18500	AUC	525	550	575	600	650	650	650	600	770	929
		EP	300	350	400	450	550	580	590	590	840	966
Maharashtra	80000	AUC	1869	1980	2180	2400	716	929	970	426	533	1114
		EP	930	1050	300	400	740	700	700	409	390	385
Gujarat	376000	AUC	231	360	475	700	884	997	997	315	447	2377
		EP	170	200	500	700	546	572	235	256	340	668
Total	1190900	AUC	74227	111700	82540	100700	118683	135582	137591	138677	148845	156270
		EP	40000	47000	62000	85850	70573	70867	66868	82628	81385	97100

Source: 1. MPEDA, Extracted from 'Project Report for Setting Up of Fisheries Export Promotion Zone in the Cherthala-Munambam Region in Kerala,' College of Fisheries, Kerala Agricultural University, Kochi, May 2002
2. Namboodiri, D.N. May 2002.

Exhibit 1.36**Productivity in Shrimp Farming in India**

Year	Area/ha	Production	Average Yield
		(tons)	(Kg/ha/year)
1991-92	68227	40000	586
1992-93	70700	47000	665
1993-94	82540	62000	751
1994-95	100700	82850	823
1995-96	118993	70573	593
1996-97	135582	70686	521
1997-98	141591	66868	472
1998-99	135617	82634	609
1999-00	148845	86000	578
2000-01	156270	97100	621

Source: 1. MPEDA, Extracted from 'Project Report for Setting Up of Fisheries Export Promotion Zone in the Cherthala-Munambam Region in Kerala,' College of Fisheries, Kerala Agricultural University, Kochi, May 2002
2. Namboodiri, D.N. May 2002.

Exhibit 1.37**Major Aquaculture Shrimp Producers and their Share –1999**

Country	Production	Share
	(tons)	(%)
Thailand	200000	24.57
China	110000	13.51
Indonesia	100000	12.28
Ecuador	85000	10.44
India	70000	8.59
Philippines	40000	4.91
Vietnam	40000	4.91
Taiwan	20000	2.46
Others	149000	18.30
Total	814000	100.00

Source: MPEDA, Statistics of Marine Products Exports 2001.

Exhibit 1.38**Land Holding in Aquaculture**

Land Holding	Aquaculture (%)
2 ha or below	52
2 ha to 5 ha	29
5 ha to 10 ha	12
10 ha and above	7

Source: Chandran, K. K. September 1998.

Exhibit 1.39**Export of Fresh and Frozen Shrimps from India**

(tons, US\$ million)

	2000		2001	
	Q	V	Q	V
Block Frozen	86456.9	673.9	61257.9	371.0
IQF	7634.3	36.7	12557.8	77.4
Total	94091.2	710.6	73815.7	448.4

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.40**Export of Prepared and Preserved Shrimps from India**

(tons US\$, million)

	2000		2001	
	Q	V	Q	V
AFD	206.5	7.9	236.3	8.2
Breaded Shrimp	0	0	0	0
Cooked Salad Shrimp	18.1	0.1	0	0
Total	224.6	8.0	236.3	8.2

Source: MPEDA. Statistics of Marine Products Export 2001.

Exhibit 1.41

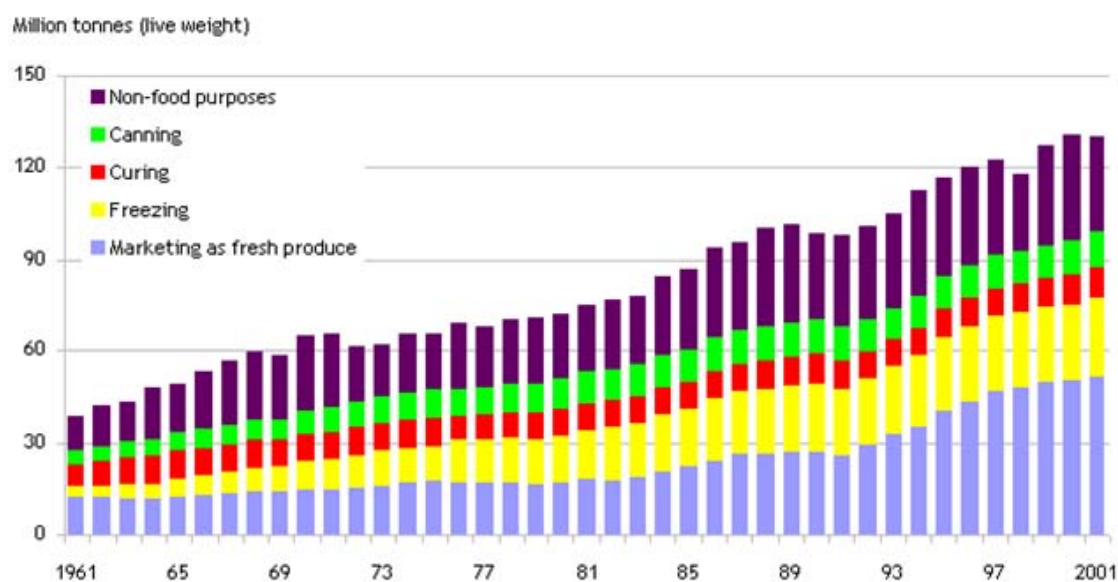
Disposition of Fish Catch (Percentage Distribution) for the year 1998 in India

Category	Percentage
Marketing Fresh	73.7%
Frozen	7.5%
Curing	10.8%
Canning	0.2%
Reduction	5.8%
Miscellaneous	1.8%
Total	100%

Source: Ministry of Agriculture, Department of Animal Husbandry and Dairying, Govt. of India. Handbook on Fisheries Statistics 2000.

Exhibit 1.42

Utilization of World Fisheries Production



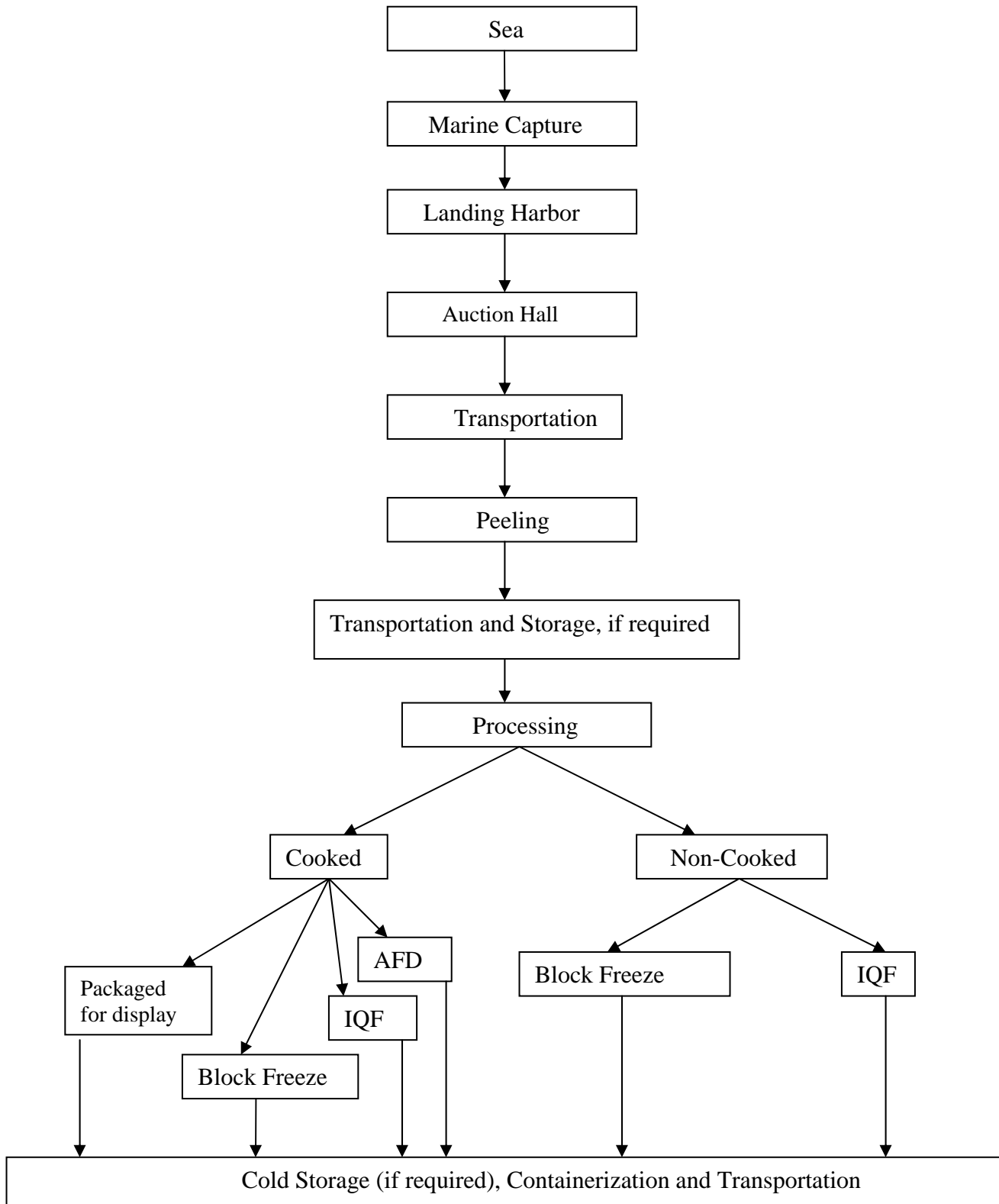
Source: FAO and Overview of Fish Production, Utilization, Consumption And Trade based on 2001 Data, May 2003. (www.fao.org)

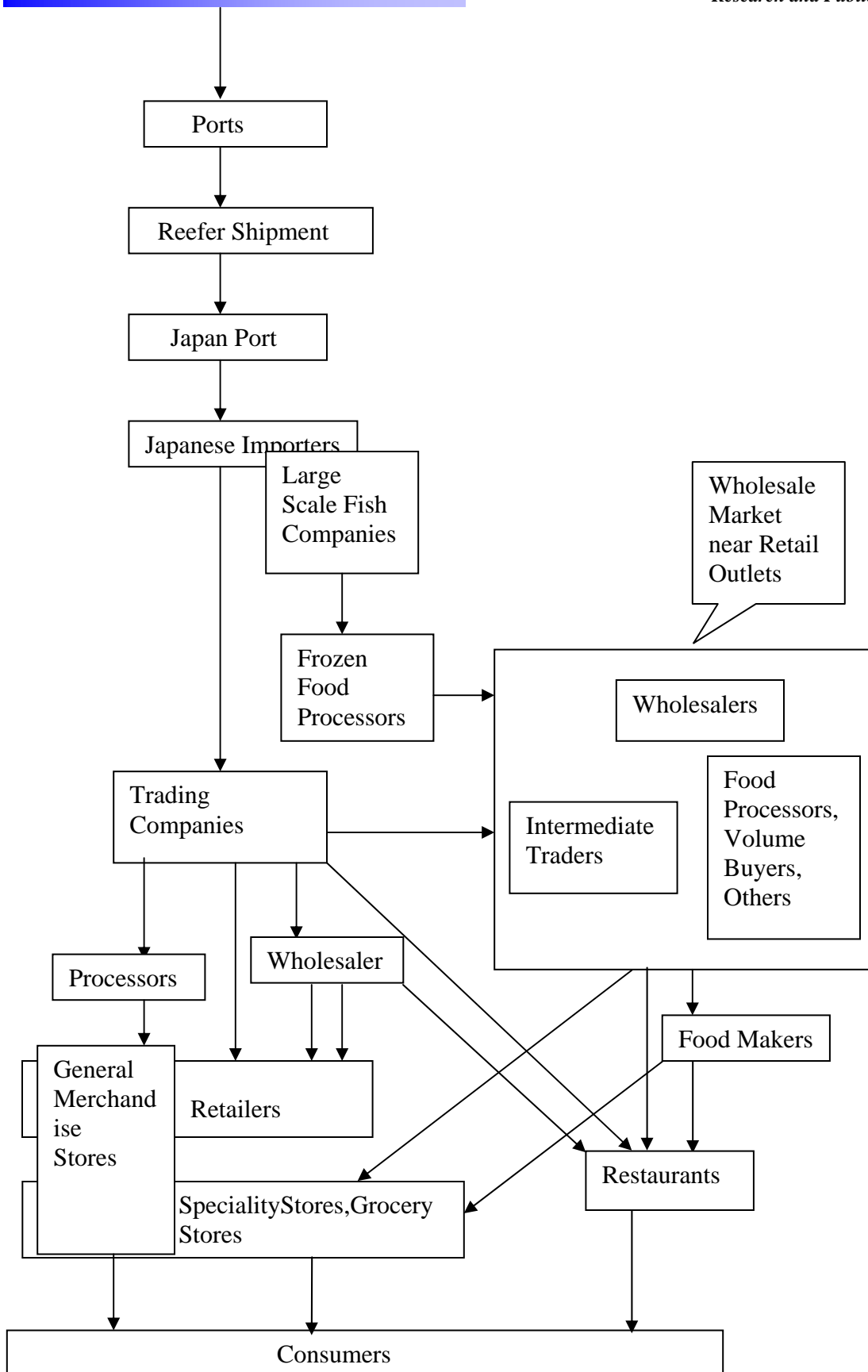
Part II

Supply Chain and Infrastructure

1. Supply Chain for Shrimp

We illustrate the supply chain for shrimp exports, with Japan as the importing country.





2. Infrastructure

From the description in Part I, we identify the following infrastructural requirements along the supply chain.

- (i) Boats & Trawlers
- (ii) Ice
- (iii) Water
- (iv) Fishing Harbor/Landing Centres and Auction Halls
- (v) Insulated Trucks
- (vi) Peeling Sheds
- (vii) Cold Storage
- (viii) Processing Plants
- (ix) Effluent Treatment Plant
- (x) Power Generation Plant
- (xi) Reefer Containers
- (xii) Human Resource-Fisherfolk, Research and Development

We outline the concerns for each of these in the subsequent sections.

3. Boats and Trawlers

- Fishing Craft (**Exhibit 2.1**): The statistics in fishing craft are guestimates at best, especially regarding the non-mechanized boats. The number of fishing vessels registered as on 31.3.2003 with MPEDA was 15502 [MPEDA, 2004].
- Fishing crafts are a major determinant of both quality and quantity of marine capture. We need larger sized, equipment rich mechanized boats that would be able to stay in the sea for more than one day.
- Discussions with industry personnel reveal that India has only about 100 deep sea trawlers, producing about 30,000 tons of catch. The implication is that most of the marine capture is done on a one-day or a two-day cycle. This limits our ability to exploit deep sea potential. Even for the deep sea trawlers, typically only six months of fishing is attempted in a year. About 25 trips take place with a cycle time of seven days. During each trip, there may be a maximum of three fishing days, resulting in 75 fishing days per trawler. This amounts to 7,500 deep sea trawler days, with about 4 tons of catch per deep sea trawler day. Thus in each trip, about 12 tons of catch are obtained. This compares unfavorably with the 25 ton to 100 ton range of deep sea trawlers of other countries.
- A trawler capacity of 15 to 20 tons of catch is priced at US\$ 250,000 (size: length 88.5 ft and breadth 24.6 ft). This is about Rs 11 million.
- In India, the maximum trawler capacity is 15 tons. Deep sea trawlers would need a capacity of 50 tons. This is likely to cost US\$ 750,000 (Rs 34 million). In New Zealand, the trawler capacity is 120 tons. Thailand has a trawler with a capacity of 150 tons [Warrior, 2003]. High end trawlers can cost upto Rs 300 million.
- With a trawler capacity of 50 tons of catch and 30 trips in a year, one deep sea trawler can supply 1500 tons of fish per annum. At an average price of Rs 5 per kg of landed catch, the revenue per trawler could be Rs 7.5 million per annum. The interest (10%) and depreciation (5%) cost on an investment of US\$ 750,000 would be Rs 5.1 million per annum. With all the other operating costs, there would be enough surplus to make it a viable business. Targeting at least 3 mt of capture by trawlers, we could be looking at 2,000 trawlers.
- Quality of boats is an area of major concern, especially in the non- mechanized and low end mechanized boats. Low end mechanized boats cost anywhere from Rs 2 to 8 million. Most boats use wood as material, which promotes bacterial deterioration of the catch, unless there are separate iceboxes or freezers. The common practice is to leave the catch on the floor of the boat, with ice layers. The ice itself is not always sufficient. An investment of the order of Rs one million in mechanized boats could significantly improve the quality and quantity of the catch. Of this about Rs 0.6 million would be for equipment like echo sounders, fish finders, GPS etc. The interest and depreciation cost would amount to Rs 150,000 per annum. If the catch value can go up by Rs 1.5 per kg, such investments would be viable for boats that can bring in 100 tons of catch per year, not considering the additional productivity that such boats could have.

4. Ice

- In India, there were 166 ice plants registered as on 31.3.2003 with MPEDA, with a capacity of 4030 tons per day (1.46 mt per annum). Of this, about fifty percent of the capacity is near fishing harbours and landing centres (Exhibit 2.2). As per earlier studies, the ice availability should be at least on a 1:1 ratio with the fish production [Bhattacharya, 2001]. The 1.4 mt of capacity is significantly lower than the total fish production of 5.7 mt, even accounting for many of the processing units producing their own ice. In terms of marine capture, the 0.7 mt of ice capacity near the landing centres is again significantly lower than the capture of 2.8 mt.
- Apart from just ice availability, the quality of ice is a significant concern, primarily because the water that is used for ice making is not always of the required standards.
- A 20 ton per day (7,300 tons per annum) ice plant would require an investment of Rs 0.5 million. Given the ideal requirement of ice, an investment of at least 2 mt per annum for the current volume of marine capture and a further investment of at least 3 mt for the future volumes would be required. The total of 5 mt per annum would cost about Rs 340 million.

5. Water

- Clean water is an essential requirement for the maritime industry.
- For producing one kg ice, one litre water is required [Namboodiri, 2002].
- For processing one kg of raw material in the peeling sheds, three litres of water is required [Namboodiri, 2002].
- In the processing plants, the potable water requirement is 10 litres per kg of raw material [Namboodiri, 2002].
- The potable water source is bore well. An investment of Rs 5 million is required for 500,000 litres of water [Warrior, 2003].

6. Fishing Harbor/Landing Centres and Auction Halls

- According to the Ministry of Agriculture, Fisheries Division, there are 185 FHs/LCs in the country. Six are major Fishing Harbours attached to major ports (Vishakhapatnam, Madras, Cochin, Bombay (Sassoon Dock), Calcutta (Roychowk) and Paradip), 41 are categorised as Minor Fishing Harbours and 138 are Landing Centres. All these FHs/LCs have been built up over a plan period of the last 40 years with a total expenditure of Rs 2180 millions divided equally between major harbours and the minor harbours [Bhattacharya, 2001].
- The following 20 FHs/LCs have landings which account for 80 % of fishery exports of the country :

Gujarat:

- 1) Porbunder
- 2) Veraval

Maharashtra:

- 1) Sasoon Dock (including Ferry Wharf)
- 2) Ratnagiri

Kerala:

- 1) Cochin
- 2) Vizhinjom
- 3) Azhikal

Karnataka

- 1) Honnavar
- 2) Mangalore
- 3) Malpe

Andhra Pradesh

- 1) Vishakhapatnam
- 2) Kakinada
- 3) Baranapadu

Tamil Nadu

- 1) Madras
- 2) Tuticorin
- 3) Mandapam (Mannar)

Orissa

- 1) Paradip
- 2) Chandipur

West Bengal

- 1) Roychowk
- 2) Digha

- FHs/LCs are generally ill-equipped and operate in unclean and unhygienic conditions. The smell of deteriorating fish is all prevalent and forms the identity of locations where fish is dealt with. Ideally, well preserved fish should have no smell. [Sait, 2003].

- The Tsukuji fish market in Tokyo is the largest auction hall in Japan. No odour is detectable in the Tsukuji market, which reflects on the excellent preservation quality of the fish.
- MPEDA has suggested that landing centres should be privatised. There is a private landing Center at Cochin [Kurien, 2003]. There is ambivalence on the part of the government authorities as to whether this should be encouraged. In the context of private involvement and infrastructure, private provisioning of FHs/LCs must be encouraged.
- Recent (since 2002) investments in FHs/LCs have been as follows:

Port	Source	Fund
Vizag	State Govt.	Rs 15 million
Roypura, Tuticorin	Central Govt.	Rs 60 million
Veraval	MPEDA	Rs 5 million

- Significant investments would be required in the 20 FHs/LCs to bring them to global standards. The current frame of reference for improvements in FHs/LCs is nowhere near what is required. A wholistic approach of infrastructural investments and changing the mindset and expectations of different users of FHs/LCs is imperative. An investment of the order of Rs 100 million in each of the major FHs/LCs may be necessary to bring in due returns.

7. Insulated Trucks

- While the large exporters use insulated trucks, the smaller exporters and domestic producers do not always have access to insulated trucks. These are an essential part of a cold chain that would enable quality in transportation from FHs/LCs to cold storage, from cold storage to processing centre and then again, from processing centre to cold storage, before being shipped in containers. The cost of an insulated truck is Rs 5 million [Namboodiri, 2002].

8. Peeling Sheds

- Peeling Sheds are an essential step in the supply chain of shrimps. They constitute an important infrastructure that leverages the low cost skilled labour engaged in this activity. Many peeling sheds are in the unorganised sector and quality could be suspect.
- A recent success story is that of a Rs 130 million shrimp peeling unit in Cochin, set up as a seafood park with ten exporters investing in it through an arrangement with MIDCON (Marine Infrastructure Development Corporation Limited) (Exhibit 2.3).

9. Cold Storage

- Exhibit 2.4 gives the statewise distribution of the cold storage capacity.
- There were a total of 483 cold storages with capacity of 119,130 tons registered with MPEDA as on 31.3.2003 [MPEDA, 2004]
- A Cold Storage with two chambers of the size 60'x 40'x 24' (ht), at the cost of Rs 700 per sq. ft would cost Rs 3.36 million [Report on Cold Storage Projects]. A full fledged cold storage with many chambers could cost upto Rs 50 million [Namboodiri, 2002].
- It is expected that as quality consciousness and exports increase, cold storage capacity would also match the requirements.

10. Processing Plants

- The processing capacity of India is tremendous. It is eight times the available catch. The processors follow HACCP and EU standards, which imply high quality conditions. So, there are no problems with processing in India [Kurien, 2003 and Sait, 2003].
- [Exhibit 2.2](#) and [Exhibit 2.5](#) give the processing plant infrastructure in India.

11. Effluent Treatment Plant

- Unscientific means of waste disposal has become a social menace in the regions like Chandiroor, Ezhupunna and Aroor where there is heavy concentration of peeling sheds and sea food processing unit. Peeling sheds do not have their own effluent treatment systems [Namboodiri, 2002].
- Common Effluent Treatment plants can be established in selected zones where peeling sheds are concentrated. These regions can be Chandiroor, Ezhupunna and Aroor. Cost of each ETP will be Rs 20 million. Total cost will be Rs 80 million [Namboodiri, 2002], for the Cochin cluster.
- Similar investments would be required in other peeling shed and processing unit clusters.

12. Power

- 110 factories have 100% standby generators. Rs10 million is invested only on generators [Warrior, 2003].
- Adequate and consistent power supply is required for the ice plants, peeling sheds and processing plants.

13. Reefer Containers

- This is an essential infrastructure. However it is not an area of concern since shipping lines would provide this. Hinterland transportation is not an issue since processing units are coast based.

14. Human Resource – Fisherfolk

- The background of the exporters entails that they are small players and are not really ethical and 80 % of them have no education. Thus, one major infrastructural problem is lack of education [Kurien, 2003].
- There are many fishing colleges in India who are producing several executives completing their bachelors or masters in Fishery. But, are they ready to sail in boats and look for the various aspects of fishing and thereby, bring about improvement by applying their skills and knowledge in practicality? [Kurien, 2003].
- In 1967, Kuriens sold their Cochin factory. It was bought by one of their own unskilled employees. This shows that anyone can enter into this business [Kurien, 2003].
- ITC was a pioneer in shrimping, but coastal trawling killed the business. Agitation by the local fishermen who are backed by the political forces and pressure groups is very common and a major hindrance [Kurien, 2003]. Corporates have burnt their fingers eg ITC, Union Carbide. Control by regulatory authorities against attack of the trawlers by the local fishermen is very difficult. The Corporates should explore deep sea trawling [Warrior, 2003].
- The fisherfolk should stay away from spawning areas. In case a catch has egg bearing females, they have to be put back. Such practices are not adopted by the fisherfolk. These are common practices in many other countries like Japan. The fisherfolk in India gives more weightage to their selfish benefits which is only a one season benefit, thereby killing the next generation [Kurien, 2003].
- Corporates have burnt their finger eg ITC, Union Carbide. Control is very difficult. Attack of the trawlers by the local fishermen. Any organizational large effort does not succeed because of a perceived loss of livelihood. Solution: The Corporates should explore deep sea trawling [Warrior, 2003].
- The auction agents mainly finance the fishermen for their fuel, food and ice. The auction agents conduct the auction at the auction hall, but under poor standards of hygiene. Thus their education and awareness of hygiene is very important [Warrior, 2003].
- Full time fishermen : 2.40 Million.
Part Time : 1.45 Million
Occasional : 2.11 Million.
Total : 5.96 Million
[FAO, 1997]
- The cultural practices of the various grassroot level constituent involved in fishing leaves much to be desired. Training and education is an absolute must, both to improve cultural practices (eg, perspective on hygiene) and for deep sea fishing.

Exhibit 2.1

Fishing Craft in Maritime States/Union Territories

S I N o	State/Union Territories	1985-86			1994-95		
		Mechanized Boats	Non- Mechanized Boats	Total Craft	Mechanized Boats	Non- Mechanized Boats	Total Craft
1.	Gujarat	2772	7795	10567	8365	12653	21018
2.	Maharashtra	5563	18415	23978	7930	9988	17918
3.	Karnataka	3153	12103	15256	3655	13141	16796
4.	Kerala	3343	27104	30447	4206	40786	44992
5.	Tamil Nadu	2514	37969	40483	8230	32077	40307
6.	Andhra Pradesh	1009	57458	58467	8911	57269	66180
7.	Orissa	674	10550	11224	1665	10249	11914
8.	West Bengal	1582	43561	5943	1880	4361	6241
9.	Lakshadweep	309	726	1035	443	1078	1521
10	Andaman and Nicobar Islands	88	1082	1170	230	1340	1570
11	Pondicherry	348	3387	3735	553	6265	6818
12	Goa	1551	2445	3996	850	2000	2850*
	Total	22906	183395	206301	46918	191207	238125

* Data for 1992-93

Source: Food and Agricultural Organization of United Nations and Fishery Survey of India. *National Workshop on Fisheries Monitoring and Control and Surveillance*, 2001.

Exhibit 2.2

Existing Infrastructural Facilities at Various
Fishing Harbours/Landing Centres

(Tons/per day)

	Ice Plant	Ice Storage	Frozen Stores
GUJARAT			
Jakhau	8	80	-
Porbunder	215	825	1025
Mangrol	80	-	-
Veraval	225	1570	1285
MAHARASTHRA			
Sassoon Dock	50	36	60
Ratnagiri	150	300	360
KARNATAKA			
Karwar	55	110	50
Honnavar	25	65	100
Alvakodi	2	-	-
Gangoli	2	-	-
Malpe	15	40	300
Mangalore	140	420	400
KERALA			
Azhikal	90	270	600
Bey pore	20	105	175
Cochin	40	90	940
Vizhinjom	525	1050	2250
TAMIL NADU			
Tuticorin	4	12	50
Mandapam(Manner)	12	88	50
Rameshwaram	3	3	-
Mallipatnam	8	8	-
Kodia Khrai	8	8	-
Nagapatnam	2	2	-
Cuddalore	2	2	-
Madras	Not	Na	Na
PONDICHERRY			
Karaikal	1	2	-
ANDHRA PRADESH			
Nizampatnam	15	45	60
Kakinada	85	88	600
Bavanapadu	65	195	120
Vishakhapatnam	180	220	1000
ORISSA			
Dhamra	5	-	-
Chandipur	6	6	-
WEST BENGAL			
Roychowk	20	80	-
TOTAL	2058	5720	9425

Note: 1) The table is drawn on the basis of estimated actual capacities available. These may differ in some cases from the official data.

2) No distinction is made between capacities owned by the harbour authorities and private parties.

Source: Bhattacharya, H. Indian Institute of Management Calcutta, 2001.

Exhibit 2.3

Cost Estimates of Seafood Park Limited

(Rs lakhs)

Sr No	Particulars of Work	Estimate as per Original Detailed Project Report	Revised Estimates	Overrun from Detailed Project Report
1.	Land	111.04	125.86	14.82
2.	Civil Works	399.10	571.87	172.77
3.	ETP Works	51.95	92.98	41.03
4.	WTP Works	20.27	43.76	23.49
5.	Relocating Canteen Building	0.00	15.85	15.85
6.	Laboratory	10.00	0.00	(10.00)
7.	Flake Ice Plants	120.00	128.00	8.00
8.	Electrification	126.18	136.84	(10.66)
9.	Chill Room Units	29.00	20.00	(9.00)
10.	Miscellaneous Assets	95.20	176.58	81.38
	Total	962.74	1311.74	349

Source of Finance

(Rs lakh)

Original Cost	
Equity	
10 seafood promoters @ Rs 20 lakhs each	200
Marine Infrastructure Development Corporation Limited (MIDCON)	70
Loan from MIDCON payable over 9 years	430
Grant from Ministry of Food Processing (MFPI)	265
Total	965
Cost Overruns	
Equity	
Seafood promoters contribution	89
MIDCON's contribution	31
Additional loan from MIDCON	95
Additional grant in aid from MFPI	135
Total	350
Overall Cost	
Equity	
Seafood promoters	289
MIDCON	101
Loan from MIDCON	525
Grant from MFPI	400
Total	1315

Source: Seafood Park (India) Limited. May 2003.

Exhibit 2.4

Built up Capacity of the Indian seafood Industry (2001-02)

State	No of Exporters	No of Process Plants	Freezing Capacity (Ton p/d)	No of Cold Storages	Storage Capacity	No of Fishing Vessels
Kerala	287	124	1585.77	169	23086.50	2963
Tamil Nadu	286	48	524.55	67	5900.00	1562
Karnataka	43	14	186.40	26	3540.00	3226
Andhra Pradesh	95	52	779.50	53	7200.00	717
Goa	9	7	104.00	9	1275.00	420
Gujarat	64	55	2216.03	57	22925.00	426
Orissa	30	21	220.00	20	2460.00	414
Maharastra	268	41	1327.11	39	19372.00	2932
West Bengal	99	37	340.00	30	3500.00	0
Delhi (UT)	92	--	0.00	1	15.00	0
Total	1273	399	7283.36	471	89273.50	12660

Source: (www.mpeda.com)

Exhibit 2.5

Recent Data on the Processing Plants in India

Category	Regd. as on 01.4.2002	Capacity MT	Regd. During 2002-03	De-Regd. During 2002-03	Regd. As on 31.3.2003	Capacity MT
Freezing Plant	356	8982.540	12	16	352	9295.900
Canning Plant	5	16.500	0	0	5	16.500
AFD Plant	2	2.000	1	0	3	3.000
Surimi Plant	9	324.000	0	0	9	324.000

Source: MPEDA Annual Report 2002-03

Part III

Customer and Competitor Countries

Japan (Customer)

- Shrimp and lobsters represent Japan's leading imported seafood product on a value basis, and it ranks second overall behind only pork as an imported food product category. Shrimp and lobsters enjoy stable demand particularly in the food service industry. They are being imported in various forms such as live, chilled, frozen, salted, and prepared.
- On a volume basis, imports of shrimp and lobsters showed consecutive annual decline from 1995 through 1998. The main reason for the sharp decline is increased frozen-shrimp prices in producing countries. The higher prices raised the price to consumers, hurting demand. Shrimp farmers in India and Indonesia have been moving to increase production in view of the higher prices. As a result, shrimp imports showed a slight increase in 1999 due to lower import prices. Since then, imports of shrimp and lobsters showed stable trend at around 260,000 tons. In 2002, total imports of shrimp and lobsters recorded 259,962 tons (up 1.5% from the year before), with a decrease by 1.3% to ¥297.4 billion ([Exhibit 3.1](#)).
- Farmed black tiger (frozen, classified under shrimp and prawn) accounts for an overwhelming share (95.7% in total volume, 90.7% in total value) of shrimp and lobster imports in 2002. Falling black tiger import prices in 2002 pushed imports up to their highest level in five years, with an increase of 1.6% to 248,868 tons. Lobster imports recovered as well, rising to 2,811 tons (JETRO. *Shrimps and Crabs*. 2003).
- Importation of shrimp and crabs is subject to provisions of the Food Sanitation Law. It is also subject to provisions of the Law for Regulation of Fishing Operations by Foreign Nationals.
- Shrimp and prawn account for most of the Japan imports. Until the early 1990s, Thailand was Japan's main source of frozen shrimp and prawn. Due to the pollution of farming ponds and widespread disease in Thailand, however, imports shifted to Indonesia. In recent years, disease has spread in Indonesia as well, so that the main source of shrimp and prawn is now shifting to India and Vietnam. As of 2002, more than 60 countries were exporting shrimp and prawns (frozen) to Japan. The leading exporter was Indonesia (53,607 tons, import share 21.5%), although imports from Vietnam have soared over the past five years from 26,697 tons to 41,516 tons (share 16.7%). Vietnam eased past India (34,820 tons, share 14.0%) into second place in the rankings for the first time in 2002. The next leading exporter is China (7.9%), which is near the 20,000 ton mark. ([Exhibit 3.2](#)).
- The domestic shrimp catch has been declining year by year. In 2001, the total catch recovered slightly to 27,168 tons, still just two-thirds the level of a decade earlier. At the same time, imports have established a consistent 90% share of the domestic market. The domestic shrimp catch in 2001 included just 1,486 tons of rock lobsters and 1,271 tons of small and medium size shrimps (*kuruma-ebi*). Also, the domestic catch tonnage reflects shrimp still in the shell, whereas most imported shrimp has been peeled and the head taken off for sale as a ready-to-eat product. Thus, in medium and large-size shrimp, imports are believed to have a market share of more than 98% on a tonnage (JETRO. *Shrimps and Crabs*. 2003).

Thailand (Competitor)

- The total fish production of Thailand was 3.58 mt in 2000, of which the share of capture was 2.89 mt and that of culture was 0.69 mt. In capture, marine capture was significant of 2.68 mt. In aquaculture, share of coastal aquaculture was almost double that of freshwater aquaculture (Exhibit 3.3).
- The net trade balance due to fish trade increased from US\$ 2366 million in 1995 to US\$ 3792 million in 2000 (Exhibit 3.4). The total fish production of Thailand was 3.6 mt in 2000 and the import of fish was 0.84 mt in 2000. The import is mainly, for domestic consumption and value addition, which is thereafter exported. Thailand's export was 1.36 mt in 2000.
- The total export of fresh and frozen fish from Thailand was 0.2 mt, worth US\$ 95 million in 2002. Asia is a large market for export of fresh and frozen fish from Thailand. In Asia, Malaysia has a significant market which imported 0.12 mt of fresh and frozen fish from Thailand of value US\$ 24.74 million in 2002. Although, in 2002 Japan imported only 7044 tons of fresh and frozen fish from Thailand, its value was a significant US\$ 18.3 million, in second place after Malaysia (Exhibit 3.5).
- The total shrimp production in Thailand was 0.36 mt in 1998 (Exhibit 3.6), of which the share of capture was 30% and that of culture was 70%. Shrimp production in Thailand was 10.26% of total fish production in 1998.
- The productivity of shrimp aquaculture in Thailand was 3.75 tons per hectare in 2000 (Exhibit 3.7). In contrast, the Indian figure was 0.823 tons per hectare in 2000-01 (Exhibit 1.36).
- The total export of fresh and frozen shrimp from Thailand was 0.14 mt of value US\$ 1368.70 million in 2001. The trend shows a gradual decline in quantity and value since 2000 (Exhibit 3.8). In contrast, India exported 0.06 mt of block frozen shrimps worth US\$ 3710 million and 0.01 mt of IQF shrimps worth US\$ 77 million in 2001 (Exhibit 1.39).
- The total export of prepared and preserved shrimps from Thailand was 0.10 mt of value US\$ 1050 million in 2001 (Exhibit 3.9). The value had reduced to US\$ 856 million for 0.11 mt in 2003 (Exhibit 3.10). In contrast, India exported 236 tons of AFD shrimps worth US\$ 8.2 million in 2001 (Exhibit 1.40). India's export of breaded shrimp and cooked salad shrimp was insignificant.
- There are a wide variety of processing plants in Thailand like freezing, canning, fish sauce, budu sauce, steamed fish, smoked fish, salted fish, dried shrimp, dried squid, dried shellfish, fish ball, fish shrimp cracker, fish meal etc. There were 131 freezing plants and 42 canning plants in Thailand in 1998 (Exhibit 3.11).
- Total number of fishing boats in Thailand was 58,119 in 2000, which included 2639 non-powered boats, 42,217 outboard powered boats and 13,263 inboard powered boats. (Exhibit 3.12).

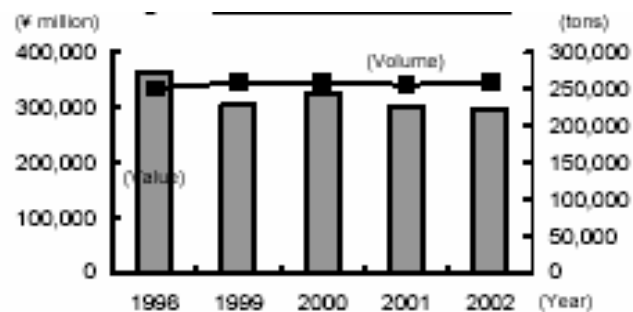
- Government Policy: [Source: Thai Frozen Foods Association, 'Foods for the World,' Bangkok, 2002 (www.thai-frozen.or.th)]

The National Fisheries Development Policy (1997-2001) was formulated under the administration of the Department of Fisheries, Ministry of Agriculture and Cooperatives. The main policies are:

1. Fishery Policy in Thai Waters
 - a. Promotion of appropriate resource management system emphasizing on development-cum-conservation
 - b. Rehabilitation of fisheries resources and environment for the maintenance of their maximum carrying capacity
 - c. Extension and development of fishing occupation and other occupation options
 2. Fishery Policy Outside the Thai Waters
 - a. Promotion and development of fishing outside the Thai waters
 - b. Protection and controls of Thai fishing vessels outside Thai waters
 - c. Promotion and development of knowledge of the fishers
 - d. Protection and assistance offered to fishers
 3. Policy on Aquaculture Development
 - a. Development of management and culturing techniques for improved production efficiency
 - b. Production and maintenance of natural environment for their continued supports to the aquaculture industry
 - c. Development and supports of basic infrastructure for aquaculture
 4. Policy on Fishery Industry Development
 - a. Promotion of fishery raw materials acquisition
 - b. Development of marketing system
 - c. Promotion and development of fishery products
 - d. Development of market information system
 - e. Controls and protection of environmental degradation as a result from the fishery industry
- The export procedure for shrimps, both chilled and frozen, is depicted in **Exhibit 3.13**.

Exhibit 3.1

Japan's Shrimp Imports



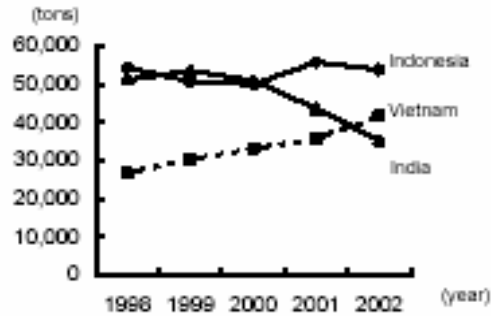
		(tons, Yen million)									
		1998	1998	1999	1999	2000	2000	2001	2001	2002	2002
		Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
<i>Rock lobster,</i>		9426	20782	8605	16920	9774	21062	7854	18478	7535	19858
<i>other sea crawfish</i>											
Frozen		7,057	13,648	6,157	9,912	7,394	14,083	5,579	11,491	5,577	12,786
Live, fresh, chilled		2,370	7,134	2,448	7,008	2,380	6,979	2,275	6,987	1,958	7,071
<i>Lobster</i>		2,451	4,986	2,782	5,252	2,971	5,604	2,485	5,155	2,811	5,999
Frozen		906	1,926	1,360	2,667	1,446	2,918	1,082	2,350	1,407	3,211
Live, fresh, chilled		1,545	3,060	1,422	2,585	1,525	2,686	1,403	2,805	1,405	2,788
<i>Shrimp & prawn</i>		239,356	338,443	247,894	282,418	247,256	299,913	245,724	278,405	249,310	271,066
Frozen		238,906	336,911	247,314	280,644	246,627	297,938	245,048	276,461	248,868	269,692
Live, fresh, chilled		450	1,531	580	1,774	628	1,976	675	1,944	442	1,373
<i>Other shrimp</i>		159	218	273	277	165	203	128	180	305	480
Frozen		136	208	175	248	127	188	122	176	302	474
Live, fresh, chilled		23	11	98	30	38	15	6	4	3	6
TOTAL		251,392	364,430	259,554	304,868	260,165	326,783	256,190	302,217	259,962	297,402

Source: (<http://www.jetro.go.jp>)

Exhibit 3.2

Principal exporters of shrimp and lobsters to Japan

Trends in import volume by leading exporters



Shares of shrimp & lobster imports in 2002 (value basis)



(tons, Yen million)

	1998	1999	2000	2001	2001	2002	2002	2002	2002
	Volume	Volume	Volume	Volume	Value	Volume	Volume	Value	Value
Indonesia	54,247	50,688	49,916	55,778	70,664	53,818	20.70%	66,125	22.20%
Vietnam	26,711	30,271	33,105	35,676	34,856	41,535	16.00%	41,137	13.80%
India	51,128	53,430	50,970	43,593	47,477	35,275	13.60%	37,802	12.70%
China	12,343	13,948	17,015	15,406	14,577	19,933	7.70%	17,693	5.90%
Thailand	17,783	19,328	18,657	20,580	27,249	19,065	7.30%	23,434	7.90%
Others	89,180	91,889	90,503	85,157	107,395	90,335	34.70%	111,211	37.40%
TOTAL	251,392	259,554	260,165	256,190	302,217	259,962	100.00%	297,402	100.00%
(E U)	1,076	1,362	1,375	1,775	2,052	1,218	0.50%	1,456	0.50%

Source: (<http://www.jetro.go.jp>)

Exhibit 3.3

Fish Production in Thailand

('000 tons)

Year	Capture			Culture			Total Production
	Marine	Inland	Total Capture	Coastal Aquaculture	Freshwater Culture	Total Culture	
1995	2827.4	191.7	3019.1	357.5	196.0	553.5	3572.6
1996	2786.1	208.4	2994.5	326.0	228.7	554.7	3549.2
1997	2679.5	205.0	2884.5	299.7	200.2	499.9	3384.4
1998	2709.0	202.3	2911.3	367.7	226.9	594.6	3505.9
1999 (P)	2704.3	205.3	2909.6	440.5	250.6	691.1	3600.7
2000 (P)	2687.8	208.0	2895.8	420.4	266.2	686.6	3582.4

(P) Provisional

Source: Extracted from Thai Frozen Foods Association, DOF. 2002. (www.thai-frozen.or.th)

Exhibit 3.4

Fish Trade in Thailand

(million tons, US\$ million)

Year	Exports		Imports		Net Trade Balance
	Q	V	Q	V	
1995	1.19	2914.45	0.87	548.13	2366.33
1996	1.15	2769.53	0.80	560.63	2208.90
1997	1.18	3465.60	0.71	685.98	2779.63
1998	1.31	4407.78	0.73	912.43	3495.35
1999	1.38	4140.10	0.93	832.23	3307.88
2000	1.36	4641.45	0.84	849.85	3791.60

Note: Original value data in Thai Baht. Exchange rate used for conversion is 40 Baht = 1 USD

Source: Extracted from Thai Frozen Foods Association, DOF. 2002. (www.thai-frozen.or.th)

Exhibit 3.5

Export of Fresh and Frozen Fish Exports in Thailand

(tons, US\$ million)

No	Country	1999		2000		2001		2002	
		Q	V	Q	V	Q	V	Q	V
1	Asia	220209	117.83	181248	91.72	176121	85.02	175573	72.85
	China	77326	47.17	41355	25.59	14530	8.21	14830	8.75
	Hong Kong	897	1.00	3055	3.60	9614	6.20	14209	7.89
	Japan	6873	21.18	5792	16.88	5868	19.91	7044	18.29
	Malaysia	114097	23.00	111930	24.32	120343	26.60	121395	24.74
	Singapore	14143	4.31	13324	4.47	15655	8.71	12402	4.96
	S.Korea	-	-	-	-	502	0.89	456	1.17
	Taiwan	6873	21.18	5792	16.88	9609	14.50	5237	7.07
2	Middle East	5003	4.23	6705	5.42	7267	6.94	7912	7.33
	Saudi Arabia	4309	3.51	5635	4.35	5865	5.36	6300	5.75
	Arabs Emirates	694	0.72	1070	1.06	1399	1.58	1612	1.57
3	USA	2627	5.47	2028	4.54	2028	3.99	1653	3.98
4	Canada	591	0.63	597	1.28	413	0.98	545	1.28
5	EU	4911	6.08	2888	3.86	3034	5.48	1903	4.18
	Belgium	403	1.23	380	0.99	269	0.78	301	0.69
	France	-	-	-	-	459	0.82	209	0.31
	Italy	4012	3.53	1857	1.11	1526	1.91	332	0.44
	UK	496	1.31	651	1.77	780	1.97	1061	2.74
6	Australia	2945	1.48	565	0.99	646	1.14	334	0.77
7	Switzerland	-	-	-	-	83	0.23	79	0.24
8	Others	15479	1.12	14489	1.00	9415	5.46	6138	4.09
	Total	251765	136.84	208520	108.80	199007	109.24	194137	94.72

Note: Original value data in Thai Baht. Exchange rate used for conversion is 40 Baht = 1 USD

Source: Customs Department/Thai Frozen Foods Association (www.thai-frozen.or.th)

Exhibit 3.6**Shrimp Production in Thailand**

(tons)

Year	Total	Capture	Capture	Culture	Culture
		Sub-total	%	Sub-total	%
1989	178,698	85,204	47.68	93,494	52.32
1990	201,239	83,012	41.25	118,227	58.75
1991	268,565	106,495	39.65	162,070	60.35
1992	276,500	91,616	33.13	184,884	66.87
1993	321,028	95,514	29.75	225,514	70.25
1994	361,219	97,773	27.07	263,446	72.93
1995	365,455	105,914	28.98	259,541	71.02
1996	348,660	109,160	31.31	239,500	68.69
1997	347,560	120,000	34.53	227,560	65.47
1998	362,731	110,000	30.32	252,731	69.67

Source: Department of Fisheries (1998), *Statistics of Shrimp Culture 1998*.
(<http://www.thaitrade.com>)

Exhibit 3.7**Area and Production of Shrimp Aquaculture in Thailand**

	Area	Production	Productivity
	(ha)	(tons)	(tons/ha)
1995	74942	259540	3.46
1996	72664	239499	3.30
1997	73120	227560	3.11
1998	76019	252731	3.32
1999	77544	275544	3.55
2000 (P)	80000	300000	3.75

(P) Provisional

Source: Extracted from Thai Frozen Foods Association, DOF.
2002. (www.thai-frozen.or.th)

Exhibit 3.8

Export of Fresh and Frozen Shrimps from Thailand

(tons, US\$ million)

No	Country	1999		2000		2001		2002		2003	
		Q	V	Q	V	Q	V	Q	V	Q	V
1	Asia	63912	533.81	60037	599.23	57366	507.86	47672	367.82	41,459	326.66
	China	14490	84.46	7827	47.60	6329	35.02	2631	12.92	2,781	17.25
	Hong Kong	4763	24.15	6077	41.86	5691	36.02	3008	16.99	2,082	12.72
	Japan	21804	274.60	23053	327.53	24878	291.78	26445	240.49	22,380	213.10
	S.Korea	3150	19.68	3596	28.24	4176	32.05	3924	27.78	6,431	41.76
	Malaysia	-	-	-	-	250	0.86	185	0.33	250	0.61
	Singapore	12971	86.83	13241	107.70	9367	66.38	6675	38.39	4,936	24.18
	Taiwan	6734	44.10	6243	46.30	6675	45.76	4804	30.92	2,599	17.04
2	USA	52746	491.32	65261	727.46	67167	681.14	42296	388.68	62,920	467.65
3	Canada	4609	44.95	4498	49.98	5802	56.63	4901	45.48	6,696	51.78
4	EU	7743	64.36	6612	58.87	7059	60.56	1814	13.40	692	5.89
	Belgium	343	2.75	315	3.17	302	2.96	313	2.42	140	1.04
	Denmark	153	1.51	156	1.84	107	1.19	17	0.16	NA	NA
	France	2395	19.37	1588	13.91	1556	12.41	364	2.65	87	1.10
	Germany	1246	11.22	860	8.89	1242	11.86	292	2.67	182	1.52
	Italy	787	3.58	921	4.56	876	4.04	170	0.63	74	0.54
	Netherlands	1145	10.99	1064	11.39	1333	12.74	106	0.96	48	0.39
	Spain	-	-	-	-	55	0.42	65	0.33	29	0.25
	UK	1674	14.94	1708	15.12	1588	14.94	487	3.58	132	1.05
5	Australia	5906	54.86	3927	42.54	3643	35.19	3209	25.42	4,033	26.69
6	New Zealand	-	-	-	-	337	2.88	454	3.64	NA	NA
7	Switzerland	2778	16.38	3605	25.12	235	2.75	77	0.71	158	1.41
	Others	411	3.02	398	3.56	2997	21.68	3330	15.46	3,478	18.71
	Total	138105	1208.71	144338	1506.76	144606	1368.70	102753	860.61	119,436	898.78

Note: Original value data in Thai Baht. Exchange rate used for conversion is 40 Baht = 1 USD

Source: Customs Department/Thai Frozen Foods Association (www.thai-frozen.or.th)

Exhibit 3.9**Export of Prepared or Preserved Shrimps and Prawns from Thailand**

(tons, US\$ million)

No	Country	2000 (Mar-Dec)		2001	
		Q	V	Q	V
1	Asia	25659	278.18	31638	330.33
	China	17	0.09	55	0.56
	Hong Kong	115	1.45	114	1.54
	Japan	15963	170.79	22206	243.50
	Korea	988	9.48	1190	10.83
	Malaysia	87	0.71	133	1.24
	Singapore	7678	88.35	7230	67.22
	Taiwan	811	7.31	710	5.43
2	USA	45114	608.38	55668	576.07
3	Canada	4344	50.32	6096	58.05
4	EU	5170	44.25	6129	50.28
	Belgium	70	0.42	123	0.79
	Denmark	56	0.65	137	1.33
	France	679	3.44	547	2.50
	Germany	1715	16.31	2258	19.41
	Italy	12	0.07	21	0.08
	Netherlands	582	5.90	607	6.60
	UK	2056	17.46	2436	19.57
5	Australia	2346	16.28	3444	24.20
6	New Zealand	418	2.27	469	2.64
7	Switzerland	172	2.32	304	4.12
	Others	472	4.79	1218	10.55
	Total	83695	1006.80	104966	1056.24

Note: Original value data in Thai Baht. Exchange rate used for conversion is
40 Baht = 1 USD

Source: Thai Frozen Foods Association, DoBE. 2002 (www.thai-frozen.or.th)

Exhibit 3.10

Export of Prepared or Preserved Shrimps and Prawns from Thailand

(tons, US\$ million)

No	Country	2002		2003	
		Q	V	Q	V
1	Asia	28,689.00	267.13	27,217.00	232.60
	Hong Kong	134	1.08	220	1.80
	Japan	21,275.00	208.95	22,932.00	201.32
	S.Korea	1,195.00	9.56	1,988.00	14.66
	Malaysia	77	0.67	31	0.16
	Singapore	5,281.00	42.53	1,040.00	9.10
	Taiwan	727	4.34	1,006.00	0.57
2	U.S.A	61,864.00	562.03	65,648.00	520.43
3	Canada	6,410.00	52.77	7,233.00	50.27
4	EU	2,585.00	17.10	2,584.00	19.21
	Belgium	70	0.53	67	0.44
	France	18	0.16	86	0.56
	Germany	1,155.00	7.81	1,607.00	12.48
	Italy	47	0.18	2	0.02
	Netherlands	239	1.56	50	0.70
	Utd Kingdom	1,056.00	6.86	772	5.02
5	Australia	2,869.00	18.16	3,614.00	21.54
6	Switzerland	171	1.79	233	2.05
	Others	2,087.00	13.57	4,226.00	9.93
	Total	104,675.00	932.55	110,755.00	856.03

Note: Original value data in Thai Baht. Exchange rate used for conversion is 40 Baht = 1 USD

Source: www.thai-frozen.or.th

Exhibit 3.11

Fish Processing Factories in Thailand

Type of Plant	1990	1995	1996	1997	1998
Freezing	108	144	144	130	131
Canning	42	52	50	44	42
Fish Sauce	116	102	102	97	88
Budu Sauce	29	54	57	70	70
Steamed Fish	55	80	81	82	93
Smoked Fish	36	26	28	24	20
Salted Fish	750	727	722	649	630
Dried Shrimp	205	158	137	139	128
Dried Squid	712	561	562	538	534
Dried Shellfish	646	237	222	217	197
Fish Ball	94	98	99	98	95
Fish Shrimp Cracker	90	125	128	117	122
Fish Meal	104	122	118	111	105
Total	2987	2486	2450	2316	2255

Source: Extracted from Thai Frozen Foods Association, DOF. 2002. (www.thai-frozen.or.th)

Exhibit 3.12

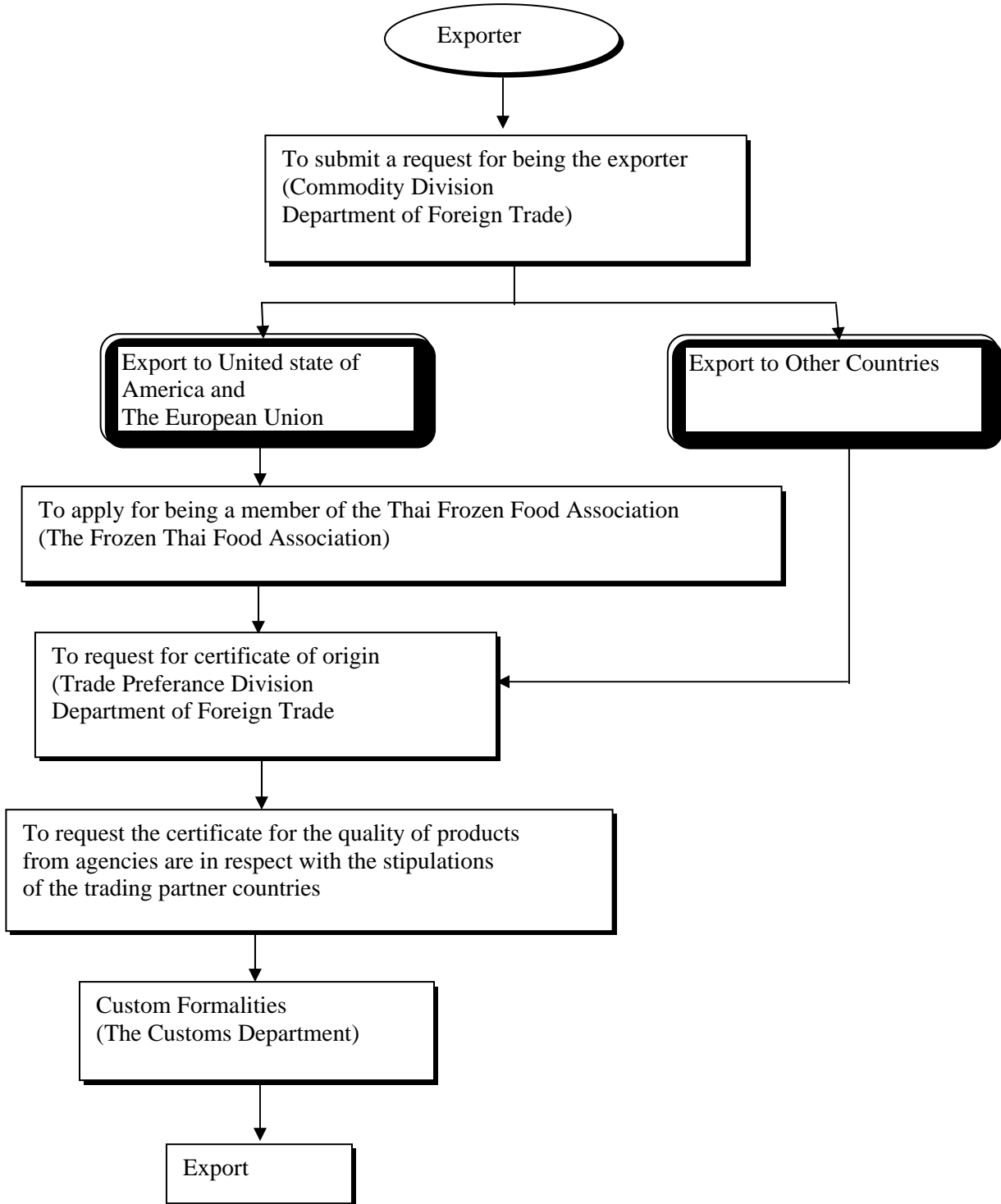
Fishing Boats in Thailand

Type of Boat	1995	2000
Non Powered Boats	2826	2639
Outboard Powered Boats	36430	42217
Inboard Powered Boats	15282	13263
Total Boats	54538	58119

Source: Thai Frozen Foods Association, NSO. 2002 (www.thai-frozen.or.th)

Exhibit 3.13

Export Procedure for Shrimps and Squids (Chilled and Frozen) in Thailand



Source: (www.thaitrade.com)

Part IV

Conclusion

Conclusion:

- Indian marine products are wanted internationally. Though shrimp is the primary product and is well set on basic processing, there is scope in value addition and (ii) increasing other fish varieties. In the latter case, the supply, quality and processing (especially canning) are the key issues.
- Deep sea exploitation is the future. We need trawlers.
- Water and ice quality in the public domain needs to significantly improve. Standards and certification would be imperative.
- Quality of the smaller mechanised boats needs to improve, with investments in equipment.
- Fishing harbours, landing centers and auction centre need investments to reach a smell free global standard, that signifies clean and deterioration free handling.
- The human resources in this sector need to be invested in, to (i) achieve mind set change in cultural practices and (ii) practice more deep sea fishing.
- Aquaculture is possibly saturated due to the regulatory context, though integrated processing by corporates still holds potential.
- We can aim to be the second player after China in the export (and domestic consumption) markets. In the export market, we can be a high per unit value player.

Part V

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Part VI

Appendices

Appendix 1

West Bengal's Fishing Industry Development Story

Scenario as of 1982

In 1982, the demand of fish was 7 lakh tons per annum, whereas the supply of fish was only 2.71 lakh tons per annum. The reasons for such performance included:

- The fishermen were in poor state and even the basics like nets were not available appropriately.
- The infrastructure for fishing was poor. There were only 20 mechanized boats operating in West Bengal, and there were no trawlers, fishing harbours and boat building yards. This prevented fishermen to exploit deep sea ventures like sand heads, a veritable gold mine of fish, 100 km off Sagar Island (the last island at the confluence of the Ganga and the ay of Bengal).
- Fishing was high-risk profession due to absence of technology to alert those in deep sea about impending cyclones, absence of shelter facilities in case of emergencies and non-availability of facilities like insurance and pensions.
- Resources like ponds and tanks were going waste, as the government was neither helping in re-excavating nor educating the fishermen on how to use them.

Developments upto 2003

In 1983, Mr Kironmay Nanda, West Bengal Fisheries Minister, planned to bridge the demand and supply gap of fish in the state. He offered attractive incentives to fishermen including subsidy from the state government for boat-building and a loan from the National Cooperative Development Corporation. He distributed fishing nets free of cost, sunk borewells for drinking water and provide for ice and diesel at cheap rate at the harbour. After two decades the scenario has changed considerably. A few developments can be listed as under:

Economic Developments

The fish catch has increased to 11.20 lakh tons per annum, and West Bengal ranks first in India's fish production. Exports have increased at least 12 times, from Rs 43.29 crores in 1982-83 to Rs 553.15 crores in 2002-03. In 2000-01, fisheries accounted for 3.53% of West Bengal's exchequer.

The employment opportunities in this industry have also boomed. The fishermen, who were deprived of steady income, now get salaries apart from free meals and fixed commission on the catch.

Infrastructural Developments

- Seven boat building yards and net making centers have come up in Shankarpur, Frasersgunj, Kakdwip and Sultanpur.
- Two wireless centers have been set up at Shankarpur and Frasersgunj for warning fishermen for impending storms.
- Four shelters have been constructed to house fishermen in case of emergencies/ natural calamities.

- Several ice plants have been set up, 500 borewells sunk to ensure drinking water and 24 training centers have been started to train fishermen in inland and marine fishing.
- 4,500 each of mechanized boats and trawlers operate in every season.

Yet to Achieve

West Bengal is still running with a deficit of 48,000 tons, which is being made up by supplies from Andhra Pradesh, Uttar Pradesh, Bihar, Maharashtra and Gujarat. Also, there are few locational infrastructure bottlenecks like the boats can use the Shankarpur fishing harbour only during high tide because of silting, lack of landing facility for boats at the fish action market at Digha, etc.

However, the West Bengal Fisheries Minister, Mr Kironmoy Nanda, credible for such an outstanding development, is working on the above problems. He has claimed to make the state 'fish surplus' by 2007.

Future Strategies

The public private partnership ventures are coming up in the area of boat building. One such player Nema Chand Barick and Co claimed that they build boats that can go upto 120 kms into the sea with a capacity of carrying 12 tons of fish.

The West Bengal government is also concentrating on breeding ornamental fish. It claims that "we produce 90% of the fish that adorn most aquariums". It is planning to grow further with the Centre's financial help.

Apart from that the West Bengal government aims to create additional five lakh jobs in the fishing sector by 2007. The government is offering short-term crop loans to fish farmers through National Bank for Agriculture and Rural Development. It claims that such plan is first in India and it has earmarked Rs 150 crore for the state.

[Ganguly, T, 2003]

Appendix 2

Dubai – Marine Products Exports

Gulf Sea Foods

The company imports the following varieties of fish:

1. Live fish (usually lobster), and
2. Chilled fish (red snapper and grouper (reef cod))

The company processes the imported fish and re-exports them.

Apart from this, the company imports shrimps and comes up with the following four segments of products:

Cooked Salad Shrimps

The company usually imports 1,400 tons of peeled and de-veined IQF (Individually Quick Frozen) shrimps annually from India, Pakistan, Bangladesh, Vietnam and Myanmar. The shrimps are processed as follows:

1. Defrosting (thawing)
2. Salting
3. Cooking
4. Chilling
5. Freezing
6. Glazing
7. Packing

These processed shrimps are ready for serving. The shrimp processing is done under continuous processing line at the rate of 400 kg per hour. The above processed shrimps are exported to USA, Canada, South Korea, Netherlands, Australia, etc. Thailand is the premium source of supply for the above value added products.

A rough estimate of the costing details of cooked salad shrimps is presented as follows:

Cost per kg of cooked salad shrimps (in USD)	
Material Cost	2.30
Overheads	1.45
Total Cost	3.75/kg
Margin	0.23

The break-up cost per kg is subject to change depending on the quality of materials and size of the order.

Processed Shrimps (Local Supplies)

The head portion of the shrimp is degraded, because nobody eats it, and it is used only for presentation. The shells and vein is also removed. The head and shell carry 35% and 10-12 % of the weight of the shrimp respectively. The headless shell carries minor proportion of the weight.

The capacity generated is 300 tons per annum. The above product is supplied in local markets (UAE), and geographically closer areas like Saudi Arabia, Oman, Iran, Kuwait, Bahrain and Qatar (AGCC). The shrimps are shipped to Saudi Arabia and Qatar, and transported through roads to the remaining markets. There is no duty for shrimps, and 5% for frozen fish.

The per capita consumption for tuna fish and shrimps is 3.5 lbs and 3 lbs respectively. In the local markets, the shrimps are supplied to airport catering, hotels and restaurants. It is not supplied in retail markets. The market for airport catering is roughly 40,000 meals per day.

The company also processes beef, lamb and chicken.

A rough estimate of the costing details of processed shrimps are presented also follows:

Cost per kg of processed shrimps (in AED*)	
Material Cost	34.25
Processing Cost	12.75
Overheads	5.21
Total Cost	52.21/kg
Margin	12.81

*Arab Emirates Dirhams

The break-up cost per kg is subject to change depending on the quality of materials and size of the order.

Freeze Dried Shrimps

For the above product, the company imports peeled and de-veined IQF (Individually Quick Frozen) shrimps from India, Pakistan, Bangladesh, Vietnam and Myanmar.

There are four ways in which shrimps can be processed to get the final product. They are (1) Air drying, (2) Canning, (3) Frozen and (4) Freeze drying. The company follows the process of freeze drying.

The shrimps are processed as follows:

1. Salting
2. Cooking
3. Flavour mixing
4. Freeze drying (The shrimps are kept in vacuum under -25° C for some time. Later, they are brought to room temperature and that enables freeze drying. This process keeps the cell structure of the shrimp intact)
5. Packing

About freeze drying: Due to freeze drying, the weight of the product reduces by 85% and when put in water, it gains weight upto 90%. (For example, if the actual weight of a shrimp is 100 gms, the processing of freeze drying will reduce its weight to 15 gms, and retain upto 90 gms, when put in water). At the same time, the cell structure of the shrimp is kept intact, which means there is generous saving in weight. This enables the transportation procedure. A container can carry upto 3 tons of fish (which is equivalent to 18 tons), as compared to 10 tons of fish when processed regularly. (Generally, a 40-footer container can carry upto 45,000 lbs of marine products). This means that there are savings of about 44% in terms of weight handling.

The processing capacity of the company is 60 tons per month. The life of these processed shrimps is 2 years.

A rough estimate of the costing details of freeze dried shrimps is presented as follows:

Cost per kg of dried material (in US\$)	
Raw Material	15.50
Flavour Cost	0.37
Packing	0.50
Shipping/Delivery	0.95
Overheard	6.50
Cost of freeze drying:	
Power	0.70
Equipment: Interest and Depreciation	3.00
Others	2.80
Total Cost	23.82/kg

The break-up cost per kg is subject to change depending on the quality of materials and size of the order.

Caviar/Fish Farming/Chilled Fish

The company has got six plants of which four are approved by EU. The chilled fish is transported through air transport. Roughly, 10 tons of chilled fish is transported every month in 20 shipments of 500-600 kgs. The exports are made to London, Rome, Amsterdam, etc and it is felt that there is a high market potential for this product. For transporting 495 kgs of fish, about 90 kgs of ice is required. The rate for Dubai-Rome: 4.05 per kg. Locals have to go as Nagutha (Captain) of a boat.

A rough estimate of the costing details of materials and transport of chilled fish are presented as follows:

Costs per kg for processing and transport of chilled fish (in AED*)	
Fixed Costs	13.21
Raw Material and processing costs	13.21
Variable Costs	7.95
Air Freight	6.15
Documentation	0.68
Packing and Ice	0.53
Interest	0.00
Contribution	0.59
Total Cost	21.16/kg

*Arab Emirates Dirhams

The break-up cost per kg is subject to change depending on the quality of materials and size of the order.

Gradewise Profitability Statement of Gulf Sea Foods

Product	RM Utilised (Kg)	Value of RM Utilised	Avg. Price of RM	Frozen Weight (Kg)	Cost of Production	Realization	Profit/Loss	Profit /kg
14070-500 Up PUD I	3,741.590	\$6,734.86	\$1.80	4,413.750	\$12,160.17	\$13,035.00	\$874.83	\$0.23
22394-250/350 PD	3,999.339	\$10,778.17	\$2.69	4,540.798	\$16,577.21	\$18,128.00	\$1,550.79	\$0.39
14070-400/600 PUD II	4,692.828	\$10,763.32	\$2.29	5,326.560	\$17,567.92	\$17,557.92	-\$10.00	\$0.00
10347-300/600 PUD III	777.364	\$1,734.10	\$2.23	882.750	\$2,861.28	\$2,805.00	-\$56.28	-\$0.07
22304-250/350 PUD IV	5,177.645	\$12,282.25	\$2.37	5,653.860	\$19,789.84	\$21,700.80	\$1,910.96	\$0.37

Source: Gulf Seafood. June 2003.

Appendix 3

Port Wise Marine Exports in India, 1997 to 2001

Port Wise Marine Exports in India in 1997

Port	1997									
	Quantity of Shrimps	Port Wise Quantity Share to Total	Value of Shrimps	Port Wise Value Share to Total	Quantity of Marine Products	Port Wise Quantity Share to Total	Value of Marine Products	Port Wise Value Share to Total	Quantity Share of Shrimp Exports to Marine Exports	Value Share of Shrimp Exports to Marine Exports
	(tons)	(%)	(Rs million)	(%)	(tons)	(%)	(Rs million)	(%)	(%)	(%)
Kochi	32643.97	30.71	5873.48	18.89	89849.35	22.52	9488.53	20.35	36.33	61.90
Chennai	19948.10	18.77	8457.80	27.20	25112.47	6.29	9094.88	19.51	79.44	93.00
Visakhapatnam	16716.42	15.73	6819.85	21.93	23237.68	5.82	7215.37	15.48	71.94	94.52
Porbandar	4684.33	4.41	840.92	2.70	97827.85	24.52	4652.93	9.98	4.79	18.07
Calcutta	10296.31	9.69	3657.83	11.76	14225.26	3.57	4142.33	8.89	72.38	88.30
Mumbai	8603.80	8.09	1915.33	6.16	52958.15	13.27	4095.39	8.79	16.25	46.77
Tuticorin	5405.14	5.08	1954.00	6.28	15321.30	3.84	2997.51	6.43	35.28	65.19
Kandla	2246.04	2.11	375.62	1.21	38085.52	9.55	2061.63	4.42	5.90	18.22
JNPT	4751.79	4.47	964.94	3.10	25442.11	6.38	2029.74	4.35	18.68	47.54
Goa	996.92	0.94	231.34	0.74	14241.36	3.57	661.71	1.42	7.00	34.96
Trivandrum	3.68	0.00	3.33	0.01	673.74	0.17	109.61	0.24	0.55	3.04
Karwar	0.00	0.00	0.00	0.00	1398.91	0.35	37.15	0.08	0.00	0.00
Mangalore/ICD	0.65	0.00	0.88	0.00	582.69	0.15	27.52	0.06	0.11	3.19
Delhi	0.00	0.00	0.00	0.00	20.64	0.01	1.56	0.00	0.00	0.00
Kakinada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipavav	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paradeep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	106297.15	100.00	31095.32	100.00	398977.03	100.00	46615.85	100.00	26.64	66.71

Source: MPEDA. Statistics of Marine Products Export 2001.

Port Wise Marine Exports in India in 1998

Port	1998									
	Quantity of Shrimps	Port Wise Quantity Share to Total	Value of Shrimps	Port Wise Value Share to Total	Quantity of Marine Products	Port Wise Quantity Share to Total	Value of Marine Products	Port Wise Value Share to Total	Quantity Share of Shrimp Exports to Marine Exports	Value Share of Shrimp Exports to Marine Exports
	(tons)	(%)	(Rs million)	(%)	(tons)	(%)	(Rs million)	(%)	(%)	(%)
Chennai	21855.87	21.62	9647.83	28.56	29448.01	9.39	10415.76	22.16	74.22	92.63
Visakhapatnam	19090.22	18.88	8848.35	26.19	22445.15	7.16	9027.78	19.21	85.05	98.01
Kochi	26217.60	25.93	5007.31	14.82	71772.13	22.89	8415.48	17.90	36.53	59.50
Calcutta	8993.60	8.89	3913.03	11.58	14441.18	4.61	4447.52	9.46	62.28	87.98
JNPT	6532.76	6.46	1370.99	4.06	43068.90	13.74	3697.80	7.87	15.17	37.08
Tuticorin	6564.40	6.49	2458.28	7.28	15568.76	4.97	3370.70	7.17	42.16	72.93
Mumbai	6548.23	6.48	1569.28	4.65	31171.66	9.94	3019.44	6.42	21.01	51.97
Porbandar	3614.02	3.57	650.15	1.92	52171.40	16.64	2705.85	5.76	6.93	24.03
Kandla	1499.08	1.48	270.03	0.80	23258.37	7.42	1318.67	2.81	6.45	20.48
Goa	187.67	0.19	40.63	0.12	7519.11	2.40	339.12	0.72	2.50	11.98
Karwar	0.00	0.00	0.00	0.00	2005.34	0.64	156.09	0.33	0.00	0.00
Trivandrum	4.11	0.00	1.55	0.00	627.50	0.20	84.17	0.18	0.65	1.84
Mangalore/ICD	4.75	0.00	6.58	0.02	5.50	0.00	7.08	0.02	86.36	92.86
Kakinada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipavav	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paradeep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	101112.31	100.00	33784.02	100.00	313503.01	100.00	47005.46	100.00	32.25	71.87

Source: MPEDA. Statistics of Marine Products Export 2001.

Port Wise Marine Exports in India in 1999

Port	1999									
	Quantity of Shrimps	Port Wise Quantity Share to Total	Value of Shrimps	Port Wise Value Share to Total	Quantity of Marine Products	Port Wise Quantity Share to Total	Value of Marine Products	Port Wise Value Share to Total	Quantity Share of Shrimp Exports to Marine Exports	Value Share of Shrimp Exports to Marine Exports
	(tons)	(%)	(Rs million)	(%)	(tons)	(%)	(Rs million)	(%)	(%)	(%)
Chennai	22102.98	21.44	9556.28	28.42	25571.14	7.82	10109.39	21.25	86.44	94.53
Kochi	28425.90	27.58	5467.15	16.26	83422.38	25.50	9598.71	20.18	34.07	56.96
Visakhapatnam	19483.91	18.90	8380.82	24.93	22744.86	6.95	8698.23	18.28	85.66	96.35
Calcutta	11946.53	11.59	4688.20	13.94	16901.95	5.17	5138.41	10.80	70.68	91.24
JNPT	6755.64	6.55	1412.19	4.20	51578.62	15.76	3995.93	8.40	13.10	35.34
Tuticorin	7020.36	6.81	2782.64	8.28	16910.54	5.17	3744.88	7.87	41.51	74.31
Kandla	1515.78	1.47	252.00	0.75	36315.38	11.10	2017.21	4.24	4.17	12.49
Porbandar	1903.49	1.85	292.77	0.87	43558.55	13.31	1982.15	4.17	4.37	14.77
Mumbai	3811.67	3.70	758.97	2.26	19184.50	5.86	1793.27	3.77	19.87	42.32
Goa	99.44	0.10	29.65	0.09	9390.81	2.87	367.23	0.77	1.06	8.07
Trivandrum	7.55	0.01	3.09	0.01	671.63	0.21	97.26	0.20	1.12	3.18
Karwar	0.00	0.00	0.00	0.00	711.26	0.22	22.03	0.05	0.00	0.00
Pipavav	0.00	0.00	0.00	0.00	193.80	0.06	7.75	0.02	0.00	0.00
Mangalore/ICD	0.00	0.00	0.00	0.00	49.10	0.02	1.47	0.00	0.00	0.00
Kakinada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paradeep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	103073.25	100.00	33623.76	100.00	327204.52	100.00	47573.91	100.00	31.50	70.68

Source: MPEDA. Statistics of Marine Products Export 2001.

Port Wise Marine Exports in India in 2000

Port	2000									
	Quantity of Shrimps	Port Wise Quantity Share to Total	Value of Shrimps	Port Wise Value Share to Total	Quantity of Marine Products	Port Wise Quantity Share to Total	Value of Marine Products	Port Wise Value Share to Total	Quantity Share of Shrimp Exports to Marine Exports	Value Share of Shrimp Exports to Marine Exports
	(tons)	(%)	(Rs million)	(%)	(tons)	(%)	(Rs million)	(%)	(%)	(%)
Chennai	29752.01	25.32	15843.51	34.94	34176.99	8.12	16665.64	26.05	87.05	95.07
Kochi	34178.28	29.09	7014.45	15.47	96678.09	22.96	11595.66	18.13	35.35	60.49
Visakhapatnam	18921.90	16.10	9418.01	20.77	23825.16	5.66	9802.65	15.32	79.42	96.08
Calcutta	11929.36	10.15	5589.44	12.33	18880.16	4.48	6196.54	9.69	63.18	90.20
JNPT	8908.04	7.58	2214.84	4.88	78408.70	18.62	6013.46	9.40	11.36	36.83
Tuticorin	7600.38	6.47	3784.78	8.35	18638.10	4.43	5116.21	8.00	40.78	73.98
Kandla	1343.91	1.14	257.16	0.57	44782.55	10.64	2660.92	4.16	3.00	9.66
Mumbai	3432.83	2.92	945.80	2.09	27102.40	6.44	2428.81	3.80	12.67	38.94
Pipavav	911.97	0.78	173.89	0.38	38047.30	9.04	1781.53	2.79	2.40	9.76
Porbandar	431.81	0.37	69.64	0.15	24989.97	5.93	1056.38	1.65	1.73	6.59
Goa	32.72	0.03	10.26	0.02	11206.36	2.66	349.13	0.55	0.29	2.94
Mangalore/ICD	63.05	0.05	28.02	0.06	3277.16	0.78	165.88	0.26	1.92	16.89
Trivandrum	1.46	0.00	0.45	0.00	460.41	0.11	111.99	0.18	0.32	0.41
Karwar	0.00	0.00	0.00	0.00	601.68	0.14	20.75	0.03	0.00	0.00
Paradeep	0.00	0.00	0.00	0.00	0.39	0.00	0.12	0.00	0.00	0.00
Kakinada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	117507.72	100.00	45350.25	100.00	421075.42	100.00	63965.66	100.00	27.91	70.90

Source: MPEDA. Statistics of Marine Products Export 2001.

Port Wise Marine Exports in India in 2001

Port	2001									
	Quantity of Shrimps	Port Wise Quantity Share to Total	Value of Shrimps	Port Wise Value Share to Total	Quantity of Marine Products	Port Wise Quantity Share to Total	Value of Marine Products	Port Wise Value Share to Total	Quantity Share of Shrimp Exports to Marine Exports	Value Share of Shrimp Exports to Marine Exports
	(tons)	(%)	(Rs million)	(%)	(tons)	(%)	(Rs million)	(%)	(%)	(%)
Chennai	35785.56	29.55	14986.71	36.62	39544.50	9.32	15763.25	26.64	90.49	95.07
Kochi	26401.78	21.80	5335.55	13.04	69170.80	16.30	9004.30	15.22	38.17	59.26
Visakhapatnam	18872.16	15.59	7462.70	18.24	21342.91	5.03	7646.65	12.92	88.42	97.59
JNPT	9763.74	8.06	2140.59	5.23	98143.03	23.13	6929.91	11.71	9.95	30.89
Calcutta	11901.04	9.83	4496.17	10.99	17647.37	4.16	5039.09	8.52	67.44	89.23
Tuticorin	8181.00	6.76	3478.62	8.50	15615.36	3.68	4391.46	7.42	52.39	79.21
Pipavav	2584.49	2.13	427.59	1.04	69755.85	16.44	3262.20	5.51	3.71	13.11
Kakinada	4410.08	3.64	1840.68	4.50	4476.55	1.05	1847.24	3.12	98.52	99.64
Kandla	538.81	0.44	99.71	0.24	28868.20	6.80	1646.78	2.78	1.87	6.05
Mumbai	1117.69	0.92	357.02	0.87	11518.97	2.71	1404.34	2.37	9.70	25.42
Porbandar	878.26	0.73	128.69	0.31	31346.86	7.39	1235.44	2.09	2.80	10.42
Mangalore/ICD	589.20	0.49	147.94	0.36	4951.62	1.17	414.47	0.70	11.90	35.69
Goa	54.68	0.05	16.81	0.04	7464.54	1.76	283.06	0.48	0.73	5.94
Trivandrum	2.97	0.00	1.58	0.00	657.65	0.15	170.61	0.29	0.45	0.93
Karwar	0.00	0.00	0.00	0.00	3815.33	0.90	134.19	0.23	0.00	0.00
Paradeep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	121081.46	100.00	40920.35	100.00	424319.54	100.00	59172.99	100.00	28.54	69.15

Source: MPEDA. Statistics of Marine Products Export 2001.

Appendix 4

International Regulatory Scenario

1. Anti-dumping

The US International Trade Commission has confirmed the levy of anti-dumping duties on Indian shrimp exports to America. The US argument is that, the countries like India, Thailand, China, Vietnam and Ecuador do not have turtle extruder devices and hence, the costs are low and if the costs are low, there is unfair competition and hence, they will levy anti-dumping duties. The Southern Shrimp Alliance and the Louisiana Shrimp Association has filed charges against India, Thailand, China, Vietnam, Ecuador and Brazil.

Indian seafood exporters are worried that an anti-dumping case initiated against them in the US, their largest market in terms of value, will severely impact business. India is also ready to fight the case filed against them by the two US organizations, as confirmed by SEAI president Abraham Tharakan and MPEDA secretary Jose Cyriac.

The total quantity of seafood exports increased from 424,470 tons in 2001-02 to 439,943 tons last year, while the increase in value terms went up from US\$ 1.25 billion to US\$ 1.41 billion. The share of the US was 12.62% in quantity and 26.79% in value.

Since the case has begun, the buyers have expressed their unwillingness to buy seafood products shipped from here after a deadline of February 9, 2004. The final verdict of the case is expected only in November and the gap from February till November could be damaging for the Indian seafood exporters as is apprehended by the seafood industry officials.

Source: The Economic Times, 20th January 2004.

2. Food Sanitation Law

Under provisions of the Food Sanitation Law, an import notification is required for all shrimp and crabs being imported for the purpose of sale or for other commercial purposes. Importers are required to submit the completed "Notification Form for Importation of Foods, etc." to the Quarantine Station at the port of entry. A determination is made based on the document examination whether or not an inspection at the bonded area is required.

Frozen sliced fresh fish and shucked shellfish, including shrimp and crabs, are to be inspected based on notification in accordance with the Standards of Frozen Fresh Fisheries for Raw Consumption. According to the Standards, the number of bacteria per 1 gram of the inspected item must be less than 100,000, and a group of colon bacilli must be dormant. Shrimp is inspected for the presence of bleaching agents. Cultivated shrimp and lobsters are also inspected for the presence of residual antibiotics and antibacterial.

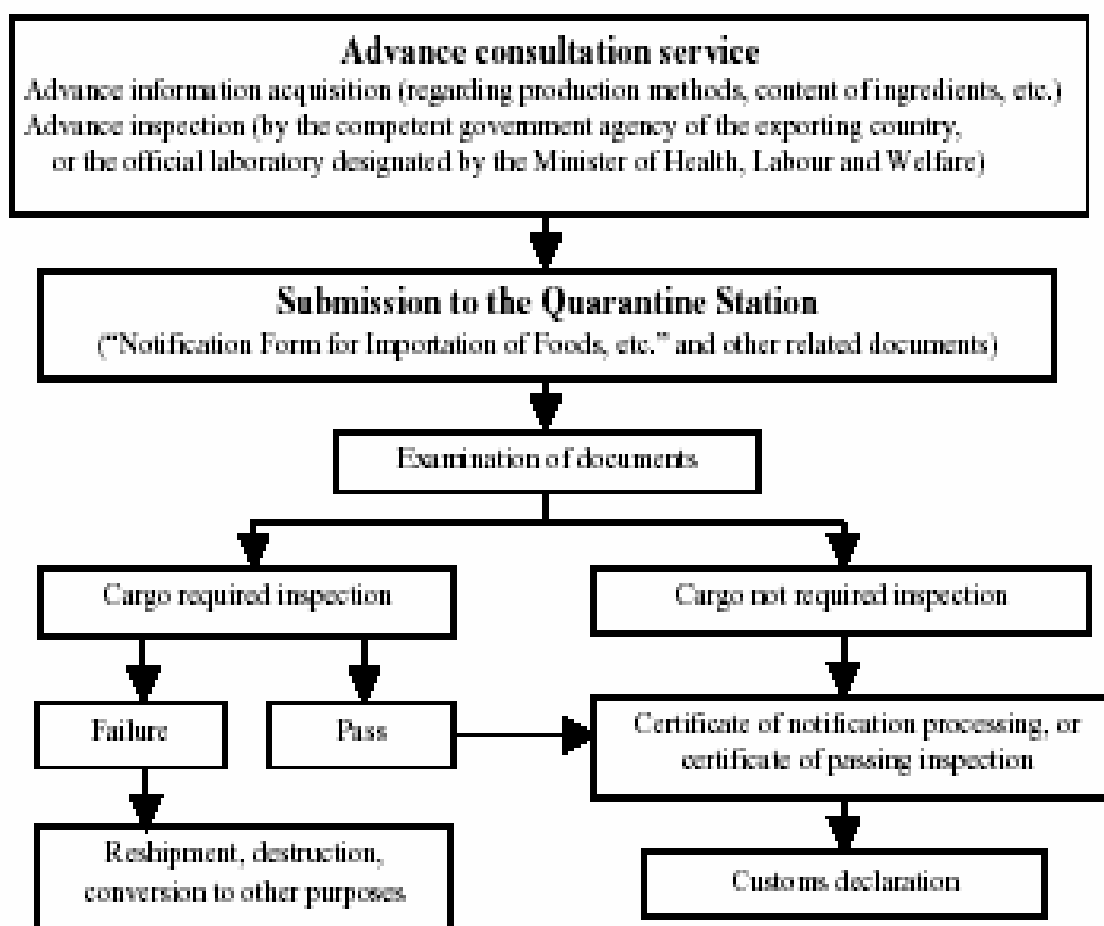
Prior to importing, the importer may take a sample of forthcoming imports to official laboratories designated by the Minister of Health, Labour and Welfare in Japan or in exporting countries. Those test results may be substituted for the corresponding inspection at the port of entry, which expedites the quarantine clearance process.

The Food Sanitation Law prohibits the sale of foods containing toxic or harmful substances and foods that are unsafe for human health. When selling shrimp without the shell inside container packaging, they must be labeled in accordance with provisions of the Food Sanitation Law.

Shrimp that are sold without shell inside container packaging are subject to labeling requirements of the Food Sanitation Law, requiring the following labeling items.

- Name of product
- Whether it is for table-eating or not
- Food additives (if it is added)
- Use-by date
- Preservation method
- Whether to be heated before eating (for boiled crabs)
- Name and address of importer or reseller

Procedures Required Under Food Sanitation Law



Source: JETRO Marketing Guidebook for Major Imported Products, 2002

Appendix 5

Standards

1. HACCP (Hazard Analysis Critical Control Point) Guidelines

(Seafood Manufacturer and/or Exporter)

Sanitation Standards

- Safety of water and ice
 - Ensure uninterrupted supply of water of potable standards, safe storage and distribution for the processing operation
- Condition and cleanliness of food contact surfaces
 - All food contact surfaces of equipment and utensils must be maintained and well sanitized to avoid contamination
 - Surfaces should be constructed using non-toxic materials
 - The packing equipment including utensils, freezer belts, conveyer belts should be made by material approved by the US FDA.

Raw Material Receiving and Storage

- Purchasing procedure of raw materials
 - Pre-qualified suppliers: Quality inspectors must visit the suppliers plant, check the systems in place and approve those in compliance with the quality norms
 - The company's agent in country of origin of raw material should depute an inspector to evaluate the material before shipment and approve every consignment
- Surplus inventory must be stored in approved warehouses and controlled
- Purchasing procedure of raw materials
 - The Letter of Credit (LC) must stipulate that the shipper's document is accompanied by the agent's approval. The shipper's document should certify that each shipment has conformed the following:
 - Strong and sea worthy packing
 - Shipped product fit for human consumption and free from chemicals
 - Shipped material free from decomposed/degraded product and the shipper would compensate if any loss due to decomposed material in the shipment after in house quality inspection in the plant has incurred
 - The LC must stipulate that a 'Health Certificate' issued by the relevant Government Authority accompany the documents
 - Shipment must be made in reputed carriers with good reefer equipment
 - The raw material must be transported at appropriate temperature in case of perishables (eg Seafood must be transported at -180 C in refrigerated containers)
- The container temperature in case of perishables must be checked at periodic intervals at the port reefer yard after arrival and deviations in temperature must be noted
- A joint survey of the container before delivery must be held
- An inspector must be present while de-stuffing each container at the public cold store to inspect the material at random, arrange for storage, and drawing samples for detailed inspection at the company's laboratory

Finished Product Handling, Storage and Delivery

- All finished products must be packed in polybags, sealed and packed in master cartons. Frozen product must be immediately transferred to the cold store
- The temperature of cold store must be maintained below -180 C and routinely recorded
- The core temperature of the product must be measured before shipment and maintained at -180 C
- Empty containers must be thoroughly inspected for cleanliness
- The containers must be pre-cooled to -180 C using a refrigeration plug point at the factory.
- The product must be brought to anteroom before loading and then the container must be stuffed. The stuffing of container must be done in night hours preferably when the ambient temperature is lower.
- While loading a 40 feet container, 50% of the load must be stuffed first, then the container must be sealed, until the temperature is brought down to -180 C, after which the rest of the loading could be done
- After the container is sealed, it must be sent to the port after attaining a temperature of -150 C and below
- In cases when the required temperature is not attained, the goods must be removed and transferred to the cold store immediately. The core temperature of the product must be then checked to ensure that it is below -120 C. If the temperature is higher than -120 C, the product must be frozen again to bring down the temperature to below -180 C and repacked.

Transportation Facilities

- Refrigerated trucks must be used to transport raw material from approved cold stores to the factory.
- Finished products must be stuffed into reefer containers at factory premises and then taken to the port for shipment
- The temperature must be maintained at -180 C

Source: Gulf Seafood LLC. HACCP Manual. February 2001.

2. AIB (American Institute of Baking) Standards for Food Safety

Receipt and Storage of Materials

- Damaged and/or badly soiled or infested containers would not be accepted. Materials shipped in damaged, dirty or infested vehicles shall be rejected. Proper documentation must be maintained specifying defects and reasons for rejection.
- Perishable or frozen materials must meet specific minimum temperature requirements at point of receipt.
- The receiving dates must be placed on the bottom unit of the pallet or individual container and be readily visible.
- Materials must be stored off the floor and away from walls and ceilings at least 18 inches. Adequate space for cleaning must be maintained between rows of stored products (ideally, 14 inches between every two pallet rows).
- All ingredients of packaging must be stored in a clean, well ventilated, and dry area and must be protected from condensate, sewage, dust, dirt, and toxic chemicals or other contaminants.
- Proper rotation of all ingredients, packaging supplies, and other materials must be undertaken on a 'first-in-first-out' (FIFO) basis or other verifiable methods to ensure stock rotation. Inventories should be maintained at reasonable and appropriate volumes to avoid excessive age and insect infestation.
- Pallets and skids should be kept clean and in good repair. When pallets or other wooden surfaces are washed, they should be properly dried before use.
- All toxic chemicals and non-product related materials must be completely segregated from all food ingredients and packaging supplies

- Complete segregation of R&D and other infrequently used raw materials and packaging supplies must be confined to a designated area and regularly inspected for signs of potential or actual contamination
- A designated morgue and/or salvage area must be provided and fully segregated from usable stock to prevent possible contamination. Reworking of salvage must be undertaken regularly to keep quantities at minimal levels
- All breather bags and socks must be stored in a dust-free environment. These must be designed and fabricated to prevent possible contamination from threads, fuzz, etc.
- All outside receiving lines or caps to both bulk dry and liquid ingredients must be locked and identified
- Clear and concise sampling procedures must be developed for QC samples required from ingredient containers. All sample openings created must be properly resealed and identified.

Transfer and Handling of Materials

- Spillage, leakage and waste must be quickly eliminated at all times
- Containers must be kept off the floor at all times and covered when not in use. All ingredient storage containers must be properly identified to maintain ingredient identity and traceability throughout usage.
- All materials selected for transport to processing areas must be visually inspected and cleaned prior to transport. Drums and barrels must be wiped clean
- All sifters, rebolters, and scalpers for flour and other finely divided ingredients must be checked and recorded at least weekly for torn screens and other defects. Reject materials must be visually inspected no less than daily with observations documented.
- All dry ingredients must be sifted and all liquid ingredients must be strained before use
- Rubbish, trash, or inedible waste must be transported and stored in properly covered labeled containers and emptied daily
- All carryover product, in-process ingredients must be properly identified and dated, and minimized by using promptly at first opportunity

Delivery Practices

- Finished products should have permanently legible code marks (satisfying Federal and State packaging requirements) are readily seen by consumers.
- Distribution records must be maintained to identify initial distribution as per Federal regulations. Finished products must be handled and transported in a way that prevents actual or potential adulteration
- Temperatures of perishable and frozen products must be maintained and recorded. All products must be loaded into a pre-cooled vehicle designated and maintained to sustain required temperatures during delivery
- Company owned vehicles used to transport foods must be visually examined, cleaned and maintained to prevent product adulteration. All route trucks must be internally inspected and cleaned at least weekly to identify possible sources of contamination from pests and/or foreign matter.
- Common carriers or customer owned vehicles must be encouraged to maintain their respective delivery vehicles in a sanitary condition, and in reasonable repair.

Source: American Institute of Banking, 1995.

3. ATA (Air Transport Association of America) and National Fisheries Institute Guidelines for Air Shipment *(Seafood Manufacturer and/or Exporter)*

Handling and Packing Considerations for all Seafood

- Selection of appropriate packing materials according to durability, water-tightness and insulation
- Pre-chilling the product before packing to preserve low temperatures
- Pre-chilling live seafood to reduce body metabolism. Adequate air for live products must be checked, and thus the bags containing seafood must not be sealed.
- Usage of proper coolant, eg gel refrigerant, wet ice in sealed bags, or dry ice (regulatory compliance for dry ice must be checked)
- Coolants must be placed to absorb heat entering package from top and bottom
- The time between packing and shipment must be minimized

Packaging Design

- Inside packaging
 - Sealed polyethylene bag of sufficient thickness to resist puncture and retain liquids
 - Double packing with single polyethylene liner placed to the outside of the insulating material
 - Adequate absorbent material or padding between sealed polyethylene product bag and inner wall of outer packaging
 - Size of polyethylene bag (sufficiently large to overlap and fold closed)
- Outside packaging
 - Outer boxed made out of corrugated paper board or solid fiberboard
 - Various plies of paperboard could be wax-saturated, impregnated, wax-coated or treated by other water-resistant processes in certain cases
 - Box and container design developed after considering the density of the product to be transported
- Banding/other types of external sealing materials should be designed not to cut or damage the container or other packages
- Shipments in unit load devices

Transportation from Packing House to Airport

- The package design must provide conditions suitable for maintaining the product temperature (about 320 F)
 - The packaged fish must reach the airport quickly
 - Transporting shipments in refrigerated and insulated vehicles is useful where packages may be exposed to elevated temperatures and/or when long trips to airport are expected
 - Packages must be loaded in transport vehicles to minimize movement and susceptibility to dropping
 - Stacks of seafood packages should be planned to avoid tilted or overhanging boxes
 - Methods and equipment used to load and unload shipments must protect package integrity
- Source: Air Transport Association of America.

Appendix 6**Field Visits Undertaken**

- a) The Marine Products Export Development Authority (MPEDA), Cochin.
- b) Landing harbour, auction site, ice factories, cold storage and exporters' processing units in the Cochin area.
- c) Dubai (as a shrimp exporter)
- d) Seafood Exporters Association of India (SEAI) and shrimp exporters' processing unit, Chennai.
- e) HLL's Marine Exports Division Office, Bangalore
- f) MPEDA, SEAI and HLL's shrimp processing unit, Cochin
- g) Japan (as a shrimp importer) and Thailand (as a shrimp exporter)
- h) Landing Harbour in Vishakhapatnam

Appendix 7**Fisheries Institutions in India****Indian Council of Agricultural Research (ICAR)**

1. Central Marine Fisheries Research Institute (CMFRI)
Kochi, Kerala
Tel: 00 91 (0)484 394 798
Fax: 00 91 (0)484 394 909
2. Central Inland Capture Fishery Research Institute (CICFRI)
Barrackpore, West Bengal
Tel: 00 91 (0)33 - 560 0177
Fax: 00 91 (0)33 - 560 0388
3. Central Institute of Fisheries Technology (CIFT)
Kochi, Kerala
Tel: 00 91 (0)484 - 667 039
Fax: 00 91 (0)484 - 668 212
4. Central Institute of Fisheries Education (CIFE)
Mumbai, Maharashtra
Tel: 00 91 (0)22 - 636 3404
Fax: 00 91 (0)22 - 636 1573.
5. National Bureau of Fish Genetic Resources (NBFGR)
Lucknow, U.P.
Tel: 00 91 (0)522 - 442 403
Fax: 00 91 (0)522 - 442 403
6. Central Institute of Freshwater Aquaculture (CIFA)
Bhubaneswar, Orissa
Tel: 00 91 (0)674 - 465 421
Fax: 00 91 (0)674 - 465 407
7. Central Institute of Brackish-water Aquaculture (CIBA)
Chennai, Tamil Nadu
Tel: 00 91 (0)44 - 8218126
Fax: 00 91 (0)44 - 8218125
8. National Research Centre on Coldwater Fisheries (NRCCWF)
Bhimtal, U.P.
Tel: 00 91 (0)5942 - 47279
Fax: 00 91 (0)5942 - 47279

Ministry of Agriculture

9. Fishery Survey of India (FSI)
Botawala Chambers
Sir P.M. Road
Mumbai – 400 001, Maharashtra
Tel: 00 91 (0)22 - 261 7101/7144/7145
Fax: 00 91 (0)22 - 270 2770
 10. Integrated Fisheries Project
Foreshore Road
P.B. No. 1801
Kochi – 682 016, Kerala
Tel: 00 91 (0)484 - 361317
Fax: 00 91 (0)484 - 373516
 11. Central Institute of Fisheries Nautical and Engineering Training (CIFNET)
Dewan's Road
Kochi – 682 016 Kerala
Tel: 00 91 (0)484 - 351107
Fax: 00 91 (0)484 - 370879
 12. Central Institute of Coastal Engineering for Fishery (CICEF)
64, Palace Road
Bangalore – 560 052 Karnataka
Tel: 00 91 (0)80 - 226 7841
Fax: 00 91 (0)80 - 225 8945
- Fishery Schools and colleges:
13. Tamil Nadu Agricultural University, Madurai
 14. Dept. of Agricultural & Rural Management Centre from Agri & Rural Dev. Studies
 15. A. G B Pant University of Agriculture & Technology, Pant Nagar, Veraval
 16. College of Fisheries, Gujrat
 17. School of Applied Live Sciences, Pathanamthitta