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# **Focus India: Business Guide for Canadian Aquaculture Firms**

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*Prepared for the*

**Department of Foreign Affairs and International Trade  
Government of Canada**

*by*

**ProMarket International, Ottawa**

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**\*\*Cette documentation est disponible en français\*\***

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## Executive Summary

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The purpose of this business guide is to provide Canadian firms with a snapshot of the aquaculture industry in India, and to indicate the potential opportunities for direct sales, technology licensing or formation of joint ventures in India. The guide includes numerous sources of information - directories of companies, industry associations, research institutions and government agencies, Internet web sites, and various publications - which Canadian firms can access to better define the market opportunities that suit their specific business interests and objectives, as they seek ways to enter the Indian market.

When one considers what India has to offer - expanding markets, growing infrastructure of scores of hatcheries, grow-out farms, feed producers and fish packaging centres, British-based language and laws, well educated manpower, a growing biotech sector, significant government incentives for the aquaculture industry and, both public and private sector financing - Canadian firms may find it advantageous to establish a presence in India and use it as a springboard to the burgeoning Asian, Mid-East and European markets.

The potential for aquaculture in India has been barely tapped. India has up to 4 million ha of fresh water, 1 million ha of brackish water, and about 8 million ha of inshore sea water available for aquaculture, along with a tropical climate and a tremendous diversity of fin fish, shell fish and seaweed. However, current aquaculture production, of which a majority is fresh water fin fish (i.e. carp), amounts to hardly one million tonnes/yr. Coastal aquaculture in the form of tiger shrimp farming produces 75,000 tonnes/yr, spread over only 100,000 ha.

The SEMB virus has hurt India's coastal shrimp farms, but not to the extent that it damaged South-East Asia's shrimp farms. This sector in India has been influenced much more by environmentalists raising concerns about pollution from farm effluents, and very recently by strictures placed by the Supreme Court on their operations regarding noncompliance with environmental regulations. Also, in the key states of Andhra Pradesh and Tamil Nadu, less than 50% of the hatcheries are operating, and insurance companies are reluctant to insure the coastal farms unless the farm owners implement better operating practices in compliance with Supreme Court orders. According to the Aquaculture Foundation of India (AFI), an industry group, the demand for better disease diagnostic and prevention technologies, feed production, and operating equipment such as aerators, has never been greater.

The AFI has offered to assist Canadian firms to identify potential opportunities and partners specific to the firms' interests and capabilities, but strongly recommends that Canadian firms should offer a multi-disciplinary, one-stop shopping approach to the Indian aquaculture firms. Relaxation of import restrictions, full convertibility of the Indian currency, and additional incentives to fish exporters, which are all underway, further make the Indian aquaculture market a more attractive target for Canadian firms, especially those offering biotech products and services.

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## 1. INTRODUCTION

It is commonly agreed that the long term world requirements for fish products can only be met by increasing the aquaculture contribution to a stabilised level of capture fish production. Thus on a global basis, the FAO suggests that there is a reasonable expectation of aquaculture production expanding from levels of 16 million tonnes (Mt) in 1993 to around 30 million tonnes by the year 2010. The FAO cautions, however, that the service industries will have to play a more important role in environmental planning, system management, and disease monitoring and control than at present if catastrophic production crashes are to be avoided. This warning note is particularly relevant in India, where the rapid but somewhat uncontrolled growth of the shrimp farm industry has run into problems, and is forcing a general reappraisal of the need for scientific planning and management in aquaculture practice. This new awareness of the social requirement for sustainable development provides opportunities for marketing integrated management and technology transfer packages suitable for existing farms, and for the proposed new developments in the inland fishery. Canadian expertise, linked to or allied with an Indian partner, could become part of the technical restructuring required to guarantee the sustainable expansion of Indian production.

The intent of this Business Guide is to collate available data on aquaculture in India, and in doing so provide a starting point for the Canadian aquaculture service industry to assess the opportunities and develop a strategy for market entry into that region.

## 2. GLOBAL PERSPECTIVE

India has the second largest aquaculture industry in the world, China being rated in first place. It is useful, from a service viewpoint, to refer to the global statistics relevant to that ranking. Thus, drawing on FAO data:

- global aquaculture production is comprised of
  - 68% finfish
  - 24% molluscs
  - 8% crustaceans
- 60% of global production is from inland farms
- 80% of global aquaculture tonnage is from Asia, with China at 7 Mt and India at 1.4 Mt representing the major volume producers.
- of the global finfish production, 85% is non-carnivorous (mostly carp, but including other cyprinids, tilapia, and milkfish) and is consumed domestically. About 15% of finfish are salmonids which are cultivated for export.
- cultured shrimp production is of the order of 0.75 Mt worldwide (1994), and is almost all exported. As of 1994, the Indian contribution was 0.062 Mt.

The long term expansion of the industry along the production channels referred to above suggests that in the case of finfish, more intensive farming will require enhanced health monitoring and control, species diversification, and new technologies to reduce costs, particularly for exports. For example, in India, higher levels of technology will be required to control environmental impact, disease, and broodstock performance.

The developing countries in S.E. Asia depend heavily on cultured shrimp for foreign exchange. India is one of the later arrivals on that score. Again, disease, environmental mismanagement, and the lack of a technical support infrastructure have stalled progress in this sector of aquaculture. These problems also confirm the need for an integrated management system for sustainable production.

### 3. AQUACULTURE IN INDIA - OVERVIEW

Complex and diverse are adjectives used to describe many aspects of India, and aquaculture is no exception. The industry ranges from the traditional seasonal fish husbandry in paddy fields and the trapping of prawn fry in a coastal inlet, to the semi-intensive shrimp farms on the East coast and the trout farm trials (Norwegian associates) in the North. India is primarily a carp producer on a volume basis and, in keeping with global trends, it proposes to use inland aquaculture to increase its domestic protein production as the following statistics demonstrate<sup>1</sup>.

<b>Fish Production India</b>		
	<b>1992</b>	<b>2000</b>
Marine and coastal	2.6 Mt	3.5 Mt
Inland fishery	1.7 Mt	4.5 Mt
<b>Total</b>	<b>4.3 Mt</b>	<b>8.0 Mt</b>
<b>Aquaculture Components</b>		
Freshwater	0.9 Mt	2.1 Mt
Shrimp	0.06 Mt	0.125 Mt

<sup>1</sup>*Indaqua 95 - Proceedings*. Kochi: Marine products Export Development Authority 1995.

The contribution of aquaculture to exports is almost totally related to shrimp production. Of the total fish exports (1993) of 0.25 Mt worth 800 M\$ US, almost 50% (400 M\$ US) was realised from cultured shrimp. Government projections for expansion of the shrimp industry as a dollar earner are ambitious, and lately have been qualified by acknowledgement of the need for management, technology, infrastructure and of course, regulations. Insofar as it represents a downstream service market, these projections are tabulated below:

<b>Cultured Shrimp Production</b>				
	<b>1995</b>	<b>1997</b>	<b>2000</b>	<b>2010</b>
Production (000t)	62	78	125	150
Farm area (000 ha)	82	100	125	160
Seed (billions)	8	11	17	24
Hatcheries	115	185	288	400
Broodstock (000)	150	220	346	486

Shrimp production is conducted in a mix of traditional, extensive, and semi-intensive farming, with seed densities increasing in that order. The 1995 tonnage was generated from:

- 50,000 ha - traditional farming
- 30,000 ha - extensive farming
- 2500 ha - semi-intensive farming

The proposed controlled expansion of production is likely to occur in a manner that will see new core semi-intensive farms with several low cost, relatively low-tech, satellite extensive farms under their management.

No general appreciation of Indian aquaculture would be complete without reference to the much quoted aquatic capacity of the country to become the 'fish basket' of Asia. The three categories of potential are defined as:

- 8 million ha of coastal sea water in sheltered bays, lagoons, etc, providing a largely untapped scope for finfish, mollusc, and seaweed farms;
- about 1 million ha of brackish water in coastal marshland. The unregulated exploitation of this category for shrimp farming has created significant environmental and ecological problems; and,
- 4 million ha of freshwater lakes, ponds

all covering a range of climate from sub-tropical (28° N) to equatorial. The development of even a small percentage of these areas will require heavy investment in infrastructure (roads, electricity) to realise their potential. The 100,000 ha of brackish water zone formed for shrimp is having difficulties and the inland fishery, mainly the major Carps - Catla, Rohu, and Mirgala - is now attracting attention for the development of finfish for export.

#### 4. PRESENT STATUS OF INDIAN AQUACULTURE

Due to its importance to foreign exchange earnings and profits, cultured shrimp aquaculture is at present the primary, almost singular, focus of attention in Indian aquaculture. In order to understand the present status of shrimp farming, a brief history is relevant:

- In the late 80's, the (Federal) Marine Products Export Development Authority (MPEDA) created a demonstration hatchery and grow-out facility for *P. monodon* species of Tiger Shrimp, and promoted the establishment of extensive and semi-intensive shrimp farming for export.
- MPEDA policies spawned intense entrepreneurial activity by agricultural workers, cooperatives, the burgeoning middle class, and corporations seeking business diversification.
- Production soared until the appearance of viral disease in 1994. Then in 1995, strong condemnatory reactions from social and environmental groups resulted in a Supreme Court injunction against the development of new farms. Thus, in late 1995 shrimp production stalled. For example, of the 76 hatcheries in the States of Tamil Nadu and Andhra Pradesh, only 26 are now in production.
- Financial institutions and insurance companies have greatly reduced their involvement in the industry; however, they are promoting better management practices.
- Finally, in February 1996, the MPEDA announced a new master plan for subsidised aquaculture development to be promoted by State Governments "... in areas where there would be no social opposition..."

The above is a snapshot of an industry in trouble, urgently seeking help in the form of joint ventures that could infuse both capital and technical management skills and practices, as well as re-establish confidence in the industry.

The following quote from a major Indian newspaper is representative of the Indian industry's current status:

**"Inland Aquaculture Gaining Importance...** The focus has now shifted to inland aquaculture in the Cauvery delta with coastal aquaculture running into rough weather. Big sea food industrialists who started prawn farms in Nagapattinam district are keeping their fingers crossed, thanks to opposition from locals and cases pending in the Supreme Court, besides virus attacks. In the case of inland aquaculture, pollution problems and virus attacks are virtually nil. Even small and marginal farmers can invest money in the project. The Government is planning to train women in inland aquaculture."<sup>2</sup>

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<sup>2</sup>*The Hindu*. November 14, 1995.

## 5. NEEDS AND OPPORTUNITIES

Prior to addressing the current opportunities for aquaculture services in India, it may be instructive to note the 1990 findings of a study on the potential for Canadian services in S.E. Asian countries. Some of the recurring needs mentioned were:

- site evaluation methodologies
- training programmes
- environmental, quality, and water control for shrimp and finfish farms
- artificial feed
- diagnostic kits
- therapeutics

These requirements are relevant to India in 1996. With the immediate need being service support to the shrimp industry, joint venture proposals linked to an integrated management approach to disease control are expected to attract interest. The same marketing thrust toward scientific control of operations could be applied toward more intensive operations in the inland water sector, hence, offering preventative methods of disease control in order to avoid the crisis that has hit the crustacean sector.

Also, there is potential in the area of equipment supply, since Indian manufacturers have by and large failed to participate actively in the expansion of shrimp culture farms. Although there are Indian sources of paddle wheel aerators, salinity, pH and DO meters, test kits for soil and water, and even sand filter systems, operators prefer the greater reliability and performance of these units purchased from offshore suppliers. There is, therefore, a strong potential for competitively-priced direct supply of equipment in the short term, and a medium term opportunity for lucrative joint venture initiatives to technically upgrade the domestic equipment quality.

In the medium to long term, there is an opportunity to participate in developing the production technology for medium to high-value added species not yet exploited in Indian salt water or fresh water culture. Here again, an integrated system contribution to joint ventures with Indian companies might be used to produce some of the following species for export markets:

### Marine

Seabass  
Groupers  
Mulletts  
Indian salmon  
Mussels  
Crab, clams  
Lobster  
Seaweeds

### Freshwater

Prawns  
Trout  
Tilapia  
Catfish  
Mussels

Perhaps the broadest opportunity for Canadian services lies in the application of expertise by the Canadian aquaculture biotechnology sector to Indian problems of broodstock development, disease monitoring and treatment, hybridisation and genetics, toxicity services, and water and effluent treatment. Given the underexploited potential of Indian aquaculture and the belated appreciation of the need for scientific management, this may be an appropriate time to market Canadian bio-tech services on a broad front.

## 6. REGULATORY FRAMEWORK

There are two dimensions of the aquaculture regulatory framework of interest to Canadian aquaculture firms. The first is concerned with the Central and State governments' control on the planning, environmental impact assessment, design, and operation of farms. The second relates to the treatment of foreign investment, and sales of technology and services. In regards to the latter, it is encouraging to note that the continued relaxation of trade and monetary barriers by the Government of India "...substantially eliminates licensing, quantitative restrictions, and other regulatory controls..."<sup>3</sup> The Indian aquaculture industry is allowed to import foreign technical investment/collaboration, technology, equipment, chemicals and therapeutics, feeds, etc. with much simplified procedures and exempt from duties. Foreign interests may own 51% of an aquaculture operation. Visas are readily granted and may be renewed in India.

Until quite recently, there was little in the way of a regulatory framework affecting the start-up of traditional to semi-intensive aqua farms. Under the promotional influence of the Central government and with minimal State control, shrimp farms appeared in villages on traditionally rich agriculture land, and in fish-rich mangrove swamps. This situation is now being corrected. The Central Ministries of Environment and Agriculture and the Central and State Pollution Control Boards are co-operating to create and implement the necessary regulations. Environmental impact assessment studies are now a prerequisite for new medium to large farm acreages. Also, effluent treatment is to be made compulsory in critical regions. Other major issues being addressed include salt contamination of the water table and neighbouring agriculture land, and the tapping of fresh water reservoirs for shrimp tanks. Tamil Nadu, one of the States heavily involved in shrimp farming, has passed an Aquaculture Act in order to regulate industry. These guidelines and laws may also create an opportunity for the considerable Canadian expertise in environmental impact assessments.

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<sup>3</sup>"An Exposition on Aquaculture." Kochi: Marine Products Export Development Authority, 1995.

## 7. INFORMATION SOURCES

The following lists detail technical information on Indian aquaculture, relevant technical literature, Web sites and trade show sources. These are complemented by a contact list of Indian public entities and leading companies in the industry. Key documents, currently available from the South Asia division, DFAIT (tel: 613-996-5903), are the proceedings of the Indaqua 95 Conference and the MPEDA Directory of Aquaculture. Primary contacts in the country are the Central Government's Fisheries Development Commissioner, and Dr. M. Sakthivel at the Aquaculture Foundation of India. The latter group, set up by the industry, can provide detailed profiles of producing companies (as shown below), and help open doors to the Indian aquaculture industry.

<b>Representative models of big and small shrimp farmers and their requirements.</b>		
<b>Name of the Company</b>	Visakha Aqua Farms (P) Ltd.	NCC Blue Water Products Ltd.
<b>Area Under Culture</b>	80 Hectares	100 Hectares
<b>Species Under Culture</b>	P. monodon	P. monodon
<b>Investment Made</b>	15 crore rupees (CDN \$ 6 million)	15-18 crore rupees (CND \$ 6-7 million)
<b>Major components of the project</b>	Hatchery, pier, main feeder canal, siphon & farm	Hatching, grow-out farm, processing plant with cold storage & ice plant
<b>Date of commencement</b>	26th August 1995 (1st culture)	March 1993
<b>Number of crops taken</b>	One	Four
<b>Average Production/Hectare</b>	2.5 tonnes	5 tonnes
<b>Problems faced</b>	<ul style="list-style-type: none"> <li>• Non-availability of financial assistance from Banks to complete/diversify the project.</li> <li>• Water draining problem due to low lying area and flooding during rainy season</li> <li>• No proper disease diagnostic capability or mobile disease diagnosing programmes from the governments/private side</li> <li>• Non-availability of brooders &amp; Artemia</li> </ul>	<ul style="list-style-type: none"> <li>• Delay in sanction of loan from Banks</li> <li>• Flooding during rainy season</li> </ul>

## Resource Material Canada - India Aquaculture

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### General:

1. **Aquaculture Development: Progress and Prospects**  
T.V. Pillay, *Fishing*, New Books 1995
2. **The State of the World Fisheries and Aquaculture**  
F.A.O. UN Rome 1995
3. **Aquaculture Update**  
*Seafood Business*, V.13, #1, 1994
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Aquaculture Info. Centre, USDA, *National Agriculture Library* 1994
5. **Seafood Buyers Guide**  
*Seafood Business*, V.12, #5, 1994
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Pegasus Consultants 1991

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7. **Aquaculture in India - a Goldmine For Investment**  
R. Ganapathy, *Aquaculture Magazine*, pp. 28-37, Jan. 1996
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13. **Network of Aquaculture Centres in Asia: Project Findings and Recommendations**  
F.A.O. UN Rome 1995

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Centre for Aquaculture Research and Education, Nagarjuna University, 1990
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G. Kirkland, Deloitte and Touche, November 1990

### **Aquaculture Contacts / Addresses - India**

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 F: 91-8345-3137 (aquaculture)

Harrison's Aquaculture Ltd.  
 4, Kasthuri Rangan Rd  
 Alwarpet  
 Madras 600 010  
 T: 91-44-499-3413  
 F: 91-44-499-0160 (aquaculture)

Amalgam Harvest Ltd  
 Gee Crescent  
 114, Poonamallee High Rd  
 Madras 600 084  
 T: 91-44-825-7112  
 F: 91-44-825-5233 (aquaculture)

Ashvini Cold Storage Ltd  
 23 A, Mowbrays Rd  
 First Cross Street  
 Sri Ram Nagar  
 Alwarpet  
 Madras 600 018  
 T: 91-44-451-4941  
 F: 91-44-452-4126 (aquaculture)

Scanet Aqua Export Ltd  
 47, Sterling Ave., 1st Floor  
 Nungambakkam  
 Madras 600 034  
 T: 91-44-833-2367  
 F: 91-44-825-5149 (aquaculture)

Vantage Aquatics  
 40, Kabaleeswar Nagar  
 Neelankarai  
 Madras 600 041  
 T: 01-44-492-7719  
 F: 91-44-492-7274 (aquaculture)

Combay Aqua-Tech Ltd  
 203, Sterling Centre  
 R C Dutt Rd  
 Baroda  
 Gujarat 390 005  
 T: 91-265-338607/337956  
 F: 91-265-337956 (aquaculture)

Pioneer Marine Products Ltd  
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Sivakasi 626 123  
T: 91- -22422  
F: 91- -22655 (aquaculture)

Empee Marine Products Ltd  
693, Anna Salai  
Madras 600 002  
T: 91-44-852-2510  
F: 91-44-852-3412 (aquaculture)

Kings International Neendakam  
Quilon  
Kerala 680 320  
T: 91-474-2038/2995 (aquaculture)

Avanthi Feeds Ltd  
G2 Concord Apts. 6-3-658  
Somajiguda  
Hyderabad 500 462  
T: 91-842-310260  
F: 91-842-310261 (feed)

Venture Aquatech Pvt. Ltd  
36, M C Nicholas Rd  
Chetpet  
Madras 600 001  
T: 91-44-825-5648  
F: 91-44-826-4314 (bio-supplies)

Super Shrimp Farms Pvt. Ltd  
No. 10, 3rd Street  
Gopalapuram  
Madras 600 086  
T: 91-44-881068 / 881479  
F: 91-44-825-5458 (hatchery)

The Waterbase Ltd  
16 / 168-1, Ramamurthy Nagar  
Nellore 524 003  
T: 91-861-31539  
F: 91-861-31515 (aquac. & hatchery)

Visakha Aquafarms (P) Ltd  
41, Pandurangapuram  
Visakhapatnam 530 003  
T: 91-691-563971  
F: 91-691-566472 (aquac. & hatchery)

Rank Aqua Estates Ltd  
Road #1, Banjara Hills  
Hyderabad 500 034  
T: 91-842-221548  
F: 91-842-238064 (aquac. & hatchery)

Suvarna Aqua & Export Ltd  
Divi Towers  
Dharam Karan Rd  
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T: 91-842-291467  
F: 91-842-290832 (aquac. & hatchery)

Nagarjuna Aqua Exports Ltd  
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NCC Blue Water Products Ltd  
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F: 91-482-226214 (aquac. & hatchery)

Alsa Marine Harvest Ltd  
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Anna Nagar  
Madras 600 040  
T: 91-44-6212937/6212945  
F: 91-44-6212945 (aquac. & hatchery)

Surya Udyog Ltd  
S3 31 / 32, Sector A, Zone B  
Mansheswar Industrial Estate  
Bhubaneshwar  
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T: 91- 480843  
F: 91- 481523 (aquac. & hatchery)

Ruia Aquaculture Ltd  
101 / 103 Kedia Chambers  
S V Road, Malad  
Mumbai 400 064  
T: 91-22-888-4546  
F: 91-22-882-3770 (aquac. & hatchery)

Hitide Seafarms Ltd  
118, 3rd Main  
1st Block RMV, 2nd Stage  
Bangalore 600 004  
T: 91-80-333-5637  
F: 91-80-558-3215

Hindustan Lever Ltd  
Hindustan Lever House  
165 / 166 Balkbay Reclamation  
Mumbai 600 029  
T: 91-22-287-0622  
F: 91-22-297-3010 (aquaculture)

V Sheshamani  
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42 / 1 Palingrove Rd  
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34 Cathedral Rd  
Madras 600 085  
T: 91-44-315627/315828  
F: 91-44-315098 (consultants)

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Kalol 382 721  
T: 91-2764-4301  
F: 91-2764-2385 (consultants)

D L Thapar  
Assam International Operations Division  
Penthouse Suite, Claridges Hotel  
12 Aurangzeb Rd  
New Delhi 110 001  
T: 91-11-301-1128  
F: 91-11-301-4714 (consultants)

Indo Shrimp & Seeds Ltd  
5107, H2 Second Ave  
Anna Nagar  
Madras 600 040  
T: 91-44-6261161  
F: 91-44-6261026 (hatchery)

Tanna Shrimp Mart Ltd  
281 Precision Plaza  
Mount Rd  
Madras 600 018  
T: 91-44-4348158  
F: 91-44-4343150 (hatchery)

Blue Gold Maritech Ltd  
No2 Rutland Gate, 5th St.  
Madras 600 006  
T: 91-44 826 0175  
F: 91-44 825 6274 (hatchery)

Magunta Aqua Ltd  
9 Bazullah Rd  
T. Nagar  
Madras 600 017  
T: 91-44-8280321  
F: 91-44-8283108 (aquac. & hatchery)

S & S Industries Ltd  
Aarthi Chambers, 2nd Floor  
180 Anna Salai  
Madras 600 006  
T: 91-44-8250914  
F: 91-44-6257996 (aquac. & hatchery)

Sharat Seafood Ltd  
122 T T K Rd  
Alwarpet  
Madras 600 018  
T: 91-44-4994663  
F: 91-44-4995893 (aquac. & hatchery)

N N Sharma, Man. Dir  
Green Hills Plantations  
Som Dull Chambers  
11, 9, Bhikaji Cama Place  
New Delhi 110 066  
T: 91-11-6423313  
F: 91-11-6874556

R S Kurar  
Sudesh Seafoods Ltd  
B 2 'Simran', 46 Sher-E Punjab Soc.  
Brakar Caves Rd  
Mumbai 400 093  
T: 91-22-6360451  
F: 91-22-8361483

S S Tadjudeon  
Mumbai Sheetal Pvt Ltd  
B-11, Maherzin Co-op Housing Soc. Ltd  
Wodehouse Rd  
Colaba  
Mumbai 400 005  
T: 91-22-2184567  
F: 91-22-2181204

Tata Exports Ltd  
Shah House, Shivsagar Est.  
Dr Annie Bassant Rd  
Mumbai 400 018  
T: 91-22-4920300  
F: 91-22-4926379

M I Essa  
Manager  
Seven Seas India  
A-1, Gems Court  
14 Khadar Naway Khan Rd  
Madras 600 006  
F: 91-44-8257170 (freshwater fish)

K Joshua  
Proj. Manager  
Tasparac  
Shrimp Hatchery Complex  
48-7-9 Speenager  
Vishakhapatnam 530 016  
T: 91-691-52860  
F: 91-691-47190 (freshwater fish)

G M Nair  
Gen. Manager  
Brittania Industries Ltd  
15 Tartalla Rd  
Calcutta 700 088  
T: 91-33-4784850  
F: 91-33-4784456 (lobster)

P Rajarainam  
Man. Dir.  
Grounders Rice Exports Ltd  
6 Haddows Rd  
1st Street  
Madras 600 006  
T: 91-44-827-1389  
F: 91-44-828-4922 (shrimp)

Shashi Kumar  
Director  
Roshni Seafoods Ltd  
Trade Centre, 2nd Floor  
114 Wahaan Rd  
Madras 600 002  
T: 91-44-833314 (shrimp)

Mac Industries Ltd  
183 Mount Rd  
Madras 600 015  
T: 91-44-2351911  
F: 91-44-2353505 (aquac. & hatchery)

United Freshwater  
Prawn Hatcheries Pvt. Ltd  
827 Eleventh Cross  
Thillainar  
Trichy 620 018  
T: 91- 265451, 40652  
F: 91- 493-9971 (hatchery)

Sharat Seafoods Ltd  
207 Lingapur Building  
Amrutha Estate  
Himayat Nagar  
Hyderabad 500 029  
T: 91-842-236604  
F: 91-842-210569 (hatchery)

Southern Seafoods Ltd  
No 64, Monteith Road  
Egmore  
Madras 600 008  
T: 91-44-869675/869586  
F: 91-44-868165 (hatchery)

Rosen Fisheries  
Marathakkara Post  
Thrissur  
Kerala 680 320  
T: 91-487-272894  
F: 91-487-873371 (hatchery)

MPDA Prawn Hatchery  
Prawn Farm Project Complex  
Vallarpadom  
Kochi 682 031  
T: 91- 361724 (hatchery)

Nikita Aquaculture Pvt., Ltd  
21 Padmanabha 2nd Street  
Adyar, Madras 600 020  
T: 91-44-491-9494  
F: 91-44-491-0755

<b>Web Sites relevant to Aquaculture</b>	
Northern Aquaculture	<a href="http://www.islandnet.com/~chet/newpart.htm">http://www.islandnet.com/~chet/newpart.htm</a>
Fisheries and Oceans	<a href="http://www.ncr.dfo.ca/home.htm">http://www.ncr.dfo.ca/home.htm</a>
Industry Canada	<a href="http://info.ic.gc.ca/ic-data/">http://info.ic.gc.ca/ic-data/</a>
Aquaculture Abstracts	<a href="http://sunsite.nus.sg/bibdb/subjmenus/subj24.html">http://sunsite.nus.sg/bibdb/subjmenus/subj24.html</a>
Documents on Aquaculture	<a href="http://www.alternative.com/libs/agaqua.htm">http://www.alternative.com/libs/agaqua.htm</a>
Aquaculture	<a href="http://sunsite.nus.sg/bibdb/subjmenus/subj87.html">http://sunsite.nus.sg/bibdb/subjmenus/subj87.html</a>
Can. Inst. Biotechnology	<a href="http://www.biotech.ca/">http://www.biotech.ca/</a>
AquaNic	<a href="http://weber.u.washington.edu/~aqualink/index.html">http://weber.u.washington.edu/~aqualink/index.html</a>
Biotechnology Practice (KPMG Can.)	<a href="http://www.kpmg.ca/bio-main.html">http://www.kpmg.ca/bio-main.html</a>
Univ. Arizona	<a href="http://ag.arizone.edu:80/azaqua">http://ag.arizone.edu:80/azaqua</a>
Aquaculture Development Programme	<a href="http://www.htdc.org/~dlnr/adp/adp.html">http://www.htdc.org/~dlnr/adp/adp.html</a>
Seafood	<a href="http://www1.usa1.com/~bcurran">http://www1.usa1.com/~bcurran</a>
Seafood Data Search	<a href="http://www.seafood.com/biz/tsackton/index.html">http://www.seafood.com/biz/tsackton/index.html</a>
World Aquaculture Soc.	<a href="http://thorplus.lib.purdue.edu/AquaNic/was.html">http://thorplus.lib.purdue.edu/AquaNic/was.html</a>
Worldwide Guide to Aquaculture	<a href="http://www.theworld.com/SCIENCE/AQUACULTURE">http://www.theworld.com/SCIENCE/AQUACULTURE</a>
Aquaculture Management	<a href="http://www-erp.phys.ocean.dal.ca/applications/aqua.html">http://www-erp.phys.ocean.dal.ca/applications/aqua.html</a>
Aquanet	<a href="http://www.aquanet.com/aquanet">http://www.aquanet.com/aquanet</a>
Canada Aquaculture Inst.	<a href="http://www.upei.ca/icmp.html">http://www.upei.ca/icmp.html</a>
Aquaculture Information Centre	<a href="http://www.nalusda.gov/aic/">http://www.nalusda.gov/aic/</a>
Aquaculture Research	<a href="http://www.ncr.dfo.ca/regions/maritime/sabs/aqua.htm">http://www.ncr.dfo.ca/regions/maritime/sabs/aqua.htm</a>
Aquanic Sources	<a href="http://www.ansc.purdue.edu/aquanic/">http://www.ansc.purdue.edu/aquanic/</a>
B.C. Dept. Agric., Fish	<a href="http://bbs.qp.gov.bc.ca/bcmaff/bcagweb.htm">http://bbs.qp.gov.bc.ca/bcmaff/bcagweb.htm</a>
Dept. Fisheries and Oceans	<a href="http://www.ncr.dfo.ca/home.htm">http://www.ncr.dfo.ca/home.htm</a>
Marine Aquaculture Act 1995	<a href="http://www2.hawaii.edu/ulib2/aqua/aqua-leg.html">http://www2.hawaii.edu/ulib2/aqua/aqua-leg.html</a>
Electronic Silk Road - Marketplace	<a href="http://www.usa1.com/~ibnet/marketp.html">http://www.usa1.com/~ibnet/marketp.html</a>
Bioweb Aquaculture Biotechnology	<a href="http://www.bioweb.org/aqua/index.htm">http://www.bioweb.org/aqua/index.htm</a>
International Marine Biodiversity Corp.	<a href="http://www.phys.ocean.dal.ca/ocevision/Companies/IMBDC.html">http://www.phys.ocean.dal.ca/ocevision/Companies/IMBDC.html</a>

Asian Institute of Aquaculture	<a href="http://www.ait.ac.th/AIT/aqua/homepg.htm">http://www.ait.ac.th/AIT/aqua/homepg.htm</a>
Univ. Tasmania - Aquaculture	<a href="http://info.utas.edu.au/docs/aquaculture">http://info.utas.edu.au/docs/aquaculture</a>
Institute of Aquaculture - Stirling	<a href="http://www.stir.ac.uk/aqua">http://www.stir.ac.uk/aqua</a>
Resources on Aquaculture	<a href="http://seagrant.d.umn.edu/~seagr/aqua.html">http://seagrant.d.umn.edu/~seagr/aqua.html</a>
ICAR	<a href="http://aceis.agr.ca/icarhome.html">http://aceis.agr.ca/icarhome.html</a>
National Aquaculture Information Centre Documents	<a href="http://www.ansc.purdue.edu/aquanic/publicat/govagen/NAL">http://www.ansc.purdue.edu/aquanic/publicat/govagen/NAL</a>
Potential of Aquaculture in Bermuda	<a href="http://www.bbsr.edu/Spec.Pub.List-95-ToC.html">http://www.bbsr.edu/Spec.Pub.List-95-ToC.html</a>
Aquaculture Institute	<a href="http://mendel.mbb.sfu.ca/fish/fish.html">http://mendel.mbb.sfu.ca/fish/fish.html</a>
Hydroponic Aquaponic Aquaculture	<a href="http://www.intercom.net/biz/aquadu/hatech/">http://www.intercom.net/biz/aquadu/hatech/</a>
Aquaculture Related Items (Aqua-L list server, etc.)	<a href="http://www.ansc.purdue.edu/aquanic/infosorcs/">http://www.ansc.purdue.edu/aquanic/infosorcs/</a>
US Dept. Agriculture	<a href="http://www.nalusda.gov/other-internet-sites/accessw3.html">http://www.nalusda.gov/other-internet-sites/accessw3.html</a>
US Fish and Wildlife Services	<a href="http://www.fws.gov/fishery.html">http://www.fws.gov/fishery.html</a>
Gateway Catalog: Aquaculture	<a href="http://www.mannlib.comell.edu/catalog/subject/ag-aqua.html">http://www.mannlib.comell.edu/catalog/subject/ag-aqua.html</a>
Aquaculture E-Mail List (World)	<a href="http://www.cco.caltech.edu/aquaculture.html">http://www.cco.caltech.edu/aquaculture.html</a>
Inst. Marine Biosciences	<a href="http://www.imb.nrc.ca/imb/imb.html">http://www.imb.nrc.ca/imb/imb.html</a>
Aquatic Animals - E-Mail Lists	<a href="http://www.act.win.com/fish/lists.html">http://www.act.win.com/fish/lists.html</a>
Newfoundland Inst. Fisheries Research	<a href="http://www.dlo.agro.nl/dlo/rivo-dlo.html">http://www.dlo.agro.nl/dlo/rivo-dlo.html</a>
International Ocean Inst.	<a href="http://is.dal.ca/~mjwood">http://is.dal.ca/~mjwood</a>
Vaccine Delivery	<a href="http://www.ucs.mun.ca/~stephenm/vacdeliv.html">http://www.ucs.mun.ca/~stephenm/vacdeliv.html</a>
Guide to Sustainable Aquaculture Archives	<a href="http://sunsite.unc.edu/london/sustainable-agriculture.html">http://sunsite.unc.edu/london/sustainable-agriculture.html</a>
Infobiotech Canada	<a href="http://www.ibr.nrc.ca/ibr">http://www.ibr.nrc.ca/ibr</a>
Arizona Aquaculture	<a href="http://ag.arizona.edu/azaqua/">http://ag.arizona.edu/azaqua/</a>

<b>Web Sites - India</b>	
Asia Trade and Business Opportunities	<a href="http://www.asia-directory.com/~bruno/">http://www.asia-directory.com/~bruno/</a>
India World	<a href="http://www.indiaworld.com">http://www.indiaworld.com</a>
India	<a href="http://www.indiaserver.com">http://www.indiaserver.com</a>
Business Line	<a href="http://www.indiaserver.com/news/bline/bline.html">http://www.indiaserver.com/news/bline/bline.html</a>
India Network	<a href="http://India.bgsu.edu/index.html">http://India.bgsu.edu/index.html</a>
Bombay - Gateway to India	<a href="http://www.bchs.uh.edu/~mdoshi/bombay/bombay.html">http://www.bchs.uh.edu/~mdoshi/bombay/bombay.html</a>
UUNet India	<a href="http://www.uunet.in/">http://www.uunet.in/</a>
Indian Economy	<a href="http://www.webcom.com/~prakash/ECONOMY/">http://www.webcom.com/~prakash/ECONOMY/</a>
INDOLink	<a href="http://www.genius.net/indolink">http://www.genius.net/indolink</a>
Infotech Enterprises	<a href="http://infotech.stph.net">http://infotech.stph.net</a>
News India Online	<a href="http://www2.ios.com/~newsindi">http://www2.ios.com/~newsindi</a>
India Web	<a href="http://www.webindia.com">http://www.webindia.com</a>
India Corporate Gateway	<a href="http://www.owl.net.rice.edu/~ravi/india/index.html">http://www.owl.net.rice.edu/~ravi/india/index.html</a>
Access India	<a href="http://www.accessindia.com/">http://www.accessindia.com/</a>
Explore India	<a href="http://delta.org/~srivasta/index.html">http://delta.org/~srivasta/index.html</a>
Asia Compass	<a href="http://www.singnet.com.sg/~datum/welcome.html">http://www.singnet.com.sg/~datum/welcome.html</a>
Access Asia	<a href="http://www.accessasia.com/">http://www.accessasia.com/</a>
Know About India	<a href="http://www.cs.buffalo.edu/~skumar/india.html">http://www.cs.buffalo.edu/~skumar/india.html</a>
Indian Colleges etc.	<a href="http://www.cs.wisc.edu/~shubu/iitk/colleges.html">http://www.cs.wisc.edu/~shubu/iitk/colleges.html</a>
World Business Centre	<a href="http://IndiaOnline.com/wbc.html">http://IndiaOnline.com/wbc.html</a>
India	<a href="http://spiderman.bu.edu/misc/india">http://spiderman.bu.edu/misc/india</a>
Research Institutes in India	<a href="http://iucaa.emet.in/india-inst.html">http://iucaa.emet.in/india-inst.html</a>
Raj's India List	<a href="http://archive.cis.ohio-state.edu/~singh-rv/india/india.html">http://archive.cis.ohio-state.edu/~singh-rv/india/india.html</a>
Home Page of India	<a href="http://www.jagunet.com/~mahesh/india.html">http://www.jagunet.com/~mahesh/india.html</a>
India	<a href="http://longyear.acs.nmu.edu/~bobby/india.html">http://longyear.acs.nmu.edu/~bobby/india.html</a>
India Online	<a href="http://indiaonline.com">http://indiaonline.com</a>
India Information	<a href="http://sunsite.sut.ac.jp/asia/india">http://sunsite.sut.ac.jp/asia/india</a>

<b>Trade Shows &amp; Conferences</b>		
<b>NAME</b>	<b>PLACE / DATE</b>	<b>CONTACT / FAX N°</b>
World Aquaculture 96 (ref. only) World Aquaculture Soc. Conf. and Exhibition	Bangkok, Thailand Jan 29, 1996	J. Massey 504-388-3493
International Boston Seafood Show (ref. only)	Boston March 12, 1996	Diversified Expositions 207-772-5059
European Seafood Exposition (ref. only)	Brussels April 23, 1996	Diversified Expositions 207-772-5059
Tokyo International Seafood Show	Tokyo June 11, 1996	contact: 81 3814 8687
Atlantic Aquaculture Fair	St. Andrews June 20, 1996	S. Brittain 506-658-0750
Aqua Tech Asia 96 (water technology)	Singapore June 24, 1996	Int. Assoc. Water Quality 44 171 233 1197
Aquaculture Canada 96	Ottawa June 2, 1996	contact: 506-529-4609
Second World Fisheries Congress	Brisbane, Australia July 28, 1996	contact: 617-369-1512
International Congress on Fish Biology	San Francisco July 14, 1996	D. MacKinlay 604-666-3540
American Fisheries Society Trade Show	Dearborn, Michigan August 25, 1996	Amy Fink 301-897-8096
Aquaculture Asia 96 and Aquatech 96	Kuala Lumpur Sept. 25, 1996	Infish 603-291-6804
Aquatech 96 (water technology)	Amsterdam Sept. 23, 1996	Amsterdam RAI 31 20 646 4469
India International Trade Fair	New Delhi Nov. 14, 1996	Indian Trade Promotions 91 11 331 8142
Aquacoltura 96	Verona, Italy Date:	Fiera de Verona 39 45 588 237
AHARA	New Delhi Jan. 12, 1997	Indian Trade Promotions 91 11 331 8142

Aqua-Fisch 97	Friedrichshafen, Germany Feb. 27, 1997	49 7541 708110
Environ - Watertec India 97 (no details)		
Seapex 97	Lorient, France	M Vieira 416 929 2564
Aquaculture Europe 95 and Aqua Nor 97 Trade Show	Trondheim, Norway	Nor-Fishing 47 73 51 61 35
Indian Seafood Trade Fair 98		Marine Prod. Export Dev. Auth. 91 484 313361

<b>Selected Indian Aquaculture Company Profiles • 1993</b>	
<b>Alsa Marine</b>	<ul style="list-style-type: none"> <li>• 32ha shrimp farm producing 2500 - 3000 t/y at 4t/ha/c</li> <li>• 20000t/y processing plant</li> <li>• 1500t capacity cold storage</li> </ul>
<b>Rank Aqua</b>	<ul style="list-style-type: none"> <li>• 150ha shrimp farm producing at 5t/ha/c</li> <li>• 100M seed/y prawn hatchery</li> <li>– Spin-off company Somkan marine produces feed and technology through its links with a Taiwan company</li> <li>– Tech. transfer to Rank also from Aquafarm in the Philippines</li> </ul>
<b>S &amp; S Industries</b>	<ul style="list-style-type: none"> <li>• hatchery for shrimp seed</li> <li>• grow-out ponds</li> <li>• processing plant</li> <li>– Technical assistance agreement with Hanaqua of Taiwan</li> </ul>
<b>Innovative Marine</b>	<ul style="list-style-type: none"> <li>• processing plant rated at 24000t/y</li> </ul>
<b>Mac Industries</b>	<ul style="list-style-type: none"> <li>• 42ha prawn farm rated at 5t/ha/c</li> <li>• 2 prawn hatcheries</li> <li>• 2 processing plants</li> <li>– Technology transfer agreements with Trudina Investments, Japan</li> </ul>
<b>Waterbase</b>	<ul style="list-style-type: none"> <li>• 70M seed/y shrimp seed</li> <li>• 112ha farm</li> <li>• 1500t/y feed plant</li> <li>• 2000 capacity freezer plant</li> </ul>
<b>NOCIC</b>	<ul style="list-style-type: none"> <li>• seafood processor who buys shrimp from satellite producers to whom it supplies know-how, seed, and feed</li> </ul>
<b>Hindustan Lever</b>	<ul style="list-style-type: none"> <li>• 65ha shrimp farm</li> <li>– Running a catfish production project: large processor of fish, lobster, surimi</li> </ul>
<b>DCL Maritec</b>	<ul style="list-style-type: none"> <li>• hatcheries</li> <li>• grow-out ponds</li> <li>• 1500t/y processing plant</li> <li>– Technical assistance provided by CPA Aqua of Thailand</li> </ul>
<b>King International</b>	<ul style="list-style-type: none"> <li>• 100M/y prawn seed: second hatchery at 50M/y</li> <li>• 120ha shrimp farm</li> <li>• 2 processing plants</li> </ul>
<b>Vijaya Shrimp Farms</b>	<ul style="list-style-type: none"> <li>• 4M/y hatchery</li> <li>• 53ha farm</li> <li>• process plant</li> <li>– Feed supplied by Hanaqua of Taiwan</li> </ul>
<b>Suvarna Aqua</b>	<ul style="list-style-type: none"> <li>• 200M/y shrimp seed hatchery</li> <li>• 9600/y feed plant</li> <li>• processing plant</li> <li>– Linked to Talcott, USA for hatchery and grow-out technology, to Gold Coin, Singapore for shrimp feed and to Asia Pacific for processing</li> </ul>

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