PROSPECTS OF MARKETING THE INDIGENOUS ORNAMENTAL FISHES OF KERALA

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CERTIFICATE

This is to certify that the thesis entitled **"Prospects of Marketing the Indigenous Ornamental Fishes of Kerala"** is an authentic record of research work carried out by Smt. Mini Sekharan. N under my guidance and supervision in partial fulfillment of the requirements for degree of **Doctor of Philosophy** in School of Industrial Fisheries, Cochin University of Science & Technology, Kochi-16, under the faculty of Marine Sciences. No part of the thesis has been presented for any Degree or Diploma.

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Kochi-16
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ABBREVIATIONS

AVA	Agro Vetenary Authority
BOBP	Bay of Bengal Project
C&F	Cost and freight
C.I.F	Cost, insurance and freight
CBI	Centre for the Promotion of Imports from Developing Countries
CIFT	Central Institute of Fisheries Technology
CITES	Convention on International Trade in Endangered Species of Wild Fauna & Flora
CMFRI	Central Marine Fisheries Research Institute
COP	Conference of Parties
CR	Critically Endangered
DA7	Dead after seven days
DD	Data deficient
DEPB	Duty exemption pay back scheme
DMP	Domestic market preference
DNA	Deoxy Ribo Nucleic Acid
DOA	Dead on Arrival
EEFC	Export earners foreign currency
EMS	Environmental Management System
EN	Endangered
FAO	Food and Agricultural Organisation
FIRMA	Fish Resource Management Society
FOB	Freight On Board
GDP	Gross Domestic Product
HPE	Highly preferred in the export market,
HK$	Hong Kong Dollar
IATA	International air transport association
ICAR	Indian Council of Agricultural Research
ITC	International Trade Centre
IUCN	International union for conservation of Nature & Natural Resources
KMO	Keiser Meyer Olkin measure of sampling adequacy
LAR	Live Animal Regulation
LPE	Low Preference in the Export Market
LR/nt	Low risk near threatened
MAC	Marine Aquarium Council
MDA	Market Development Assistance
MPE	Medium preferred in the export market,
MPEDA	Marine Products Export Development Authority
NBFGR	National Bureau of Fish Genetic Resources
OIE	Office International Des Epizootics
PCA	Principal Component Analysis)
PIJAC	Pet industry joint advisory council
QMS	Quality Management system
R^2	Coefficient of determination
RFP	Red fluorescent protein
SPS	Sanitary and Phyto Sanitary
SPSS	Statistical Package for Social Sciences
SWOT	Strength Weakness Opportunities and Threats
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development report
UNEP	United Nations Environmental Programme
US$	United States Dollar
USA	United States of America
VU	Vulnerable
WTO	World Trade Organisation
β	Rate of change in growth

Chapter 1

Introduction

1.1 General Introduction

The keeping of ornamental fish in aquaria is an age old hobby, popular even today irrespective of age, class, creed or geographical variations in the residing area of hobbyists. In the contemporary times of space restrictions and craze for beautifying interiors, the aquariums have become an integral element of homes, offices, hospitals, hotels, business establishments, airports and other institutions. As popularity gained momentum, the need to transfer ornamental fishes from the resource abundant places to resource deficient places resulted in the marketing of ornamental fishes. The significance of ornamental fish trade was brought to light by International Trade Centre/ United Nations Conference on Trade and Development report (ITC, UNCTAD) on International trade in Tropical aquarium fish (Anon,1979) which portrayed the trade statistics as US $ 600 million at wholesale level or US $ 200 million in terms of imports (Cost & Freight). The report further added that, the domestic breeding costs in the principal markets rose sharply since 1973-74 and many developing countries got the opportunity to increase their export sales of exotic species. Hence it began to be less profitable to breed tropical fishes than to import stock and breeders or wholesalers found it necessary to supplement their product lines by imports to meet the rapid rise in demand in terms of quantity and species. From then, the hobby of keeping flashing colourful fish in aquaria which started as a plain pastime, transformed into a million dollar business in the world export market. According to Chapman (2000), the popularity and high value of ornamental fish have placed ornamental fish production among the leading cash crops in the

aquaculture economy. Now it is for the developing countries to realise the potential of aquarium fisheries as an alternative economic activity and also form an important source of foreign exchange.

The era of globalisation which gained momentum in the nineties dismantled the tariff barriers to facilitate world trade and opened up new opportunities for both developed and developing countries, but it also posed serious risk to countries which were unable to reform their own markets to meet the requirements of the increasing non-trade barriers and become internationally competitive. From pepper and spices, to coffee and tea and then to shrimps and seer fish, Kerala's rich and varied export fare has been susceptible to the ebbs and tides of the national and international market for centuries and now it is the turn of the indigenous ornamental fishes of Kerala to be similarly affected.

1.1.1 History of ornamental fish keeping and marketing

The Britannica Encyclopedia (Anon, 2003a) noted the earliest known aquarists as the Sumerians, who kept fishes in artificial ponds at least 4500 years ago. The Encyclopedia added that the earliest records of fish keeping were reported from ancient Egypt and Assyria. The Chinese who raised carp for food as early as 1000 BC were probably the first to breed fish with any degree of success. The selective breeding of ornamental fish was later introduced to Japan, where the breeding of ornamental carp was perfected. The ancient Romans, who kept fish for food and entertainment, were the first known marine aquarists and it was in the works of Philip Gosse, a British naturalist that the term aquarium first appeared.

According to Fossa (2004a and b) reliable ancient sources indicated that the very first fish keepers who kept fish in ponds, lived in the Middle Eastern cultures of Assyria, Sumeria and Mesopotamia already more than 4000 years ago, but their interest in the fishes beyond their practical use for human consumption was not clear. Egyptians and Romans showed obvious interest in the decorative value of the fishes they kept. The honour for having created the first truly domesticated fish was attributed to the Chinese. Fossa (2004a and b) further added that the earliest Chinese literature that mentions gold fish dates from the first half of the first millennium and notes the reports of specimens of wild fishes with red scales in the Tsin dynasty or Gin dynasty period of AD 265 to AD 420. Religious aspects might have played a key role in elevating these red scaled fish from a merely interesting natural phenomenon, up to a first case of domestication of fish. Buddhism came to China from India in the first century of the first millennium, and one of its more important tenets was to respect all forms of life. With their conspicuous colour, the early gold fishes were very likely candidates for keeping in fish ponds within Buddhist temple and monasteries.

Anon (2002b) mentioned that the first long distance transportation of fishes took place in the 6th century AD in Europe and it was Cassiodorus who in 490-585 AD wrote how live carps were sent from Danube to Ravenna in Italy. According to Fossa (2004a) Chinese source from the 16th century tell of single coloured goldfish, as well as multicoloured variegated fishes. As early as the 16th century, goldfish was well

established in Japan, and about a hundred years later, the first imports to Europe took place. By 1910, large number of foreign fishes primarily from the South America and Asia had been imported into Europe and via Germany, many of them rapidly entered the United States of America, among them were Siamese fighting fish and the guppy. While goldfish or carp are often associated with Japan, they were actually first bred for their beauty and colour in China more than 1,000 years ago. Goldfish were first exported to Japan around 1500s, becoming an instant sensation. By the late 1600s, goldfish were brought to England, and over the next century they became very popular in ornamental lakes and ponds throughout the country. But Goldfish became commonplace in America only by the mid 1800s.

The principal factor in the growth of international trade in aquarium fish has been the development of international civil aviation since the second world war or perhaps by late 1960s (Anon,1979). World trade in tropical aquarium fish had assumed new dimensions leading to the changes in supply and distribution patterns in importing countries. Very recent innovations have been the advent of plastics and other modern materials. These resulted in cheaper and more plentiful equipment thus bringing the hobby within reach of even more people. When domestic electricity became available at the turn of the century, other species which required heating and other special conditions began to be kept and by about 1930 it became possible to keep saltwater fish in captivity, although high costs and supply distances restricted their acquisition. Because of

high mortality and expenses, marine aquariums were not found commonly in private homes before the middle of 1960s. Kvalvaagnaes (1982) wrote that, since 1970s technological advances from transportation improvements to artificial sea water, high powered filtration pumps and protein skimmers made it possible to distribute saltwater fishes from remote, formerly inaccessible regions to demand centres and for amateurs to successfully keep them in aquaria. According to Wabnitz *et al.,* (2003) it is generally acknowledged that the collection and export of tropical marine fish for aquarium trade started in Srilanka in 1930, on a small scale. During the last quarter century and particularly during the last ten years, technology has developed to enable the keeping of tropical fishes with relative ease. This has fuelled a renaissance in fish keeping in general, as these beautiful tropical fishes have made their way into the living rooms around the world.

1.1.2 World status of ornamental fish marketing

Olivier (2001a) mentioned that the total wholesale trade in ornamental fish is estimated at about US $ 900 million and the retail trade of US $ 3000 million (Live animals for aquarium only). Singh and Dey (2003) noted that the estimated annual wholesale value of world trade in ornamental fish is estimated to be more than US $ 1 billion and in the retail level about US $ 1.5 billion fish are traded annually worth US $ 6 billion. The entire industry including accessories is estimated to be worth about US $ 14 billion.

Lim (2005) pointed out that, based on extrapolation from partial estimates of the United Nations Environment Programme in 2001, the

value of the marine ornamental fish trade was US $ 200-300 million per year and accounted for about 10% of the total international ornamental fish trade and indicated that the total ornamental fish trade could be as high as US $ 2-3 billion a year. Latest FAO statistics presented the world ornamental fish trade as US $ 448.77 million. Of this US $ 227.96 million is from imports and US $ 220.81 million is through exports (FAO, 2003). Rana (2004) argued that the differences between imports and exports may be mainly attributed to the undervaluing of exports for customs and tax reasons and inclusion of freight and import tariff. FAO (2003) statistics shows that, with an import of US $ 64.22 million, USA stands on top of the charts and Singapore tops the exporters list, with an export of US $ 41.43 million.

1.1.3 Ornamental fish trade in India

Hindu mythology glorified the Matsyavatara, the divine creations of nature which depicted the reincarnation of Lord Maha Vishnu and hence the Indians respected fishes, from time immemorial. Kulkarni (1982a) stated that Nawabs of Aoudh of Pre British days were said to have been interested in fish but whether they kept aquarium fish is not yet known. According to Sane (1982a), it was in Bombay in the first or second decade of the present century that aquarium keeping commenced as a hobby on a small scale which led to the formation of societies in Madras and Bombay and especially the Taraporewala aquarium in 1951. He further added that the aquarist society of India had held shows in Bombay while some were held in Madras a little later and as the hobby increased on one side, the

number of public aquaria grew through out India and in the past two decades, it has been growing by leaps and bounds. By 1965 ornamental fish exporters could get enrolled with Marine Products Export Promotion Council and the registration of Marine Products Export Development Authority (MPEDA) came into force in 1973 (Sane, 1982a). MPEDA obtained inspiration from the ITC, UNCTAD/GATT report on ornamental fish trade (Anon, 1979) and organised a seminar in Bombay in 1982, thus beginning its activities for promoting ornamental fish trade. A compilation of the on the ornamental fish exports from MPEDA Statistics Review during the period 1969 to 2005, revealed that Indian ornamental fishes have been exported for the past 36 years. The export started on an experimental basis in 1969 with foreign exchange earnings to the tune of US $ 0.04 million (16.4 lakhs) and grew to US $ 0.99 (443.84 lakhs) in 2004-2005. On comparing the latest export statistics in the world trade i.e. 220.08 million US $ (FAO, 2003) with the export statistics from India in the corresponding year i.e. Rs. 254.95 lakhs (MPEDA Statistics Review, 2003), it was noted that the share of India formed just 0.25% of the world exports.

1.2 Background of the study

The fisheries sector plays a pivotal role in the national economy of India, in view of its contribution to the food basket. According to Yadava (2005), this sector contributed Rs. 1,37,180 million to the Gross Domestic Product (GDP) during 2003-2004 (at constant prices), which amounted to 4.42 percentage share in agriculture GDP and 0.96 percentage in the total

GDP. Viewing the categorisation of ornamental fishes in India's export basket it can be seen that they come under marine products export, which in turn is included in the agriculture and allied products export. According to Venkateshan (2006), export of marine products amounted to Rs.6646.69 Crores in 2004-2005 and ornamental fish export during that year (443.84 Lakhs) formed 6.68% of the marine product exports. The ornamental fish export from Kerala in that year (4.6 Lakhs) as per MPEDA Statistics, formed just 1.03 % of the Indian ornamental fish exports in 2004-2005.
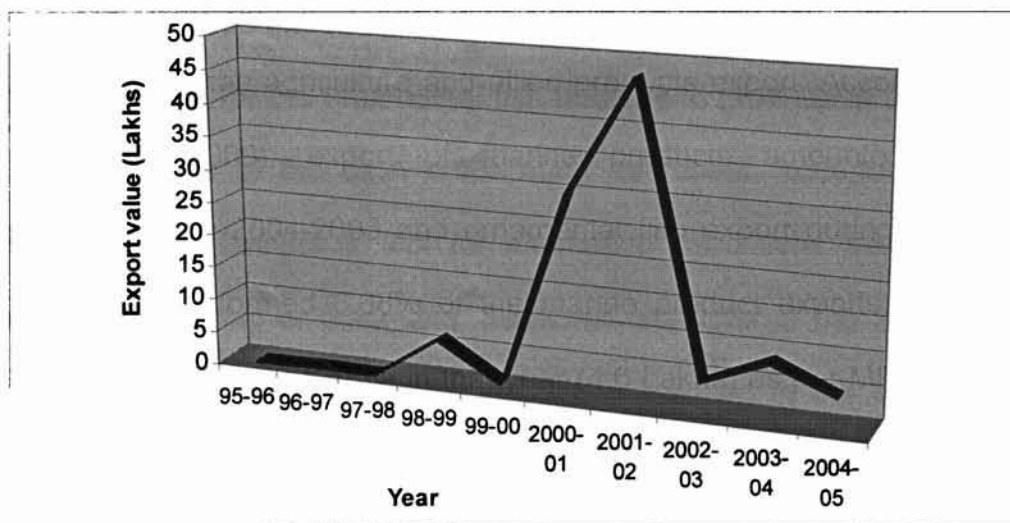
Figure 1.1 Ornamental fish export from Kerala

Figure 1.1 depicts the ornamental fish export from Kerala during 1995-96 to 2004-2005. The figure reflects a decline in exports from Kerala after a peak in 2000-2002 periods which formed a major impetus for the study.

1.3 Relevance of the study

The fisheries sector of Kerala is well developed but compared to the food fish sector the ornamental fish sector has not picked up. Several studies on the indigenous ornamental fish resources of Kerala are presented in

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the literature review section of the study which pointed out that there was a potential for marketing those fishes and described no further. Hence marketing research has to prepare the firms in Kerala to a new world prospect of the trade to sustainably market the indigenous ornamental fishes of Kerala. The economic benefits of aquarium fish trade and especially indigenous ornamental fish trade have accrued only to a few, but it can create a lot of job opportunities at all levels that include primary, secondary and tertiary as well as ancillary industries connected with aquarium business and also bring in foreign exchange earnings. Given the necessary encouragement and required assistance by all concerned, there is a very good scope for the ornamental fish Industry to grow up in a fast pace. Fall in prices of the cash crops such as rubber, coconut and arecanut persuaded farmers to opt for alternative avocations such as ornamental fish breeding or marketing. Seasonal character of the fishing industry and the post tsunami scarcity for fishes resulted in the limited employment for fishermen and they too looked forward to alternative sources of income. Hence the farmers and fishermen who have access to downstream of water bodies and tribal people or fishermen who have access to upstream water bodies can be subjected to trainings in collection, breeding and marketing of indigenous fishes. The results of the study is expected to provide information on the sustainable marketing of the indigenous ornamental fish of Kerala and yield information needed by collectors, wholesalers, retailers and resource managers and new entrants, regarding the state of industry and provide suggestions for successful future management and policy making campaign.

1.4 Objectives of the study

The objectives of the research which seeked insights into the possibilities for marketing the indigenous ornamental fishes of Kerala were as follows,

1. To identify the marketers of India, catering the indigenous ornamental fishes of Kerala to the domestic and export markets, in order to compare the marketing mix strategies pursued by the different categories of marketers.

2. To find the most prospective export markets for the indigenous ornamental fishes of Kerala.

3. To study the consumer preferences in the domestic ornamental fish market of Kerala that will enable innovative ventures into this potential market to enhance the industry in a great way.

4. To conduct a SWOT analysis of ornamental fish industry in Kerala to analyse the strengths, weaknesses, opportunities and threats.

1.5 Limitations of the study

➤ Fishermen were not included as respondent marketers as they were not full time marketers engaging in indigenous ornamental fish marketing, by utilising the four marketing mix tools namely product, place, price and promotion.

➤ SWOT analysis was based on the results obtained from the previous chapters and were sorted under four heads namely strength, weakness, opportunity and threats.

1.6 Plan of the study

The thesis is organised into four sections. The first section is an introduction to the study and comprises Chapter one and Chapter two.

> ➤ Chapter one provides an overview of the study and describes the background of the study, history and status of ornamental fish keeping and marketing in the world, history and status of ornamental fish keeping in India, need for the study, the objectives probed, scope and limitations of the study, plan of the study and the literature survey.

> ➤ Chapter two discusses the research design and methodology.

The second section is on the marketing mix pursued in indigenous ornamental fish marketing and the section is spread into four chapters i.e. Chapter three, Chapter four, Chapter five and Chapter six.

> ➤ Chapter three portrays the indigenous ornamental fishes of Kerala in the marketing scenario.

> ➤ Chapter four outlines the channels of distribution in marketing indigenous ornamental fishes.

> ➤ Chapter five presents a study on the price of indigenous ornamental fishes.

> ➤ Chapter six examines the promotional strategies adopted to boost the ornamental fish sector in Kerala.

The third section is on the traditional markets and the future prospective markets for indigenous ornamental fishes of Kerala. The 7th and 8th chapters are included in this section.

➤ Chapter seven deals with prospects in export market for indigenous ornamental fishes of Kerala.

➤ The eighth chapter is devoted to the prospects in domestic market for indigenous fishes as ornamental fishes.

The fourth section is the concluding section which includes the ninth and tenth chapters.

➤ Chapter nine presents a SWOT analysis of the indigenous ornamental fish marketing industry in Kerala.

➤ Chapter ten gives conclusions and recommendations of the study.

1.7 Review of Literature

1.7.1 Marketing

As a prologue to the study on the prospects of marketing the indigenous ornamental fishes of Kerala, a scanning of literature on ornamental fish marketing was carried out to show the relevance and significance of the research objectives of the present study. The literature review also seeks to show that other researches have not yet adequately explored the objectives of the present study.

Generally people tend to equate marketing with selling. Levitt (1960) drew a perspective contrast between the selling and marketing concepts. Selling focuses on the needs of the seller; marketing on the needs of the buyer. Marketing management functions in the marketing literature is termed as marketing mix and the four factor classification of market mix was popularised by Mc Carthy (1981). Chaston (1984) states that in the fishing industry, the widely accepted image of marketing is that

it is simply responsible for promoting the product in order to increase sales. He also stressed the need to identify the product needs of the customers who make up the market sector in which the company operates, to ensure that the company's products offer the attributes most capable of satisfying the need. Only at this point in marketing process can the company begin to use the variables of price, promotion and distribution to generate the required level of sales. Chaston (1984) further added that, in the fishing industry there have been numerous examples of companies who failed to appreciate the full scope of marketing management functions and invested in increased capacity without assessing the real nature of the market need. American Marketing association defines marketing as the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual and organisational objectives (Bennet, 1988). The marketing concept holds that the key to achieving organisational goals consists in determining the needs and wants of target markets and delivering the desired satisfaction more effectively and efficiently than competitors. According to Shoot and Butte (1992), the concept of marketing mix refers to the set of controlled demand impinging instruments that can be combined into a marketing programme used by a firm (or any other organisation) to achieve a certain level and response from target market. Talukdar and Bhowmick (1993) points out that the perishable items having shorter life need special attention for orderly marketing to make them available at proper place, time and form desired by the consumers in well presented manner at proper place. Hence timely harvesting and

procurement, quick transportation, modern storage and processing, advance packaging and maintenance of a cool chain in their marketing process are some of the factors for immediate attention and a weak marketing process not only affects the social status of the producers and consumers but it also affects country's economy at large. Larkin *et al.*, (2001d) noted that the market data on ornamental fishes generally do not identify the attributes of the product fully and project price and quantity as if the products are homogenous and experimental market approach assumes that the product, ornamental fish is heterogeneous i.e. differentiated with respect to attributes such as species, country of origin, method of capture, culture, size, colour, price and condition. He carried out a study based on conjoint analysis which is an accepted methodology to elicit consumer preferences for product with different attributes of varying levels.

The booming ornamental fish trade has given rise to an extensive literature on various aspects relating to ornamental fish trade. The literature on ornamental fish trade in the study is described under the heads global ornamental fish trade, ornamental fish trade in different countries, the ornamental fish trade in India and Kerala with special reference to the indigenous ornamental fishes of Kerala.

1.7.2 Global ornamental fish trade

Conroy (1975) highlighted the international trade in ornamental species. Anon (1979) presents a study on international trade in tropical aquarium fish and carried out a market study in USA, Germany, UK, the

Netherlands, Belgium, Sweden, France and Switzerland and summarised the major findings as main characteristics of international trade in tropical aquarium fish by country. The report portrayed the data on demand, supply, import duties and taxes, distribution network, prices and trade practices. Bassleer (1994) stated that worldwide sales of ornamental fish are estimated at US $ 900 million wholesale and US $ 3 billion retail. Some 99% of the market comprises home hobbyists with the remaining 1% consisting of public aquaria and research institutes. Ramachandran, (1999) presented an introduction to the international trade in ornamental fish. Olivier (2001b) described the dynamic distribution network in marketing. The study involved fishermen or collectors, the breeders, the wholesaler, the exporter, the importer, the transhipper, the retailer and other important players and also presented an overview of the supply and demand situation in ornamental fish trade. She also listed the problems in ornamental fish trade as supply problems, destructive fishing methods, mortality rates and the concept of sustainable development applied to fish keeping. Lim (2005) analysed the FAO trade statistics from 1976 to 2002 and noted that there were several trends emerging in the global ornamental fish trade. The international trade situation was further updated by Singh and Dey (2006).

1.7.3 Ornamental fish trade in different countries

Eichler (1981) discussed the possibilities and problems related to the exporting of ornamental fish from Mozambique. He stressed the need to investigate the market situation in Europe, America, Japan and South

Africa, the channels for export and maintained that to make recommendations for an export venture, it was necessary to look at what species are available for export, the possibility of catching and acclimatising them and the interest of dealers in buying them, conditions closely connected to their competitiveness with those being exported from other countries.

Albaladejo and Corpuz (1981) examined the status and trade mechanics of the Teh Aquarium Fish Industry of Philippines aiming at the establishing of guidelines for resource management schemes that would ensure the protection and continuous growth of the industry. Interviews were held with collectors, middlemen, and exporters concerning the history and present status of the industry. Inherent problems of the industry are reviewed and recommendations and suggestions as to what resource management policies can be promulgated to ensure the growth of the industry are presented in this paper.

Kvalvaagnaes (1982) described some of the problems to be overcome for Indonesia to successfully develop further its ornamental fish trade and also mentioned the sources of fishes, species, species of interest, prices, supply methods, marine invertebrates, and freshwater plants. Sadovy (1992) carried out a preliminary assessment of the marine aquarium export trade in Puerto Rico through a series of informal interviews and inspected the export shipment species lists of six major export business and noted that 106 species of fish and invertebrates were exported from the country which added to 160,000 and 200,000 organisms

in 1991. Seventy percent of this volume was composed of six species. He further added that the unregulated industry in the country needs urgent monitoring and regulating.

Jonklaas (1982) carried out pioneer works on ornamental fish trade from Srilanka and described the aquarium fish potential in some developing countries with special reference to Srilanka and India. According him the aquarium fishery in Sri Lanka began as long ago as the 1930s, but it was not until the 1950s that it was firmly established and began to expand. It is a high value industry, with viability dependent on a healthy resource base. Jonklaas (1985) wrote on the population fluctuations in some ornamental fishes and invertebrates off Sri Lanka. Roy (1995) wrote on better management of the ornamental fish sector in Srilanka and noted that captive breeding and export of ornamental fish was an important industry in Srilanka which provided jobs, incomes and foreign exchange but also raised environmental concerns and he added that Bay of Bengal Project (BOBP) brought all of ornamental fish industry's players together to discuss management. Madhu (1996a) in an article entitled business runs on trust presents the profile of the leading exporter from Srilanka who also put forward his views of trade and its management. The exporter opined that, rather than an absolute ban which would also ban the species in abundance, the fly by night operators are to be discouraged for management regulations. He also mentioned the transformation of the industry from a wild caught fish dependant one to tank raised fish dependant one. The industry which has no insurance runs

on trust as it is fraught with risks of delayed payment, mortality and natural disasters and profit margin has to cover all these. Madhu (1996b) writes on the ornamental fish divers of Srilanka who were instrumental in elevating the position of India in the world trade. Rana (1998) highlighted the factors that attributed to the incredible development of Srilankan ornamental fish sector of transforming itself from traditional marine ornamental fish exporting country to a source of high quality cultivated fishes thus increasing the exports from around US $ 0.5 to US $ 5 million between 1994 and 1996 exports. The factors noted were the shift from small backyard facilities where ornamental fishes were reared on a part-time ad hoc basis to purposely built facilities managed on a full-time professional basis, parallel development of components such as economic viability of production, nature of producer, organisation, local institutional and human capacity, relevant infrastructure and a sound appreciation of the intricacies of international markets, government incentives such as exemption of import duties on equipment and feed and local tax along with provision of land and infrastructure in some cases the entrepreneurship of the private sector. Werakoon (1998) gave a brief account of the development of the ornamental fish industry in Sri Lanka, considering future trends and requirements for advancements and covered areas such as adequate stocks of freshwater aquarium fish; harmony among breeders and exporters; research and development; government guidance and support; and adequate air freight facilities and export services. He concluded that research and development is a key activity to support the industry and there is a need to produce new varieties, prevent and treat

diseases, improve fish nutrition and feeding, and pass on technology and management practices to the small producer. Ekaratne (2000) briefly reviewed the status and trends in the export trade of ornamental fish species, the impact of the export effort on resources, and the status of information relevant for resource and habitat management. The study enlisted the marine and freshwater species, including endangered species, and explained of the population, biology, ecology and distribution of those fishes. Wijesekara and Yakupitiyage (2001) assessed the present status and future trends in the ornamental fish industry in Sri Lanka to probe the fish production system which caters the international market; and identified the constraints within the industry. They added that the aquarium fish industry in Sri Lanka has become a valuable foreign exchange earner during the past few years, by exporting wild caught marine, brackish-water and freshwater species as well as captive bred freshwater fish earning Rs.530 million in 1998.

Edward (1988) prepared a preliminary report on the aquarium fish trade of the Republic of Maldives. Edwards and Shepherd (1992) pointed out that the export of aquarium fish from the Maldives began in 1980 and in 1989 almost 54,000 marine fishes, worth approximately US $ 130,000, were exported. The collection of aquarium species is confined to a relatively small area around the capital island, Male. Estimates of annual exports of 95 species were obtained by examining packing lists held by Maldivian Customs. In parallel, the population densities of about 70 aquarium-fish species were estimated by visual assessment. Using a

number of assumptions, potential yields for 65 of these species, those for which export data were available, were estimated for the area (530 Km^2) within a 13 Km radius of Male. Monitoring and regulation of the aquarium fish trade is discussed, together with the need for collection of catch statistics by those involved in the trade. The importance of regulation of collection techniques, of standards of facilities, and of satisfactory packaging of fish for export, is stressed. If more accurate estimates of sustainable yields are to be obtained, there needs to be monitoring of populations of key aquarium fish species in designated collecting areas where exploitation levels are known. Until such estimates become available, the cautious approach adopted in the Maldives to estimate yields and set species-based quotas will, it is hoped, prevent local overexploitation. Adam (1995) reviewed the aquarium fish trade in Maldives. According to Adam (1997), the aquarium export fishery from Maldives started in 1979 exporting mainly to Sri Lanka. The fishery centered around the International airport where the fish are air freighted to Sri Lanka, Europe, USA and the Far East. About 100 species of fish are exported, with 20 species comprising over 75% of the trade. Some of the species exported are very rare in the Maldives and are very vulnerable to overexploitation. The fishery is reviewed and management issues and options for monitoring and regulations are also discussed.

Cheong (1996) gave an overview of the current international trade in ornamental fish with special reference to Singapore. Huat (2003) narrated the status of ornamental fish industry in Singapore and added

that, in spite of being a city state with very little land for agriculture, the country has more than 64 fish farms in 2001, and is the largest producer of farm bred fishes. For Singapore to remain competitive in the world market both farmers and the exporters of the country strive continuously for higher productivity and better fish quality. Agro Vetenary Authority (AVA) also works closely with the industry and the research institutes aiming at the improvement of production technology and fish quality for export. Lee (2005) attributes the success of ornamental fish industry in Singapore to its excellent operational environment and unique strength of local players. He also gave a brief account of the recent trends and issues confronted by the ornamental fish industry of the country. Ling and Lim (2006) presented a clear picture of status of the trade and farming in Singapore. The farms have added upto 70 with 156 hectre farm area which produced 132.9 million pieces of ornamental fish worth US $ 23.7 million, which accounted for 46% of the fish exported from the country.

Betram (1996) wrote on the aquarium fishery in Cook Islands and stressed the need for management and added that the recently developed fishery for aquarium fish has been a success in terms of creating employment, fisheries development and self imposed management. Graham (1996) described about the managing of Managing Palau's aquarium fishery and Graham (2001) wrote about the Live Reef Fisheries of Palau, its history and prospects for management.

Chapman *et al.,* (1997) stated that ornamental fish production is among the leading cash crops of the United States of America aquaculture

economy, and retail value of the fish trade is worth approximately US $ 1,000 million. Using import and export documents trends in total values for the U.S. trade in ornamental fish was reported and the number and value of the most commonly imported ornamental fish was found out. Adams *et al.,* (1999) projected the volume and value of marine ornamentals collected in Florida. Adams *et al.,* (2001) provides a brief description of the industry in Florida during the 1990s, focusing on the existing set of harvest regulations, trends in volume and value of landings by major species groups, and harvest by region, so that the resource managers can develop more effective regulatory measures that provide for the sustainability of the resource, thereby ensuring that Florida retains its share of this growing market. The marine life fishing industry in Florida is defined by the state as the non-lethal harvest of marine plants, finfish, and invertebrates that are sold live for commercial purposes (primarily into the saltwater aquarium industry). Adams *et al.,* (2001) while writing on International trade in live, ornamental 'fish' in the U.S. and Florida, described the U.S. trade in live, ornamental 'fish' during the 1994-98 periods. Imports and exports are discussed by country of origin and destination. In addition, trends in international trade in live ornamentals through Florida ports of entry are described. Where ever possible, these trends are described by product form. The discussion highlights the relative importance of the international market for this increasingly important market to purveyors of live marine ornamentals in Florida. Larkin *et al.,* (2001b) highlighted the economic profile of the Florida's marine life industry by summarising the industry data on total landings, revenues and trends over time. Regional analysis

showed the primary collecting areas located in Florida. Seasonal analysis shows when the majority of landings occur within the year. Statistics on the number of participants by type provide insight into the size of the industry. Trends are evaluated in terms of changes across the nine year period from 1990 to 1998. Larkin *et al.,* (2001c) carried out US tropical wholesalers survey to understand the demand for Florida products both domestically and internationally and the need for changes in the way industry is regulated and to provide insight concerning the following issues such as recent market trends and channels, importance of imports, differences in marketing imported versus domestic products, marketing advantages and disadvantages of species collected in Florida, identification of major foreign competitors, factors influencing sales of live animals and expectations on the future of the industry. The study stated that Florida firms deal primarily in marine species and collect much of their own product whereas wholesalers outside Florida handle more freshwater species and purchase most of their inventory, the majority from suppliers and the study suggested that the marketing strategies in Florida should point to the high quality of Florida species with emphasis on the growing popularity of the invertebrates.

Dufour (1997) concludes that harvest of ornamental marine fish is of economic interest for Pacific Island countries and if their transportation costs and salaries are controlled, the development of this activity could quickly yield for an annual harvest of 100,000 fish, a turnover of US $ 200,000 and 10 to 20 permanent jobs. He proposed that catches of

vulnerable species be regulated according to precautionary approach by setting quotas.

Chan and Sadovy (1998) carried out a market survey and review of government statistics to establish imports and exports of marine ornamental fishes into and out of Hong Kong, examined the local trade in terms of volume, value and species composition. The survey concluded that when compared with net imports, export and re-export volumes over the 15-year period were small, indicating that most imports entered the local market, or were exported, unrecorded. The market survey of marine aquarium shops in Hong Kong was carried out. From this survey, an annual estimate of 957,563 coral reef fish was calculated for the local trade, valued at HK $ 57,453,780, with a mean retail price of HK $ 60 per fish. These figures account for an estimated 2-3% of the global value and volume of marine aquarium fish trade, according to 1992 figures and, compared with government figures, indicate that official declarations of imports are under reported by at least 2-3 folds. A total of 342 marine aquarium fish species, from 49 families, were recorded with about 60% belonging to the families Labridae, Chaetodontidae, Pomacanthidae and Pomacentridae.

Fang (1998) presented a status report of the ornamental fish industry in Taiwan, which is recognised as an important exporter of ornamental fish. The steady supply of skilled manpower, long experience in ornamental fish cultivation, large domestic market and enterprising management are factors contributing to the success of the industry. Ten

major categories of exportable ornamental fishes from Taiwan are African Cichilids, blood Parrots, South American Cichilids, discus, killifish, koi and endemic freshwater varieties and marine varieties.

Daw *et al.*, (2001) describes the findings of research conducted in Eritrea in 1997, when the capture, transport and export of aquarium fish were reviewed and potential impacts and the status of management were investigated through liaison with stakeholders and researchers. To earn revenue for Eritrea, a 20% export tax was imposed, although this was calculated from declarations by the operators. The emerging nature of the trade allowed detailed monitoring by the Ministry of Fisheries. However, management efforts were constrained by a lack of capacity for enforcement and baseline research. Several potential effects of the trade exist but other, land based impacts may be more pressing concerns for Eritrea's reefs. Research priorities for management are discussed as well as the implications of mariculture of Eritrean species by other nations.

Wood (2001) tabled a complete summary profile of ornamental fish trade in 47 countries. Boonyaratpalin and Seermwatanakul (2003) described the current status of ornamental fish industry in Thailand including ornamental fish business, ornamental fish export data and ornamental fish and plant production for export. Sugianti and Darmawan (2003) gave a clear picture of the aquarium Industry in Indonesia. Ploeg (2004) wrote on the aquatic industry in china.

Dey (2005) elaborated on the Malaysian ornamental fish industry

which is marching ahead to number one position in the world trade. He pointed at the official statistics published by the department of fisheries which noted that 408 million ornamental fish was produced in 2003 and exported US $ 18.09 million worth of fish in 2003 to over 55 countries, accounting for over 10% of the global exports, positioning it as the second largest exporting country. A unique feature of the country noted by him was that each of the state specialised in different varieties of fish. Intensified efforts have been made to propagate indigenous varieties and successful attempts in this direction have been achieved in the breeding and marketing of dragon fish, *Scleropages formosus.* Leong (2006) described the status of ornamental fish industry in Malaysia, which started off in the fifties and have made a quantum leap over years to garner a market share of 9 percent of the total world exports second only to Singapore. The country produces about 400 species and 600 varieties of aquarium fish produced from about 450 farms and a total area of farming not less than 1000 hectres.

1.7.4 Ornamental fish trade in India

Taking cue from ITC, UNCTAD/GATT report on international trade in ornamental fishes (Anon, 1979) the Marine Products Development Authority of India (MPEDA) took up a workshop which came up with several papers on ornamental fish trade in India. Bawne (1982) described the status of aquarium fish trade in Bombay. Chapgaar (1982) made a compilation of some of the popular Indian aquarium fishes of India with description of their external appearance and place of occurrence based on

the works of Day. He also mentioned the persons who were instrumental in the introduction of some Indian ornamental fishes into the trade. Mukherjee (1982) added a note on the prospect of aquarium fish for international trade. Sane (1982a) gave a detailed description of the status of the ornamental fish trade in India. From the time he began exports in 1962, to the present scenario and notes that the export of live tropical aquarium fish has been neglected due to the lack of awareness in the people and officials at different levels, regarding these small sized and unimportant fish which can earn a tremendous foreign exchange for the country. Shenoy (1982) mentioned the scope for development of export trade of tropical fishes from the Eastern region of India.

Dordi and Dasgupta (1983) opined that even though India has a vast coastline and plentiful marine resources, the country has not been successful in earning enough foreign exchange due to the disorganised trade. He adds that an essential part of the export of live aquarium fish is suitable distribution system with proper care towards packing and transportation and hence the article is devoted to the often neglected subject of packing.

MPEDA with the assistance from the Centre for the Promotion of Imports from the Developing Countries (CBI), the Netherlands and under the bilateral cooperative programme of Indo -Netherland took up projects in phased manner. Phase -1 of the project (Tomey, 1985) dealt with resource survey of marine ornamental fishes in Lakshadweep water, Phase -2 of the project (Tomey, 1986) was on a pilot study on the

transportation of fishes from Kawarathi to Amsterdam, Phase -3 (Anon, 1986) dealt with, training mission to Netherlands, workshop and sales mission to West Europe with the participation in the Interzoo fair- 88 and Phase - 4 was a workshop on ornamental fish export. The workshop had papers by Shenoy (1986), Nopany (1986) and Sane (1986). Nopany (1986) discusses the problem in ornamental fish export from India as breeding, freight charges, lack of incentives and requested the granting of a cash compensation of fifteen percentage to offset exporters high cost of collection and transportation, and also a subsidy to breeders to the extend of at least 25% in cost of land, sheds and other constructions for establishment of fish farms as infrastructure for storing aquarium fish. Shenoy and Dey (1986) prepared a feasibility report on the setting up of an ornamental fish exporting unit for enhancing the ornamental fish export from India.

Basavaraja *et al.,* (1988) wrote on the live-bearing freshwater ornamental fish, all of which belong to the family Poeciliidae. The paper also details the methods involved in the breeding of these species of fish, describing their gestation, delivery and larval rearing. Bhaskar *et al.,* (1989) wrote on the exotic freshwater aquarium fishes and their role in the aquarium fish trade in India. The paper listed 261 species of egg laying and 27 species of live bearing fishes which has been introduced into India. Kumar (1995) wrote in detail on the culture of ornamental fishes and their export potential. Nayar (1996) briefly described that ornamental fish trade is a booming trade in various countries and especially in India and put

forward the reasons in the way of expansion of the industry. Murty (1996) wrote on the distribution of ornamental fishes in Lakshadweep Islands, Andaman group of islands and several islands in Gulf of Mannar and Palk Bay. Dominant species of ornamental fishes in the Lakshadweep, common ornamental fishes from Wandoor Marine National Park, Andamans, important ornamental fishes known from Gulf of Mannar and Palk Bay have been listed. Brief notes on natural history of major ornamental fish groups have been summarised. The author concludes by providing suggestions to formulate a strategy for exploitation and export of ornamental fish, to control over exploitation. Hand book on aqua farming compiled by Dey (1996) describes the domestic ornamental fish market of India which has two hundred full time and one thousand five hundred part time ornamental fish breeders. He further described the Indian ornamental ichthyofauna which includes freshwater, brackish water and marine fishes, the mass production of both marine and freshwater fishes, diseases and the setting up of an export oriented ornamental fish unit. Jayashankar (1998) noted that ornamental fish trade has emerged as a resource with considerable economic potential and pointed out that apart from improving foreign exchange reserves this trade can generate more job opportunities and self employment. The paper lists commercially important marine, ornamental fishes of India; discusses captive propagation and culture, research and development efforts needed and use of DNA finger printing for identification, efficient monitoring and genetic improvement of stocks; and stresses the importance of aquarium fish culture in earning foreign exchange and generating rural employment opportunities. Kumar (1999)

presented a rough statistical data which shows the present status of aquarium industry in India and added that in India most of the aquarists are inaccessible to modern technical developments in ornamental fish farming. He listed the common Indian varieties of aquarium fishes and also discussed the measures to be taken for the development of the ornamental fish production and boosting of exports. Mohanta and Subramanian (1999) described diseases in an ornamental culture system such as microbial diseases, fungal diseases and protozoan diseases. Various management techniques of prevention and treatment of these diseases have also been discussed. Mukherjee *et al.*, (1999) notes that West Bengal's devil catfish (*Chaca chaca*), a native fish which had been considered unimportant and 'trash fish', now rules the foreign market of aquarium fish. But the indiscriminate use of pesticides and other environmental factors are threatening their existence. A list of some of the exportable ornamental fish treated as trash fish in West Bengal is presented and an examination is made of various problems which face the ornamental fish industry. Gopalakrishnan and Ponniah (1999) wrote about the introduction of red Piranhas for aquarium purposes in India and the stressed the need to exercise caution while introducing piranha and all other exotic fishes including aquarium fishes. According to Dayal and Kapoor (2001) the domestic market of India is quite promising for tropical ornamental fish with the demand exceeding the supply. They referred the Western Ghats of India as a goldmine of fish biodiversity and presented a comprehensive list of 106 ornamental fish endemic to Peninsular India, with special reference to the Western Ghats and also detailed the

conservation status of some 48 potential freshwater ornamental fish out of the 106 ornamental fish reported from Peninsular India.

Sane (2000) briefly examined the potential for export of some ornamental fish species from the Western Ghats region of India and suggested that attempts should be made to develop infrastructure for the ornamental fish trade and understand the breeding behaviour and requirements of endemic ornamental species to lead to a mass-scale breeding and an assured supply of fish, giving a boost to the export figures of these species. Ramachandran (2002a and b) listed the exotic fishes popular in the aquarium market of Kerala along with their prices.

Das and Sinha (2003) described the four categories under which the Indian ornamental fish trade can be categorised namely, culture, breeding, export and marketing of accessories and adds that farmers and exporters have to be brought together for the purpose of integrating the production and export activities in a manner that would be mutually beneficial and such a relationship will push up the level of exports from the country. Ghosh *et al.*, (2003) wrote on ornamental fish farming which has become a small scale aqua business in India. Swain *et al.*, (2003) while writing on the prospects of export oriented freshwater ornamental fish culture in India notes that emphasis must be laid on systematic cataloguing of commercially important aquarium fishes bringing in new species for diversification, detailed studies in breeding, biology, behaviour aspects, nutritions feed formulations disease diagnosis and comprehensive health management. Sane (2005) stressed that lack of

facilities to import brood stock of beautiful exotic fishes is a factor affecting ornamental fish exports from India.

1.7.5 Ornamental fish trade in Kerala

There is a paucity of information on the ornamental fish trade in Kerala apart from the works of Ramachandran (2002a and b), Shyma (2002) and Saju (2003). Literature survey on the marketing of indigenous ornamental fishes of Kerala revealed that very few works attempted describing aspects relating to the marketing of indigenous ornamental fishes.

Sane (1982a) noted some of the indigenous fishes that have prospects in export market. Tomey (1986) described the marine and fresh water fishes, their markets and prices. Dey (1996) described the Indian ornamental ichthyofauna which includes freshwater, brackish water and marine fishes of Kerala as well. Harishankar and Bijukumar (1997) brought out a colourful profile of the indigenous ornamental fishes of Kerala. Tekriwal and Rao (1999) presented a photographic profile of the indigenous ornamental fishes exported from India, which included the photographs of fishes from Kerala. Pramod *et al.*, (2002) described the export prospects of *Puntius filamentosus* and *Puntius mahecola* from Kerala. Sekharan *et al.*, (2002) wrote on the role of Chalakkudy riverine resources in the ornamental fish marketing sector of Kerala. Ramachandran (2002a) and Ramachandran *et al.*, (2002) presented a detailed list of 178 indigenous ornamental fishes exported from India and their market prospects and described some of the indigenous fishes Kerala. Ramachandran *et al.*, (2002) studied the feasibility of collecting

and maintaining indigenous fishes of Kerala successfully in aquaria for marketing purpose. They also presented the details of the indigenous ornamental fishes of Kerala (Photographs presented in Annexue -1) by hoisting a website www.ornamental fishes.org during the MPEDA Adhoc on 'Resource analysis of Indigenous ornamental fishes of Kerala for the development of markets in India and abroad'. Kurup (2002) wrote on the popularisation of aquarium keeping and promotion of ornamental fish culture and marketing in Kerala. Ramachandran *et al.,* (2004) studied the captive survival of freshwater ornamental fishes of Kerala in aquaria. Sekharan and Ramachandran (2005a and b) detailed the positioning of the indigenous ornamental fishes of Kerala in the target markets.

Review of literature on indigenous fishes of Kerala revealed that, substantial works have been conducted on the distribution of tropical fresh water fishes in Kerala. The monumental ichthyofaunal study of Day (1865 and 1878) was followed by works in the southern region by Pillai (1929) who reported the presence of 369 species from the Travancore region and his list contained freshwater (72 species), brackish water and marine forms. John (1936a and b) documented 73 species from Travancore region. Hora and Law (1941) and Hora and Nair (1941) reported the presence of 76 species of freshwater fishes from Travancore. After that most of the studies were conducted in the South Western gap during the forties and fifties and include Raj (1941a and b), Chacko (1948), Menon (1950), Silas (1950), Menon (1951a and b) and Silas (1952). Silas (1953) described the new fishes from Western Ghats with notes on *Puntius*

arulius. Silas (1954) noted *Garra hughi,* a new Cyprinid fish from Western Ghats and Silas (1958) noted the Cyprinid fishes of the genus Chela.

The earlier specific study in the higher reaches of Chalakkudy river system in Anamalai and Nelliampathy hills was carried out by Silas (1951). Later Thobias (1973) carried out a detailed study on the fishes of Thrissur district which was followed by a study by Antony (1977) on Systematics, ecology, binomics and distribution of the hill stream fishes of Thrissur district. Inashu (1991) carried out the systematics and bionomics of Inland fishes of Thrissur district and listed 57 species of which 17 species were from the Chalakkudi River. Pethiyagoda and Kottelatt (1994) reported three new species from Chalakkudi River under the genera Travancoria, Osteochilichthys and Horabagrus. Biju *et al.,* (1996) reported the occurance of *Tetraodon travancoricus* in Chalakkudy and Keecheri rivers. Shaji *et al.,* (1996) reported new species under the genus Garra. Ajith Kumar *et al.,* (1999) described the fish fauna abundance and distribution in Chalakkudy river system.

Rajan (1955) added notes on a collection of fishes from the head waters of Bhavani River. Fish fauna distributed in Silent Valley region was studied by Indira and Rema Devi (1981), Remadevi and Indra (1981), Remadevi and Indra (1984), Remadevi and Menon (1992a) and Remadevi and Menon (1992b).

Remadevi and Indra (1986) reported *Noemacheilus pambarensis* from Idukki. Shaji and Easa (1992) worked on the extension of the range

of *Nemacheilus petrubanerescui*. Easa and Basha (1995) studied the freshwater fish diversity in the Kerala part of Nilgiri Biosphere. Easa and Shaji (1995) added *Puntius melanampyx* as an addition to the fish fauna of Silent valley. Shaji and Easa (1995) studied the Extension of *Danio (Brachy danio) rerio* (Ham-Buch). Menon and Remadevi (1995) added *Hypselobarbus kurali*, a large barb from the South western rivers of Peninsular India. AjithKumar (1997) wrote about the biodiversity of the Western Ghats in India with Special reference to Conservation of its fish fauna. Arunachalam *et al.*, (1999) made a new record of Heteropneustus (Gunther) (Claariadae- Hetepneustidae) from Western Ghats.

Rita (1977) and Rita *et al.*, (1978) studied the Loaches of Kerala. Talwar and Jhingran (1991) listed the fishes of India and adjacent countries and in this study he has listed the indigenous fishes of Kerala. Shaji and Easa (1995) added *Homaloptera menoni* to the faunistic list of Kerala. Shaji *et al.*, (1995) further described the fresh water diversity in Aaralam wild life sanctuary. Shaji and Easa (1996) studied the freshwater fish diversity in Wyanad. Gopi (1996) studied the extension range of *Silurus wynadensis* (Day). Menon and Jacob (1996) noted *Crossocheilus periarensis* from Thannikudy.

Zacharias *et al.*, (1996) listed the fish fauna of Periyar Tiger reserve. Arun *et al.*, (1996) updated the list of fishes from Periyar Tiger reserve. Arun (1997) and Arun (1998) described the distribution of fishes in Periyar Lake. Biju *et al.*, (1998b) reported *Sicyopterus grissseus* (Day) from Periyar River in Kerala. George *et al.*, (1999) collected *Pisodonophis*

boro from Periyar after more than a century. Zacharias and Minimol (1999) identified Noemacheilus menoni from Mlappara in Periyar Tiger Reserve. Gopi (2001) noted *Garra periyarensis*, a new Cyprinid fish from Periyar Tiger Reserve.

Raghunathan (1998) carried out an ichthyological investigation in the river Chaliyar. Biju *et al.*, (1998a and 1999a) studied the freshwater fish distribution in the Rivers of North Kerala.

Variavel *et al.*, (1998) added *Hypselobarbus kurali* as an addition to the faunistic list of Kerala. Jayaram (1999a) and Jayaram (1999b) listed the fresh water fishes of Indian region in which he included the fishes of Kerala. Rajuthomas *et al.*, (2002) described the freshwater fishes of Southern Kerala with notes on endangered and endemic species. Ajithkumar *et al.*, (2003) detailed the list of fresh water fish fauna and its distribution in Kerala. Pethiyagoda and Kottelatt (2005) reviewed the barbs of *Puntius filamentosus* group of South India and Srilanka.

Manimekalan and Das (1998) reported *Glyptothorax davvissinghi*, a new catfish from Nilgiri Biosphere Reserve. Biju *et al.*, (1999b) reported the fishes of Parambikkulam wildlife sanctuary in Kerala. Rajuthomas *et al.*, (1999) described the icthyofauna of Iravikulam National park.

Several aspects of ornamental fishes have been taken up of late. Premkumar and Balasubramanian (1984) studied the breeding biology of the Scarlet banded barb, *Puntius amphibius* from Chackai canal. Inashu (1993) worked on the sexual dimorphism of fresh water puffer fish

Tetraodon travancoricus (Hora and Nair), from Trichur District. Inashu (1999) studied the sexual dimorphism in cat fish *Ompok bimaculates* (bloch). Sunil *et al.,* (1999) studied the length weight relationship in the Catfish *Horabagrus brachysoma* (Gunther). Sunil (2000) studied the length weight relationship in *Rasbora daniconius* (Ham) from Achenkoil River. Mercy *et al.,* (2002a) studied the length weight relationship of *Puntius denisonii.*

The indigenous fishes of Kerala as ornamental fishes were mentioned in the works of Gopalakrishnan and Ponniah (1996), Anon (1998), Arunachalam *et al.,* (1998), Kurup (1999), Arunachalam *et al.,* (2000), Dayal and Kapoor (2001), Mercy *et al.,* (2002), Ramachandran (2002a and b), Jameela Beevi and Ramachandran (2002a and b), Kurup (2002), Radhakrishnan and Kurup (2001), Radhakrishnan and Kurup (2002), Jameela Beevi and Ramachandran (2002a), Jameela Beevi and Ramachandran (2002b), Jameela Beevi and Ramachandran (2003), Mercy *et al.,* (2003), Vargese *et al.,* (2003) and Philippose (2006).

Studies on marine ornamental fishes of India especially were carried out by Jones and Kumaran (1980), Jonklaas (1982), Pillai *et al.,* (1983), Madan Mohan *et al.,* (1987), Pillai *et al.,* (1987a and b), Madan Mohan and Pillai (1988), James (1988), Murthy *et al.,* (1989), Vijayanand and Vargese (1990), Emmanuel *et al.,* (1990), Pillai and Madan Mohan (1990), Pillai *et al.,* (1992), Murthy (2001), Philippose (1998), Gopakumar (2001), Gopakumar *et al.,* (2001), Gopakumar (2002), Gopakumar *et al.,* (2002), Madhu and Rema Madhu (2002). Sureshkumar *et al.,* (2004)

identified 40 species (belonging to 20 families) of the potential marine ornamental fishes in the trawl bye catches of the Ponnani fishing harbour, South West coast of India in order to assess the temporal and spatial availability of these fishes were discarded due to low consumer acceptance and small size. Literary works that explore new avenues for indigenous fishes as ornamental fishes need to come up for their effective utilisation in a sustainable way.

Chapter 2

Research Methodology

2.1 Introduction

The chapter on research methodology encompasses research design and methodology. Research design is a framework for conducting marketing research and the methodology details the procedures necessary to pursue the objectives of the study and includes respondents sampling, data collection and data analysis.

2.2. Research Design

The present study on the "Prospects of marketing the indigenous ornamental fishes of Kerala" falls into the category of an exploratory research as described by Aaker *et al.*, (1997). The objective of exploratory survey is to provide insights and understanding and has characteristics such as flexible and unstructured research process, loosely defined information, small and non representative sample and qualitative analysis of primary data (Malhotra, 1996). The present research seek insight into the prospects of marketing the indigenous ornamental fishes of Kerala by comparing the marketing mix variables (Product, Place, Price, and Promotion) pursued by three different categories of indigenous ornamental fish marketers of India (Exporters, Suppliers and Aquarium shopkeepers), so that the marketers of Kerala and other people intending to be marketers can emulate their marketing pattern. Four factor classification of marketing mix popularised by Mc Carthy (1981) formed the focal theme of the study. The study also tries to understand the export markets and trends.

To study the possibility of penetrating the product into the domestic

market, consumer oriented marketing championed by academics Mc Carthy (1960) and Kotler (1995) was followed. The perspective of consumer oriented marketing championed in the early 1960s by academics is based on determining what a target group of customer want, and then maximising their satisfaction with the product or service. Kotler (2001) outlined the common approach used by marketing research firms as the formal procedure for identifying the major segments in the market involving three steps namely survey stage (involving exploratory surveys or focus groups), analysis stage (comprising a factor analysis or cluster analysis) and a profiling stage.

2.2.1 Data Collection

Primary data collection was carried out at the outset to obtain data on the marketing mix, markets and marketing pattern of the three categories of marketers of indigenous ornamental fishes of Kerala. Primary data was also collected to study the consumer behaviour in ornamental fish purchase. Secondary data collection was carried out for reviewing the literature on ornamental fish trade aspects, to understand the ornamental fish trade statistics world wide, India and Kerala and to review the earlier works carried out on the indigenous ornamental fishes of Kerala. The data were collected from journals, reports, CD ROMS and the internet. The secondary data was collected from various sources that included,

1. Marine Products Export Development Authority (MPEDA), which is a statutory body under the Ministry of commerce, India.

2. Central Institute of Fisheries Technology (CIFT), & Central Institute

of Marine Fisheries Research Institute (CMFRI) in Kochi, which are the research institutes of Indian Council of Agriculture Research (ICAR).

3. Department of Fisheries in Kochi and Trivandrum, under the State Government.

2.2.2 Survey Method

The study conducted a marketer's survey by personal interview method and a customer survey by mall intercepts (Churchil.Jr, 1995). General discussion of the mall intercept as a data collection technique was put forward by Gates and Solomon (1982) and Bush and Parashuram (1985).

2.2.3 Survey Instrument

Questionnaires were developed as basic tools for collecting primary data. It was structured in such a way that the primary objectives of the research could be addressed to (Aaker *et al.*, 1997). The study used two separate questionnaires for marketer's survey and customer's survey. Unlike the unstructured questionnaire of exploratory research, this study used structured questionnaire as survey instrument in order to facilitate analysis using SPSS 13.0. The questionnaire schedule is given in annexue-2 and annexue-3.

The indigenous ornamental fish marketer's survey questionnaire contained five sections on profile, product, place, price and promotion. The types of measurement included dichotomous, multichotomous and rank order scales.

The customer survey questionnaire consisted of five sections which aimed at obtaining customer response on profile, motives in purchasing ornamental fishes, willingness to keep indigenous ornamental fish in aquarium, comparison of indigenous and exotic fishes, attributes preferred in indigenous fishes, and low affinity towards the marine ornamental fish keeping. Type of measurements or attitude rating scales used in coding questionnaire responses were, Nominal scales (Dichotomous or Multiple choices), Ordinal scales (Rank order scales), Interval scales (Rating on likert scales) and Semantic differential scales (Chuchchil. Jr, 1995).

2.2.4 Sample Selection

In the present study, the two surveys were carried out which aimed at two different set of respondents. The first set of respondents were the marketers of India dealing with the indigenous ornamental fishes of Kerala which included three categories i.e. exporters of India and Kerala, suppliers of Kerala and retail aquarium shopkeepers of Kerala. The second set focused were the ornamental fish customers visiting the outlets marketing the indigenous ornamental fishes of Kerala.

> According to the list collected from the Directory of ornamental fish exporters, published by the MPEDA (Anon, 2001) there were 25 registered ornamental fish exporters in India, of which only 13 were found to be active during the study period (2000-2005). For exporters' survey, a census survey (Aaker *et al.*, 1997) of all active exporters was carried out, as the population size itself was quite small.

> Preliminary survey revealed that, aquarium outlets outside Kerala were not marketing indigenous ornamental fishes of Kerala. Hence the retail aquarium marketers were surveyed from Kerala alone. The number of all aquarium outlets in the state added up to 163, as per the directory of fisheries and ornamental fish trade (Sanjeevaghosh, 2001). A preliminary survey was conducted in order to understand the outlets which catered indigenous ornamental fishes of Kerala and 13 outlets from Kerala were short listed for further study.

> The number of active suppliers of indigenous ornamental fishes of Kerala added up to nine and all of them were subjected to census survey.

Hence the 13 exporters, 9 suppliers and 13 aquarium retailers added up to thirty five marketers from India who dealt with indigenous ornamental fishes of Kerala and they were personally administered the marketers' questionnaire.

The second set of respondents for customer survey in the domestic ornamental fish market in Kerala were chosen after conducting a preliminary survey of all outlets in Ernakulam district (Anon, 2001b) which added up to 37. This was the only place in the state where aquarium shops sold all three varieties of indigenous ornamental fishes of Kerala i.e. marine, fresh water and brackish water fishes. Four outlets were chosen from the thirty seven outlets for the exploratory survey by conducting mall intercept. A convenience sample of 137 respondents was selected from

the four outlets. Small or non representative samples are the characteristics of exploratory surveys (Malhotra, 1996).

2.2.5 Data Analysis

Data collected were edited, coded and analysed using statistical package for social sciences (SPSS 13.0). Univariate and multivariate analysis (Hair et al., 1999) were carried out. In Univariate analysis simple statistical measures such as frequencies, cross tabulations and descriptive statistics such as percentages arithmetic mean, standard deviation are used for exploring the composition within the variables. Non parametric tests such as chi-square were also applied. In Multivariate analysis appropriate statistical measure such as Factor analysis, Cluster analysis and Profile analysis (Hucheson and Sofroniou, 1999) was used to arrive at conclusion.

In the analysis of marketers survey, simple cross tabulations (Aaker et al., 1997) of marketers survey results was carried out with the category of marketers (Exporters of India, Retail aquarium traders and Suppliers of Kerala). Cross tabulation is a statistical technique for studying the relationship among and between nominal variables. In cross tabulation the sample is divided into sub groups in order to learn how the dependant variable varies from sub group to sub group. Cross tabulation table require fewer assumptions to construct and they serve as the basis of several statistical techniques such as chi square (Aaker et. al., 1997).

To get an idea of the future prospects in ornamental fish exports

from India to the international markets, a trend analysis (Box and Jenkins, 1984) using method of least squares was carried out. The export data of ornamental fishes from India to its major markets for a period of 10 years (1993-94 to 2003-2004) was subjected to the analysis.

Customer survey in the domestic ornamental fish market aimed at identifying the important variables that initiated customers in ornamental fish purchase by a factor analysis. A profile analysis was carried out to find the factors that differentiated indigenous fishes from exotic fishes based on consumer perception. Market preferred groups of indigenous ornamental fish were identified by cluster analysis. Yet another factor analysis was carried out to find the factor due to which hobbyists kept away marine aquarium fish keeping.

Factor analysis is an interdependence technique focusing on variables and cluster analysis is an interdependence technique that focus on objects. Cluster often focuses on variables also. Factor analysis is the general name denoting a class of procedures primarily used for data reduction and summarisation. In marketing research there may be a larger number of variables most of which are correlated and which must be reduced to a manageable level. Relationships among sets of many interrelated variables are examined and represented in terms of a few underlying factors. Numerous applications of factor analysis in marketing research has been described by Malhotra (1996).

Profile analysis based on semantic differential scales is widely

used to describe the set of beliefs that comprise a person's image of an organisation or brand. The procedure is also insightful for comparing images of competing brands, stores or services. When combined with proper item analysis techniques, seems to offer the marketing researcher a most valuable research tool.

Cluster analysis classifies objects into relatively homogenous groups called clusters based on the set of variables considered. Objects in a cluster are relatively similar in terms of these variables and different from objects in other clusters. Cluster analysis has been used in marketing for a variety of purposes; segmenting the market, understanding buyer behaviour, identifying new product opportunities, selecting test markets, and reducing data (Malhotra, 1996). A detailed description of the methodology is presented in the respective chapters.

Chapter 3

Indigenous Ornamental Fishes of Kerala in Trade

3.1 Introduction

Product is the most basic marketing mix tool, which stands for the firm's tangible offer to the market, including product quality, design, features, branding and packaging. According to Terpstra (1972) the product brings buyer and seller, the firm and its market, together. It is the area of product that the interests of the firm and interests of the customer overlap the most. Lancaster (1979) defines the product as a bundle of value attributes from which people select the most beneficial bundle of values for their money in the process of exchange. Such values offered in exchange, for example, tangible objects (often called 'goods'), services, ideas, concepts, places, media of exchange, personality, exchange experiences and so on. In marketing, a product can be seen as the need satisfying offering of the firm (Mac Carthy and Shapiro, 1983). Kodithuvakku (1993) states that, based on the product theories in marketing, it is quite evident that the tangible product (physical entity) involved in the ornamental fish trade is a live good, 'the fish'. However, a product is not merely the physical tangible good. The different intangible factors such as images, services and so on, which are capable of affecting the demand and thus, changing the value of the tangible element in the market place must also be considered as a coherent part of the product. He identified the factors which were of crucial importance in terms of changing values (as perceived by customers) of the "live goods" (i.e., ornamental fish) in the market place. According to him, a variety of criteria are used to classify ornamental fish in the market place i.e. based on origin, fish may be classified as freshwater fish or saltwater

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fish and method of production also appears to be a major determinant of the value of the product. Based on the origin of fish in native country and a foreign country ornamental fishes are classified as indigenous and exotic fishes respectively.

In the present study, the product referred was 'the indigenous fishes of Kerala in the ornamental fish trade'. Indigenous is an adjective word, which according to WEBSTER Dictionary (1996) is, anything originating in a (specified) place or country; not exotic; native, Innate; Inherent. Though ornamental fishes are defined in a number of ways as small, colourful and beautiful, it is impossible to provide a particular definition and the most appropriate way to define ornamental fish would be as 'any fish of aquarist choice'. The objectives addressed in the study were,

1. To compare the product strategy of the marketers who dealt with the indigenous ornamental fishes of Kerala.

2. To compile the indigenous ornamental fish product line of the Indian firms marketing indigenous fishes of Kerala.

3. To categorise the indigenous ornamental fishes of Kerala based on their market preference.

4. To analyse the trends in the export of highly market preferred indigenous ornamental fishes of Kerala.

3.2 Methodology

The ornamental fish marketers of India dealing with indigenous ornamental fishes of Kerala added up to thirty five, and were census surveyed by

personal interview method using SPSS friendly, structured and pre tested questionnaire as described in detail in the research methodology (chapter two).

3.2.1 Product strategies employed in indigenous fish marketing

The specific questions in the product section of the questionnaire of the marketers' survey were on the product strategies, product line and the marketing pattern of the marketers. The answers on product strategies were subjected to cross tabulation (Aaker *et al.*, 1997) with the category of marketers (i.e. exporters of India, suppliers of Kerala and retail aquarium shopkeepers).

3.2.2. Indigenous fishes of India noted in the ornamental fish trade

In order to compile a complete list of the indigenous ornamental fishes of India and Kerala noted in the trade, a review of all the customer invoices of the surveyed exporters for a period of ten years from 1996 to 2005 was carried out. Simultaneously a review of the indigenous ornamental fishes marketed by domestic marketers was also carried out.

3.2.3 Classification of indigenous fishes based on market preference

Three variables based on the marketing pattern of the indigenous ornamental fishes of Kerala in trade were chosen for the study, which included, the number of markets to which fishes was catered, marketing frequency, and the quantity (in numbers of fishes marketed per year). Each variable was divided into five classes. The class for the number of markets included one, two, three, four and five markets. Marketing

frequency per year was classified as less than ten times, ten to twenty times, twenty to thirty times, thirty to forty times and forty and above times. The classes for the number of fishes marketed per year were, less than five hundred, five hundred to thousand, thousand to one thousand five hundred, one thousand five hundred to two thousand and two thousand and above. The marketers were asked to indicate their choice for the specific class of selected variables for the fifty seven indigenous ornamental fishes marketed from Kerala. The results were then cluster analysed based on Heirarchial clustering (Hucheson and Safroniou, 1999) to obtain the different clusters of indigenous ornamental fishes based on market preference.

3.2.4 Trend analysis of indigenous fishes

The highly market preferred indigenous fishes, were chosen based on cluster analysis and the number of those fishes exported during the nine year period from 1996-2004, based on the customer invoices of the 13 exporters surveyed were compiled and trend analysed using method of least squares (Box and Jenkins, 1984).

3.3 Results and Discussion

3.3.1 Product strategies in marketing the indigenous fishes

Marketers were enquired about the ornamental fishes marketed by them, fishes having demand in the domestic market and export market, reasons for the preference of indigenous fishes in the export market.

3.3.1.1 Ornamental fishes marketed by the marketers

Marketers were posed the alternatives such as marine indigenous fishes exclusively, fresh water exotic fishes along with freshwater indigenous fishes and freshwater indigenous fishes exclusively, freshwater indigenous fishes along with marine fishes and freshwater exotic fishes along with marine fishes to understand the type of fishes marketed by them.

The result of cross tabulation of the category of marketers and ornamental fishes marketed by them are presented in Table 3.1.

Table: 3.1 Fishes marketed by indigenous ornamental fish marketers

Category	Marine	Freshwater Exotic & Freshwater indigenous	Freshwater indigenous	Freshwater indigenous & Marine	Freshwater exotic & Marine	Total
Exporters	7.7%	38.5%	46.2%	7.7%	.0%	100%
Suppliers	11.1%	11.1%	66.7%	.0%	11.1%	100%
Retailers	7.7%	76.9%	.0%	7.7%	7.7%	100%
Total %	8.6%	45.7%	34.3%	5.71%	5.71%	100%

Source: Primary data

High percentage (45.7%) of the marketers dealt with fresh water exotic fishes along with freshwater indigenous fishes and very less percentage (34.3%) of the marketers dealt with freshwater indigenous fishes exclusively. Among marketers, high percentage of the exporters of India (38.5%) and the suppliers of Kerala (66.7%) were noted to market indigenous ornamental fishes of Kerala, which also point at the preference for the indigenous fishes in the export markets.

The reasons for the apprehension in marketing indigenous ornamental fishes exclusively was due to the fact that, marketers considered it to be an unprofitable proposition to market indigenous fishes exclusively and hence preferred supplying indigenous fishes in combination with other fishes. The percentage of marketers catering marine fishes exclusively or in combination was also very less. The percentage of exporters dealing with marine (7.7%) or marine and wild caught indigenous fishes (7.7%) was comparatively lesser. The reasons may be attributed to the difficulty or lack of awareness in handling the marine fishes or the lack of demand for the fishes in the market. None of the exporters dealt with freshwater exotic fishes and marine fishes together, as they found the export price for the marine and exotic fishes to be unattractive and lower price fetching than the price fetched by those fishes in the domestic market. Sane (1986) pointed out that live aquatic invertebrates which were covered along with ornamental fishes till 1973 under tropical aquarium fish, were removed after the formation of MPEDA which resulted in the reducing of the marine ornamental fish export as it became uneconomical to collect only marine fish without the invertebrates. Some reasons which were attributed to the decline in the marine ornamental fish exports included coral reef conservation policies, lack of expert divers, lack of knowledge or technical know how regarding harvesting, packing and acclimatising of marine ornamental fishes.

3.3.1.2 Ornamental fishes having demand in the export market

When the respondent marketers were queried about the preference for the

indigenous fishes in the export market, majority (62.9%) of them were of the opinion that freshwater indigenous fishes had high demand in the export market (Table 3.2).

Table: 3.2 Ornamental fish having demand in the export market

Category	Marine	Freshwater wild	Marine & Freshwater exotic	Marine& Freshwater wild	Total
Exporters	.0%	30.8%	38.5%	30.8%	100%
Suppliers	11.1%	77.8%	.0%	11.1%	100%
Retailers	.0%	84.6%	7.7%	7.7%	100%
Total %	2.9%	62.9%	17.1%	17.1%	100%

Source: Primary data

Majority of the exporters (38.5%) were of the opinion that marine and freshwater exotic fishes had demand in the export market. But high percentage of the suppliers (77.8%) and aquarium shop keepers (84.6%) followed the view of majority of the marketers regarding the demand for fresh water wild caught or fresh water indigenous ornamental fishes in the export market. Olivier (2001b) stated that, in the international trade, in value terms, freshwater species represent about 90% against 10% for the marine species. According to Fossa (2004a) over the last two or three decades advanced aquarists in the west have become increasingly interested in the wild type fishes.

Sane (1982a) mentioned the species which had importance in the export market such as Botia viz. *Botia lohacata, B.striata, B.dayi, B.dario, B.histrionica, B.almorlae, B. shimogensis, B. geto* etc. The other genera

which had an importance included *Gagata, Nangra, Calcharithys, Sisor, Chaka* and other genera of catfishes and *Tetraodon tavancoricus*. Tomey (1986) also throw light on some of the marine and freshwater ornamental fishes of India which have demand for export, their markets, exportable species and their prices. Dawes (2002) while writing on ornamental aquatic industry in the new millennium mentioned that, despite the ongoing success in captive breeding of marine fishes for ornamental fish industry, wild harvested invertebrates will still form the bulk of the trade for the foreseeable future.

The survey response also showed that 17.1 % of the respondents noted a preference for marine fishes along with exotic fishes in the export markets. Among exporters, 38.5% were of the opinion that marine and freshwater exotic fishes had preference in the export market. Singh and Dey (2003) pointed out that, imports to USA were mainly of freshwater species, and the two species, the guppy and the neon tetra accounted for 40% of the market. Some of the other popular species were mollies, swordtails, discus, angelfish, African cichlids, zebra danios and platties. There was a growing interest among the young hobbyists in the keeping of marine species. With about 10% of the households possessing aquaria the country had more than 10 million home aquariums. In Japan, tropical fishes dominate the market and the most popular species were the guppies (28% of the market), neon tetra, red nose tetra, cardinal tetra, black tetra, tiger barb, harlequin fish, discus, angel fish, siamese fighting fish, gourami, platy, sword tail, julil catfish (corydoras) mainly algae eater,

white clouds and zebra danio. In Europe, guppies formed 28% of the market. Among the most popular species were the neon tetra, cardinal tetra, guppy, platy, swordtail, Siamese fighting fish, angelfish, corydoras, rasbora, gourami and loach.

A small percentage (17.1%) of marketers felt that there was a demand for marine fishes along with indigenous fishes and a smaller percentage of the marketers (17.1%) felt that demand was noted for marine and exotic fishes in the export market. Demand for marine fishes alone was mentioned only by 2.9% of the marketers. According to Kvalvagnaes (1982) no marine fish has gained the popularity as clown fish of species i.e. *Amphiprion ocellaris, Amphiprion percula.* The genus *Abdufduf* (common damsel fishes) has earned a solid reputation for hardiness and easy keeping followed by wrasse, especially the cleaner warsse i.e. *Labroides dimidatus.* Clowns, damsels, butterflyfish, midget emperor fish, wrasse, sea anemones, shrimps and tubeworms have always been the sought after groups of marine ornamentals. Marine species are becoming more popular particularly the *Pomacentridae, Acanthuridae, Labridae, Pomacanthidae, Chaetodontidae, Balistidae, Syngnathidae,* and the invertebrates. Wood (1985) noted that, during the last two decades marine aquarium hobby has increased markedly in popularity and volume and added that according to numerous professionals, the marine aquarium with live coral reefs is the trend of the 21st century. According to the United Nations Environmental Programme (UNEP) report by Wabnitz *et al.,* (2003), a total of 1471 species of marine

fish are traded world wide with the best estimate of annual global trade ranging between 20 and 24 million individuals. The report noted that Damsel fish (*Pomacentridae*) make up almost half of the trade, with species of angel fish (*Pomacanthidae*), surgeon fish (*Acanthuridae*), wrasse (*Labridae*), gobies (*Gobiidae*) and butterflyfish (*Chaetodontidae*) accounting approximately another 25-30 percent. The most traded species are the blue green damsel fish (*Chromis viridis*), clown anemeone fish (*Amphiprion ocellaris*), the white tail dascyllus (*Dascyllus aruanus*), the sapphire devil (*Chsiptera cyanea*) and the three spot dascyllus (*Dascyllus trimaculatus*). Though there existed a general notion among the marketers that the freshwater indigenous fishes had high demand in the export markets, the present study inferred that there was a preference for fresh water exotic, and marine fishes also in the export markets.

3.3.1.3 Ornamental fish having demand in the domestic market

Table: 3.3 presents the marketers view of the ornamental fishes having demand in the domestic market. 42.9% of the marketers were of the view that freshwater exotic fishes had high demand in the domestic market and 40% opined that, preference was for fresh water exotic and marine fishes. High percentage of the suppliers (66%) also reaffirmed the demand for exotic fishes in the domestic market. Bhaskar *et al.,* (1989) detailed a list of 300 exotic fishes which were introduced in the Indian ornamental fish market to cater the domestic demand. Ramachandran (2002a) portrayed the exotic fishes popular in the aquarium market of Kerala. 40% of the marketers felt that a combination of fresh water exotic and marine fishes

had demand in the domestic market.

Table: 3.3 Ornamental fish having demand in the domestic market

Category	Freshwater exotic	Freshwater exotic & Freshwater wild & Marine	Freshwater exotic & Marine	Total
Exporters	30.8%	.0%	69.2%	100%
Suppliers	66.7%	.0%	33.3%	100%
Retailers	38.5%	46.2%	15.4%	100%
Total %	42.9%	17.1%	40.0%	100%

Source: Primary data

Even though, 38.5% of the aquarium shopkeepers of Kerala felt that exotic fishes have demand in the domestic market, it was noted that higher percentage (46.2%) of them opined that the freshwater exotic, fresh water indigenous and marine fishes have demand, which was a positive note for the marketers and breeders of indigenous ornamental fishes. 69.2% of the exporters held the view that freshwater exotic and marine ornamental fishes had importance in the domestic market. Though it was inferred from the study that, there was a high preference for the exotic varieties in the domestic aquarium market, small preference was noted for marine and indigenous ornamental fishes too. As per the survey, brackish water fishes as such did not have a demand in the domestic market, but on shop visits one could observe brackish water species such as *Scatophagus argus*, *Etroplus maculates* and *Etroplus suratensis* which were acclimatised to the freshwater and were sold as freshwater fishes.

3.3.1.4 Reasons for the preference for indigenous fishes

The respondents were posed the alternatives such as demand for unique variety, lack of quality captive bred fishes, lack of enough captive bred stock, lack of supply from the marine sector.

Table: 3.4 Reason for indigenous fish preference in the international markets

Category	No marine fish supply	Captive bred used domestically	Lack of quality captive bred	Unique variety	Total
Exporters	7.7%	.0%	30.8%	61.5%	100.0%
Suppliers	.0%	.0%	44.4%	55.6%	100.0%
Retailers	.0%	53.8%	38.5%	7.7%	100.0%
Total %	2.9%	20.0%	37.1%	40.0%	100.0%

Source: Primary data

Table 3.4 shows that, according to 40% of the marketers the demand for unique variety was a major reason for the preference of indigenous wild caught fishes in international markets. 37% of the marketers mentioned that there was a lack of quality captive bred fishes. 61.5% of the exporters also stressed that, demand for unique variety formed the major reason for the preference. The fact that captive bred stock is used up in the domestic industry formed the response of 53.8% of the aquarium shopkeepers, 38.5% felt that quality captive bred fishes were not available in India. Bleher (1993) stated that one major trend, which has emerged recently in the global ornamental fish market is the formation of specialist groups with the tendency of keeping only one fish species by hobbyists. For example specialist hobbyist groups now exist for East African Killifish, Central

American Cichilids, Cat Fish, Discus, live bearers, anabantids and so on. Fossa (pers comm.2003) added that, the fascination with aquarium keeping comes mainly from the exotic appeal of foreign fishes. Even though native fishes are beautiful and brilliant, it is the stranger animals imported from other countries that appeals the most. Hence indigenous fishes are valued in other countries than in the domestic markets.

3.3.1.5 Introduction of new indigenous fishes to the trade

Table 3.5 revealed that only a small percentage of the marketers took up innovative ventures of introducing indigenous ornamental fishes to the trade.

Table: 3.5 New variety Introductions

Category	Yes	No	Total
Exporters	30.8%	69.2%	100%
Suppliers	22.2%	77.8%	100%
Retailers	.0%	100.0%	100%
Total %	17.1%	82.9%	100%

Source: Primary data

Majority of the marketers (82.9%) had not introduced any new variety into the trade and very less percentage (17.1%) of the marketers took up innovative venture of introducing new varieties into the trade. Research studies indicate that early entrants in the market enjoy several advantages over late entrants, especially in obtaining a significant market position (Sands, 1979; Urban *et al.,* 1986). Cohen *et al.,* (1997) stated that, for most of the firms, successful new product introductions are engines of

growth. Several frame works including the product lifecycle and the growth share matrix postulate the need for new products that generate future profitability and prevent obsolescence of the firm's product line (Cooper, 1984; Chaney *et al.*, 1991).

According to Chhapgar (1982) introduction of fishes which are presently not known in the international aquarium fish hobby was challenging to the more enterprising exporter and he added the names of some of the indigenous ornamental fishes introduced by Indian entrepreneurs to the aquarium trade such as the melon or amber barb (*Puntius melanampyx*), honey gouramy (*Colisa chuno*), dadio (*Laubuca dadyburjori*), the noble gourami (*Ctenops nobilis*), the hifin variable barb (*Puntius umangi*) and the rainbow snakehead (*Channa blether*). Tekriwal and Rao (1999) mentioned that, the long fighting catfish, *Olyra* species won third prize at Aquarama, 1993 in the new variety introduction category when it was exhibited by the author and he also exhibited red line torpedo (*Puntius denisonii*) in the 1997 Aquarama (Ornamental fish exhibition and Seminar in Singapore held every alternate year) new species wild caught category, where it won the third prize. Thus, the study noted that very few marketers in India were innovative and risk taking and introduced indigenous ornamental fishes to the market.

3.3.1.6 Breeding of indigenous ornamental fishes of Kerala

In the global ornamental fish trade, the importers place orders for bulk quantities and look for standard, uniform sized fishes. Marketing of indigenous fishes can be enhanced, only if there is a recurring supply of

standard sized fishes for which breeding of the species has to take place.

Table: 3.6 Breeding of indigenous ornamental fishes of Kerala

Category	Bred indigenous fishes	Not Bred indigenous fishes	Total
Exporters	30.8%	69.2%	100%
Suppliers	.0%	100.0%	100%
Retailers	.0%	100.0%	100%
Total %	11.4%	88.6%	100%

Source: Primary data

From Table 3.6, it was noted that 88.6% of the marketers had not bred any indigenous variety and only 11.4% tried to breed varieties of indigenous ornamental fishes. 30.8% of the exporters took up breeding indigenous ornamental fishes such as *Puntius melon* and *Danio* species. Among suppliers and aquarium shopkeepers none attempted any kind of breeding activities of indigenous ornamental fishes. Mercy *et al.*, (2002a) carried out the breeding of *Danio malabaricus*. Mercy *et al.*, (2003) carried out studies on the reproductive behaviour of Common Catopra (*Pristolepis marginata*) under captive conditions. Mercy (2006) mentioned the breeding of 13 fishes in captivity namely *Puntius melanampyx, Puntius melanostigma, Puntius filamentosus, Pristolepis marginata, Garra mullya Nemacheilus triangularis, Danio malabaricus* and *Esomus danricus* during the tenure of the project entitled "Germplasm Inventory, Evaluation and Gene Banking of Freshwater fishes". Ng and Tan (1997) gives an example of the Bala shark (*Balantio cheilos melanopterus*) which was over fished to the point of extinction in their native Sumatra. However breeding and culture

operations of this species has advanced to the point where a majority of individuals entering the aquarium trade originate from culture operations. Bartley (1999) noted that the endangered Golden dragon fish are being successfully raised for sale to the pet industry at a licenced facility. According to Tlusty (2004) breeding supports a conservation programme, there is some environmental benefit or elimination of environmental damage via breeding programme, or to enhance the further production of domesticated species. Captive culture can dramatically decrease the need to collect wild stocks.

CMFRI intensified its research on breeding, seed production and culture of marine ornamental fishes and took up marine ornamental fish breeding on a priority basis and hatchery production technologies were developed for clownfish and damselfish (Gopakumar, 2001; Gopakumar *et al.*, 2001; Ignatius *et al.*, 2001; Madhu and Rema Madhu, 2002; Ignatius and Jagadish, 2003), made a significant achievement in the seed production of seahorse. Experimental success was also obtained in the hatchery rearing of three species of damsel fishes (Gopakumar *et al.*, 2002). Tlusty (2002) while elucidating the benefits and risks of aquacultural production for the aquarium trade noted that, aquacultural production of ornamental species should be pursued when species are difficult to obtain from wild. Organised trade in ornamental fishes depends primarily upon the assured and adequate supply of standard sized fishes. But the study found that very less marketers took up breeding of indigenous ornamental fishes.

3.3.1.7 Indigenous fishes of Kerala in ornamental fish trade

The number of indigenous ornamental fishes of Kerala supplied by the marketers is presented in Table 3.7.

Table: 3.7 Number of Indigenous ornamental fishes of Kerala marketed by respondents

Category	Less than 10	10-20	20-30	Total
Exporters	23.1%	7.7%	69.2%	100.0%
Suppliers	50.0%	25.0%	25.0%	100.0%
Retailers	100%	0%	0%	100.0%
Total %	57%	9%	32.4%	100.0%

Source: Primary data

It was noted that, 57% of the respondents' marketed less than 10 indigenous ornamental fishes of Kerala. High percentage of the exporters depended on 20-30 varieties from the state but the survey noted that exporters of Kerala marketed just 10-15 indigenous varieties. It was noted that 50% of the suppliers of Kerala supplied less than 10 varieties and 25% supplied 20-30 varieties. All the retail aquarium fish marketers marketed less than 10 varieties. Thus it was inferred that the marketers of Kerala do not utilise the indigenous resources as the exporters from states other than Kerala. The trend among the marketers of Kerala is to market less varieties in large number which can be harmful for the resource.

According to Sane (1982a) the price list of exporters from far eastern countries like Singapore, Thailand, Hong Kong and Indonesia cover 250 odd varieties of fish offered at different sizes, in order to catch

up the market abroad. An Indian exporter should be able to offer at least 100 different varieties of fish out of which 75% should be available at any time ready for export. According to Beamish *et al.,* (1993) in terms of product lines, it is found that a broader product line helps firms to diversify risks and lead to better export success. According to Varshney and Bhatacharya (1996) marketers when they consider entering into the international markets are usually concerned about their profit making prospects in the product portfolio. The products being offered to the foreign consumers must have something special either in terms of attraction or advantage which will motivate them to opt for this particular product in preference to others. Larkin *et al.,* (2001c) stated that species diversity is important at marketing channels closer to the consumers. While large numbers of fish are sold in this industry, the key to a region's success is the possession of a large selection of varieties. An isolated producer with a small selection will find it difficult to market large numbers of fish because buyers demand variety. A lengthy product list facilitates better purchase as customers prefer greater assortment of products which increases the chance of exactly meeting their need. Successful marketers have to improve their species portfolio with new species or varieties by decreasing the number of fishes marketed rather than concentrating on few species in high numbers which might otherwise lead to over exploitation of few species. Anon (2003c) contemplate on European Aquatic Sector and adds that the hobbyists are constantly on the look out for new specimens, thus the principal prerequisite for the dealer if he is to achieve sales is a sufficiently large assortment of fishes.

3.3.1.8 Frequency at which Indigenous ornamental fishes of Kerala are marketed by the respondents

Table 3.8 show that majority (65.7%) of the respondents marketed the indigenous ornamental fishes always and 34.3% only occasionally. Among exporters 69.2% marketed the fishes always and 30.8% marketed the fishes occasionally. 77.7 % of the suppliers marketed the fishes of Kerala always and 22.2% marketed occasionally. Among aquarium shopkeepers 53.8% marketed Kerala varieties always and 46.2% marketed occasionally.

Table: 3.8 Marketing frequency of indigenous fishes

Category	Always	Occassionally	Total
Exporters	69.2%	30.8%	100.0%
Suppliers	77.8%	22.2%	100.0%
Retailers	53.8%	46.2%	100.0%
% within Q1	65.7%	34.3%	100.0%

Source: Primary data

3.3.2 Indigenous ornamental fishes marketed from India and Kerala

Product lines of Indian indigenous ornamental fish marketers included Indigenous freshwater fishes, Indigenous marine fishes and exotic fishes. Product line is a group of products that are closely related because they perform a similar function and are sold to the same customer groups, are marketed through the same channels or make up a particular range (Stanton, 1994). The indigenous ornamental fishes marketed from India are presented in Table 3.9.

Table: 3.9 Indigenous fishes of India in the ornamental fish trade

Scientific Name	Trade Name
	Killi fishes
Aplocheilus lineatus	Striped panchax
Aplocheilus panchax	Red panchax
Aplocheilus rubrostigma	Jewel panchax
Aplocheilus blochii	Dwarf panchax
	Hilltrouts
Barilius bakeri	Blue dotted hilltrout
Barilius barilius	Half banded hill trout
Barilius barna	Silver hilltrout
Barilius bola	Goliath hilltrout
Barilius canarensis	Pretty hilltrout
Barilius gatensis	Metallic hill trout
Barilius shacra	Striped hilltrout
Barilius tileo	Spotted hilltrout
Barilius vagra	Half banded hilltrout
	Chameleon fish
Badis badis	Dwarf chameleon fish
Badis badis burmanicus	Red chameleon fish
	Scarlet badis
Badis assamensis	Assam badis
Badis bengalensis	Red badis
	Chela
Chela altpar	Glass winged danio
Chela cachius	Neon hatchet
Chela dadyburjori	Burjor's brilliance
Chela labuca	Indian glass hatchet
	Murrels or snakeheads
Channa amphibia	Bhutan snakehead
Channa barca	Violet snake head
Channa bleheri	Rainbow snake head
Channa gahucha(orientalis)	Black and golden snakehead, Bengal snake head
Channa harcouri butleri	Cobra snake head
Channa marulis isabella	Isabella snakehead
channa marulis marulis	Peacock snakehead
Channa marulius	Peacock snake head (Isabela snakehead)
Channa micropeltes	
Channa orientalis	Special snakehead
Channa punctata	Checkered snake head, striped murrel
Channa special rainbow	Super snake head
Channa stewarti	
Channa striata	Striped snake head
Channa umangi	Broad banded snakehead
New channa bleheri	Asian snakehead
New channa species	Water emperor

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Anguilla bengalense	Brown snakehead
	Danios
Danio devario	Torquoise danio
Danio aequipinnatus	Gaint danio
Danio dangila	Mustached danio
Brachy danio rerio	
Danio nilgheriensis	
Danio malabaricus	Malabar danio
	Eels
Mastacembelus canarensis	
Mastacembelus punctatus	Spiny eel
Mastacembelus pancalus	Yellow spiny eel
Mastacembelus armatus	Tyre track eel
Macrognathus aculeatus	Peacock eel
Macrognathus guentheri	Guenther's spiny eel
Lycodontis tile	Spotted moray eel
Pisodonophis boro	Olive eel
Moringua raita borua	Pink worm eel
	Paradise fish
Macropodus cupanus dayi	Paradise fish
	Asian paradise fish
	Rainbow paradise fish
	Brown paradise fish
	Cobra paradis fish
	Checkered paradise fish
	Barbs
Puntius amphibius	Scarlet banded barb
Puntius arulius	Aruli barb
Puntius arulius tambrapamei	Four spot barb
Puntius bimaculatus	Silver barb , two spot barb
Puntius canius	Red gelius
Puntius chalakudiensis	
Puntius chola	Green swamp barb
Puntius conchonius	Rosy barb, fire barb, Indian rosy barb
Puntius denisonii	Red line torpedo
Puntius dorsalis	Long snouted barb
Puntius fasciatus paradhani	Pradhan's barb
Puntius fasciatus fasicatus	
Puntius filamentosis madraspatensis	Black spot barb
Puntius filamentosus	Filament barb
Puntius filamentosus assimilis	Filament barb
Puntius filamentosus lepidus	DMK fish
Puntius frazeri	Frazero's barb
Puntius gaiti	Zebra barb
Puntius gelius	Golden dwarf barb
Puntius guganio	Streaked barb
Puntius jerdoni	Jerdon's barb
Puntius kolus	Shooting barb
Puntius mahecola	Malini's barb
Puntius melanampyx	Melon barb

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Puntius narayani	Rainbow barb
Puntius phutino	
Puntius sahyadrensis	Sahyadris barb, maharaja barb
Puntius shalynius	
Puntius sophore	Sophres barb
Puntius sucatio	
Puntius terio	Terry barb (one spot barb)
Puntius ticto	Tic-tac-toe barb
Putnis vittatus	Kooli barb
Esomus danricus	Flying barb
Osteobrama cotio cotio	Diamond barb
	Red fin barb
Oriechythys casuatus	Hi fin barb
Oreichthys umangi/casuatis	Hifin variable
Osteolichthys nashi	Black border tail orange
Osteolichthys longidorsalis	Hifin barb
Oreichthys sp	Draped fin bvarb
Gonoproktopterus thomassi	Sombre barb, Red canareese barb
Gonoproktopterus curmuca	Red tailed silver shark
Gonoproktopterus amphibius	Nilgiri shark
	Southern orange tailed shark
Pangasius pangasius	Indian tigershark
Clupisoma serva	Platinum shark
Labeo boga	Red gill shark
Labeo so	Black shark
Labeo so	Bronze shark
Labeo bicolor	Red tailed black shark
Labeo chrsophekadian	
Horadandia atukorali	Glow light carplet
Schismatorhynchosnukte	Double mouth tor
Deccan mahseer	Tor khudree
Schismato rhynchosnukte	Double mouthed tor
Tor musallah	Magnificient tor
	Catfishes
Amblyceps mangois	Scissortail catfish
Aorichthys aor	Shovel mouth catfish
Aorichthys seengala	Shovelnose catfish
Arius maculatus	Spotted shark catfish
Arius singhala	Shovelnose catfish
Arius sona	New velvet catfish, Dusky shark catfish
Bagarus bagarus	Painted gaint catfish
Bagarus yarelli	Gaint river catfish
Batasio batasio	Transluscent catfish
Batasio teengana	Assamese mottled catfish
Bhavania australis	Goblin sucker catfish
Chaca chaca	Devil catfish
	Jewel catfish
Chanda ranga	
Chandramara chandramara	Head stander catfish(golden headstander catfish)
Clarius batrachus	Albino catfish
Conta conta	Thread tail catfish, Sucker catfish
Exostoma berdmorei	Birdmore's cat fish
Gagata centia	Clown cat fish/yellow catfish
Gagata ichkea	

Gagata virididescens	Broadheaded catfish
Glyptothorax sp.	Copper catfish
Glyptothorax anon	Black line catfish
Glyptothorax brevipinnis	Bronze catfish
Glyptothorax cavio	Banded torent catfish
Glyptothorax coheni	Sucker catfish
Glyptostemum sp.	
Hara filamentosus	Gaint mouth cat fish
Hara hara	Butterfly catfish
Hara horai	Elongated moth catfish
Hara jerdoni	Dwarf anchor catfish
Heteropneustes fossilis	Asian stinging catfish
Horabagrus brachysoma	Yellow cat fish
Horabagrus nigricollaris	While collared imperial carfish
Laguvia asperos	Mango catfish
Laguvia kapuri	Bee catfish
Laguvia ribeiroi	Ribero's catfish
Laguvia shawi	Cheeta catfish
Mystus cavasius	
Mystus gulio	Shadowcatfish (longwhiskered catfish)
Mystus keletus	Blue sheen catfish (grey catfish)
Mystus malabaricus	
Mystus menoda	Menoda catfish
Mystus montanus	Buttercatfish
Mystus oculatus	
Mystus tengra	Guinea catfish, golden zebra catfish
Mystus vittatus	Pyjama striped catfish
Nangra itchrea..ichkea	Brilliant catfish
Nangra viridiscens	Broad headed catfish
Olyra horai	Fighting catfish
Olyra kempi	Fighting catfish
Olyra longicaudata	Long fighting catfish
Ompok bimaculatus	Butter catfish
Ompok pabda	Gulper catfish
Plotosus canius	Eel catfish
Pseudeotrophis atherinoides	Striped glass catfish
Rita pavimentatus	Velvet catfish
Rita rita	White catfish
Sisor rhabdophorus	Whiptail catfish
Wallago attu	Killer catfish
	New catfish
	Shark catfish
	Orangebanded catfish
	Blyths catfish
	Cyntinal catfish
	Catfish bowwhiskered
Macrones sp	Silver catfish
	Goby
Brachiogobius nanus	Goby Bumblebee Goby, Bee fish
Eleotris fusca	Dusky goby
Eleotris marmoratus	Bicolor goby
Eleotris melanosoma	Bicolor goby
Eleotris marmoratus	Bicolor goby

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Glossogobius giuris	Sleeper goby
Gobopterus chuno	Multispotted neon goby, glass goby
Gobiopsis macrostoma	
Odontelaotris macrodon	Armadillo goby
Oligolepis acutipinnis	Mustached sail fin goby
Pseudocryptes lanceolates	Banded goby
Sicyopterus griseus(Day)	Clown goby
Stigmatogobius sadanundio	Knight goby
	Moon goby
	Crocodile face goby
	Variatus hifin goby
	Neon goby
	Blackface neon goby
Apocryptes bato	Scarydragon
Boleophthamus boddarti	Bluespot dragon
Scartelaos histophorus	
Odontamblyopus rubicundus	Rubicundus eel goby
	Loaches
Aborichthys bijulensis	Side winder loach
Acanthocobitis botia	Leopard loach
Acanthocobitis rudipinnae	Puma loach
Bhavania australis	Goblin sucker catfish
Botia birdi	Reticulated loach, Tiger loach
Botia dario	**Golden banded loach, rani or necktie loach**
Botia geto	
Botia lohacata	**Y-Loach/tiger loach**
Botia rostrata	Twin banded loach, reticulated loach
Botia striata	Striped loach
Homaloptera	Zigzag sucker fish
Homaloptera montana	Anamalai sucker loach
Lepidocephalus annandeili	Tailspot loach
lepidocephalus dibruensis	Assam loach
lepidocephalus goalparensis	Goalpara loach
Lepidocephalus gunthea	Panther loach
Lepido cephalus thermalis	Malabar loach
Mesonemacheilus triangularis	Stone loach
Nemacheilus scaturgina	Victory loach
Noemacheilus anguilla	Black line loach
Noemacheilus beavani	
Noemacheilus barapaiensis	
Noemacheilus botia	
Noemacheilus corica	Polka dotted loach
Noemacheilus ruppelli	Long snouted loach
Noemacheilus savana	Half banded loach
Noemacheilus triangularis	Zodiac loach
Pangia pangio	Indian coolie loach
Psilorhinchus balitoria	Angel hill stream sucker loach
Psilorhynchus sucatai	Checkered torrent fish
Psilprhyncus homaloptera	Torrent fish
Schistura	Grizzled loach
Schistura beavani	Banded loach
schistura denidayi	Ring loach

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Schistura denisoni dayi	Ring loach
schistura devdevi	Olivaceous loach
schistura multifasciatus	Manybanded loach
schistura silkmaiensis	Grizzled loach
Scistura corica	Polka dotted loach
Scistura scaturjina	Black &white loach
scistura semiarmaus	Fascinating loach
scistura yenjitie	Black panther loach
Somieptus gagato	Jaguar loach
Travancorea elongata	Angel sucker loach
	Checkered loach
	Tiger loach
	Glass fishes
Ambassis gymnocephalus	Bold glassy perchlet
Chanda baculis	Black spot glass fish
Chanda ranga	Jewel glass fish
Chanda wolfi	
Nandus nandus	Leaf fish
Parambassis thomassi	Gaintglass fish
pseudambassis baculis	Himalayan glass perchlet
Pseudambassis ranga	Highfin glass fish
	Puffer
Monotretus travancoricus	**Red greed dwarf puffer**
	Zodiac puffer
Chelonodon patoca	White spotted puffer
	Emrald puffer
	Chocolate puffer
Chelonodon steindachneri	Topaz puffer
	Black velvet puffer
Tetradon fluviatilis	**Green puffer**
Tetraodon cutcutia	**Malayan puffer**
Tetraodon lineatus	
Lates calcarifer	Gaint seaperch
	Round sea perch
Anabas testudineus	Climbing perch
	Garra
Garra bicornuata	Rhynocerus algae eater
	Rainbow algae eater
	Bengal algae eater
Garra gotyla gotyla	
	Silver algae eater
Garra mullya	Brown algae eater
	Deccan algae eater
Garra hughi	Rhinoceros garra
Garra lissorhynchus	
Garra annandalei	
Beleophthalmus boddaerti	Blue spotted dragon
Apocryptes bato	Scary dragon
	Scat

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Scatophagus argentimaculatus	Green scat
scatophagus argus rubrifrons	Red scat
Scatophagus tetracanthus	
	Cichilids
Etroplus suratensis	Pearl spot
Etroplus maculatus	Orange chromidae
Etroplus canarensis	Banded chromidae
Sillaginopsis panijus	Antenna fish
Notopterus notopterus	Black knife fish, black razor fish
Nandus nandus	Leaf fish
Orizias melastigma	Blue eyes
Amblypharyngodon mola	
	Scarlet gem
	Rasbora
Rasbora rasbora	Slender rasbora
Rasbora daniconius	Black line rasbora
Rasbora neigheriensis	Dark line rasbora
	Round pan sole
	Eye langerine
	Striped alligator fish
	Indian tongue sole
Periophthalmus perso	Jewel mudskipper
Colisa latia	Dwarf gourami
Ctenops nobilis	Noble gourami
	Speckled snow trout
Colisa chuna	Honey gourami
Colisa fasciata	Dwarf gourami
	Konkan sunfish
Pristolepis malabaricus	Malabar sunfish
Pristolpis marginatus	Yellow sunfish
Dermogenys pusillus	Wrestling half beak
xenetodon cancila	Freshwater gar
Rhinomugil corsula	Indian anableps
Eupatricthys vacha	
Cyanoglossus macrostomus	Malabar sole

Source: Compilation of primary and Secondary data

According to Jonklaas (1982) India's resources are vast; not only does the

mainland provide a large variety of freshwater and brackish water

ornamental fishes but their territories of Laccadives and Andaman with

their large expanse of coral reefs and unpolluted coastal lines could provide enough ornamental fishes plants and invertebrates to earn many million dollars per annum. Ramachandran (2002a) listed 178 indigenous fishes which were exported from India. The ornamental fish list compiled from customer invoices for a period of 10 years (1996–2005) revealed that, indigenous ornamental fishes marketed in India in the domestic and international markets added up to 319. The list presented the trade names of indigenous fishes along with the scientific names as the fishes were popular in the market based on trade names. Ekaratne (2000) catalogued 59 species of wild caught freshwater fish exported from Srilanka and recorded 400 species names noted from the recorded exports from Sri Lanka regarding which he added that, although no list can claim to be completely flawless and fully accurate, the physical examination of every return on export data lodged with customs over a period of 2 years is a reasonable progressive starting point for compiling an export list. This statement supports the list compiled in the present study to be an authoritative reference list for marketers and other information seekers.

Dey (1996) noted the popular groups of the freshwater indigenous fishes in trade as barbs, catfishes, loaches, murrels, hilltrouts, danios, eels, killifishes, puffer and cichilids. Indigenous fishes marketed by the respondents were classified into different groups of fishes as cat fishes (23%) which formed the major group which included largest number of fishes. Barbs (19%) trailed close behind and was followed by loaches (15%), murrels (7%) and gobies (7%). Hence catfishes, barbs and loaches

formed the major group of fishes marketed from the country.
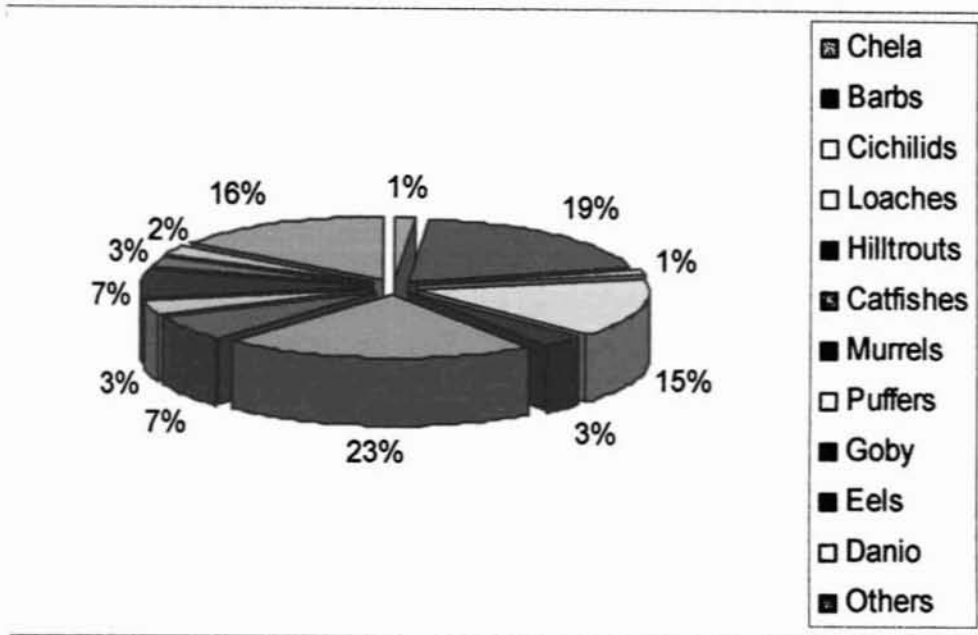
Figure: 3.1 Different group of indigenous fishes in aquarium trade

From the 319 indigenous ornamental fishes marketed from India, 57 indigenous varieties were noted from the water bodies of Kerala, thus forming 18% of the indigenous ornamental fishes exported from India. The name, scientific name, trade name of the indigenous varieties of Kerala noted in export markets is presented in the Table (3.10). Sane (1982a) stated that India and especially Kerala has several species which could be popular, especially the hill streams and the lakes at reasonable altitude for example melon barbs from Kodaikanal lakes, *Puntius sahyadrensis* from Mahabaleshwar lake, Puntius *denisonii* from Kerala, *Puntius melanampyx.* Kanyakumari from Kerala, *Macropodus cupanus* dayi from Cochin downwards. According to Gopalakrishnan and Ponniah (1999), the fresh water ornamental fish fauna of Kerala is biologically more diverse represented by 125 species The Western Ghats is a gold mine of fish

Table: 3.10 Indigenous ornamental fishes of Kerala noted in trade

Scientific name	Trade name	Local name
Amblypharyngodon mola	Brass fish	Vayambu
Aplocheilus lineatus	Stirped Panchax	Poochutty;
Aplocheilus panchax	Red panchax	Poochutty;
Aplocheilus blockii		Manathukanni
Anabas testudineus	Climbing perch	Karippidi
Barilius bakeri	Blue spotted hill trout	Pavukan
Barilius barna	Silver hill trout	
Barilius canarensis	Jerdon's baril	Paral
Chela dadiburjori	Burjor's Brilliance	Chela
Channa striatus	Snake head	Varal
Channa marulius	Peacock snake head	Cherumeen;
Channa micropeltes	Snake head	Bral
Channa orientalis	Snakehead	
Channa gachua	Brown snake head	Vatton
Chanda ranga	High fin glass fish	Arinjil
Danio aequipinnatus	Giant danio	Thuppalamkothi
Danio malabaricus	Malabar danio	**Thuppalamkothi**
Esomus danricus	Flying barb	Meshaparavai
Etroplus maculates	**Orange chromide**	Pallathy
Etroplus suratensis	Pearl spot	Karimmeen
Eleotris fusca	Bicolor goby	Mongal
Glossogobius giuris	Sleeper Goby	Poolan
Garra gotyla gotyla		
Gonoproktopterus curmuca	Red tailed silver shark	Kooral
Gonoproktopterus amphibius	Scarlet banded barb	urulen kendei
Gonoproktopterus thomassi	Nilgiri shark	Kooral
Horabagrus brachysoma	Yellow cat fish	Moongil;
		Manjakkori
Horabagrus nigricollaris	White collared imperial	Majaletta
Homaloptera montana		
Horadandia atukorali	Glowlight carplet	
Lates calcarifer	Gaint sea perch	Kalanchi
Lepidocephalus thermalis	Loach	
Mystus vittatus	Striped loach	Chillankoori
Macropodus cupanus	**Spiretail Paradise fish**	Karimkana
Macrognathus aral	Spiny eel	Aarakan
Mastacembelus armatus	**Marble spiny eel**	Aaral
Notopterus notopterus	Grey feather back	Black knife fish
Nemacheilus triangularis	Zodiac Loach	Koima; Koitha
Nandus nandus	Leaf fish	Muthukkila
oryzias melastigma	Blue eyes	Karimkana

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Puntius arulius	Aruli barb	Vazhakkavarayan
Puntius bimaculatus	Two spot barb	Paral
Puntius denisonii	Red line torpedo fish	Chorakkaniyan
Puntius fasciatus	Melan barb	Vazhakkavarayan
Puntius filamentosus	Indian tiger barb	Poovaliparal
Puntius filamentosus lepidus	Indian tiger barb	Valel chutty paral
Puntius mahecola	Malini's barb	Valel chutty paral
Puntius sophore	Softfin swamp barb	Paral
Puntius ticto	Tic Tac Toe barb	Putterparal
Puntius vittatus	Silver barb	Attuvatta
Rasbora daniconius	Slender rasbora	Paral
Sicyopterus griseus	Clown Goby	Kallelotti
Scatpohagus argus	Green scat	Nachara
xenetodin cancila	Pipe fish	Kolaan
Tetraodon travancoricus	Puffer	Attunda
Wallago attu	Killer catfish	Attuvaala

Source: Primary Survey

biodiversity with 85 endemic taxa and over 15 taxa of adjacent areas.

A comprehensive list of 64 ornamental fishes endemic to Peninsular India with special reference to Western Ghats was prepared by National Bureau of Fish Genetic Resources i.e. NBFGR (Gopalakrishnan and Ponniah, 1996) belonging to 14 families. Ramachandran *et al.,* (2002d) as a part of an MPEDA adhoc project on "Resource Analysis of potential ornamental fishes of Kerala for marketing in India and abroad" selected 13 rivers from the 44 rivers of the state, collected 112 indigenous fishes during the period 2000-2001 and carried out transportation studies, captivity, survival studies and reared them in aquarium for 2 years to understand the suitability for captive rearing and test marketing to project them as a potential indigenous ornamental fishes. Though Kurup and Radhakrishnanan (2006) listed 175 indigenous fishes of Kerala and presented 75 fishes as potential ornamental fishes of Kerala, they have not carried out any aquarium feasibility or market feasibility studies to

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understand the potential of the collected fishes as ornamental fishes. Gopakumar (2002b) conducted studies on the captive rearing of more than 84 species of marine ornamental fishes from Kerala coast. The fascinatingly colourful marine varieties from waters of Kerala were surgeon fish, triggerfish, butterfly fish, wrasses, damsel fish, angels, moorish idol. Murthy (2002) Identified 165 marine fishes from Lakshadweep and nearby areas which has the potential to be marketed as ornamental fishes. Sureshkumar *et al.*, (2004) identified 40 species (belonging to 20 families) of the potential marine ornamental fishes in the trawl bye catches of the Ponnani fishing harbour, South West coast of India in order to assess the temporal and spatial availability. These fishes were discarded due to low consumer acceptance and small size. Only a handful of marine fish are traded in the domestic markets of Kerala and only the genus Amphiprion were marketed in consistent numbers. Brackishwater water species such as *Monodactylus argentius*, *M.seabe*, *Scatophagus argus* are common in Indian waters and they could be collected, cultured and traded. *Etroplus suratensis*, *E.maculatus*, *Ambassis* species have been successfully bred in low saline waters and are potential brackish water fishes fit for planned mass production and export.

3.3.3 Market preference for indigenous ornamental fishes of Kerala

Market forces drive the collection of ornamental fish and importers or customers often request for particular species and some fish which are constantly in demand. These are always targeted because dealers can virtually guarantee a sale. Heirarchial clustering (Aaker *et al.*, 1997)

Dendrogram using Average Linkage (Between Groups)
Rescaled Distance Cluster Combine

```
         C A S E                  0        5       10       15       20       25
Label                      Num    +---------+---------+---------+---------+---------+
Puntius denisonii           23    ┐┐
T. travancoricus            31    ┘│
P. fasciatus                24    ┐ │
P. mahecola                 26    ─┤│
Chela dadiburjori            5    ─┴┘
M. armatus                  19    ─┘
Nandus nandus               22    ┐
P. Jerdoni                  25    ─┤
Anabas testudineus           1    ─┤
Danio malabaricus            7    ─┤
Etroplus maculates           8    ─┤
Barilius bakeri              2    ─┘
Xenetodon cancila           18    ┐
S. argus                    30    ─┤
Etroplus suratensis          9    ─┼┐
L. thermalis                15    ─┤│
Pangasius pangasius         17    ─┘│
P. vittatus                 28    ┐ │
R. daniconius               29    ─┤ │
Barilius canarensis          3    ─┤ │
N. semiarmatus              21    ─┤ │
P. ticto                    27    ─┤
Mystus vittatus             16    ─┤
N. triangularis             20    ─┤
H. brachysoma               13    ─┤
H. nigricollaris            14    ─┤
G. amphibius                10    ─┤┐
G. thomassi                 12    ─┤│
Barilius gatensis            4    ─┤┤
Chanda ranga                 6    ─┘│
G. curmuca                  11    ──┘
```

Figure: 3.2. Indigenous ornamental fish clusters based on market preference

classified the indigenous ornamental fishes of Kerala based on market preference into four clusters which is presented in Figure 3.2. The four clusters of fishes as per the cluster analysis dendrogram were, fishes highly preferred in the export market (HPE), fishes that showed a medium preference in the export market (MPE), fishes that had low preference in the export market (LPE) and fishes preferred in the domestic market (DMP).

P.denisonii, T.travancoricus, P.mahecola, C.dadyburjori ,Mastacembelus armatus and *P.fasciatus* were the fishes that were included in the cluster namely highly preferred fishes in the export market (HPE). These were fishes which showed and increasing demand in export markets and were requested in all export enquiries. The survey revealed that these fishes were exported in consistent numbers, very regulary from India. The preference for the fishes of the HPE cluster was so high that the importers demanded any of those fishes (especially *Puntius denisonii* and *tetraodon travancoricus*) in all the consignments they imported from India.

Fishes which had a medium preference in the export market (MPE) were *Barilius bakeri, Etroplus maculates, Danio malabaricus, Anabas testudineus and Nandus nandus*. The fishes were marketed from Kerala for more than ten years but were not observed regularly in the export consignments of the exporters. Fishes which had a low preference in the export market (LPE) included *Puntius vittatus, Nemacheilus triangularis, Mystus vittatus, Gonoproktopterus amphibious, Chanda ranga, Rasbora daniconius, Nemacheilus semiarmatus, Horabagrus brachysoma, Gonoproktopterus amphibious, Barilius gatensis, Barilius canarensis,*

Puntius ticto, Horabagrus nigricollaris, G.curmuca. These fishes did not have an elaborate history of export and were not regularly marketed.

Fishes which were preferred in the domestic market (DMP) included *Lepidocephalus thermalis, Xenetodon cancila, Etroplus suratensis, Pangasius pangasius and Scatophagus argus. Lepidocephalus thermalis* was marketed along with loaches and was not promoted as indigenous fish. But *Pangasius pangasius* was an indigenous fish which was easily passed off as Silver sharks in the domestic market. Small sized scats which were acclimatised to freshwater was another fish popular indigenous fish gaining popularity along with the exotic fishes. *Xenetodon cancila* showed low survival rate (Ramachandran *et al.,* 2004) and hence could not be exported eventhough it was quite unique due to its appearance and long beak and found a place in the domestic market.

The study thus indicated four clusters of preference in indigenous ornamental fish marketing. Highly preferred and medium preferred fishes added up to fifteen species. But a core of only five species of the highly preferred group dominated the indigenous ornamental fish market and those fishes were marketed in large numbers. In Queensland, Australia, more than 60% of all fish which are commercially harvested come from 5 families (Pomacentridea, Chaetodontidae, Pomacanthidae, Labridae and Gobidae). These are also the most important groups in the Pacific fisheries. In CostaRica, Anguilar (1992), found that eight species were taking 81% of the trade, and Graham (1996) reported that in Palau, 10 species made up 60% of exports. According to Wood (2001) many supplying countries have

one or more 'rarities' that are in demand, for example, Guam is currently the only source for rusty angel (*Centropyge Shepardi*) which is endemic to Southern Mariana islands and Southern Japan. Similarly, Taiwan is a source of blue striped angel fish which is restricted to Southern Japan, Taiwan and Hong Kong (Allen, 1981). Ramachandran *et al.,* (2002) described the indigenous fresh water ornamental fishes of Kerala popular in the export market as *Puntius denisonii, Puntius sophore, Puntius jerdoni, Tor khudree, Chela fasciata, Barilius bakeri, Barilius gatensis, Barilius canarensis, Danio malabaricus, Gara mullya, Nemacheilus guenthari, Nemacheilus semiarnatus, Lepidocephalus thermalis, Mystus montanus, Mystus armatus, Mystus gulio, Ompok malabaricus, Ompok bimaculatus, Hyporhampus limbatus, Xenetodon cancilla, Aplocheilus lineatus, Aplocheilus dayi, Ambassis commersoni, Parambassis thomassi, Channa striata, Channa marulius, Mastacembelus armatus* and *Tetraodon travancoricus* and created a website *www.ornamentalfishes.org* for disseminating the information to the stakeholders. The website has the details of the fishes which were collected and maintained in aquaria for feasibility studies and marketing and the photographs of the indigenous fishes are presented in Annexue one. The study by Ramachandran *et al.,* (2002) had not classified the fishes based on market preference. But the present study noted that, even though 57 indigenous fishes were marketed as ornamental fishes only a core group of species accounted for perhaps two third of every shipment. Indigenous fishes of Kerala are unique in beauty and variety and possess range of attributes that confirm their suitability as aquarium fishes. Kerala can be in the fore front in ornamental

fish marketing and bring India in the ornamental fish atlas of the world provided; we get a clear understanding of the fishes in demand and supply positions and portray in the market.

3.3.4 Trend in the indigenous ornamental fishes export

Highly market preferred indigenous ornamental fishes of Kerala according to the present study included *P.denisonii*, *T.travancoricus*, *P.fasciatus*, *P.mahecola*, *C.dadyburjori*, and *Mastacembelus armatus* and they were chosen for trend analysis. Figure 3.3, 3.4, 3.5, 3.6, 3.7 portrays the trend in the export of the highly market preferred fishes. Table 3.11 shows a comparison of coefficient of determination (R^2) and rate of change in growth (β) for the export of selected indigenous ornamental fishes of Kerala. The measure of the regression model's ability or accuracy to predict is determined by the (R^2) value or coefficient of determination value. In the case of trend based on number of indigenous ornamental fishes exported, R^2 value was highest for *Puntius mahecola* followed by *Tetraodon travacoricus P.mahecola*, *Puntius fasciatus* and *Puntius denisonii*. Hence these fishes showed a perfect model fit and indicated that in the following year the increase in the number of fish exported would be defenite. *Tetraodon travancoricus* and *Puntius mahecola* were two highly preferred indigenous ornamental fishes which have been exported in consistent numbers over the past nine years and the study shows clear indication that in the years that follow these fishes would show an increase in the number of fishes exported. For *Mastacembelus armatus* R^2 value was very less which indicated that a trend was not possible and that a
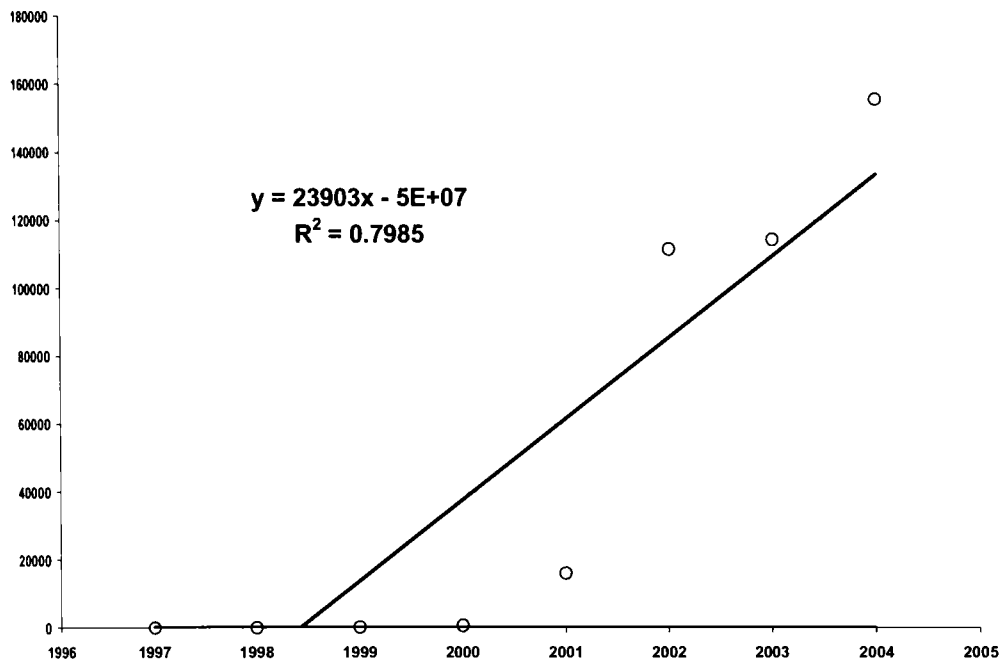
Figure: 3.3. Export trend of *Puntius denisoni*

$$y = 23903x - 5E+07$$
$$R^2 = 0.7985$$
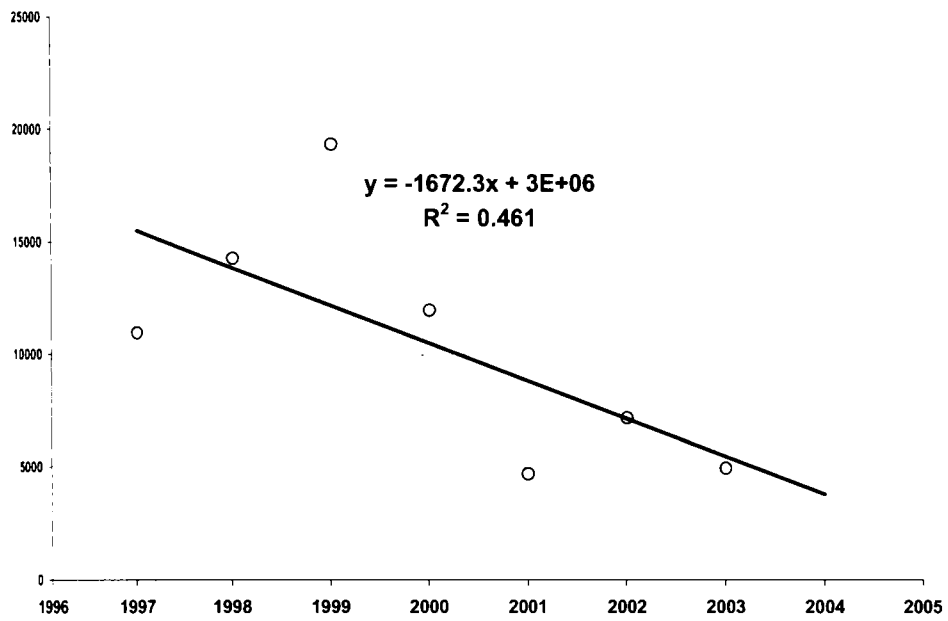
Figure: 3.4. Export trend of *Puntius fasciatus*

$$y = -1672.3x + 3E+06$$
$$R^2 = 0.461$$

$$y = 326.96x - 652976$$
$$R^2 = 0.9405$$
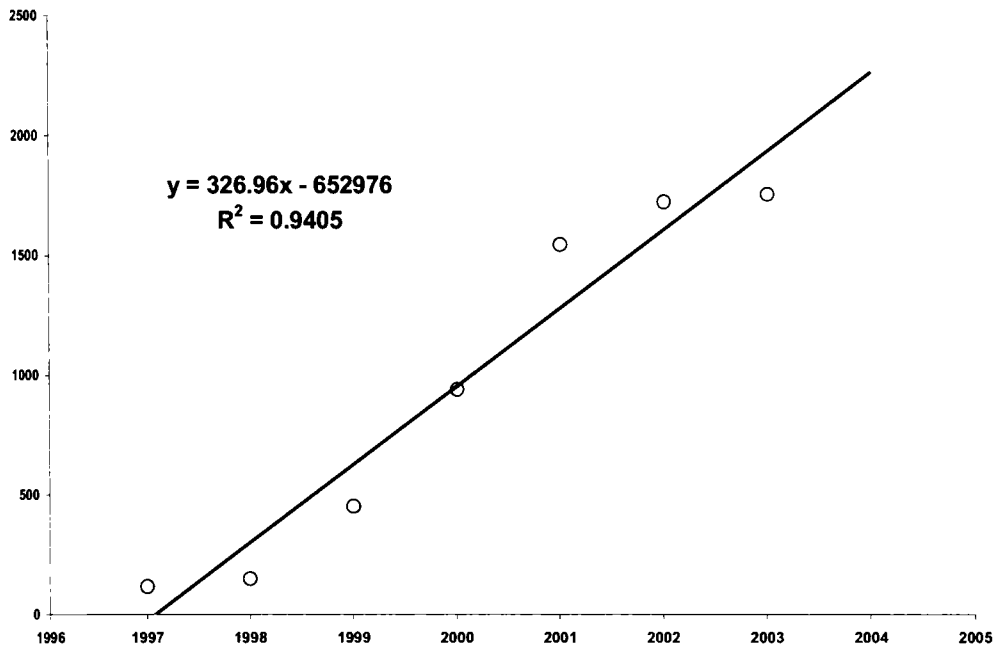
Figure: 3.5. Export trend of _Puntius mahecola_

$$y = -368.04x + 739655$$
$$R^2 = 0.0573$$
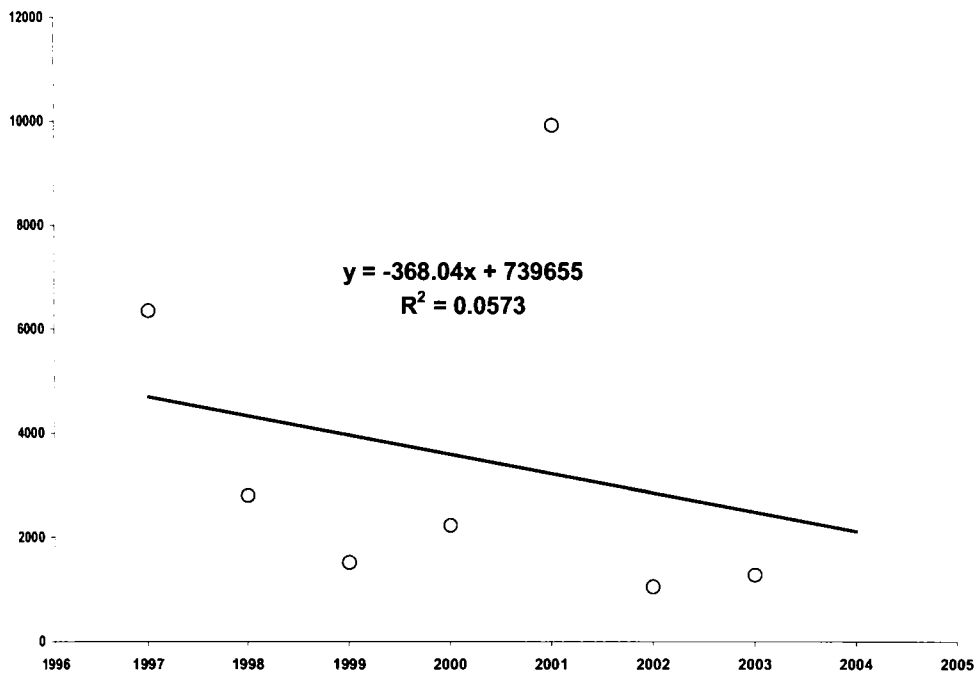
Figure: 3.6. Export trend of _Mastacembelus armatus_

$$y = 76786x - 2E+08$$
$$R^2 = 0.907$$
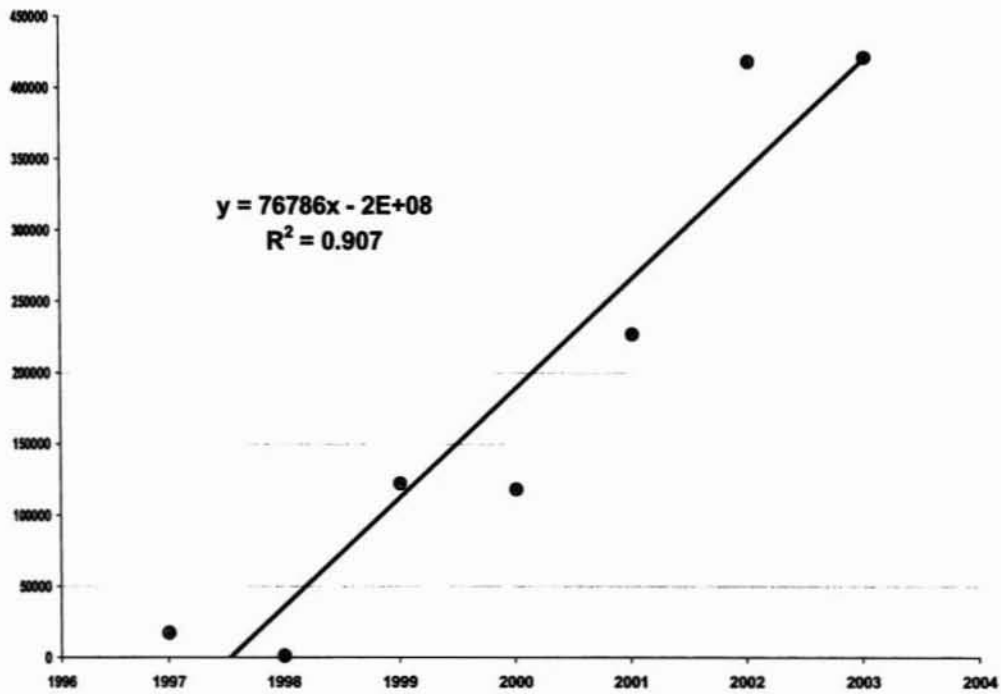
Figure: 3.7. Export trend of *Montretus travancoricus*

Table: 3.11 Comparison of trend in the export of indigenous fishes

Fishes	TREND BASED ON NUMBER	
Scientific name	Coefficient of determination (R^2)	Rate of change in growth (ß)
Puntius denisoni	0.7985	23903
Puntius fasciatus	0.461	-1672.3
Puntius mahecola	0.9405	326.96
Monotretus travancoricus	0.907	76786
Mastacembelus armatus	0.0573	368.04

Source: Primary data

prediction could not be done. Though *Mastacembelus armatus* had a high market preference it was not marketed in consistent numbers due to the lack of availability.

' β ' indicating the rate of change in export growth (in terms of numbers) was more for *Tetraodon travancoricus* followed by *Puntius denisonii, Chela dadyburjori and Puntius mahecola. β for Puntius fasciatus* showed a negative value which indicated a decrease in growth. Eventhough the ' β ' value of *Mastacembelus armatus* was higher than that of *Puntius mahecola the growth rate of Mastacemebelus couЯld* not be considered as definite as its R² was very less. Andrews (1990) opined that reliable data are required on the number and species of ornamental fish involved in the trade particularly with regard to wild caught specimens and the ornamental fish trade must become actively involved in and support all aspects of conservation of animals upon which the industry is based and maintain a close working relationship with those organisms seeking to impose further trade restrictions. He further added that number of indigenous ornamental fishes marketed have to be recorded whether it is in the domestic or export marketing to note the level of exploitation for trade before quota implementation is carried out. No previous attempts have been carried out to calculate the number of indigenous ornamental fishes traded from Kerala or to analyse the trend in their exports. The trend analysis study indicated that the export of *Tetradon travancoricus, Puntius denisonii, Chela dadyburjori and Puntius mahecola* is on the increase, where as the rate of change in the export growth of *Puntius fasciatus* is on

the decrease. Hence the study conclude that among the highly preferred

indigenous ornamental fishes marketed   from Kerala the number of

Tetraodon travacoricus and *Puntius denisonii* have to be made recordical.

Calculation of the number of indigenous ornamental fishes of HPE cluster

and further determination of the trend in export of those fishes enabled the

selection of species (*Tetraodon travacoricus* and *Puntius denisonii*) for any

future studies on quota implementation and conservation.

Chapter 4

Channels of Distribution in Indigenous Ornamental Fish Marketing

4.1 Introduction

A channel of distribution is known as "Place" in the "4 P's" model of marketing (Mac Carthy, 1960). The role of distribution within the marketing mix is getting the product to its target market (Stanton *et al.,* 1994). On the other hand, an agent or broker who does not take title and normally would not take physical possession of the product would be considered as a part of marketing channel. This follows because the agent or broker by helping to bring buyer and seller to consummate a transaction facilitates the transfer of the title (Bucklin, 1972). According to Jonklaas (1982), the resources of some developing countries in particular African states and India are very great, but the country with the most limited resources has been the most successful in aquarium trade viz., Singapore. Although resources of Srilanka are very limited compared to India, they have been utilised to achieve a fair degree of success in the export trade. This clearly denotes that the resources alone can not enable a country to develop its trade. Jonklaas (1982) put forward the factors which determine a successful enterprise in ornamental fishes as skilled collectors or fishermen, good supply lines, adequate and cheap transport, proper technology, investments and airfreight facilities to the target markets. Olivier (2001b) and Lee (2005) stated that Singapore's excellent logistics hub played a pivotal role in elevating the country's position as the world's major ornamental fish exporter.

In the case of ornamental fish marketing, packaging is a vital factor

as the fish is packed in live condition and has to reach the final destination with least mortality. Ornamental fish packing have come over a drastic transformation in the years to improve the quality of packing so as to reduce mortality. Miller (1956) described that, plastic bags were used by tropical fish importers to package aquarium fish for transport by air or in motorised vehicles in the early 1950s. Sane (1982b) gave a brief history of packaging and transportation of live fish and stated that commodity number '1024' of IATA (International Air Transport Association) gives a detailed description of what could be carried as live tropical aquarium fish which also includes aquarium plants and invertebrates. Dordi and Dasgupta (1983) added that an essential part of the export of live aquarium fish is suitable distribution system with proper care towards packing and transportation. Frose (1986) elaborated the basic rules to be observed while packing fish in plastic bags. Singh (1997) described the handling and transportation of live fish.According to Teo and Chen (1989) packaging of ornamental fishes is a valid factor especially in the case of international marketing. This is mainly due the requirement of fish to be packed, in order to reduce freight cost along with the assurance that live fish will arrive at destination in good condition. Richards and Rajadurai (1989) notes that, the trade in aquarium fish is a multi million dollar business, the success of which largely depends on efficient packaging, which has to begin with good quality water, healthy fish, proper loading density and good capture and handling methods. Mintel (1991) notes that most of the weight of shipment is water and it is expensive to shift a box of water round the world if they can not sell what is in it at the other end. Live

animal regulation (LAR) of international air transport association (LAR IATA, 1993) put forward the packing methods of ornamental fishes for export. Cole *et al.,* (1999) detailed the shipping practices in the ornamental fish industry and provided guidelines for growers on choosing an airline carrier, selecting shipping bags and boxes and determining how densely to pack fish, by species. They discussed the packing procedures and shipping additives and gave the instructions to be carried out on receiving fish. Ploeg (2005a) described a new packing method namely, comfort packing for ornamental fish marketing. An attempt was made at gaining an insight into the channels of distribution in the marketing of indigenous ornamental fishes of Kerala with the objectives given below.

1. To study the channels of distribution in indigenous ornamental fish marketing to compare the profile of the marketers.

2. To compare some of the infrastructural facilities of the marketers.

3. To note the methods adopted by marketers for gaining market information.

4. To examine the major constraints faced or anticipated by the marketers in the exporting of indigenous ornamental fishes.

4.2 Methodology

The population comprising marketers of indigenous ornamental fishes of Kerala i.e. exporters of India, suppliers of Kerala and retail aquarium shopkeepers of Kerala were surveyed using SPSS (Statistical Package for Social Sciences) friendly, structured and pretested questionnaire. The methodology is described in detail in chapter two.

4.2.1 Distribution channels of indigenous ornamental fishes

The specific questions in the questionnaire on channels of distribution were on the profile of the marketers i.e. age, experience, education level and period during which they established the firm. The results of the specific questions were then cross tabulated with the category of marketers.

4.2.2 Infrastructure, quality and regulations in marketing ornamental fishes

The channel aspects relating to infrastructural facilities (i.e. storage facilities, transportation facilities), quality complaints, market information gained by the marketers and regulations encountered in marketing were probed. The answers of the marketers were cross tabulated with the category of marketers.

4.2.3 Methods adopted in gaining market information

To update its marketing strategies, marketers need to equip themselves with the latest market information. Respondents were enquired about the methods adopted by them, to find the purchaser, for demand assessment, for deciding the quantity to be collected and the results obtained for the questions were cross tabulated with the category of marketers.

4.2.4 Constraints in the export of indigenous ornamental fishes

In order to find the constraints by the marketers in indigenous ornamental fish export, nine constraints in the export of indigenous ornamental fishes were identified as variables for the study based on discussions with

experts and marketers during the preliminary survey. The constraints included tough export procedure, flight facilities, high cargo rates, lack of market information, trade and non trade barriers, high mortality rates, language problem, financial problems and difficulty in consignment filling. Marketers were asked to rank the constraints as ten for the major constraint to one for the minor constraint. The mean score of the ranks given for the constraints by the marketers of metropolitan cities and marketers of Kerala were marked on a radar chart. Vavra (1998) noted that in a radar chart, each vector represented a variable i.e. here the constraint. The mean scores of the ranks obtained and marked in the vectors were then joined together to form ellipsoids to understand the constraints faced or anticipated by the marketers in Kerala and the metropolitan cities of India.

4.3 Results and Discussion

4.3.1 Marketing channels of indigenous ornamental fishes of Kerala

The general survey revealed that the indigenous ornamental fish trade involved part time collectors or fishermen, suppliers, retailers and exporters. These channel members facilitated the collection, acclimatisation, packing, transport and marketing of the fishes. The figure 4.1 illustrates the channels of distribution of the indigenous ornamental fishes of Kerala. Indigenous fishes were collected from different collection sites of various water bodies of Kerala i.e. fresh, brackish and marine waters. Ramachandran et al., (2002) described the resources from which indigenous ornamental fishes were mainly collected for ornamental fish

trade. The fishermen fished in the vicinity of their own fishing village which was mostly near the water bodies such as rivers, lakes or sea. They were not fulltime ornamental fish collectors but depended on food fish collection for livelihood.
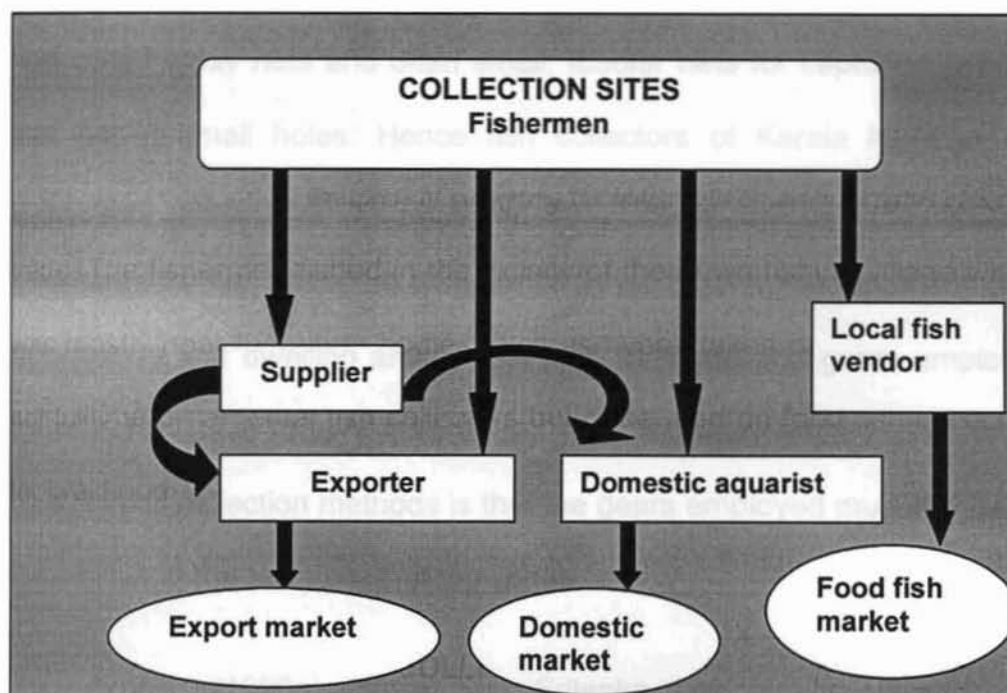
Figure: 4.1 Distribution channels of the indigenous ornamental fishes of Kerala

It was observed that fishermen in Kerala collected fishes using the food fish collecting gears such as cast net and scoop net for the capture of freshwater and marine ornamental fishes. In Sri Lanka and the Maldives collectors catch most of their fish using hand nets (Wood, 1985). Randall (1987) notes that, of the other fishing techniques used, the barrier nets are the best. He further added that hand nets or dip nets are used for fishing with diving equipment as they are selective. In Australia (Couchman and Beumer, 1992) the Pacific region (Pyle, 1993) and Florida (Larkin *et al.*, 2000b) fishers often use much larger barrier, drop or fence nets. In

south East Asia where aquarium fisheries is most developed, fishers are assisted by a method called Hookah, whereby compressors are installed on their vessels and connected to long plastic tubes that the divers bite between their teeth to which a regulator is attached. Madhu (1996a) described that the divers in Srilanka capture ornamental fishes using hand nets called moxy nets and often small, tubular nets for capturing species that live in small holes. Hence fish collectors of Kerala have to use specialised gears such as large variety of traps and nets for catching ornamental fishes. Since the ornamental fishes differ in their morphological appearance and dwelling areas, collection methods and gears employed for collection have to vary accordingly. One important aspect to be taken care of in all collection methods is that the gears employed must not cause deformities in the body parts of the fishes.

Madhu (1996a) states that Srilanka has highly efficient well equipped and market aware expert divers (scuba divers) who helped to establish a US $ 5 Million fetching export industry. But the study noted that in India and especially Kerala there were no skilled divers who collected ornamental fishes on a professional basis as in the case of Sri Lanka and Maldives. In marine fish collecting sites such as Vizhinjam, clam collectors were employed for marine ornamental fish collection. The fishermen in Kerala were not full time ornamental fish collectors and obtained money for the collection as price per fish but did not possess any trainings or tactics in the capture of ornamental fishes without inflicting much damage. Many of them were seen to use destructive methods such as *thotta*

pottikkal or dynamiting and *nanchu kalakkal* or poison application for fish capture. Destructive fishing methods are currently the most serious problem for this sector.

Rubec (1986; 1987) noted that investigations during 1980s revealed the fact that about 80-90% of fish exported from the Philippines had been captured using sodium cyanide. Randall (1987) and Sadovy (1992) notes that among the other toxic substances used to harvest ornamental marine fish are organophosphorus insecticides, quinaldine, chlorine, diesel, fuel and dynamite. In the Philippines, fishery with sodium cyanide is prohibited, but it is still used in 80% of the cases (Hingco and Rivera, 1991). Erdmann *et al.*, (2000) noted that the damaging techniques such as the use of sodium cyanide are non selective methods used to capture fish and they adversely affect the health of fish and also kill non target organisms. Parida *et al.*, (2004) present an alarming fact that lost fishing gears have the potential to go on fishing for years in a macabre phenomenon called ghost fishing causing a slow and painful death to many marine animals and untold losses to target and non target species.

From the study it was inferred that, indigenous ornamental fish from Kerala reached the export market through two channels. In the first channel, fish was transferred from fisherman (collector), through supplier to the exporter, who in turn exported it to the international market. Suppliers were channel members, who requested the small-scale food fish fishermen to catch certain number of specific fishes based on the purchase order they received from the exporter. Suppliers then collected

indigenous fishes from the fishermen fishing in different collection sites of various water bodies and in turn transferred the fishes to the exporters in the metropolitan cities. In the second channel, fish was transferred straight from collector to the exporter. Here the exporter took the initiative to obtain the fishes from the collector.

Other channels noted in the domestic market were supply of indigenous fishes to the aquarium outlets. Apart from supplying to the exporters, the suppliers often collected fishes from the fishermen and supplied to the domestic aquarium shops. At times the fishermen supplied small sized fishes (*Scatophagus argus, Etroplus maculatus and Etroplus suratensis*) or peculiar appearing fishes to the local aquarium outlets. Indigenous fishes of ornamental value were at times passed unknowingly to the domestic food fish market by local vendor.

4.3.1.1 Profile of the indigenous ornamental fish marketers

Table 4.1 presents the age group of the indigenous ornamental fish marketers who dealt with indigenous ornamental fishes of Kerala.

Table: 4.1 Age of the indigenous ornamental fish marketers

Category	26yrs-35	36yrs-45	46-55	56 -65	66 and above	Total
Exporters	.0%	38.5%	30.8%	23.1%	7.7%	100.0%
Suppliers	33.3%	33.3%	33.3%	.0%	.0%	100.0%
Retailers	15.4%	15.4%	38.5%	30.8%	.0%	100.0%
Total %	14.3%	28.6%	34.3%	20.0%	2.9%	100.0%

Source: Primary data

It was noted that, highest percentage of marketers was of the age group 46-55. On analysing the exporters separately it was seen that all classes from 36-45 and above i.e. 46-55, 56-65, 66 and above had good percentage representation and there were no exporters in the class 26-35. Among the suppliers, the percentage representation was equal among the three classes i.e. 26-35 years, 36-45 years and 46-55 years. Aquarium fish marketers were highest in the age group 46-55. The study suggested that the marketers in ornamental fish trade belonged to the higher age group. It was also noted that the exporters of indigenous fishes were of higher age group and there were no exporters in the lower age group. But among the suppliers the lower age groups also marketed indigenous fishes. High aged retailers were more in indigenous ornamental fish marketing which may be due to the fact that new comers depended only on the marketing of flashy coloured exotic fishes.

Table: 4.2 Education level of the marketers

Category	Less than secondary	Up to Higher secondary	Up to Degree	Up to Post Graduation	Total
Exporters	.0%	7.7%	69.2%	23.1%	100.0%
Suppliers	11.1%	33.3%	44.4%	11.1%	100.0%
Retailers	.0%	38.5%	46.2%	15.4%	100.0%
Total %	2.9%	25.7%	54.3%	17.1%	100.0%

Source: Primary data

Table 4.2 presents the education level of the marketers of Indigenous ornamental fishes of Kerala which revealed that good percentage of the marketers (54.3%) had a bachelor degree and very less (2.9%) marketers

had less than secondary education. Among aquarium shopkeepers and suppliers, education level less than higher secondary or secondary level was noted. It was noted that the marketers exporting indigenous ornamental fishes of Kerala were highly educated. Among marketers, exporters were highly educated unlike the general notion and it was the suppliers and aquarium shopkeepers who were comparatively less educated.

Table: 4.3 Period of establishment of the firms

Category	Before 1980	1980-84	1985-89	1990-94	1995-99	2000-04	Total
Exporters	7.7%	30.8%	.0%	30.8%	30.8%	.0%	100%
Suppliers	0%	11.1%	11.1%	.0%	33.3%	44.4%	100%
Retailers	7.7%	30.8%	7.7%	15.4%	30.8%	7.7%	100%
Total %	17.1%	14.3%	5.7%	17.1%	31.4%	14.3%	100%

Source: Primary data

Table 4.3 revealed that highest percentage (31.4%) of firms marketing the indigenous ornamental fishes was established during 1995-1999 period. This supports the fact that within the last ten year span there was a mushrooming of indigenous ornamental fish marketing firms in Kerala. When a boom in the market is sensed for a particular variety, along with licensed and reputed marketers, many unscrupulous elements entered the market to make the best bargain out of the situation.

Table 4.4 presents the experience of the indigenous ornamental fish marketers which showed that, high percentage (54.3%) of the

marketers had an experience of less than 5 years in indigenous ornamental fish marketing. On analysing the exporters separately it was seen that high percentage (46.2%) had an experience of 10-14 years and 7.7% had an experience of more than 20 years in the marketing of indigenous fishes of Kerala. The pioneer in ornamental fish export from India began marketing the indigenous fishes of Kerala in the year 1962. High percentage (55.5%) of the suppliers had an experience of less than 5 years.

Table: 4.4 Experience in marketing indigenous ornamental fishes

Category	Less than 5 years	5-9 years	10-14 years	15-19 years	20 and above	Total
Exporters	23.1%	15.4%	46.2%	7.7%	7.7%	100.0%
Suppliers	55.6%	33.3%	11.1%	.0%	.0%	100.0%
Retailers	84.6%	15.4%	.0%	.0%	.0%	100.0%
Total %	54.3%	20.0%	20.0%	2.9%	2.9%	100.0%

Source: Primary data

84.6% of the aquarium shopkeepers began marketing indigenous ornamental fishes of Kerala less than 5 years ago. Majority of the marketers showed very less experience in the marketing of indigenous fishes. Though the exporters showed more experience it was noted that the suppliers and retailers had very less experience in the marketing of indigenous ornamental fishes. The marketers experience indirectly reflects on the quality and overall marketing of fishes. Hence suppliers have to enhance their experience in handling fishes before actually beginning to market fishes, as live fishes require a lot of care in handling.

Table 4.5 presents the location of the indigenous ornamental fish marketers. From the table it is apparent that majority (65.7%) of the marketers of indigenous ornamental fishes of Kerala was located in Kerala itself and only the remaining 34.3% were from metropolitan cities of India. MPEDA Directory (Anon, 2001) revealed that only 8% of the total licensed exporters were from Kerala.

Table: 4.5 Location of the marketers

Category	Kerala	Metro	Total
Exporters	15.4%	84.6%	100.0%
Suppliers	100.0%	.0%	100.0%
Retailers	92.3%	7.7%	100.0%
Total %	65.7%	34.3%	100.0%

Source: Primary data

Of the indigenous ornamental fish exporters 15.5% was from Kerala and 84.6 % was from the metropolitan cities. All the suppliers of indigenous fishes were from the state itself, but high percentage (92.3%) of aquarium shopkeepers marketing the indigenous ornamental fishes of Kerala operated in Kerala and the remaining 7.7% in the metropolitan cities.

4.3.1.2 Markets of the indigenous ornamental fishes of Kerala

The category of marketers were cross tabulated with the markets to which they catered fishes to and the results are presented in Table 4.6 which indicated that, high percentage (65.7%) of indigenous ornamental fish marketers supplied fishes in the domestic market itself and very less percentage (22.9%) exported the fishes. It was also noted that a small

percentage of the marketers supplied fishes in the domestic and export markets.

Table: 4.6 Markets of indigenous ornamental fish marketers

Category	Domestic market	Export market	Export & domestic market	Total
Exporters	7.7%	61.5%	30.8%	100.0%
Suppliers	100.0%	.0%	.0%	100.0%
Retailers	100.0%	.0%	.0%	100.0%
Total %	65.7%	22.9%	11.4%	100.0%

Source: Primary data

Based on the area to which the marketers catered the indigenous fishes, the markets may be segmented into the domestic and export markets. High percentage of respondents' were noted to market fishes in the domestic market because, all the suppliers supplied fishes to the major exporters in the metropolitan cities of India which is domestic market itself and the aquarium shopkeepers of Kerala supplied small quantity of indigenous fishes in the retail shops. The study noted that the marketers of indigenous ornamental fishes of Kerala preferred marketing in the domestic market reasons for which may be attributed to the lack of awareness of the export market potentials or hesitancy in taking the risk of exporting or other reasons which need a further probe. Figure: 4.2 illustrate the region wise export of aquarium fish from India based the MPEDA statistics from 1995-96 to 2003-2004. The figure revealed that indigenous ornamental fish was exported from India through Chennai, Calcutta, Mumbai, Kochi, Mangalore and Porbander.
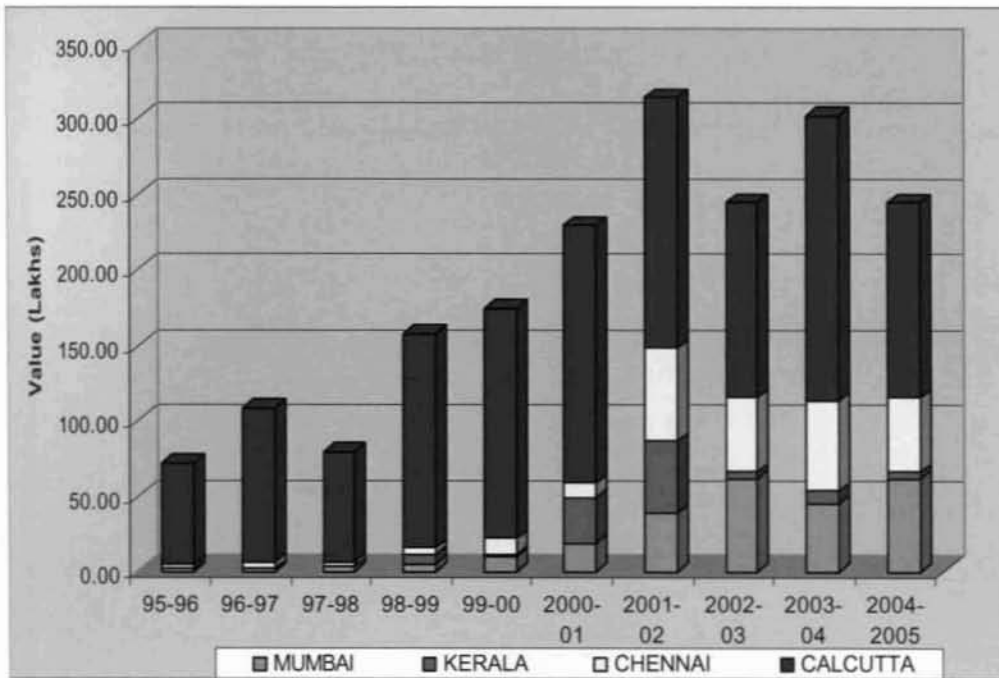
Figure: 4.2. Region wise ornamental fish export from India
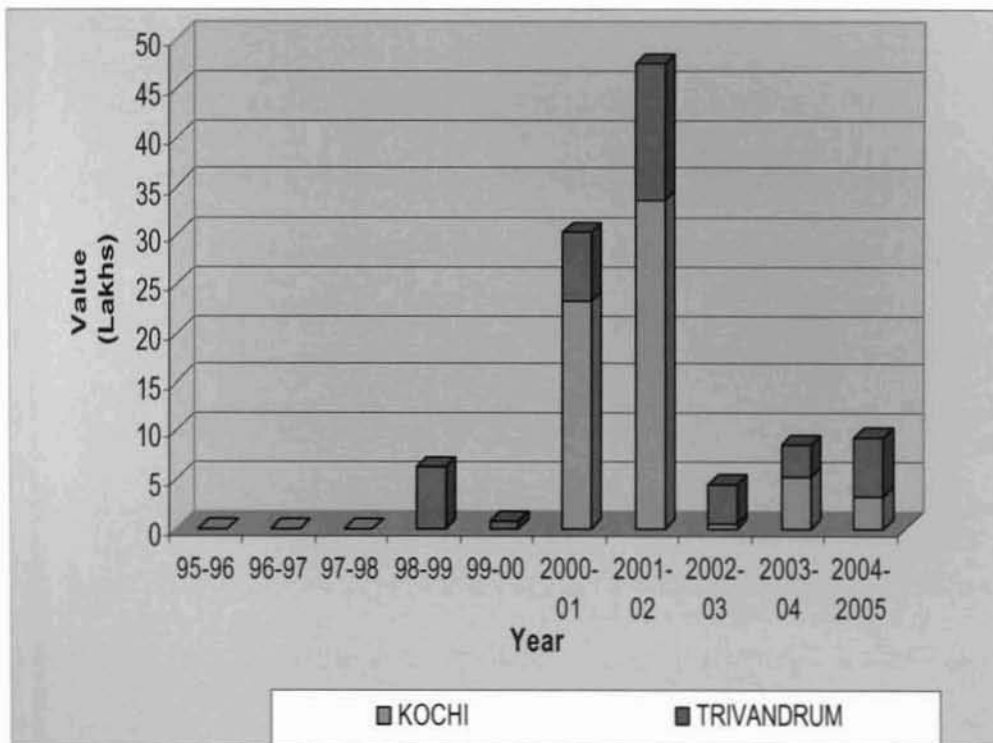
Figure: 4.3. Export of ornamental fishes from Kerala

When the region wise export of ornamental fishes from India was studied it was noted that, of the four major ports majority of the exports took place from Calcutta, followed by Mumbai and Chennai. Exports from Kerala stood in the fourth position in export value. On comparing the ornamental fish exports from Kerala (Figure 4.3) it was noted that during 98-99 to 2001-2002 major exports took place from the Cochin International airport rather than from Thiruvananthapuram International airport or any other airports in Kerala, but during the recent years 2002-2003 to 2004-2005 majority of the export took place from Thiruvananthapuram International airport. This may be due to the fact that marketers began depending on that airport due to the availability of more flights or due to the availability of straight flights to Singapore which is the major market highly prefered by the exporters.

4.3.2 Infrastructure, quality and regulations in marketing

Channel aspects relating to Infrastructure (transport, storage), quality (Quality problems, precautions) and regulations affecting the indigenous ornamental fish marketing were probed in the section.

4.3.2.1 Transport facilities used by the marketers

Fast delivery in order to reduce the mortality rate should be the prime aim of the channels of the trade in perishable products such as fishes. According to Talukdar and Bowmick (1993) perishable items have shorter life and need special attention for orderly marketing. Kumar (2002) pointed out the need to select any one mode of carrier vehicles, trains or flights, as the case may be, keeping in view always the need to reduce the transit

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time to the barest minimum as delay cause oxygen scarcity resulting in suffocation and death of fishes.

Table: 4.7 Transport facilities used by the marketers to obtain fish

Category	Train	Plane	Jeeps /Vans or cars	Total
Exporters	61.5%	7.7%	30.8%	100.0%
Suppliers	.0%	.0%	100.0%	100.0%
Retailers	.0%	.0%	100.0%	100.0%
Total %	22.9%	2.9%	74.3%	100.0%

Source: Primary data

From table 4.7 it was inferred that, 74.3% of the marketers resorted to trucks, jeep or vans for transporting indigenous ornamental fishes from the collectors' site. 22.9% of the marketers transported their fishes by train and 2.9% airlifted the fish. Suppliers and aquarium shopkeepers preferred using jeeps, vans or cars for transporting fishes to their holding areas. Majority of the exporters resorted to train and very less percentage (7.7%) airlifted the fishes to their holding areas. Quick transportation in marketing process is a factor demanding immediate attention of the marketers.

4.3.2.2 Storage or Holding facilities

High percentage of the marketers reported that they had sufficient storage facility. Table 4.8 reveals that among the exporters, 100% had sufficient storage facility. Of the suppliers only 22.2% had storage or holding area and 77.8% did not have enough area and they preferred to hold fish for a

short time period as possible. A similar result was noted by Larkin *et al.,* (2001a) in the US wholesale market survey, which found that the wholesalers located in Florida had significantly less holding capacity.

Table: 4.8 Storage facilities of marketers firm

Category	Sufficient storage facilities	Lack sufficient storage facilities	Total
Exporters	100.0%	.0%	100.0%
Suppliers	22.2%	77.8%	100.0%
Retailers	92.3%	7.7%	100.0%
Total %	77.1%	22.9%	100.0%

Source: Primary data

Larger exporters particularly those who have regular weekly shipments to the same buyer maintained a stock of key species as they had sufficient holding facility. The study thus revealed that infrastructural facilities of suppliers of indigenous ornamental fishes of Kerala who were the key players did not have a satisfactory level of holding area for fishes. Post harvest survival and post shipment survival can be maintained only if infrastructural facilities are improved and marketers maintain a specified holding area for the quarantine and holding of the fishes. Sheriff and Subasinge (1992) stressed the importance of quarantine for aquatic organisms before and after transportation and added that it is a must for which a modest temporary holding facility is necessary so that it can reduce mortalities and spread of disease and pathogens both nationally and internationally. The study also noted that due to the lack of sufficient

holding space the marketers were compelled to dispose the fish that reached them at throw away prices which in turn result in the crashing down of the price of the indigenous ornamental fishes of Kerala.

4.3.2.3 Quality of indigenous ornamental fishes

Quality has been defined as perceived superiority or excellence in a product as compared with the competing alternatives from the perspective of the market place (Garvin, 1988; Zeithaml, 1988). Of late International markets have started demanding evidence of quality standards or an assurance through certificates from quality standards organizations of international repute and governments of respective countries. Rao (2000) stressed the ever increasing emphasis on quality assurance advocated through ISO 9000 or similar quality systems. The world leader in ornamental fish exports, Singapore possess progressive fish farms which are certified by ISO 9002 Quality Management System (QMS) and ISO 14001 Environmental Management System (EMS) and strive to be world class in their services as well as products and one of the firm have been reported to have fetched the distinction of being the first in the world to be approved by CITES to trade in captive-bred (farm-bred) endangered Dragon Fish (*Scleropages formosus*).

Marketers obtained feedback on the quality of fishes marketed by them from their customers i.e., the importers. Figure 4.2 illustrate the percentage of marketers and the quality complaints obtained as feed back by them. According to 34% of the respondents dead on arrival (DOA) formed the major complaint, followed by deformity (29%), bad health

(20%), dirty water (5%), size difference (5%), shortage (3%) and wrong

fish (3%).
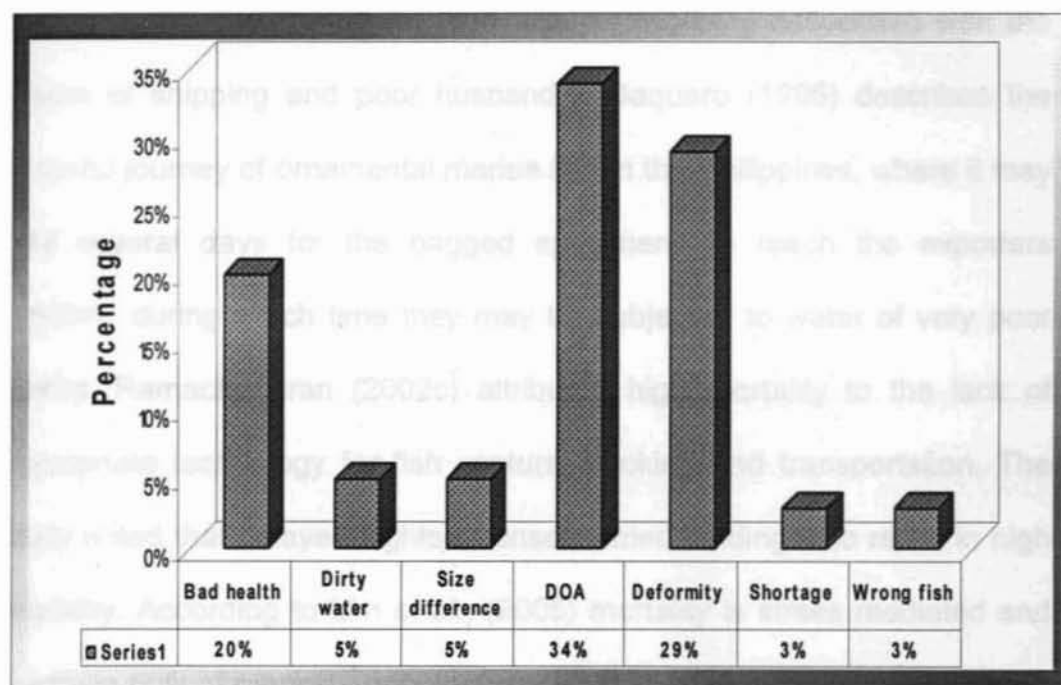
Figure: 4.4 Pecrentage of marketers and Quality complaints

Hence the study noted that mortality formed the major quality

complaint in the marketing of the indigenous ornamental fishes of Kerala.

According to Bassleer (1994) the possible reasons suggested for the post

harvest mortality were, physical damage to the fish, use of cyanide, poor

handling, diseases and stress in facilities, inferior water quality during

transport and in the tanks and collection of unsuitable species. Rubec *et*

al., (2000) discussed mortalities in the aquarium trade and acknowledged

that high delayed mortalities of marine fish were probably associated with

a variety of factors, including cyanide, stress, ammonia, oxygen depletion,

disease and starvation. Wood (2001) and Wabnits *et al.,* (2003) noted that

there are many factors that lead to mortalities of marine aquarium fishes

including physical damage and the use of chemicals such as sodium

cyanide during collection, inferior water quality, poor handling, disease and stress at all stages during collection and transport. Olivier (2003) and Balboa (2003) mentioned the high level of mortality associated with the impact of shipping and poor husbandry. Baquero (1995) describes the stressful journey of ornamental marine fish in the Philippines, where it may take several days for the bagged specimens to reach the exporters facilities, during which time they may be subjected to water of very poor quality. Ramachandran (2002c) attributed high mortality to the lack of appropriate technology for fish capture, packing and transportation. The study noted that delayed flights or unscheduled landing also result in high mortality. According to Lim *et al.*, (2005) mortality is stress mediated and the main bulk of mortality occurs during the first week recovery period and not on arrival, and he advocated that the industry should consider revising the basis of the warranty system to their customers, from dead on arrival to cumulative mortality at seven days post shipment (or dead after seven days, DA7), in order to cut down losses occurring after shipment.

Bassleer (1994) noted that under normal conditions, the mortality rate is very low and between 5-10 %. Accurate figures of the numbers that die prematurely are not available, but various estimates have been made. Research on mortality rates between Srilanka and the UK (Wood,1985) indicated that in the mid 1980s there was about 50% mortality during and immediately after collection and before export, 10% mortality in transport to UK and further 5% in holding facilities (importers and retailers). Vallejo (1997) likewise reported that mortality rates at Philippines export facility

ranged from 30-40% which is greater than 10% rate estimated for Srilanka by Wood (1985) and the 10-20% rate reported for Puerto Rico by Sadovy (1992). Sadovy estimated mortalities from the time of capture to the time of export to vary within a range of 10-20%, depending on capture, handling and shipping methods, the level of skill of collectors and conditions of holding facilities. Pyle (1993) reports average pre shipment mortalities in most of the Pacific to be as low as 1-2%, which includes those that are released back into the sea because they are substandard. Schimidt and Kunzamann (2005) studied the post harvest mortality in the marine aquarium trade in an Indonesian export facility. They observed an unacceptably high mortality rate of 10-40% in spite of advanced equipment used in the export facility. The high variability in mortalities and injuries among the six observed deliveries indicate that the quality of treatment and handling was quite variable and suggests that improving consistency in treatment and handling could yield positive results. According to Lim (2005) despite the very high loading density, the Singaporean exporters are able to limit the death on arrival to 2-3%, which is only half of the standard set by the industry as 5-10%. Lee (2005) states that one of the benchmark that Singapore exporters assure buyers is to guarantee upto 97% survival rate of the fish being exported. Most of the other exporting countries guarantee only upto 95% survival rate.

According to Lim *et al.,* (2003), in the ornamental fish industry there were standards for acceptable losses during air transport and the exporters were expected to compensate their customers when the dead

on arrival (DOA) rate exceeded 5%. DOA and its claims varied depending on importers. Loss of fish in transit up to 5-10% were ignored but above that it had to be generally borne by the trade i.e., exporter, even if the responsibility may sometime be of the airlines or any other sources. Exporters often insisted that a notification or feed back be sent within 24 hours in order to send a free replacement on next shipment. Yet another prevalent method was to reduce the prices of the dead fishes which was to be remitted back by the exporter or is to be deducted in the next shipment. Product quality is an important attribute in the marketing of indigenous ornamental fishes. Quality standards as expected by international markets and customers in the domestic market should be widely publicised and strongly adhered to. Management of the trade has to include strategies to reduce mortalities of harvested species and ensure that those species unsuited for life in captivity are not collected or marketed.

4.3.2.4 Regulations in the marketing of ornamental fishes

From the Table 4.9 it was inferred that 25.7% of the marketers dealt with Appendix II listed fish of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) i.e. Arowana, Dragon Fish (*Scleropages formosus*). 74.3% of the marketers had not dealt with any CITES regulated fishes. Apart from *Scleropages formosus,* none of the fresh water fishes of the world or India were listed in CITES. CITES formed in 1973 (CITES,2000) is an international treaty that protects endangered and threatened species of animals and plants from over-exploitation by regulating their international trade and operates through an

import/ export permit system.

Table: 4.9 Marketing of CITES regulated fish

Category	Market CITES regulated fish	Do not market CITES regulated fish	Total
Exporters	.0%	100.0%	100.0%
Suppliers	0%	100.0%.	100.0%
Retailers	100.0%	.0%	100.0%
Total %	25.7%	74.3%	100.0%

Source: Primary data

At the core of CITES are the appendices. Species are listed according to their conservation status as Appendix I, Appendix II and Appendix III. Appendix I involves species in danger of extinction and all commercial trade is prohibited. Appendix II comprise species vulnerable to overexploitation for which commercial trade should be regulated so that they will not become threatened with extinction. Regulated trade is allowed if the exporting country has issued a permit that includes a finding that the trade will not be detrimental to the survival of the species or its role in the ecosystem. The marine species whose trade is regulated by CITES are included in Appendix I and II. All great whales, all marine turtles, six fur seal species and coelacanths are included in Appendix I. *Sclerophagus formosus* is the ornamental fish included in Appendix I. All dolphins, basking shark, whale shark and all sturgeon species, queen conch, all giant clam species, seahorses, all stony coral species and all antipatharian (black coral) species are included in Appendix II. Appendix III includes

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species for which a country needs the cooperation of other countries in order to control international trade to complement domestic regulation, requires an export permit from the listing country and a certificate of origin from all other countries. The member countries or parties usually meet every two and half years. According to Fossa (2003) the most important decision of COP 12 (Conference Of Parties), held at Santiago, Chile (3-15th Novemebr, 2002) was the inclusion of all Sea horses (*Hippocampus species*) on Appendix II. The last Conference Of Parties (COP) took place in Bangkok from 2nd October to 14th October, 2004. Fossa (2005) notes that from the trade's point of view, the most important item on the agenda of 2004 was a proposal regarding the listing of stony corals, specifically of Helioporidae, Turboporidae, Milleporidae, Stylasteridae and Scleratinidae. While writing on the tracking of trade in ornamental coral reef organisms and the importance of CITES and its limitations , Bruckner (2001) added that in order to obtain more accurate information on the trade in ornamental fishes and impacts of this fishery, exporting countries must establish data gathering and monitoring systems.

International Union for Conservation of Nature and Natural Resources (IUCN, 2004) listed 1500 species of the world's fishes (both freshwater and marine) as having been assessed for their conservation status. In the list, 1135 fishes are fresh water fishes and 477 were marine fishes. Table 4.10 presents the indigenous fishes of India which were listed as IUCN threatened fishes.

Table: 4.10 IUCN Red listed threatened fishes from India

Scientific Name	Common Name	Red List
Carcharhinus leucas	Bull shark (E)	LR/nt
Eleotris melanosoma	Broadhead sleeper (E)	LR/nt
Glyphis gangeticus	Ganges shark (E)	CR
Himantura fluviatilis	Ganges stingray (E)	EN
Horaglanis krishnai	Cave catfish (E)	VU
Indoreonectes evezardi		DD
Macrognathus aral	Spiny eel (E)	DD
Monopterus indicus		DD
Pristis microdon	Freshwater sawfish (E), Great-tooth sawfish (E), Largetooth sawfish (E)	EN
Pristis pectinata	Smalltooth sawfish (E), Wide sawfish (E)	EN
Pristis zijsron	Green sawfish (E), Longcomb sawfish (E)	EN
Rhinobatos typus	Common shovelnose ray (E), Giant shovelnose ray (E)	VU
Schismatogobius deraniyagalai	Redneck goby (E)	DD
Schistura sijuensis		VU

Source: IUCN, 2004.

The list has 14 Indian fishes which were included in the IUCN categorisation. Of the 14 fishes in the threatened list, only 4 species are listed as endangered and they include *Himantura fluviatilis, Pristis microdon, Pristis pectinata* and *Pristis zijsron*. On comparing the indigenous ornamental fishes marketed from India which were listed in

Table 3.9, it was inferred that none of the indigenous fishes marketed from

India were noted in the IUCN categorised fishes of India (Table 4.10). The

study noted that marketers did not market any fishes in the IUCN

categorisation.

The fish species listed under Wild Life Protection act of 1972 and

fishes listed as per notification of the ministry of environment and forests,

dated 11th July 2001 (Anon, 2002a), include Shark and ray (9 varieties),

Sea Horse, Giant grouper, Sea cucumber, Reef building corals, Black

coral, Organ pipe coral, Fire coral, Sea fan (All gorgonians), Sponges (All

calcareans) and Mollusca (24 items) and hence cannot be exported. Table

4.11 list species banned from ornamental fish trade as per the act. Export

restriction continues in the case of fresh and frozen silver pomfrets of

weight less than 300 grams and seashells of all species excluding

polished sea shells and handicrafts made out of sea shells. Seashells of

the following species are prohibited for exports, *Troches niloticos, Turbo*

species, Labsis species, Tridacna gigas and Xancus pyrum. In the study

on comparing the indigenous ornamental fishes marketed from India, listed

in 3.9, it was noted that marketers of indigenous ornamental fishes of

Kerala did not deal in/of the species banned from trade as per the

regulations of the ministry of environment and forests.

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Table: 4.11 Species banned from ornamental fish trade

Items banned from trade	Species
Shark and ray	*Anoxypristis cuspidate, Carcharhinus hemiodon, Glyphius gangeticus, Glyphius glyphius, Himanturafluviatilis, Pristis microdon, Pristis zijsron, Rhynchobatus djiddensis, Urogymnus asperrimus.*
Sea Horse	All Syngnathidians
Giant grouper	*Epinephelus lanceolatus*
Sea cucumber	All Holothurians
Reef building corals	
Black coral	
Organ pipe coral	
Fire coral	
Sea fan	All gorgonians
Sponges	All calcareans
Mollusca	*Cassis cornuta, Charonia tritonis, Conus malneedwardsi, Cypracasis rufa, Hippopus hippopus, Nautilus pompilus, Tridacna maxima, Tridacna squamosa, Tudicla spiralis, Cypraea lamacina, Cypraea mappa, Cypraea talpa, Fasciolaria trapezium, Harpulina arausica, Lambis chiragra, Lambis chiragraarthitica, Lambis crocea,Lambis millepeda, Lambis scorpius, Lambis truncate, Placenta placenta, Strombus plicatus sibballdi, Tochus niloticus, Turbo marmopratus*

Source: Secondary data

The Marine Aquarium Council (MAC) launched an international certification system that aims to protect marine fishes and coral reefs to ensure the quality of organisms in the marine aquarium trade. With the new certification system, consumers will be able to identify certified facilities and organisms by looking for the MAC certification label on store windows and retail aquarium tanks. The industry will be able to locate MAC certified suppliers and facility operators on the MAC web site at www.aquariumcouncil.org. (MAC, 2001). Fishes that are collected from MAC certified collection areas and handled by MAC certified industry operators that meet the MAC standards are labeled as MAC certified. In SriLanka, collectors do not have to be registered but many of the established collectors are in favour of some form of licensing system because they realise the fishery can absorb only a certain number of collectors (Wood and Rajasuriya, 1999).

4.3.3 Methods adopted by marketers for gaining market information

To increase the fishes in the product line and to formulate better marketing strategies marketers need to equip them selves with the latest market information. Respondents were enquired about the methods adopted by them to find the purchaser, for demand assessment and for deciding the quantity to be collected and the results obtained for the questions were cross tabulated with the category of marketers.

4.3.3.1 Idea source for indigenous ornamental fish marketing

Interest and experience formed the major reason of 31.43% of the total marketers' and market survey (8.6%) inspired very less percentage of the

marketers in the marketing of indigenous ornamental fishes (Figure 4.5).
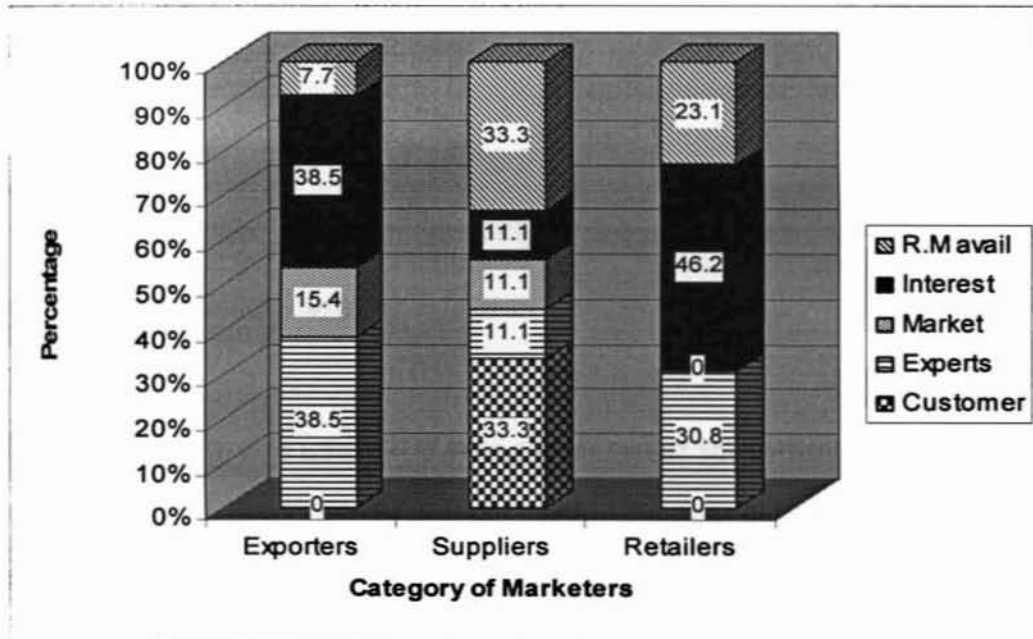
Figure: 4.5 Idea source for indigenous ornamental fish marketing

38.5% of the exporters considered customers as idea source and 38.5% were inspired by exporters to take up the marketing of indigenous fishes. 33.3% of the suppliers began marketing indigenous fishes based on the idea of their customers (who are exporters of India located in the metropolitan cities of India). Rest, 33.3% of the suppliers began marketing the fishes as they were readily available. High percentage (46.2%) of the aquarium shopkeepers began marketing due to their interest and experience and 23.1% took up marketing of indigenous ornamental fishes as the fishes were easily available to them. Thus it was concluded that, very less marketers were initiated by market surveys before taking up indigenous ornamental fish marketing.

Christensen *et al.*, (1987) argued that successful exporters enter foreign markets based on detailed market studies. Hart and Tzokas (1999)

found that informal market research activities such as customer visits, exhibitions and company visits significantly related to export performance.

4.3.3.2 Methods adopted in finding purchaser

Table 4.12 revealed that, the majority of the marketers i.e. 40% of the total had not adopted any particular means in finding purchasers for their product.

Table: 4.12 Methods used in finding purchaser for indigenous fishes

Category	No particular means	Through websites	Through MPEDA	Through personal contact	Trade fairs attending	Total
Exporters	.0%	15.4%	30.8%	15.4%	38.5%	100%
Suppliers	100.0%	.0%	0%	0%	0%	100%
Retailers	11.1%	.0%	0%	66.7%	22.2%	100%
Total %	40%	5.7%	11.4%	22.9%	20.0%	100%

Source: Primary Survey

22.9% got to know of their purchaser through personal contact, 20% through trade fair attending, 11.4% of the marketers obtained purchasers through the trade enquires received by MPEDA, and 5.7% through websites of customers. On a detailed analysis of exporters it was noted that the highest percentage of exporters found their business counterparts through trade fair attending (38.5%).according to Balagopal (2004) trade fairs act as a window for the products direct contact with the specialist importers and were felt to be the best way of making commercialized links. Successful marketing is contingent on presence at trade fairs actively supported by follow up of promotion and visits. High percentage (30.8%) of the exporters also took the assistance of MPEDA for finding purchaser.

Rao (2000) added that MPEDA acts as a liaison between importers in the foreign countries and exporters of our country. A point worth mentioning is that, a small percentage (15.4%) of the exporters of India had begun using innovative means like websites of customers (15.4% of exporters) to find their purchasers. The survey showed that only 15.4% of the exporters found their purchasers through personal contact. According to Ellis and Pecotich (2001), data pertaining to 31 export market entries support the view that decision makers' cosmopolitanism has a significant influence on the initiation of exports. They studied the social factors influencing export initiation in small and medium sized enterprises and stated that any investigation of the relationship between awareness of foreign market opportunities and the subsequent initiation of exports accommodate four possible export initiation scenarios, seller initiated (exporters initiative), buyer initiated (an unsolicited order), broker initiated (sponsored by an entrepreneurial mediator agency) or initiated as a result of a trade fair.

4.3.3.3 Methods adopted for demand assessment

Marketers generally adopt a number of methods for demand assessment such as past sales pattern, market research, consumer survey and own judgement. From Table 4.13 it is clear that good percentage of the marketers depended on marketers own judgement (74.3%) for demand assessment and 17.1% assessed demand based on past sales pattern. Consumer survey and market research was carried out by just 5.7% and 2.9% of the marketers. High percentage of exporters (84.6%), suppliers (55.6%) and aquarium shopkeepers (76.9%) depended on judgement by

themselves.

Table: 4.13 Assessment of demand for indigenous ornamental fishes

Category	Past sales pattern	Market research	Consumer survey	Own judgment	Total
Exporters	.0%	7.7%	7.7%	84.6%	100%
Suppliers	44.4%	.0%	.0%	55.6%	100%
Retailers	15.4%	.0%	7.7%	76.9%	100%
Total %	17.1%	2.9%	5.7%	74.3%	100%

Source: Primary data

Chaston (1983) states that in many instances the firms in fishing industry do not make real attempt to evaluate market acceptance of the species. The participating companies merely proceed to make major investments in fishing vessels and processing facilities to exploit the new resource. Compared to the scale of costs associated with this action, a market research survey prior to such investment would represent a small increment in cost, yet yield significant information to reduce the risk of the new species not being capable of establishing itself in the marketplace against other competitive products. Market research and customer surveys are indespensible before beginning nay *any* business venture, particularly fish and live fish marketing. Since any fault or incorrect decision can lead to large financial losses.

4.3.3.4 Decision regarding the quantity to be collected

Marketers' decision to collect indigenous ornamental fishes depended on many factors like an unsolicited purchase order, storage capacity, species

availability and consignment filling.

Table: 4.14 Decision regarding the quantity to be collected

Category	Purchase order	Storage capacity	Species availability	Consignment filling	Total
Exporters	.0%	30.8%	38.5%	30.8%	100.0%
Suppliers	.0%	11.1%	88.9%	.0%	100.0%
Retailers	53.85%	7.7%	38.5%	0%	100%
Total %	20%	17.14%	51.4%	25.7%	100.0%

Source: Primary data

From the data in table 4.13, it was noted that species availability was a major factor in indigenous fish collection for marketing (51.4%). This was the same when the three categories of marketers were analysed separately. It could be seen that storage capacity was not given much consideration while collecting fish indicating a low percentage response of 17.14 % of the total. Though 30.8% exporters attached importance to the storage factor, the marketers of Kerala i.e. suppliers (11.1%) and aquarium shopkeepers (7.7%) gave least importance for storage capacity. Chaston (1983) stated that the fishing industry usually faces seasonal production but year round demand necessitating the holding of inventory for a longer period than in most other industries and an accepted standards for many producers is to assume an average inventory level during the year equal to 4-5 months sales. The mortality rates of fishes in marketing may be attributed to the limited holding capacity of the channel members.It can be concluded that any marketer dealing with indigenous

fish has to obtain a license from MPEDA and that license has to be issued only to those marketers who have sufficient storage area. Since storage or holding area has sufficient influence on the quality of fishes marketed by them and price fetched. If there is sufficient storage space, they can be held back during off season and higher price can be demanded.

4.3.3.5 Feedback from customers

Feedbacks from customers formed an important motivation for the marketers to improve quality.

Table: 4.15 Feed back from customers regarding quality

Category	Always	Occasionally	Not at all	Total
Exporters	61.5%	38.5%	.0%	100.0%
Suppliers	77.8%	22.2%	.0%	100.0%
Retailers	7.7%	76.9%	15.4%	100.0%
Total %	45.7%	48.6%	5.7%	100.0%

Source: Primary data

45.7% of the marketers replied that they receive feedback from their customers always, 48.6% reported occasional feedback and 5.7% were not receiving feedback at all (Table 4.15). The feedbacks received were mostly concerning the quality problems of the ornamental fishes imported by them. Study on the methods adopted by marketers for gaining market information denoted the fact that very few marketers of indigenous ornamental fishes of Kerala attempted to gain awareness regarding the globalised market. The market information system does not serve the beneficiaries to the extend it is required and the marketers here were

not able to or do not try to detect minute variations in the international market trends by good market researches.

4.3.4 Major constraints in exporting indigenous ornamental fishes

Earlier studies on ornamental fish trade noted that the industry is fraught with several constraints. Sane (2005) listed the non availability of breeding stock, lack of scientific training on breeding techniques, feeding and health care, inadequate transport facilities and poor marketing strategies which affect the ornamental export from India. The study therefore aimed at identifying the major constraints faced by the marketers of Kerala and the exporters of the metropolitan cities in indigenous ornamental fish marketing. An effort was made to understand tne constraints faced by marketers of Kerala and marketers of metropolitan cities separately. The radar chart in figure 4.4. illustrate two ellipsoids formed by the mean score of the rankings of the marketers of Kerala and marketers of metropolitan cities(which include exporters). According to the exporters from metropolitan cities, the constraints with highest mean score included, high cargo rates (7.8), tough export procedure (5.6), flight facilities (9.2), difficulty in consignment filling (7.43) and lack market information (6.9). Highest mean score in the case of marketers of Kerala was noted for high cargo rates (9.8), flight facilities (6.9), and lack market and information (6.8). Yet another aspect which was noted in their response was that, the mean score of ranks in the case of marketers from Kerala were language problem, flight facilities, consignment filling and lack of market information were higher than the mean score of the marketers of the metropolitan

cities. Hence the study noted that, in order to enable the marketers of Kerala to come up in ornamental fish exports, steps have to be taken to minimise the major constraints faced by them such as flight facilities, high cargo rates, and lack of market information, language problem and consignment filling.

Non availability of flights connecting Kerala to international markets formed a major reason hindering exports. Majority of the flights opening from the airports of Kerala are domestic flights or flights to Middle East countries. Straight flights to the consumer markets of India such as U.K, Europe and Japan are not available from Kerala airports. Connecting flights from metropolitan cities have to be resorted to, which requires transhipment of consignments which is proved to cause high mortality. Kumar (1999) stated that an important constraint for developing export traffic was want of direct flight from major Indian cities to the foreign countries. In the live fish trade, transportation is a critical aspect where the success or the failure of the business depends largely on the availability of air-cargo space to major markets. Brichard (1980) added that the richest fishing grounds and the most perfect collecting and conditioning facilities of ornamental fishes would be seriously hampered by inadequate air connection with the markets. In the ornamental fish trade where speed and safety are essential features, the lack of proper transportation to markets abroad, placed poor prospects on African countries in developing substantial exports of ornamental fishes. The two flights which carried the largest number of ornamental fish consignments from India were, Luftansa

and Singapore airlines, rather than the Indian airlines or air India. The number of flights operating from Kerala to various destinations is very less and straight flights are not available from Kochi.

High cargo rate formed by the combining of airfreight and box packing charges is another constraint hindering the ornamental fish exports. According to Balagopal (2004) pricing in the ornamental industry is based on "landed cost" (the price of the fish plus the box charge and freight charge divided by the number of fish shipped). The packing cost from the country was about US $ 10.00 per box for the oxygen supply, plastic bag, styrofoam and corrugated cardboard box, and handling charges and the terms of payment was such that 100% advance payment was to be done by the buyer by Telegraphic payment. The sizes of cartons commonly used for packing and transportation were 60 ×40 ×20 cm, 59 ×43 ×20 cm, 55 × 36 ×40 cm. Anon (1979) and Sane (1982) pointed out that approximately 40% of the total cost is contributed by freight. Marketers have to note the fact that importers compare prices of different suppliers by determining the landed cost of the fish and high cargo rates persuade the importers to import fishes from countries which are able to provide more varieties of fishes at cheaper rate and lesser airfreight.
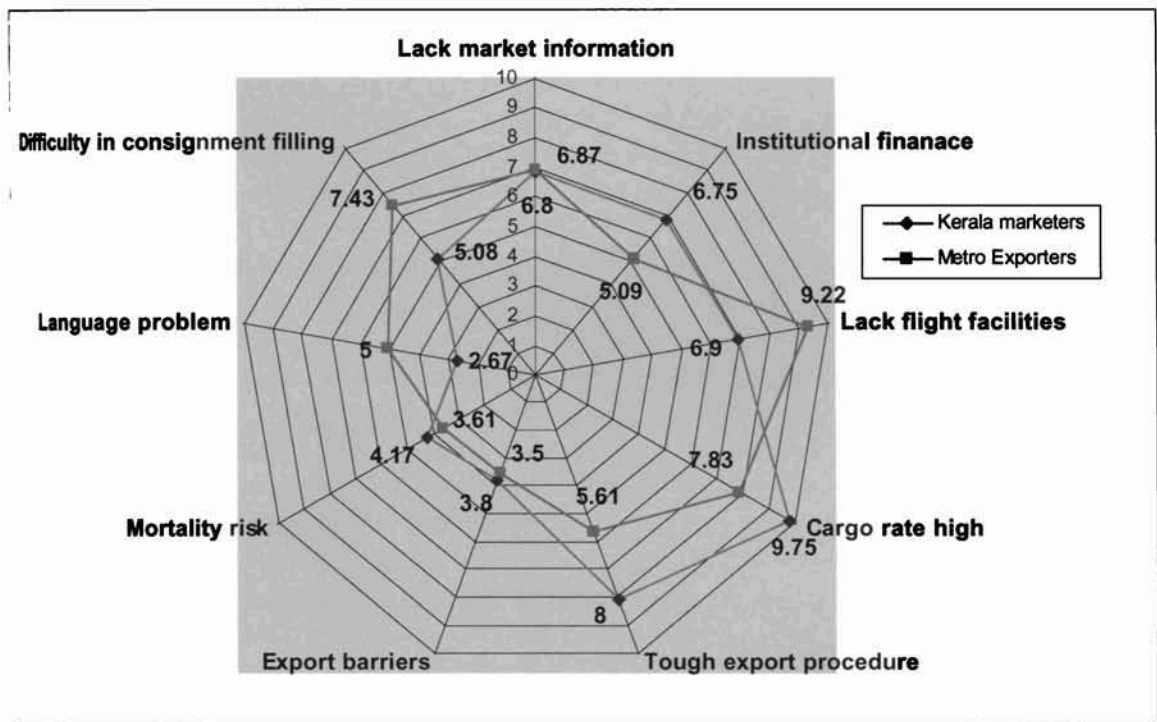
Figure: 4.6. Constraints in indigenous ornamental fish export

Sane (1982) recommended an airfreight at concessional rate or commodity rate to be extended to aquarium fish exports. Nopany (1986) stated that the freight rates in Indian airlines are 2-3 times higher than the rates from competitor countries such as Singapore, Thailand, Honkong, Srilanka and Malaysia and proposed for commodity rates from Calcutta to Los Angeles in Air India which was refused on flimsy ground that the cargo consisted of live animals and that the cargo involves transshipments. Kumar (1999) stressed that the national carriers, Air India should be willing to carry live fishes at concessional rates.

Lack of market information was an important aspect to be taken care of to improve the ornamental fish exports. According to Rao (2000), marketing information is the basic input for the organisations to become adaptable to changes in the external environment. He added that, marketing information relating to supply and demand positions in various traditional markets, changes in regulations, competitive positions and market expectations are required by the exporters to orient their organisations towards the requirements of the external environment. Olivier (2001a) pointed out that, better communication is required between all parties involved in the trade which can then improve transparency, and ensure more general awareness of the problem in the sector and find ways to resolve them. The study notes that market awareness can give the marketers the ability to bargain making the indigenous ornamental fishes a multibillion dollar foreign exchange earner. Hence MPEDA and Fisheries Department have to publish the details of price variations in the

markets for indigenous fishes, the increase or decline in demand for varieties etc in monthly News Letter to aid the marketers.

Language problem formed an important constraint for majority of the marketers from Kerala. Hence many established and experienced traders in Kerala who had all facilities such as storage area, access to collectors experience and the willingness to expand their business had to restrain from taking up the export of indigenous ornamental fishes of Kerala.

Difficulty in consignment filling formed a constraint in exporting as indigenous ornamental fishes were not available in the required numbers. Unless there is an organised and regular supply of fishes of standard size the hundred kilogram consignment fillingwhich is a minimum for export will be difficult for ornamental fish export. The trade will not be in a position to become full fledged with the capture from wild alone and hence there should be a regular supply from the breeding of wild caught fishes and quality exotic species. Sane (1982) notes that even after getting commodity rates, airfreight contributes between 60-70% of the landed costs and between 80-90% of the landed costs without commodity rates. He suggested that Indian firms marketing ornamental fishes must be able to offer as large a variety as possible to keep down the landed costs. For this purpose, it is necessary to increase the number of boxes to the maximum possible, which will reduce the handling charges for the importer. A UK importer has to pay a minimum clearance of 32 pound sterling per shipment whether it is one box or 100 boxes, so he prefers a

shipment from far eastern countries where he can buy many more boxes and also get larger variety, thus reducing his cost as against an Indian ten boxes of hundred kilogram shipment from India.

In the present study, export barriers were not found to be a major constraint by the marketers, but in the present day context, the international trade is affected by tariff and non tariff trading barriers. Spread of pathogens and possible introduction of undesirable species through unregulated movement of aquarium stocks have made it highly sensitive to international laws and regulations. According to Sumner *et al.*, (2001), tariffs are taxes on imports of commodities into a country or region, and are implemented for two clear economic purposes. First, they provide revenue for the government. Second, they improve economic returns to firms and suppliers of resources to domestic industry that face competition from foreign imports. Tariffs that confront export products from developing nations to the industrialised world have been reduced through WTO/GATT agreements, while the non tariff barriers have assumed a greater significance and changed in character. According to Munro (1995) non tariff barriers to fisheries trade implemented in various forms range from quotas, health certificates and labeling to enforcing rigorous documentations. He further added that, the non tariff barriers to trade are however expected to change from time to time.

Yet another aspect gaining significance is the issue of transgenic fishes or genetically modified organisms. International instruments some legally binding and others voluntary cover a broad range of issues

associated with GMOS in aquaculture, the introduction (tran^{s}boundary movement) and release into the environment, international trade, human health, labeling, intellectual property rights and ethics (Bartley, 1999: Dunham et al,. 2001; FAO, 2001). Fossa (2001a) mentions that although the topic of genetically modified aquarium fish first made its appearance almost a decade ago, it has only been within the last couple of years that it has been begun causing a stir within the industry circle. Today genetically modified Zebra danios (*Brachy danio rerio*) have hit the spot light. Two genetically modified strains have been developed within the Department of Biological Science of the National University of Singapore. One a fluorescent green strain contains a gene (Green Fluorescent Protein or GFP) from Jelly fish, *Aquorea victorea,* while a fluorescent red or pink stain, contains a gene (Red fluorescent protein or RFP) for Sea anemone species, Discosoma Sp. Fossa (2002) adds that, in Taiwan, fluorescent greenish yellow Medakas (*Oryzias latipes*) will be ready for their launch in the international aquatic sector. Gong (2001) attempted to use the transgenic technology to develop novel varieties of ornamental fish by transferring a jellyfish green fluorescent protein (GFP) gene by using the zebrafish (*Danio rerio*) as a research model. Dawes (2000) raises concern of the subject of alien invasive species that has been gaining momentum stated it as one of the hot issues in the new millennium.

While portraying Europe as market, Tomey (1997) pointed out that, within this market and with regards to recent developments in European legislation, tracking i.e. following a shipment from point of export to import

and tracing i.e. the ability to follow consignment all the way back to its original source, for example, a particular breeder or farm for health and welfare for all items are becoming a basic issue. A special issue in the coming ten years will be the prevention of new epidemics in the global market, probably resulting in the reduced international trade of live organisms. Kumar (2002) stated that, European countries demand health certificate in Modelene-10 form on all imports. Pleog (2005b) noted that the health certificates are in line with OIE (1995) and WTO. He further added that the health certificate proposed by European Union countries demand that fishes should be free from diseases such as *Spring viraemia of carp* (SVC) is the only disease which seem to be affecting ornamental fishes from among the list of diseases and must be asserted by a vetenary inspector. According to (Bartley, 1999b), Food and agricultural organization (FAO) Code of conduct for responsible fisheries emphasises the need to minimise the risks of disease transfer and other adverse impacts on the wild and cultured stocks associated with the introduction of native and non native species and transport of eggs, larvae and fry, brood stocks or other live materials. The FAO code of conduct also adopts the principle that international trade in fish and fishery products should be conducted in accordance with principles, rights and obligations as per international agreements. Several nations have become cautious of trans boundary introductions in their concern to protect the native fauna and also to avoid the entry of exotic pathogens. India is also a signatory to a range of trade related agreements under WTO. One of the important agreements under WTO is, application of sanitary and phyto sanitary

(SPS) measures. SPS specifies that measures should be applied only to the extent necessary to protect human, animal and plant life or health. SPS agreement uses the standards, guidelines and recommendations developed by Office International Des Epizootics (OIE) for animal health and zoonoses as the international benchmark. Goswamy and Bhattacharya (1999) notes that although Asian countries have long established quarantine and inspection programmes for plants and domestic animals, similar programmes are virtually non existent for fish and other aquatic organisms and Indonesia is the first country in South East Asian region to attempt to implement a quarantine system for aquatic animals. According to Kumar (2005) for the rapid growth of live ornamental fish industry of India, import of brood stock of different varieties is a pre requisite. As Government of India has placed ornamental fishes in the restricted item of import and enquires special import license for importing fishes and the obtaining of license and import is a Herculean task for marketers. He put forward several recommendations which need to be seriously studied for simplification of quarantine procedures in the country. Rathore *et al.,* (2006) presented a framework of strategic plan for fish quarantine in India. Each country is therefore expected to have acquired facilities for complying with the above conditions and to have evolved appropriate code of practices, either of its own, or as a group of nations.

Chapter 5

Price of Indigenous Ornamental Fishes of Kerala

5.1 Introduction

Price can be perceived as an important attribute of any product (Mc Donald, 1989; Stanton *et al.*, 1994). It is not only an important marketing mix, but it is also a major determinant of the firms profit and cash flows. According to Rao (1984) and Nagle and Holden (1995) pricing is one of the most important marketing mix decisions, price being the only marketing mix variable that generates revenue, and that has an immediate and direct effect on the buyer behaviour. In practice however, pricing decisions are often made arbitrarily or merely on the basis of cost related criteria, with no or limited pricing research to guide them. As a result price fails to capture the value realised by other marketing mix instruments. Chaston (1984) states that price is an important variable by which potential users evaluate the validity of a company's product positioning, a factor often ignored in the fishing industry. In the case of ornamental fishes, prices are quite variable for different body sizes and colour varieties. Conroy (1975) noted that, price may also vary according to how the fishes are described in the dealers' lists, i.e. the sizes of the fishes as small, medium or large and so on. In such cases, exporters state the actual size of the fish as a guide to the importer. According to Balagopal (2004), FOB (Freight on Board), CIF (Cost Insurance & Freight) and C & F (Cost and Freight) are price quotation terms used when the prices in international markets are offered or quoted. Balagopal (2004) further added that for Indian conditions, FOB price of the commodity is significant. Even while price quotations of other types are submitted to the foreign buyers, the

FOB price of the product should be desirable or at least identifiable in the entire pricing structure because all the export benefits offered by the Government of India are usually related to the FOB price of the product. In the domestic market, indigenous ornamental fishes are priced as Rupees per hundred (whole sale) and Rupees per pair (retail). Export prices for ornamental fishes are always quoted in US dollar per fish.

The study tried identifying the export (FOB) price of indigenous ornamental fishes of Kerala in the export markets, as the indigenous ornamental fishes were more frequently supplied to export markets rather than to the domestic markets. Demand for indigenous fishes in the domestic market had just begun to take off and hence the prices were not fixed. The specific objectives of the study were,

1. To find the pricing factors and pricing methods employed by the indigenous ornamental fish marketers.

2. To list the average unit value (FOB price) fetched by the indigenous ornamental fishes of Kerala in the international market and to classify the indigenous ornamental fishes of Kerala based on FOB price.

3. To analyse the variations in the export prices over years for indigenous ornamental fishes of Kerala.

5.2. Methodology

5.2.1 Pricing factors and pricing methods

Marketers were enquired about the pricing factor by posing alternatives

such as cost of production, demand for the product, competition prices and product attributes.

5.2.2 Classification of indigenous fishes in trade based on price

Primary data on the FOB price of indigenous fishes was collected by interviewing suppliers, aquarium shopkeepers and exporters. Based on the FOB price fetched by indigenous ornamental fishes of Kerala during 2004-2005, indigenous ornamental fishes of Kerala were classified into high priced, medium priced and low priced fishes. The fishes fetching an FOB price equal to 2 or above 2 dollars per fish were classified as high priced, between 0.6 to 2 dollars as medium priced and less than 0.6 dollars as low priced fishes.

5.2.3 Price fluctuations in the export price

The data on FOB prices of the indigenous fishes over ten year period were compiled from the customer invoices (for a period of ten years from 1996-2005) of the 13 exporters surveyed during marketers survey in order to study the price fluctuations in the export price of the fishes.

5.3 Results and Discussion

5.3.1 Pricing factors and pricing methods

It was inferred from the table 5.1 that the product attributes i.e. ornamental fish attributes formed the most important pricing factor according to 40% of the marketers, in the marketing of indigenous ornamental fishes. Pricing based on product attributes was followed by demand for the product, cost of production and then the competition prices. A similar pattern of pricing

was noted in the case of the three categories of marketers. High percentage of exporters, suppliers and retailers consider product quality followed by demand for the product to be important factor. Chaston (1984) added that the commonest form of pricing setting in the fish industry uses cost plus pricing.

Table: 5.1 Pricing factor

Category	Cost of production	Demand of the product	Competition prices	Product attributes	Total
Exporters	23.1%	30.8%	7.7%	38.5%	100.0%
Suppliers	22.2%	22.2%	22.2%	33.3%	100.0%
Retailers	15.4%	30.8%	7.7%	46.2%	100.0%
Total %	20.0%	28.6%	11.4%	40.0%	100.0%

Source: Primary data

Table: 5.2 Pricing method

Category	Cost plus	Market price/ competitive price	Premium price	Penetration price	Total
Exporters	15.4%	61.5%	7.7%	15.4%	100.0%
Suppliers	.0%	55.6%	.0%	44.4%	100.0%
Retailers	15.4%	76.9%	.0%	7.7%	100.0%
Total %	11.4%	65.7%	2.9%	20.0%	100.0%

Source: Primary data

Table 5.2 presents the pricing method adopted by marketers in indigenous ornamental fish marketing. Majority (65.7%) of the indigenous ornamental fish marketers adopted market pricing (competitive pricing) and this was the same in the case of different category of

marketers such as exporters, suppliers and aquarium shopkeepers. A number of studies suggest that pricing policies are critical to attending successful export performances (Chetty and Hamilton, 1993; Bilkey, 1982; Bilkey, 1987). However research has been inconclusive. The study by Koh and Robieheux (1988) and Bilkey (1987) revealed that exporters perceived better export performance if they charged higher prices for export sales rather than for sales in the domestic market. In contrast, Christensen *et al.*, (1987) revealed that the exporting firms use a competitive pricing strategy.

Table: 5.3 Price fixation in comparison with competitors

Category	Below	Above	At par	Total
Exporters	.0%	15.4%	84.6%	100.0%
Suppliers	11.1%	55.6%	33.3%	100.0%
Retailers	7.7%	23.1%	69.2%	100.0%
Total %	5.7%	28.6%	65.7%	100.0%

Source: Primary data

The study noted that, marketers generally fix price below, above or at par with the price of the competitors. From the table 5.3, it is noted that 65.7% of the marketers fixed the price at par with the competitors' price, 28.6% fixed price above the competitors' price and 5.7% fixed below the competitors' price. Though high percentage of the exporters and aquarium shopkeepers fixed price at par, high percentage of the suppliers fixed price above fellow suppliers.

Table: 5.4 FOB Price of indigenous ornamental fishes of Kerala

Scientific name	FOB Price	Scientific name	FOB Price
Amblypharyngodon mola	0.40	Lates calcarifer	1.50
Aplocheilus lineatus	0.25	Lepidocephalus thermalis	0.04
Aplocheilus panchax	0.04	Mystus vittatus	0.20
Aplocheilus blocki	0.14	Macropodus cupanus	0.29
Anabas testudineus	0.20	Macrognathus aral	0.40
Barilius bakeri	0.50	Mastacembelus armatus	0.12
Barilius barna	0.10	Notopterus notopterus	0.40
Barilius canarensis	3.50	Nemacheilus triangularis	0.80
Chela dadyburjory	0.17	Nandus nandus	0.30
Channa striatus	3.00	Ompok bimaculatus	0.30
Channa marulius	0.75	Oryzias melastigma	0.04
Channa micropeltes	5.00	Pangasius pangasius	0.70
Channa orientalis	0.60	Puntius arulius	2.25
Channa gechua	4.00	Puntius bimaculatus	0.30
Chanda ranga	0.08	Puntius denisonii	5.00
Danio aequipinnatus		Puntius fasciatus	0.16
Danio malabaricus	0.25	Puntius filamentosus	0.80
Esomus danricus	0.05	Puntius chalakudiensis	1.00
Etroplus maculatus	0.20	Puntius filamentosus lepidus	0.40
Etroplus suratensis	0.35	Puntius jerdoni	1.60
Eleotris fusca	0.15	Puntius mahecola	0.80
Glossogobius giuris	0.20	Puntius sophore	0.20
Garra gotyla gotyla	0.30	Puntius ticto	0.12
Gonoproktopterus curmuca	3.00	Puntius vittatus	0.12
Gonoproktopterus amphibius	1.60	Rasbora daniconius	0.09
Gonproktopterus thomassi	3.00	Sicyopterus griseus	1.50
Horabagrus brachysoma	3.00	Scatophagus argus	0.25
Horabagrus nigricollaris	2.50	Xenetodon cancila	0.50
Homaloptera montana		Tetraodon travancoricus	0.10
Horadandia atukorali	0.07	Wallago attu	1.20

Source: Primary data

From Table 5.3 it was noted that a small percentage (11.1%) of the suppliers fixed prices below the existing prices. Such unhealthy practise of price reduction among the suppliers posed a severe threat of a price crash or decline in the existing price of indigenous ornamental fishes of Kerala. This may be a reason why high priced fishes such as *Puntius denisonii* which fetched 16 dollar in 1996 fetched an all time low price 3 to 5 dollars in 2005.

5.3.2 FOB Price of the indigenous ornamental fishes of Kerala

Table 5.4. presents the FOB Price fetched by the fifty seven indigeneous fishes of Kerala in the export market during the period 2004-2005, based on primary survey. From the table it was observed that indigenous fishes fetched price, ranging from 0.04 to 5 dollars. Classification of high priced, medium priced and low priced indigenous ornamental fishes based on FOB prices are presented in Figure 5.1, 5.2 and Table 5.5 respectively. It was inferred that high percentage (63.3%) of the indigenous ornamental fishes marketed from Kerala was included in the low price class. 15% of the fishes fetched medium price and 18.33% fetched high price. Thus, the study concluded that, among the indigenous ornamental fishes marketed from Kerala, high percentage of the fishes fetched a very low price. Among the high priced fishes, *Puntius denisonii* fetched the highest price followed by *Channa micropeltes*, *Gonoproktopterus brachysoma*, *Gonoproktopterus thomassi*, *G.curmuca*, *Barilius canarensis* etc. Low price was fetched by *Rasbora daniconius* and *Horandandia atukorali*.
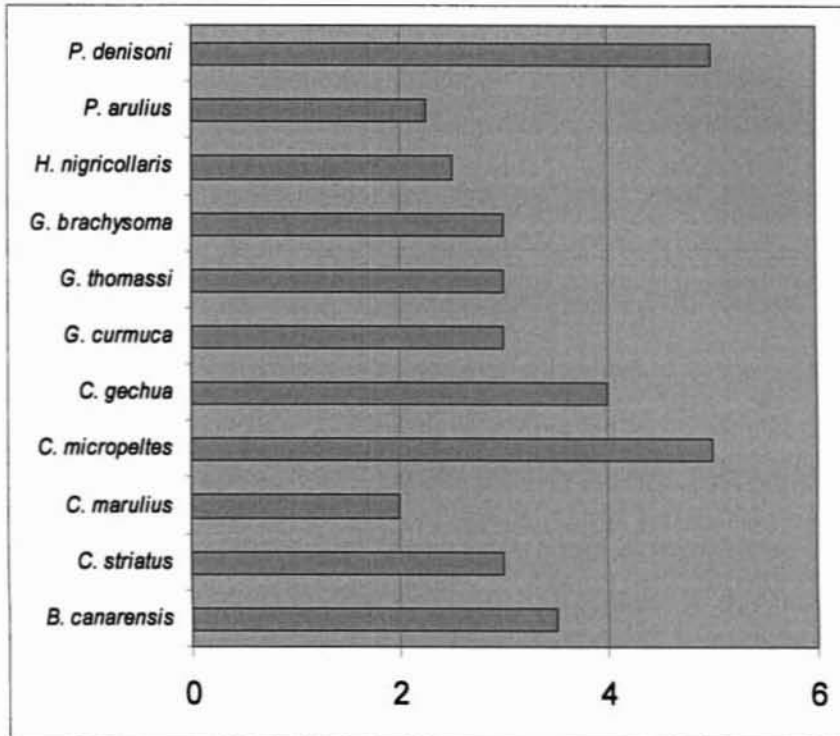
Figure: 5.1 High priced indigenous fishes of Kerala (FOB Price in US $)
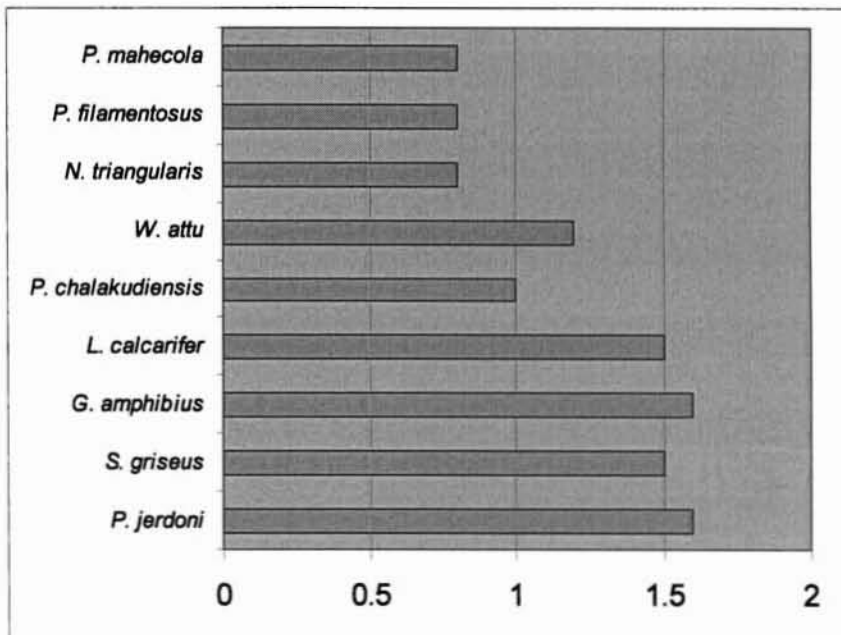
Figure: 5.2 Medium priced indigenous fishes of Kerala (FOB Price in US $)

Table: 5.5 Low priced indigenous ornamental fishes of Kerala

Low priced fishes	FOB Price per fish (in US$)
Amblypharyngodon mola	0.40
Aplocheilus lineatus	0.25
Aplocheilus panchax	0.04
Aplocheilus blocki	0.14
Anabas testudineus	0.20
Barilius bakeri	0.50
Barilius barna	0.10
Chela dadyburjory	0.17
Channa orientalis	0.60
Chanda ranga	0.08
Danio aequipinnatus	0.25
Danio malabaricus	0.25
Esomus danricus	0.05
Etroplus maculatus	0.20
Etroplus suratensis	0.35
Eleotris fusca	0.15
Glossogobius giuris	0.20
Garra gotyla gotyla	0.30
Mystus vittatus	0.20
Macropodus cupanus	0.29
Macrognathus aral	0.40
Mastacembelus armatus	0.12
Notopterus notopterus	0.40
Nandus nandus	0.30
Ompok bimaculatus	0.30
Oryzias melastigma	0.04
Pangasius pangasius	0.70
Puntius bimaculatus	0.30
Puntius fasciatus	0.16
Puntius filamentosus lepidus	0.40
Putius sophore	0.20
Putius ticto	0.12
Putius vittatus	0.12
Rasbora daniconius	0.09
Scatophagus argus	0.25
Xenetodon cancila	0.50
Tetraodon travancoricus	0.10
Horadandia atukorali	0.07

Source: Primary data

5.3.3 Variation in export prices over years

On analysing the price of high priced fishes over a ten year period from 1996 to 2004 (Table 5.6) it was noted that *Puntius denisonii* which fetched 30 dollars during its introduction in the export market in 1996, fetched a price as low as 5 dollars in the recent years (2004-2005) and is further

Table: 5.6 FOB price (US$) of indigenous fishes (1996- 2004)

Indigenous fishes	1996	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Anabas testudineus	2	1	0.8	0.5	0.3	0.2	0.15	0.1	0.1	0.57
Barilius bakeri	2	1	2.5	2.5	0.8	0.5	0.46	0.4	0.5	1.18
Chela dadyburjory	0.23	0.75	0.75	0.5	0.3	0.17	0.18	0.2	0.2	0.36
Channa marulius	6	6	4	2	2	0.75	1	2	2	2.86
Danio malabaricus	0.4	0.4	0.35	0.35	0.3	0.25	0.25	0.2	0.2	0.30
Etroplus maculatus	0.55	0.55	0.5	0.5	0.4	0.2	0.2	0.25	0.25	0.37
Etroplus suratensis	0.6	0.5	0.5	0.4	0.35	0.3	0.3	0.35	0.35	0.40
Horabagrus brachysoma	25	20	10	5	3	3	3	2	2	8.11
Horabagrus nigricollaris	10	10	5	5	3	2.5	2.5	2	3	4.77
Mastacembelus armatus	0.5	0.35	0.4	0.3	0.25	0.12	0.25	0.4	0.45	0.33
Notopterus notopterus	0.6	0.4	0.4	0.35	0.35	0.4	0.3	0.25	0.25	0.36
Nemacheilus triangularis	1.2	1.2	1	1	1	0.8	0.8	0.5	0.5	0.88
Nandus nandus	3	3	2	1	0.8	0.3	0.35	0.35	0.24	1.23
Putius denisonii	30	25	20	15	8	5	3	4	5	12.78
Puntius fasciatus	0.5	0.45	0.35	0.22	0.2	0.16	0.2	0.4	0.42	0.32
Puntius filamentosus	1	0.8	0.7	0.8	0.5	0.5	0.4	0.5	0.25	0.61
Tetraodon travancoricus	0.9	0.8	0.6	0.3	0.2	0.1	0.15	0.18	0.22	0.38

Source: Primary Survey

heading to 3 dollars. It fetched a mean FOB price of 12.78. In contrary to that, low price fetching fishes such as *Etroplus suratensis* did not show much variation over years. It fetched 0.6 in 1996 and reached 0.4 dollars in 2004-05 period. Export price variations of indigenous ornamental fishes of Kerala was studied by means of coefficient of variation. Bhuyan *et al.*, (1993) studied the price variation of the wholesale prices of paddy by means of coefficient of variation. FOB prices of the most frequently marketed indigenous ornamental fishes of Kerala from 1996 to 2004, for a period of ten years was analysed and their mean, standard deviation and coefficient of variation is presented in Table 5.7.

Table: 5.7 Coefficient of variations of indigenous ornamental fishes

Scientfific name	Mean	Standard deviation	Coefficient of Variation (%)
Anabas restudies	0.57	0.62	109.06
Barflies bakeri	1.18	0.89	75.43
Chela dadyburjory	0.36	0.24	66.07
Channa marulius	2.86	2.00	69.78
Danio malabaricus	0.30	0.08	26.35
Etroplus maculatus	0.37	0.15	40.31
Etroplus suratensis	0.40	0.10	25.75
Horabagrus brachysoma	8.11	8.60	106.14
Horabagrus nigricollaris	4.77	3.14	65.80
Mastacembelus armatus	0.33	0.12	35.11
Notopterus notopterus	0.36	0.11	28.93
Nemacheilus triangularis	0.88	0.26	29.47
Nandus nandus	1.23	1.15	93.35
Putius denisonii	12.78	10.12	79.21
Puntius fasciatus	0.32	0.13	39.71
Puntius filamentosus	0.61	0.24	38.83
Tetraodon travancoricus	0.38	0.30	78.85

Source: Primary data

The study noted highest mean price of 12.78 US $ for *Puntius denisonii* which was followed by *Horbagrus brachysoma* and *Horabagrus nigricollaris*. The reason due to which the fishes *Puntius denisonii*, *Horbagrus brachysoma* and *Horabagrus nigricollaris* fetched high price was that they were endemic to Kerala (Shaji and Easa, 2000) and could not be obtained from any other locality other than Kerala. Captive breeding was not perfected for the species hence there was no regular supply of these fishes in large numbers for the trade thus making its availability limited. From Table 5.1 it was noted that product attributes formed an important pricing factor according to majority of the marketers. Ramachandran *et al.*, (2004) noted high survival for *Puntius denisoni*, *Horbagrus brachysoma* and *Horabagrus nigricollaris* implying their suitability for aquaria which also might have been a factor for the high price of those fishes. From Table 5.1 it was noted that, the product attributes formed an important pricing factor according to majority of the marketers. Hence we can assume that the endemism of the fishes and attributes such as beauty, colour and high survival rate played a key role in elevating the price of *Puntius denisoni*, *Horbagrus brachysoma* and *Horabagrus nigricollaris*. Wood (2001) notes that value of fish based on the FOB Price may be as low as US $ 0.10 for small and abundant species. She added that, readily available but more interesting specimens generally range from US $ 1 to 5, while price of less common species range between US $ 10-30. Rarities such as unusual hybrids or deep water species may have an export price of hundred or even thousands of dollars. According to her rare varieties and the ones which are difficult to

collect command highest prices. The lowest mean price was noted for *Danio malabaricus* and *Puntius fasciatus.* These were two fishes which could be bred easily in captivity and could be obtained in large numbers from places even outside Kerala as a result of which the price of those fishes kept decreasing over years.

Puntius denisonii obtained highest standard deviation followed by *Nandus nandus* and *Horbagrus brachysoma.* The coefficient of variation was highest for *Anabas testudineus* followed by *Horababagrus brachysoma, Nandus nandus, Puntius denisoni, Tetraodon travancoricus* and *Barilius bakeri* indicating high fluctuations in their FOB prices. The high fluctuations in the prices may be attributed to a number of reasons such as, high variations in demand, competition between the channel members, lack of market awareness among channel members or lack of a floor price. The significance of maintaining a floor price for ornamental fishes was mentioned by Sane (1982a). The coefficient of variation was lowest for *Etroplus suratensis, Danio malabaricus, Nemacheilus triangularis,* and *Notopterus notopterus* indicating least fluctuation in their *FOB* prices. The small fluctuations in the price may be due to the stabilising of prices due to various reasons such as lack of demand, increased supply or ease of availability. The study also indicated that it was the highly market preferred fishes that showed a high coefficient of variation rather than the low preferred indigenous ornamental fishes.

Majority of the indigenous ornamental fishes of Kerala fetched very low price and fishes which fetched high price showed high fluctuation.

Market awareness, storage facilities to hold back the fish till it fetches a better price can improve the FOB price fetched for the indigenous ornamental fishes of Kerala and the fixing of a floor price for the fishes can minimise the fluctuation in price to a certain extent.

Chapter 6

Promotion of Indigenous Ornamental Fishes of Kerala

6.1 Introduction

In the age of information, marketing would be incomplete without effective communication with the prospective buyers. Promotion is an element of organisation's marketing mix that informs market of a product, its merits and characteristics thus positioning it in the market place. Mac Carthy, who originally coined the four P's, explains that promotion is concerned with telling the target market about the right product (Mac Carthy and Shapiro, 1983). He also indicated however that promotion goes beyond merely presenting this information infact, the objective of presenting this information is to influence attitudes and behaviour. Thus, promotion seeks to both inform and influence. Study by Kirpalani and Macintosh (1980) related several marketing variables to export performance and concluded that promotional activities contributed to higher export sales levels. According to Chaston (1984) a popular misconception is that promotional programme will sell any product. In fact, unless product is capable of satisfying market need and is offered at an acceptable price, promotion will not influence potential purchasers. Marmoria and Marmoria (1997) added that promotion refers to activities and processes designed to change or reinforce behaviour or ideas of consumer through communication so that they are persuaded to buy what they might not otherwise buy. The real role of promotion therefore is to communicate to potential purchasers, information about product benefits compared to competition, thereby increasing market awareness for the product. The objectives put forward in the study were,

1. To compare the promotion tools adopted by the three categories of

indigenous ornamental fish marketers.

2. To study the promotional efforts taken up by various governmental and non governmental organisations.

6.2. Methodology

6.2.1 Promotion tools to promote ornamental fishes from Kerala

The three categories of marketers of indigenous ornamental fishes i.e. exporters of India, suppliers of Kerala and retail aquarium shopkeepers of Kerala were questioned on the promotion tool chosen by them from among the different forms of promotion such as advertising, personal selling, sales promotion and public relations and the results were cross tabulated with the categories of marketers surveyed as detailed in the methodology in chapter two.

6.2.2 Promotion taken up by governmental and other organisations

An effort was made to compare the promotion tools adopted by the governmental and non governmental institutions of Kerala in promoting ornamental fish trade by classifying the activities into the five promotion tools i.e. advertising, personal selling, sales promotion and public relations.

6.3 Results and Discussion

6.3.1 Promotion tools in indigenous ornamental fish marketing

Advertising media build up a long term image for a product and include brochures, trade journals, hoardings and internet. Table 6.1 indicated that high percentage of the marketers of indigenous ornamental fishes (60.7

%) used brochures and very less percentage (3.6%) of the marketers used trade journals as advertising media.

Table: 6.1 Advertising media used in indigenous fish marketing

Category	Trade journals	Brochures	Website	Hoardings	Total
Exporters	8.3%	25.0%	66.7%	.0%	100.0%
Suppliers	.0%	100.0%	.0%	.0%	100.0%
Retailers	.0%	80.0%	.0%	20.0%	100.0%
Total %	3.6%	60.7%	28.6%	7.1%	100.0%

Source: Primary survey

Latest trend noted in ornamental fish marketing was that of e-marketing. 28.6% of the marketers used website as advertising media. Majority of the exporters used website as advertising media, followed by brochures and trade journals, but high percentage of suppliers and aquarium shopkeepers used brochures for advertising. Chaston (1984) states that in order to build awareness through advertising, the same message must be repeated frequently. As it is extremely expensive to execute repetitive campaigns, the major advertising campaigns are beyond the capabilities of most companies in fishing industry. The study thus noted that, a high preference was noted for brochures in indigenous ornamental fish marketing, the reason for which may be attributed to the fact that brochures build up a long term image for a product in a cheaper way compared to the other advertising media.

Sales promotion offer advantage of communication, incentive and

invitation used for short run effects such as dramatising product offers and boosting sales. Sales promotion tools include trade fairs, exhibitions, pop displays, samples, free gifts, price reduction and discount.

Table: 6.2 Sale promotions

Category	Trade fair	Price discounts	Trade fair & discounts	Trade fair &samples free gifts	Total
Exporters	.0%	.0%	.0%	100.0%	100.0%
Suppliers	11.1%	77.8%	11.1%	.0%	100.0%
Retailers	7.7%	53.8%	38.5%	.0%	100.0%
Total %	5.7%	40%	17.1%	37.1%	100%

Source: Primary survey

Table 6.2 indicated that all the promotion tools were tried out by the exporters at different point of time, but price discounts (40%), trade fairs and free gifts (37.1%) formed the most preferred sales promotion tools. It was noted that the marketers adopted trade fair in combination with discounts or samples and free gifts as promotion tool rather than trade fair alone for promotion purpose. According to Balagopal (2004) free sample as gifts to potential customers, in order to motivate them to use the product and weight the utility in relation to the competitive product, for a product with comparative specifications is a method of sales promotion which would prove to be quite effective if channelised through a proper physical network. Medium and small scale exporters participate in international fairs and exhibitions as they provide them with an opportunity to explore the export markets to display their products and help in assessing the marketability of their products. AQUARAMA and

INTERZOO were two major trade fairs for ornamental fishes in which the marketers participated. Indigenous fishes of Kerala such as *Puntius denisonii* have achieved laurels in AQUARAMA copetetions, which enabled the fishes to attain recognition in the trade (Tekriwal and Rao, 1999). Trade fairs act as a window for the direct contact of the product with the specialist importers and were felt to be the best way of making commercialised links. Successful marketing is contingent on presence at trade fairs actively supported by follow up of promotion and visits. Sanler (1994) and Business marketing (1996) stressed the importance of trade shows as an important component of the marketing mix for many industrial products, constituting a multibillion dollar business both in the United States and Europe. They accounted for about 10% of the business marketing communications budget of U.S. firms and more than 20% of the budget of many European firms.

Table: 6.3 Direct marketing

Category	Telephone	Internet or fax	Total
Exporters	30.8%	69.2%	100.0%
Suppliers	77.8%	22.2%	100.0%
Retailers	100.0%	.0%	100.0%
Total %	66.7%	33.3%	100.0%

Source: Primary survey

Direct marketing is an interactive system of marketing which is non public, customised, up to date and interactive. It uses one or more advertising media i.e. direct mail, catalogue, telemarketing, electronic

shopping (telephone, television direct response marketing, internet direct response marketing) and so forth to effect a measurable response or transaction at any location. Table 6.3 revealed that telephone (66.7%) and fax (33.3) were the most popular direct marketing techniques adopted. The major public relations tools are publications, events, identity media-logos, brochures, and business cards. Marketers were enquired about the public relation tools used by them and the results are presented in Table 6.4 which revealed that 77.1% of the marketers used identity media such as logos, brochures and business cards and 11.4% used events and identity media.

Table: 6.4 Public relation

Category	Publications	Events	Identity media	Events & identity media	Total
Exporters	23.1%	7.7%	69.2%	.0%	100.0%
Suppliers	.0%	.0%	88.9%	11.1%	100.0%
Retailers	.0%	.0%	76.9%	23.1%	100.0%
Total	8.6%	2.9%	77.1%	11.4%	100.0%

Source: Primary survey

Sales promotion tools were the most preferred in indigenous ornamental fish marketing. The study revealed that among sales promotion tools, discounts and trade fairs were mostly preferred in indigenous ornamental fish marketing. Sales promotion tool and direct marketing were the highly preferred techniques in export marketing. According to Hanssens *et al.*, (2001) sales promotions are relatively easy

to implement and tend to have immediate and substantial effects on sales volume. Consequently the relative shares of promotion in firms marketing budgets continue to increase (Currim and Schneider, 1991). However sales promotions rarely have persistent effect on sales, which tend to return to pre promotion days after a few weeks or months (Dekimpe et al., (1999); Srinivasan et al., (2000); Nijs et al., (2001); Pauwels et al., (2004). Consequently promotions effectiveness in stimulating long term growth and profitability for the promoted brand is in doubt (Kopalle et al., 1999). A detailed study on the effectiveness of sales promotion tools in ornamental fish marketing is wanting.

6.3.2 Promotion taken up by governmental and other organisations

An effort was made to compare the promotion tools adopted by the governmental and non governmental institutions of Kerala in promoting ornamental fish trade by classifying the activities into the five promotion tools mentioned in Table 6.5. It was noted that advertising media, sales promotion and publications were the only activities taken up by the institutes and organisations in Kerala. Since none of the organizations were commercial activity centres, they had not adopted direct marketing and personal selling techniques. On comparing the activities of various institutes and organizations in Kerala it was noted that all the institutes/organisations carried out sales promotion of ornamental fishes by trade fairs. But advertising media was used only by the MPEDA, the State government and Fish Research Management Society (FIRMA).

Table: 6.5 Various institutions and promotion tools

Organisations	Ad media	Sales promotion	Public relations
State Fisheries dept	Trade journals, Brochures	Trade fairs	Events
MPEDA	Trade journals, Brochures	Trade fairs	Website, Publications, Events
Matsyafed	-	Trade fairs	-
KAU	-	Trade fairs	Events (Workshops & trainings)
CUSAT	-	Trade fairs	Website, Publications, Events (Workshops & trainings)
CMFRI	-	Trade fairs	Events (Workshops & trainings), Publications

6.3.2.1 Promotional schemes being implemented by Matsyafed.

The promotion activities taken up by Matsyafed can be categorised as sales promotion and public relation. The Kerala state cooperative federation for fisheries development (Matsyafed) launched a novel programme on ornamental fishery development of the state as early as 1998-99 with the financial assistance from the ministry of human resources, Government of India with a view to providing employment for at least 25,000 educated fisherwomen of the state. The project outlay was Rs.48 Crores and was implemented in three phases. During the first phase 120 cooperative societies spread in 8 districts were selected and financial assistance was given to 300 fisher women. Ornamental fish culture under this programme comprised, culture in small ponds held by a group of two women and in cement tank units owned by four women. Matsyafed also

impart training on ornamental fish domestication, breeding and rearing in any one of the ornamental fish farms of the state (Shobanakumar, 2002)

6.3.2.2 Promotional schemes implemented by MPEDA

With a view to augmenting the production for export of ornamental fishes MPEDA took up several promotion activities such as workshops or trainings, projects, assistance schemes, subsidies, advertising and planning for an aqua technology park.

a. Workshops / trainings/Projects

The ITC publication on International trade in tropical aquarium fish (Anon, 1979) motivated MPEDA, resulting in the organisation of the seminar in Bombay on 'Prospects of aquarium fish exports from India' in 1982. As a part of the activities for product development, MPEDA availed assistance from the centre for promotion of Imports from the developing countries (CBI) the Netherlands. Under the bilateral cooperative programme of Indo-Netherlands, MPEDA undertook a project in phased manner and the details of the project are compiled in the table 6.6.

Initially a one month resource survey of marine ornamental fishes in Lakshadweep and freshwater fishes in Bombay and Madras (Phase-I) was conducted in May, 1986. This was followed by an extensive research i.e. Phase-II of the project which involved a pilot study on the transportation of fishes from Kawarathi to Amsterdam. Six member training mission as a part of phase-III of the project was sent to Netherlands for a training on ornamental fish to understand the present market situation in the

Netherlands and also to analyse the possibility of ornamental fish export to the Netherlands with the participation in the Interzoo fair -88 which made clear that the Netherlands still has to be considered as a very important outlet of this trade. Phase-IV of the project comprised a workshop/ seminar

Table: 6.6 CBI assisted MPEDA Projects

	Conduct time	Report
PHASE 1	7th May -6th June, 1985	Report on resource survey of marine ornamental fishes in Lakshadweep & freshwater fishes in Bombay and Madras in May, 1986.
PHASE 2	January-February, 1986	Report on pilot project on the export of ornamental aquarium fishes and aquatic plants from India –January February 1986
PHASE 3	5th to 19th May, 1986	Report on the training mission on ornamental fish export to the Netherlands
PHASE 4	December 1986-Jan 1987	Report on the workshop /seminar on ornamental fish export

Source: Compiled from MPEDA reports

on ornamental fish export. Besides MPEDA also organises regular workshops for the beneficiaries on different aspects of ornamental fish such as domestication, breeding, culture, diseases and marketing. The business meet held in Kochi in April, 2005 was an innovative step in facilitating the interaction of Indian entrepreneurs with that of foreign counterparts (INFOFISH, 2005).

b. Subsidies and assistance schemes of MPEDA

According to Nair (2002), MPEDA launched a scheme which offered a

subsidy assistance of fourty thousand rupees for those ornamental fish breeding units which were established on or after 24th September, 1999 and had an infrastructural capability of producing more than 50,000 fingerlings on an annual basis. As per the official unpublished records the benefit was availed by 782 units in India and 295 units in Kerala from 2000-2001 till 2003-2004. MPEDA in 1996 approved yet another development assistance scheme for the export of aquarium ornamental fish which was implemented in the year 1996-97. The objective of the scheme was to give a thrust to the export of ornamental fish from the country and to fetch better unit value realisation by competing with our neighbouring countries. Under this scheme it was proposed to reimburse 10% of the FOB value of exports to a maximum of Rs 3 lakhs per exporter per year, the account of which would be kept in cumulative basis. A manufacturer exporter who wished to participate in international fares like, "Inter Zoo", "Aquarama" etc., as a joint participant with MPEDA, according to the Market Development Assistance Scheme (MDA) of MPEDA was eligible for 50% subsidy of rental charges for a stall space of 6 sq.m and 30% of return air ticket in economy class. MPEDA also funded a two year project to Cochin University of Science and technology on the "Resource analysis of indigenous ornamental fishes of Kerala for the development of markets in India and abroad".

c. Aqua technology park

MPEDA with the technical assistance from Agri food and Vetenary Authority (AVA), Singapore and INFOFISH, Malaysia intends to provide

centralised infrastructure facilities to promote ornamental fish breeding and marketing of exportable varieties of ornamental fishes by setting an aqua park with research and development units near Nedumbassery International Airport, at Cochin. Singh (2000) wrote on Singapore's agro technology parks which helped to fuel its aquarium fish trade. In the mid-1980s, Singapore adopted an innovative strategy to develop agriculture by setting up agro technology parks using high-tech methods designed to have a complementary mix of non-polluting farms which can co-exist in the city-state's urban environment. Bojan (2005) described in detail how Aquatechnology park would be able to promote ornamental fish trade in India. According to him the proposed park having 4 hectre area can house seven independent ornamental fish breeding units of 0.5 hectre each. Each breeding unit is expected to have a production capacity of 5.2 million fishes. Hall and Warmolts (2001) stressed the importance of the role of public aquaria in the conservation and sustainability of the marine ornamental fish trade. They added that the collective annual attendance in the public aquaria can be used to educate and influence the visitors, local communities and other target groups about the wild life concepts and issues. The setting of the parks in the state is expected to augment the ornamental fish trade in Kerala and especially the ornamental fish export from Kerala.

6.3.2.3 Promotional activities taken up by State fisheries

Government of Kerala in 1998 prioritised ornamental fish culture sector as an avocation for generating large scale self employments well as earning

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of additional foreign exchange to the state. The fisheries department adopted promotion tools mainly trade fair conducting, public relations through events like workshops, and occasionally advertising media. Six ornamental fish exhibitions were conducted in various years from 1998 to 2004. According to Kurup (2002) the exhibitions provided a venue for the assemblage of aquarium fish traders, farmers, scientists, administrators' exporters and aquarium accessory industrial dealers for a meaningful exchange of ideas and their close interaction, and these exhibitions showcased a wide collection of both exotic and indigenous fishes of marine and freshwater origin (Kurup, 2002).

The fisheries department and the FIRMA are planning to go in for collaboration with the Singapore government's Agri-food and Vetenary authority for setting up an aqua park at Kodungallor in Ernakulam district (The HINDU, 5TH JUNE, 2005).The park would be established in a 10 acre plot with the financial assistance of the Marine assistance of the marine product export development authority with a view to promoting ornamental fish market.

6.3.2.4 Promotional activities taken up by School of Industrial fisheries

By conducting an ornamental fish exhibition namely AQUAFEST in 1982, The School of Industrial fisheries in Cochin University of science and technology took up the pioneer attempt in the state in ornamental fish promotion through exhibition in the state. The School through trade fairs or exhibitions, websites, compact disc, public relations through, classes,

trainings, lectures newspaper releases and posters tried to create awareness among the people on the prospects of marketing the indigenous ornamental fishes of Kerala. Later an MPEDA adhoc project on the 'Resource analysis of potential ornamental fishes in Kerala for the development of markets in India and abroad' (Ramachandran *et al.*, 2002) was carried in the School of Industrial fisheries which generated information on the indigenous ornamental fishes from selected rivers of Kerala feasible for maintaining in aquaria. Different methods were tried out by the project team in order to create an awareness of the significance of the indigenous ornamental fishes of Kerala, among the people to judiciously utilise these resource to the maximum economic benefit and to create more job opportunities in the state and to boost the export earnings from the industry. The steps taken up included website creation, classes, trainings, lectures, compact disc release and newspaper releases. The project created a website www.ornamental fishes.org that has information on the indigenous ornamental fishes of Kerala (Freshwater, Brackishwater and Marine) their local name, scientific name, availability, IUCN categorisation. The photographs of these fishes in its natural colouration along with description on local name, scientific name, availability, size range were presented in the website and the photographs of the fishes are presented in the Annexue- I. Two work shops conducted in connection with the project in the School was highly beneficial in disseminating information to the stakeholders. NATP - ICAR project conducted in the School carried out resource and habitat analysis of indigenous ornamental fishes all over Kerala as a part of germplasm inventory studies.

6.3.2.5 Central government scheme

Targeting 1% share in global exports by 2007, the new exim policy envisaged a series of procedural simplifications which included issue of same day licensing in all regional licensing offices, reduction in percentage of physical examination of export cargo, direct negotiation of export documents in order to help the exporters save bank charges and 100% retention in EEFC (Export Earners Foreign Currency) accounts and extension of repatriation period for realisation of export proceeds from 180 days to 360 days. All export promotion schemes including DEPB (Duty Exemption Pay Back Scheme) were to be continued. Annual advance licensing scheme was withdrawn and duty entitlement exemption certificate is abolished. According to the policy, Fish and fishery products under product code-66 sl. no.1 and 2 continued to receive DEPB at the rate of 2% and 4% respectively (EXIM POLICY, 2002).

The study thus highlighted that governmental and non governmental organisations of the state had taken up many promotional activities through their effective promotional programmes to make people aware of the potentials and possibilities of marketing and conserving the indigenous ornamental fishes.

Prospective Export Markets for Indigenous Ornamental Fishes of Kerala

7.1 Introduction

The marketers of the indigenous ornamental fishes of Kerala cater their products to both domestic and export markets. Firms move beyond the domestic market into the international trade due to the strong demand for wide variety of consumer products in the developed countries. ITC, UNCTAD/GATT report (Anon, 1979) stated that, when domestic breeding costs in principal markets rose sharply since 1973-74, many developing countries got the opportunity to increase their ornamental fish export. According to Lem (2001) fish keeping is a hobby that is practiced mainly in industrialised countries because it is still relatively costly. Fisheries commodity statistics published by the Food and Agricultural Organization (FAO, 2003) presented the latest figure on the total import and export trade of ornamental fish including invertebrates as US $ 277 million and US $ 220 million respectively. Table 7.1 presents the world ornamental fish trade i.e. both exports and imports over a period from 1984 to 2003 based on FAO Statistics. The data is an indication of the broader trends in international ornamental fish trade, which indicates that the industry is expanding.

Country wise export statistics is presented in Table. 7.2. The table shows that, Singapore which exported 18.8% (US $ 41.43 million) of the world exports, tops the exporters list, closely followed by Malaysia which exported to the tune of US $ 18.9 million i.e. 8.59% of the world exports (FAO, 2003).

Table: 7.1 World ornamental fish trade (Value US $ million)

Year	Total trade	Export	Import
1984	104.10	43.52	60.58
1985	104.25	42.80	61.46
1986	124.24	53.87	70.36
1987	153.56	66.12	87.44
1988	232.12	93.59	138.54
1989	270.98	99.92	171.06
1990	310.63	113.10	197.53
1991	341.72	125.47	216.25
1992	386.65	139.99	246.66
1993	409.26	148.40	260.86
1994	506.11	169.06	337.05
1995	529.13	203.12	326.01
1996	530.09	207.10	326.01
1997	489.91	193.60	296.31
1998	436.07	173.87	262.20
1999	415.89	171.80	244.10
2000	427.34	181.18	246.16
2001	427.29	182.67	244.62
2002	423.66	189.49	234.16
2003	498.04	220.08	277.96

Source: FAO STATISTICS (1984-2003)

Table: 7.2 Country wise export statistics (Value US $ million)

Country	Export US $ million	Export percentage
Singapore	41.43	18.8 %
Hong Kong	8.62	3.9%
Indonesia	13.37	6.08%
Czech republic	16.18	7.35%
Malaysia	18.90	8.59%
Srilanka	6.46	2.94%
Philippines	6.82	3.10%
Japan	12.40	5.63%
USA	8.56	3.89%
Germany	3.15	1.43%
Belgium	5.28	2.40%
France	3.62	1.65%
Israel	8.53	3.88%
Italy	1.3	0.59%
Netherlands	2.97	1.35%
others	62.59	28.44%
Total	220.081	100%

Source: FAO (2003)

Singh and Dey (2006) pointed out that, Asian countries contributed about 56.3% of world ornamental fish exports i.e. US $ 123.92 million in 2003. He further added that, the major Asian countries involved in the export of ornamental fishes are Singapore (33.7%), Malaysia (15.3%), Indonesia (10.8%), China including Hong Kong and Macau (6.9%), Japan (10%), Philippines (5.5%), Sri Lanka (5.2%) and Thailand (6%). With 2% of the total Asian supplies, India is amongst the top ten countries in Asia.

On comparing the latest export statistics in the world trade i.e. 220.08 million US $ (FAO, 2003) with the export statistics from India in the corresponding year i.e. Rs. 254.95 lakhs (MPEDA Statistics Review, 2003), it was noted that the share of India formed just 0.25% of the world exports. In the year 2004-2005 exports from India reached 443.84 Lakhs i.e. US $ 0.99 million, still India has not gained a foothold in the international ornamental fish trade. An awareness regarding the export markets and trends in ornamental fish exports was found to be essential to improve the ornamental fish export from India. The specific objectives of the study were,

1. To find the major markets to which Indian marketers cater the indigenous ornamental fishes of Kerala.

2. To determine the trend in the export of ornamental fishes from India to USA, UK, Japan, Netherlands, Germany, France and Singapore so as to trace the markets with high growth rate.

7.2 Methodology

7.2.1 Markets of ornamental fishes of India and Kerala

The marketers were enquired by means of marketers' survey questionnaire about the markets to which they supplied fishes and the results were cross tabulated with the respective categories of marketers i.e. exporters of India, suppliers of Kerala and aquarium retailers of Kerala.

7.2.2 Markets showing high prospects and increasing trends

The export data of ornamental fishes from India to various markets, for a period of ten years from 1993-94 to 2003-2004, based on MPEDA

Statistics, was subjected to trend analysis by method of least squares, (Box and Jenkins,1984), to choose the most prospective markets. The essence of trend estimation lies in fitting a trend line on the time series data. The straight line trend-estimation of the trend values by method of least squares makes use of the regression equation. The selection of the best fitting trend is made on the criterion of goodness of fit; the best fit is obtained when the sum of the squared deviations is the least. The method of least square provides a convenient device for obtaining an objective fit of a straight line trend line to a series of data.

7.3 Results and Discussion

7.3.1 Major Export Markets of ornamental fishes of India and Kerala

Table 7.3 shows the results of cross tabulation of the category of marketers with the markets to which they catered ornamental fishes.

Table: 7.3 Ornamental fish Markets

Category	USA	Japan	Europe	U.K	Singapore	Kerala	Indian Metros	Total
Exporters	30.8%	15.4%	7.7%	7.7%	38.5%	.0%	.0%	100%
Suppliers	.0%	.0%	.0%	.0%	.0%	11.1%	88.9%	100%
Retailers	.0%	.0%	.0%	.0%	.0%	100%	.0%	100%
Total %	11.4%	5.7%	2.9%	2.9%	14.3%	40%	22.8%	100%

Source: Primary data

The results revealed that, high percentage (40%) of the respondents' marketed fishes in the domestic market itself and 22.8% marketed to the metropolitan cities of India. Very less percentage of marketers supplied ornamental fishes to export markets such as USA, Japan, Europe, UK, and Singapore. When the exporters marketing indigenous ornamental

fishes of Kerala were analysed separately, the results (Table 7.3) revealed that high percentage (38.5 %) of the exporters catered fishes to Singapore, followed by USA, Japan, U.K, and Europe. The marketing pattern of the exporters was similar to that of ornamental fish exports from India as presented in MPEDA statistics review (2003-2004), which showed that Singapore with an export share of 34.7% of Indian exports formed the notable market of India followed by U.S.A (18.5%), Japan (13.96%), U.K (8.44%), France (1.62%), Germany (7.47%), Netherlands (1.62%) and Srilanka (1.29%). Olivier (2001a) asserted that the major markets for ornamental fishes in the world were U.S.A, Japan and Europe. Hence it was noted that India catered ornamental fishes to the World's major ornamental fish markets. Figure 7.1 illustrates the country wise ornamental fish imports in the World trade, as per FAO statistics (2003). According to the figure, USA led with a market share of 23.1%, followed by Germany (10.3%), United Kingdom (9.5%) Japan (8.9%), France (7.9 %), Singapore (4.8%), Belgium (4.2%), Netherlands (4.2%), Italy (4.1%) and China and Hong Kong (3.5%).

The importance of USA as worlds single largest market has been stressed for long (Conroy, 1975; Henley, 1984; Andrews, 1990; Tomey, 1997; Wood, 2001; Singh and Dey, 2003a; Sing and Dey, 2006). The share of imports into USA had been highest for the past 17-20 years (Olivier, 2001b). According to her, the imports marked a peak in 1995 with US $ 80.13 million forming 24.5% of the world exports and then declined
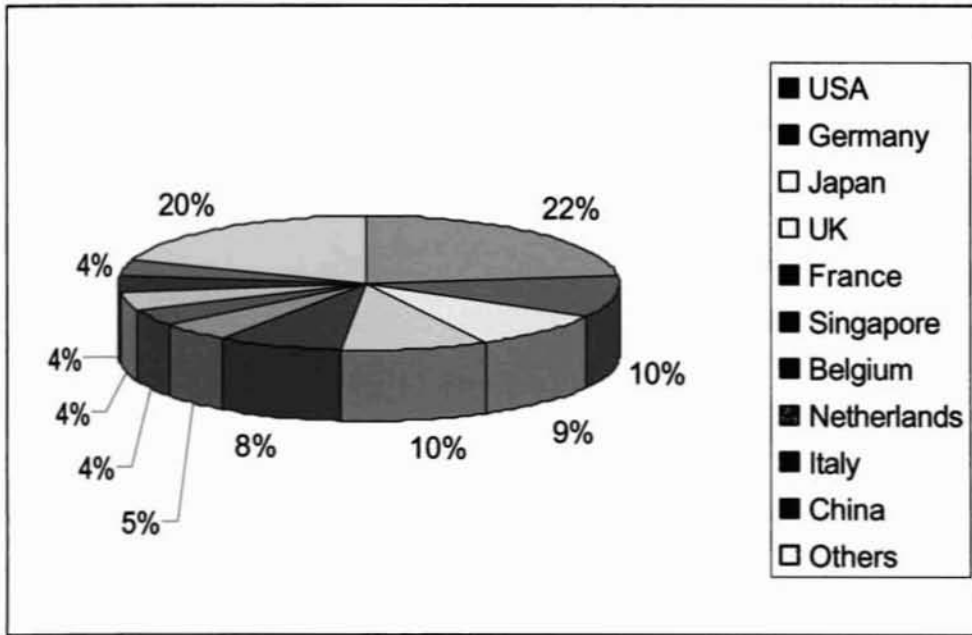
Fig: 7.1. Share of main ornamental fish importing countries of the world
(FAO, 2003)
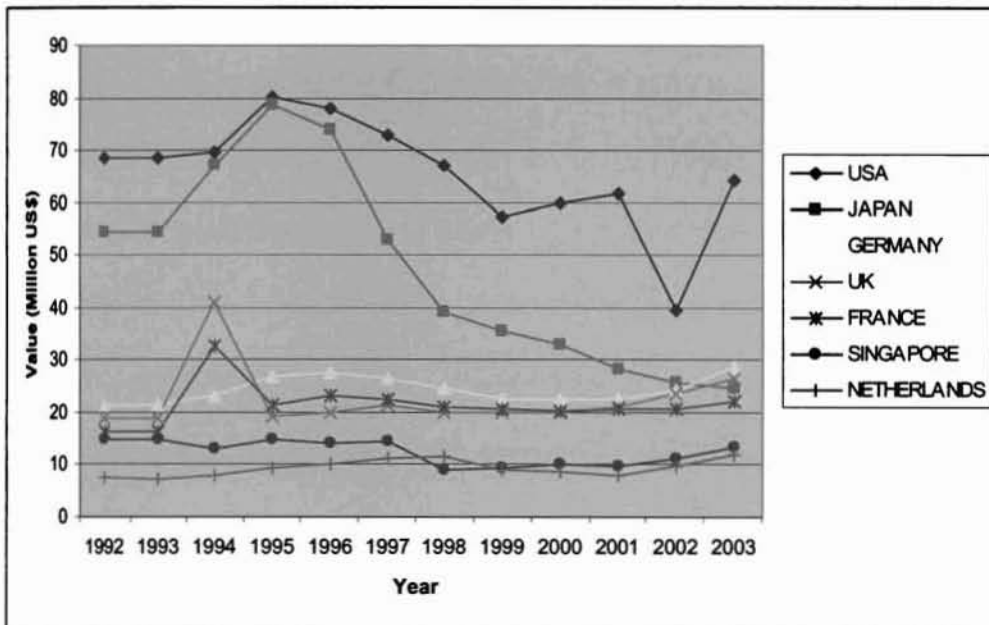
Fig: 7.2. Country wise ornamental fish imports
(FAO Statistics1993-2003)

to US $ 57.36 million in 1999 and then rose again in 2000 to US $ 60.01 million to a figure of US $ 61.77 million in 2001. Figure 7.2 notes that even though USA imports nose dived in 2002 to an all time low of US $ 39.6 million, less by 35.7% compared to 2001, its position as world largest importer remained unaltered with 22% of world import share in 2003 with US $ 64.22 million (FAO 2003). Tomey (1997) expressed hope that, despite the increasing domestic production, imports will probably continue to increase and USA's ornamental fish market will remain a major outlet for suppliers from developing countries. Pet industry joint advisory council survey (PIJAC, 2001) revealed that tropical fish keeping was the second most popular hobby after photography in USA. Bassleer (1994) presented the respective share of US import by country of origin. He pointed out that some 90% of imports of ornamental fish to USA come from Asia and 10% from South America. The major suppliers were Thailand, Indonesia, Philippines, Malaysia and Brazil. Export share from India to USA compared to the exports from other countries to USA might be negligible but review of MPEDA Statistics from 1969 to 2005 revealed that USA had been our major market for major years. During 2003-2004 the export share from India to USA was 71.55 lakhs which was 16.08% of the total exports from India (Anon, 2005).

Japan reaffirmed its position as the second largest importer of ornamental fish by importing aquarium fish amounting to US $ 20.9 million forming 7.52 % of the worlds total market share (FAO, 2003). Reasons for the remarkable increase in the Japanese aquarium market were, rapid

economic development between 1986 and 1991, an increase in leisure time due to the introduction of two day off a week system, prohibition of keeping large animals in multi storied apartment buildings and introduction of variety of aquarium equipments. Since 1993, however aquarium business had been badly affected by the economic recession in Japan particularly from the latter half of 1996. Imports fell in value gradually from US $ 73.94 million in 1996 to US $ 28.40 million in 2001 and has reached US $ 24.72 million according to the latest FAO Statistics in 2003. Tomey (1997) stressed that the decline was attributed to the recession the country had been going through. During years of recession aquarists became selective and more demanding. The estimate of the industry sub sector clearly indicated the existence of tremendous export opportunities. The retail trade of aquarium fishes in Japan in 1994 was worth US $ 1.7 million. The country was estimated to have 1.2 million aquarists who spent about US $ 140 per head annually. 3% of Japan's 40 million households owned tropical fishes compared to 8 % for USA and 5.5 % for Germany. According to Tomey (1997) the main suppliers to the Japanese market were Singapore, Brazil, Indonesia, Malaysia, USA, China (Hong Kong). The ornamental fish export from India to Japan in the year 2004-2005 was to the tune of 49.39 lakhs forming 11.13 % of India's exports (Anon, 2005).

Shenoy (1987) presented Netherlands to be a good market for tropical aquarium fish. According to the world trade statistics (FAO, 2003) Western Europe formed the largest trade block importing almost 40% of the world ornamental fish production. Singh and Dey (2003b) stated that,

in 2001 imports was to the tune of US $ 107.77 million and the top importing countries were, Germany (21%), UK (19.6%), France (19.1%), Belgium (8.8.%), Italy (8.4%) and the Netherlands (7.6%). Freshwater species accounted for more than 90% of the imports by value, the rest were marine fish, invertebrates and live rocks. The main suppliers to the Western European markets were Singapore, Czech Republic, Israel, Japan, Malaysia, Indonesia, China (Hong Kong), Srilanka, Thailand, USA and Brazil. MPEDA statistics revealed that Indian exports to the European countries was to the tune of 79.46 lakhs in 2004-2005. According to Postma *et al.,* (2004), a number of trends and the developments were noted in Europe which has an influence on the ornamental fish market. They noted that with the integration of Europe into one open market; businesses were quickly expanding from a national to European scale.

Singapore is the top exporting country in the world with a market share of 18.8 % (US $ 41.42 million) of the world trade (FAO, 2003). The top 10 countries that buy ornamental fish from Singapore, are United Kingdom, United States of America, Japan, Germany, France, Italy, Netherlands, Spain, Belgium and Switzerland. Lee (2005) stated that, Singapore is a trading hub with excellent logistic, air cargo services and breeding centre for champion guppies, sword tail, angels, discus and many other kinds of fish. Singapore exporters dealt with 500 species of ornamental fish, buying from the local farms, which accounted for about 40% of the sales, as well as from farms in the region and elsewhere for re-exporting. Rana (2004) pointed out that the prominence of Singapore as

the Asian hub for ornamental fish is beginning to wane, though Singapore is still likely to be significant player in the foreseeable future. Although Singapore maintains its lead in the trade its share in the world market has been declining, dropping from 31.8% in 1992 to 18.8% in 2003. According to Rana (2004), several factors played a role in Singapore's downturn and they include the decrease in quality fish from Singapore, decrease in number of farms due to high economic target returns from unit land set by government policy and consequent shifting of many farmers to Malaysia for ornamental fish farming, increase in direct exports from Malaysia due to the new airport facilities and their promotional activities for the sector by government, the increasing number of emerging countries that are producing fish of at least equal quality at competitive prices. Significant increases in exports were reported from emerging players like Srilanka, Thailand, Malaysia and Indonesia. Between 1990 and 2000 exports from these countries rose on an average at 44,102, 44 and 18% per year respectively. During the same period Singapore's export rose by just 0.8% per year. Dawes (1999b) notes that on the exporting front major players, like Singapore, are likely to be presented with a growing challenge from other exporting areas, the three most likely being Malaysia, SriLanka and possibly, Israel, all of which appear to be gathering momentum.

Lim (2005) stated that the demand for ornamental fish have changed among the top importing countries. In 2002, although USA and Japan still remained the top two importing countries, they imported 35 to 37% less than in 1992; in contrast all of the top importing countries in

Europe such as Germany, UK, France, Italy, Belgium and the Netherlands have imported 7.8 to 40% more fish than they had done in 1992. He added that, FAO trade statistics from 1976 to 2002, showed that over the last decade, there were several trends emerging in the global ornamental fish trade; fish traffic moving from southern to northern hemisphere, the majority of the import trade moving away from the traditional markets such as USA and Japan to Europe and the export trade shifting from more developed countries to the developing countries. The major exporting countries such as Singapore, USA and Hong Kong have been slowly losing their market shares to new players such as Malaysia and the Czech Republic. However, the latest statistics show that Singapore remained the global top exporting country and US the top importing country. Other major exporting countries include Malaysia, the Czech Republic and Indonesia; the major net importing countries are the U.K, Germany and Japan. Dawes (1999b) noted that on the importing front, Portugal and Spain are probably going to become two of the fastest-expanding marketers over the next decade. According to Rana (2004) temporal evaluation of imports suggests that the imports into major markets peaked between 1995 and 1996 during the economic boom and then declined during the subsequent global economic downturn. Since 1999, however, imports have stabilised and are now increasing in the major markets.

7.3.2 Trends in the export of ornamental fish from India

The ornamental fish export from India started on an experimental basis in 1969, with export earnings of US $ 0.04 million (16.4 lakhs). Figure: 7.3
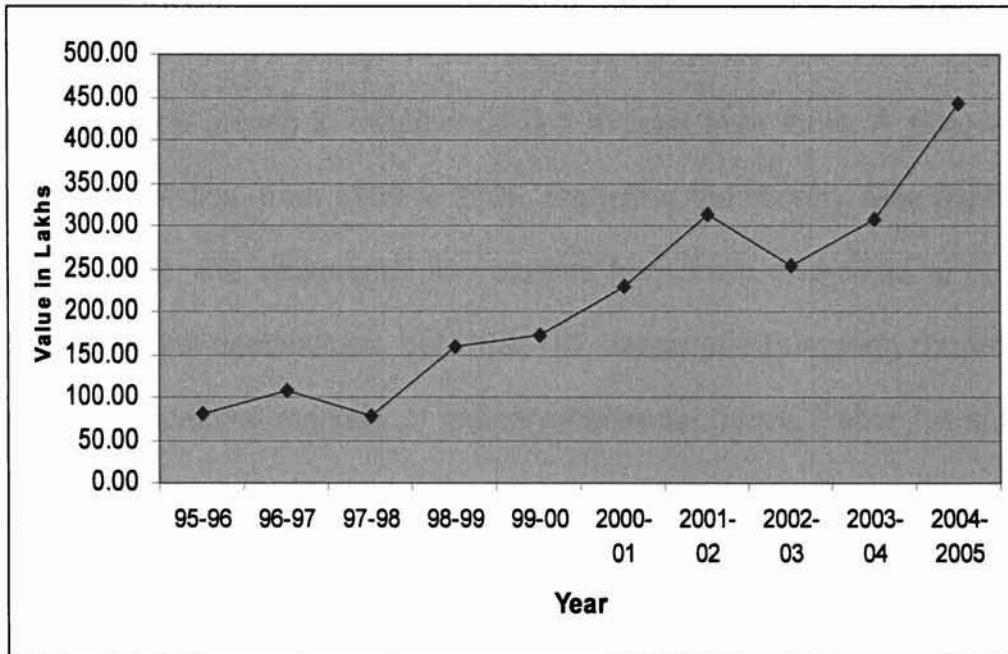
Fig: 7.3 Growth in ornamental fish exports from India

Table: 7.4 Market share from India to export markets (In percentage)

Markets	2003-04	2002-03	2001-02	2000-01	1999-00	1998-99	1997-98	1996-97	1995-96	1994-95
USA	18.5	20.39	22.59	19.57	28.04	28.53	29.49	23.06	25.58	41.12
Japan	13.96	16.47	16.88	25.3	24.1	24	20.57	30.66	24.51	21.16
Germany	7.47	7.45	6.16	5.96	6.88	7.84	13.02	11.24	7.79	8.03
UK	8.44	11.37	4.73	4.39	3.81	5.71	4.26	7.46	6.15	13.64
Nepal	0	0	0.31	0.61	2.69	5.71	8.36	5.41	8.67	4.84
Singapore	34.70	24.7	17.66	19.74	14.39	7.63	7.05	4.84	0.47	1.09
France	1.62	1.18	1.07	0.8	0.53	3.56	2.23	3.31	2.04	2.15
Bangladesh	0	0	1.09	0.79	0.16	0.3	0.49	2.91	0	0
Netherlands	1.62	2.35	1.53	1.21	4.73	1.37	4.22	2.53	2.99	2.11
Srilanka	1.29	4.7	1.59	0	0	0	0	0	0	0
Others	12.40	11.39	26.39	21.63	14.67	15.35	10.31	8.58	21.8	5.86
Total	100	100	100	100	100	100	100	100	100	100

Source: Compiled from MPEDA Statistics (1994-95 to 2003-2004)

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show the growth in ornamental fish exports from India over years. Figure 7.3 shows the growth in ornamental fish exports from India. A review of MPEDA Statistics from 1969 to 2005, regarding the country wise exports revealed that, the ornamental fish exports from India diversified to more than 30 market destinations, but USA, UK, Japan and European countries were the traditional markets of Indian ornamental fishes. Table 7.4 show the market share to the export markets such as USA, Japan, UK and European countries. The table shows that the values in export to major export markets of India such as USA, UK and Japan were on the decrease. Hence a detailed trend analysis (Figure 7.4, 7.5, 7.6, 7.7, 7.8 and 7.9) was carried out to determine the trends in export of ornamental fishes from India to its major ornamental fish markets to gain an understanding of the future prospects in export to those countries.

To examine the trend and the measure of the regression model's ability or accuracy to predict i.e. the coefficient of determination (R^2) value and rate of change in growth (β) was found from the export figure of India to five countries for a period of ten years from 1993-94 to 2002-2003. Table 7.5 shows a comparison of the coefficient of determination (R^2) and rate of change in growth (β) for the export of ornamental fishes from India to U.S.A, Japan, Germany, U.K, France, Singapore and Netherlands. R^2 value was highest for Germany which showed a perfect model fit and indicated that in the following year the increase was definite. R^2 value of Singapore came after Germany and was followed by USA, UK and Japan.
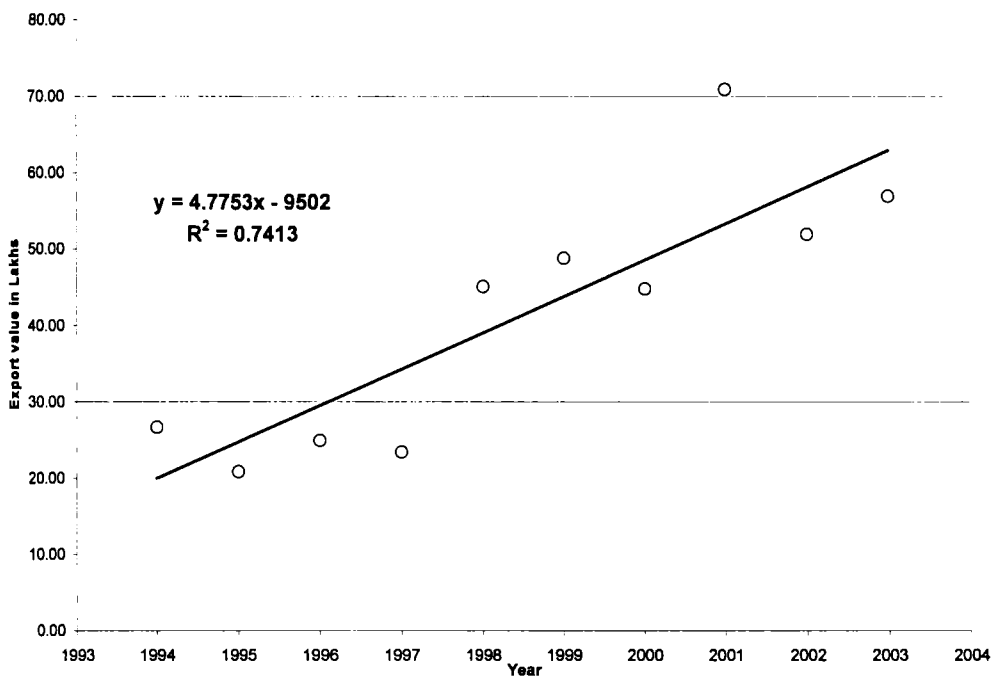
Fig: 7.4 Export trend of ornamental fish from India to USA
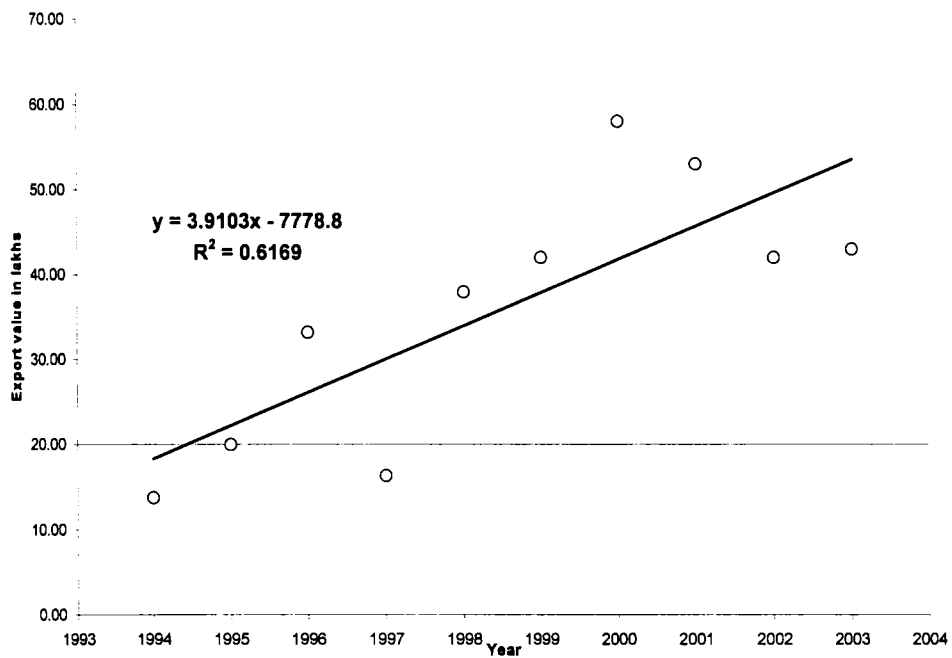
Fig: 7.5 Export trend of ornamental fish from India to Japan

$$y = 2.2646x - 4513.7$$
$$R^2 = 0.6198$$
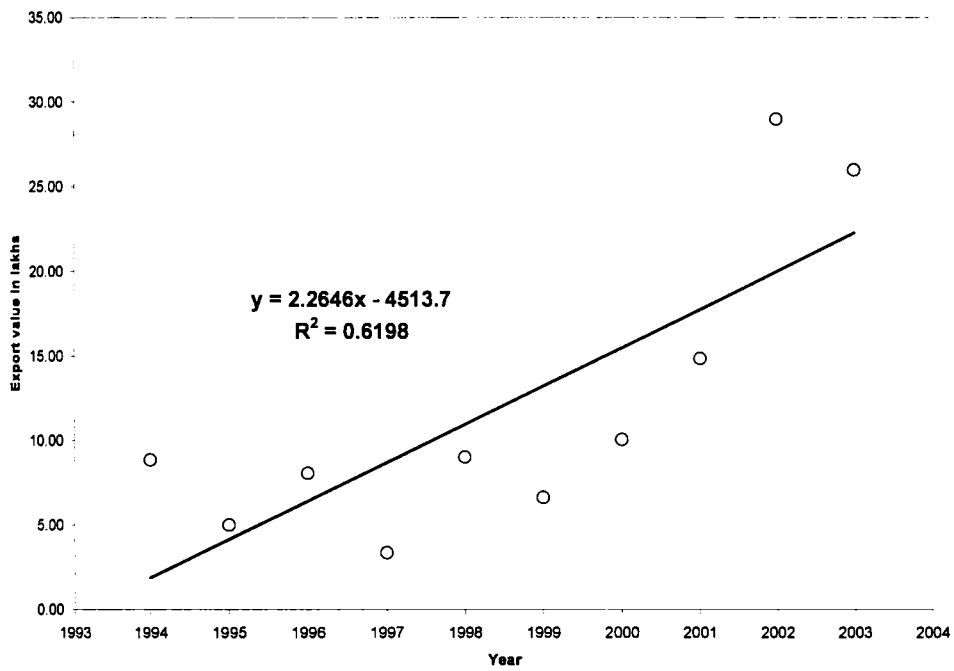
Fig: 7.6 Export trend of ornamental fish from India to UK

$$y = 10.777x - 21505$$
$$R^2 = 0.8593$$
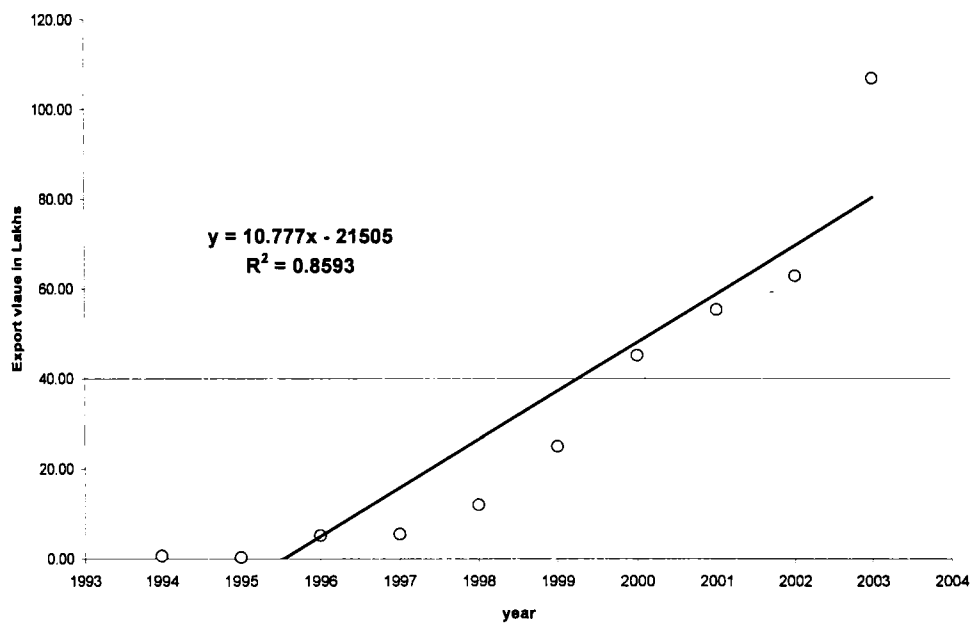
Fig: 7.7 Export trend of ornamental fish from India to Singapore
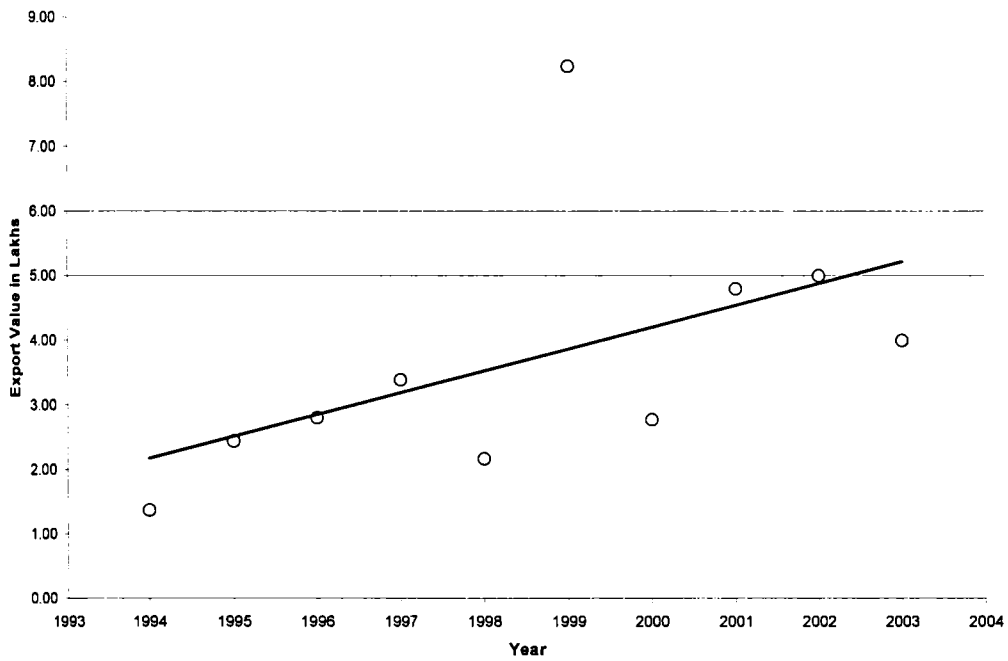
Fig: 7.8 Export trend of ornamental fishes from India to Netherlands

$$y = 1.7816x - 3547.2$$
$$R^2 = 0.9049$$
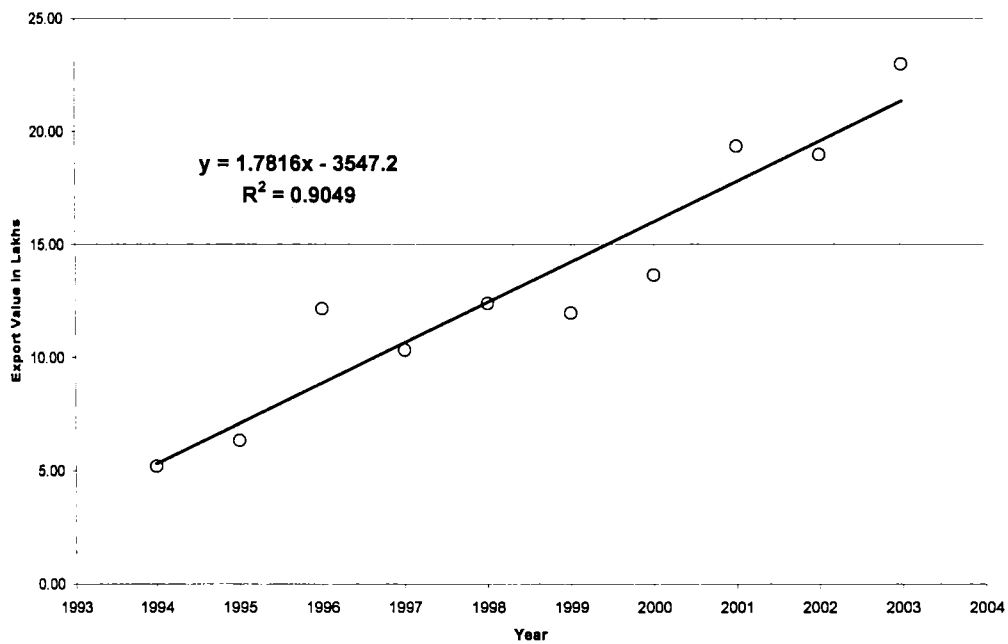
Fig: 7.9 Export trend of ornamental fish from India to Germany

Table: 7.5 Coefficient of determination and rate of change in export growth

Markets	Coefficient of determination (R ^{2})	(Rate of change in growth) β
U.S.A	0.7410	0.861
Japan	.617	0.785
Germany	0.905	0.951
U.K	0.620	0.787
France	.010	-0.102
Singapore	0.859	0.927
Netherlands	.272	.521

Source:Primary Survey

For Netherlands R² value was very less and France showed a negative R² which indicated that a trend was not possible and that a prediction could not be done.

β indicates rate of change in export growth which was more for Germany followed by Singapore, USA, UK, Japan, Netherlands and France. β for France showed a negative value which indicated a decrease in growth. The trend analysis indicated that the export to the re-exporting countries like Singapore is on the increase where as the rate of change in the export growth to consumer countries is on the decrease. Export growth of Germany formed an exception where the export growth was high which signaled a positive note for the country. If this trend of less growth rate or decreasing growth goes on continuing there is a chance for the consumer countries to phase out from the ornamental fish export market status of

India. Table 7.6 also shows the increase in export share to the major markets which shows that USA continued to be major markets for India till Singapore took over in the year 2002-2003. India had a good rapport with its traditional markets in ornamental fish export which ceased with the paradigm shift in export trend and Singapore took over the highest market share. Indian exporter's market ornamental fishes to Singapore aiming at short term benefits but they do not realize the fact that in the long run India would be losing their best markets destinations. The fact that Singapore showed a high rate of change in growth was alarming for India, as it is a re-exporting country and occupied 6th position in ornamental fish imports. Singapore is the world leader in ornamental fish exports, moreover it is a re-exporting country acquiring fishes from all parts of the world including India to expand its otherwise wide product portfolio which comprise of different strains of bred fishes and even genetically modified fishes. Importing countries and the major ornamental fish marketers of the world prefer acquiring fishes from countries which are able to supply maximum varieties of fishes and that too on a lesser airfreight. As a result the importers prefer obtaining even Indian fishes from Singapore rather than from India as Singapore has excellent logistical hub with free trade zone and better air cargo network in addition to their diversified product portfolio unlike that in India. Indian fishes fetch a low price when they are exported to Singapore.

Price obtained from Singapore for many of the Indian ornamental fishes are a far cry from the prices fetched from the traditional markets

(Sane 2006). An increase in export to Singapore therefore can only increase the quantity of exports from India but there will not be any considerable increase in the case of foreign exchange earnings and chances for India to obtain a position in the world trade seems to be very less. Sane (1982a) warned of the significant hazard in the export of aquarium fish from India to the re-exporter countries. Exporters of fish from Singapore and Bangkok are too eager to import fish of India origin which cannot be easily bred under captive condition, like *Biota agate*. If the government allows export of these fishes to far eastern exporting countries like Singapore and Thailand in particular we will be digging our own graves at least until such time we have reached an export target of at least 100 million rupees. The reason is that it is economical for the western countries to import these species from Singapore or Bangkok even by paying double or even three times the Indian prices considering the freight costs and small shipments from India. According to Saharan and Ramachandran (2006) factors which attributed to the increase in exports to re exporter country like Singapore were, lesser export fare to Singapore, short duration in export, frequent flights, thrust on the export promotions to Singapore, lack of holding/storage facility, unhealthy competition among exporters, lack of trade and non trade barriers.

The study therefore suggest that the Indian marketers have to stick on to the traditional consumer countries markets (USA, Japan, UK, Europe etc.) and also penetrate upcoming markets (Middle East and European countries) rather than increasing its exports to the re-exporting

countries like Singapore, which would fetch a better price for indigenous ornamental fishes. According to Leiberman and Montgomery (1988) growing markets offer scope for market penetration which offers free rider advantages. Christensen *et al.*, (1987) found that successful exporters are more likely to export to developed countries. Over dependence on re-exporter countries lead to the loss of traditional markets and lost markets are difficult to regain, particularly when dealing with live commodity like ornamental fish where reputation is crucial.

Chapter 8

Ornamental Fish Preferences in the Domestic Market

8.1 Introduction

In the present market scenario, customer has become very demanding. Firms face tough competition to retain the customers because the choice before the customers is increasing rapidly. According to Mehta (1972) the essence of the modern marketing concept is that all element of business should be geared towards the understanding of consumer behaviour and buying motivations. Consumer understanding is indispensable to marketers for the effective planning of their strategies. Lancaster (1979) noted that individuals are interested in goods not for their own sake but because of the characteristics they possess. Macdonald (1989) identifies the product as a problem solver, in the sense that it solves the problems of customers and as a result, that when customer buys a product, even if it is an industrial buyer, they are buying a particular bundle of benefits which they perceive as satisfying their own particular needs and wants. Chaston (1983) stressed the need to identify the product needs of the customers who make up the market sector in which the company operates, to ensure that the company's products offer the attributes most capable of satisfying the need. Only at this point in marketing process can the company begin to use the variables of price, promotion and distribution to generate the required level of sales. Kodithuvakku (1993) added that, when one tries to understand the product 'ornamental fish in the context of marketing theories, it is essential to understand the areas of consumer benefits (values) in terms of the physical characteristics of the live good (i.e., different species and types of fish and their characteristics and so on.),

ideas or image characteristics and related services etc. According to Larkin *et al.*, (2001d) the market data on ornamental fishes generally do not identify the attributes of the product fully and project price and quantity as if the products are homogenous and experimental market approach assumes that the product, ornamental fish is heterogeneous i.e. differentiated with respect to attributes such as species, country of origin, method of capture, culture, size, colour, price and condition. He carried out a study based on conjoint analysis which is an accepted methodology to elicit consumer preferences for product with different attributes of varying levels.

A general survey in Kerala revealed that lion's share of the trade in this market was in exotic fishes and the demand for varieties kept changing from time to time. Constantly changing preferences and attitudes of consumers made the domestic ornamental fish market a dynamic one. In order to cater to this dynamic market, large numbers of outlets operate within the state. A survey conducted by the Department of Fisheries in 2001, indicated the functioning of 163 ornamental fish trade units in Kerala (Sanjeeva Ghosh, 2001). An official unpublished data from that MPEDA beneficiary breeders added up to 782 units in India and 295 in Kerala. In spite of the wide array of outlets and breeding units, the demand for ornamental fishes in the domestic market remained unquenched which necessitated the bringing in of fishes from the neighbouring states especially Tamilnadu. Hence the study attempted to find the factors that influenced ornamental fish buyers in Kerala in order to probe the

possibilities for marketing the indigenous ornamental fishes in the domestic market. The perspective of consumer oriented marketing championed in the early 1960s by academics Mc Carthy (1960) and Kotler (1995) is based on determining what a target group of customer want, and then maximising their satisfaction with the product or service. Kotler (1995) outlined the common approach used by marketing research firms as the formal procedure for identifying the major segments in the market involving three steps namely survey stage (involving exploratory surveys or focus groups), analysis stage (comprising a factor analysis or cluster analysis) and a profiling stage. The objectives of the study in the domestic market were,

1. To identify the factors that prompt consumers to purchase ornamental fishes.

2. To elicit the consumers degree of willingness / non willingness to buy indigenous ornamental fish and to examine the relation between ornamental fish purchase with age, income and experience of the respondents.

3. To understand the difference in customer perceptions on indigenous and exotic fishes.

4. To find the factors that keep hobbyists of Kerala away from marine aquarium fish keeping.

8.2 Methodology

A preliminary survey covering all the 37 aquarium outlets listed in PAN Book of Fisheries Ernakulam district in Kerala (Anon, 2001), revealed that

only four outlets marketed all three kinds of indigenous ornamental fishes i.e. fresh water, brackish water and marine. Hence those outlets were chosen for the customer survey. Pre tested SPSS friendly structured questionnaire as survey instrument was administered personally to 137 respondents (a convenience sample) by mall intercepts (Gates and Solomon, 1982) as detailed in the methodology in chapter two.

8.2.1 Item development for factor analysis on ornamental fish purchase

Several authors have mentioned the attributes of ornamental fishes in their papers and articles. Mohantha and Subramanyan (1999) noted that ornamental fishes are fascinating for their brilliant colouration, variety, fin types and behavioural patterns and added that some desirable factors of ornamental fishes are passive swimming, easy adoptions of artificial feed, rearing in captivity, more coloured and branched fins, ability to withstand fluctuations in water parameters and resistance to disease infestation. He also mentioned the beauty and aesthetic value and compatibility of ornamental fishes. Dey (1996) defined ornamental fishes based on their attractive colouration, peaceful nature, tiny sizes, and suitability for keeping in captivity and adaptability for living in confined spaces. Larkin *et al.,* (2001d) described ornamental fishes as a composite of attributes at different levels. Review of literature and consultations with experts and experienced ornamental fish marketers added up the variables involved in ornamental fish purchase to 24 items. Each of the relevant variables was measured by a five point likert scale ranging from 'strongly agree' to

'strongly disagree'. Respondents were asked to indicate on the scale, the emphasis they placed on each of the 24 variables. The study then used an R-mode Principal Component Analysis (PCA) with Varimax Rotation as it could identify the minimum number of factors that account for maximum variance. A factor is a variable or construct that is not directly observable but that needs to be inferred from the input variables.

Before applying factor analysis, testing of the reliability of the scale was found out by determining the association between scores obtained from different administrations of the scale. 'Cronbach's Alpha' is the most widely used method for testing of reliability which shows the extent to which a scale produced consistent results, if the measurements were made repeatedly. In the present study Cronbach's Coefficient Alpha was found to be 0.74. According to Cronbach (1951), Cronbach's Alpha value varies from 0 to 1, but satisfactory value is required to be more than 0.6 for the scale to be reliable. High association shows that the scale yields consistent and reliable results. All the scales had coefficient alpha greater than or equal to 0.5 as recommended by Nunally (1978) thus indicating their validity and reliability. Thus, the results of the scale building portion of the data analysis provided substantial evidence for the validity and reliability of the measurement. Appropriateness of factor analysis is dependent upon the sample size. In this connection Kass and Tinsley (1979) recommended to have 5 to 10 subjects per variable up to a total of 300 (beyond which test parameters tend to be stable regardless of the subject to variable ratio). Mac Callum *et al., (*1999) have shown that the

minimum sample size depends upon other aspects of the design of the study. According to them, as communalities have become lower, the importance of sample size increases. They have advocated that if all communalities are above 0.6, relatively small samples (less than 100) may be perfectly adequate. If communalities are 0.5 to 0.6 range samples between 100 and 200 are good. In the case of low communalities (less than 0.5) sample size above 500 is recommended. Thus it is clear that, as all the communalities in the present study are between 0-5 0-6 range, the convenience sample of 137 is appropriate for the study. Formal statistics for testing the appropriateness of factor analysis namely Kaiser-Meyer-Olkin measure of sampling adequacy was carried out. KMO Statistics predicts whether the data is likely to factor well, based on correlation and partial correlation (Correlation matrix). A correlation matrix was constructed to find out the appropriateness of factor analysis as the analytical process was based on the matrix of correlation between variables. Correlation matrix is a lower triangle matrix showing the simple correlations, 'r' between all possible pairs of variables included in the analysis. The diagonal elements, which are all 1, are usually omitted. The value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.66 in the study. Therefore factor analysis was found appropriate for the data as the value was greater than 0.5. Kaiser (1974) recommends that values greater than 0.5 are acceptable, between 0.5 and 0.7 are mediocre, between 0.7 and 0.8 are good, between 0.8 and 0.9 are superb (Field, 2000). The KMO value in the study indicated that the sample for factor analysis was statistically significant.

8.2.2 Indigenous ornamental fish purchase, age, income and experience.

Consumers degree of willingness to buy indigenous ornamental fish was determined by asking them to respond on the likert scale ranging from definitely buy to definitely not buy. The willingness to buy indigenous ornamental fishes were cross tabulated (Aaker *et al.*, 1997) with age, income and experience to find if any relation existed between the factors with indigenous ornamental fish purchase, keeping of indigenous ornamental fish, willingness to buy indigenous ornamental fish in future and willingness to keep indigenous marine fish in aquarium.

8.2.3 Consumer perception on ornamental fishes

Common attributes of the ornamental fishes were chosen as variables in order to compare indigenous and exotic fishes. Eight variables considered for the study were evolved based on the factor analysis, which had sorted out the factors that motivated ornamental fish purchase and further discussions with marketers and experts on ornamental fishes. The variables chosen included colour, survival, attractiveness, status, availability in aquarium shop, awareness, suitability as aquarium fish and variety. Respondents were asked to rate each variable on a seven point Semantic rating scale bounded at each end by polar adjectives or phrases. Semantic differential scales are used widely to describe the set of beliefs that comprise a person's image of an organization or brand. The procedure is also insightful for comparing the images of competing brands, stores or services (Aaker *et al.*, 1997). The two extremes of the scale for

the selected attributes of indigenous and exotic fishes were, bright colour and dull colour, survive well and don't survive well, catch attention and don't catch attention, high status and low status, not available in aquarium shop and always available in aquarium shop, less awareness and good awareness, perfect aquarium fish and not an aquarium fish, large variety and less variety. The end positions are usually defined for the respondent in the instruction as being very closely descriptive of the object, the center position as being neutral and the intermediate positions as slightly descriptive and closely descriptive. When combined with proper item analysis techniques such as profile analysis, the semantic differential offer the marketing researcher a most valuable research tool. Profile analysis is an application of the semantic differential scale. A visual comparison of the images of different objects was aided by plotting the mean rating for each object on each scale as per Aaker *et al.,* (1997).

8.2.4 Item development for the factor analysis on marine ornamental fish purchase

A set of 22 variables was chosen to appropriately represent and determine the reasons why people keep away from marine ornamental fish keeping. The scaling format of 5 points likert scale ranging from strongly agree to strongly disagree was chosen to measure the variables. At the outset, a correlation matrix was used (Table 8.10) to find out the appropriateness of factor analysis.

Formal statistics for testing the appropriateness of factor analysis namely Kaiser-Meyer-Olkin Measure of Sampling Adequacy was then

carried out. KMO Statistics predicts whether data is likely to factor well, based on correlation and partial correlation (Correlation matrix). Value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy in the study was 0.65 which was large enough as it was greater than 0.5. Therefore factor analysis was found to be appropriate for the data. The Cronbach's Alpha (Table 8.12) was 0.73 which was above the accepted value of seven and was considered as acceptable.

8.3. Results and Discussion

8.3.1. Factors influencing ornamental fish purchase

The Principal Component Analysis using Varimax Rotation reduced the 24 variables into 8 factors which formed the determinants of ornamental fish purchase and explained 55.21 % variance. The factors which formed the key ornamental fish purchasing parameters by the ornamental fish consumers in Kerala were price, status and child preference, variety and size, colour and speed, product promotions, design and behaviour, acclimatization and survival and compatibility. The factors which influence the customers to purchase any product may be varied. The present study used factor analysis to sort out the factors that motivated ornamental fish purchase in the domestic market. Numerous applications of factor analysis in marketing research were described by Malhotra (1996). Table 8.1 lists the 26 variables and their communalities. Communality is the amount of variance a variable shares with all the other variables being considered. This is also the proportion of variance explained by the common factors. Stewart (1981) wrote that much criticism on factor analysis is based on

misunderstanding and misapplication of the technique which is actually a procedure that establishes dimensions within data and serves as data reduction technique.

Table: 8.1 Factor variables and their communalities

Variable code	Variables	Communalities	
		Initial	Extraction
BRITCOLR	I like bright coloured fishes in my aquarium	1.00	0.56
RARE UNIQ	Fishes in my aquarium should be rare and unique	1.00	0.67
DESIGN	Aquarium fishes should have designs on their body	1.00	0.65
BEHAVIOR	Fish having different behaviour pattern interest me	1.00	0.55
HEALTHY	I don't choose healthy good quality fish	1.00	0.51
SLOWFISH	Fishes moving slowly in a group are a good view	1.00	0.55
VARIETY	I buy different variety aquarium fish during each purchase	1.00	0.60
SZSUT TNK	I choose fish of size that suit my tank size	1.00	0.40
DISCOUNT	Price discounts interest me	1.00	0.49
RICHCOST	Rich people keep costly fish in their aquarium	1.00	0.58
CHIPBEG	Cheap fishes are for beginners in aquarium	1.00	0.54
PRODCOS	I am proud of the costly fish in my aquarium	1.00	0.57
AFFORDBL	I prefer less costly fish which is affordable to my pocket	1.00	0.82
PRFCHEAP	If my costly fish die I will loose money, so I prefer cheap fish	1.00	0.75
COSTL GUD	High price fishes are good to see	1.00	0.72
RICHAQ	Most of the Rich/High upper class houses have aquarium	1.00	0.67
LIVWEL	I prefer fishes which live well in my aquarium	1.00	0.53
NOTDIESUN	My fish should not die after few days	1.00	0.55
CLEANRFS	At least one fish that clean the tank is to be kept	1.00	0.55
COMPATBL	I want fishes which wont harm/ kill/ bite other fishes in tank	1.00	0.61
FRENSFIS	Beautiful fish in my friends/neighbours house interest me	1.00	0.52
CHILPRF	I don't care about my child's preference for fish	1.00	0.37
MAGAZINE	Magazine show aquarium fish as good house interior item	1.00	0.62
FENGSHUI	Fenghshui says that some fish bring luck	1.00	0.51

Extraction Method: Principal Component Analysis.

Table: 8.2 Variance and eigen values of variables of ornamental fish purchase

Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative
1	2.77	10.66	10.66	2.04	7.84	7.84
2	2.36	9.07	19.74	1.92	7.37	15.21
3	2.00	7.68	27.42	1.9	7.31	22.52
4	1.72	6.62	34.04	1.84	7.06	29.58
5	1.56	6.00	40.03	1.73	6.65	36.23
6	1.44	5.54	45.58	1.72	6.61	42.84
7	1.29	4.98	50.55	1.71	6.58	49.42
8	1.21	4.66	55.21	1.51	5.79	55.21

Extraction Method: Principal Component Analysis.

The eight factors had eigen value greater than or equal to 1. Eigen values represent the total variance explained by each factor and the eigen value criterion (Rumelt, 1970) was used in the study to determine the number of components to be extracted. The eigen values and percentage of variance of variables, produced by orthogonal varimax rotation are displayed in Table 8.2. Table 8.3 shows the rotated component matrix, eight factors and their factor loadings. In the factor model there is a small set of independent variables (factors) which are hypothesized to explain or cause the dependant variable. The factor loadings link the factors to the variable and are used to interpret the factors (Churchill, 1995). Highest variance was shown by the first factor followed by the second factor and so on. The first four factors comprised 3, 4, 4 and 3 items and the 5th and

6th factors had 2 and 3 items each and 7th and 8th items included 4 and 3 items each. Several studies have come up utilising the factor analysis. Liu (2002) studied the factors affecting brand decision in the mobile phone industry in Asia. Riquelme (2001) conducted factor analysis with 94 consumers to identify the amount of self knowledge consumers have when choosing between mobile phone brands. Kaur and Sandhu (2004) studied the factors influencing buyer behaviour in passenger car market by carrying out factor analysis. Kakati and Dhar (2002) explored competitive strategies and new venture performance in 100 owner managed new and small ventures. Results of the analytical study based on factor analysis and cluster analysis indicate the existence of multiple strategies adopted by new ventures in order to be comptetive. At present factor analysis is used not only in Social Sciences but several researches (Jayalakshmi and Rao, 2003; Deka, Goswami. and Kakati, 2005) in the field of Science too have started adopting factor analysis in their respective fields.

The first factor namely 'Price' explained 10.66% variance and three variables were loaded with the factor. 'I prefer less costly fish which is affordable to my pocket' (AFORDBL PRC) formed the first variable that loaded in the factor and obtained a factor loading of 0.86. The second variable 'If my costly fish die I will loose money, so I prefer cheap fish' (PRFCHEAP) obtained a factor loading which was 0.85. The third variable 'Price discounts interest me' (DISCOUNT) had a factor loading of 0.57. Since the variables relating to price were loaded in the first factor, it was aptly named as 'Price factor' which indicated the fact that, price of the fish

Table: 8.3 Factors influencing ornamental fish purchase (Rotated Component Matrix) (a)

VARIABLES	Factors							
	1	2	3	4	5	6	7	8
	Cost factor	Status& child preference	Variety& Size	Colour & speed	Product promotion	Design & behaviour	Acclimatising & survival	compatible
LES COST	.86							
COST FS DI	.85							
DISCOUNT	.57							
RICH AQ		.75						
RICH COST		.73						
CHIP BIGN		.43	.41					
CHILD PRF		.42						
RARE UNIQ			.77					
BEHAVIOUR			.63					
SUT TNKSZ			.45					
FRNS FIS								
BRIT COLR				.70				
PROD COST				.66				
MAGAZINE					.77			
FENGSHUI					.69			
DESIGN						.75		
COSTL GUD						.62		
VARIETY						.58		
LIV WELL							.65	
HEALTHY							.57	
NOT DIE							.50	
SLOW				.42			.48	
COMPATBLE								.69
CLEN FISH								.51

Extraction Method: Principal Component Analysis.

formed a significant factor in the buying of aquarium fish by hobbyists in Kerala. People had a preference for an affordably priced fish as death of a costly fish resulted in money loss. Discounts also lured consumers into the purchase of ornamental fish.

The second factor was termed 'Status and child preference' and it explained 9.07% variance. The first variable that loaded with the factor was 'Most of the Rich/High upper class houses have aquarium' (RICH AQ) and obtained a factor loading of 0.75. 'Rich people keep costly fish in their aquarium' (RICH COST) formed the second variable with a factor loading of 0.73. The third variable 'Cheap fishes are for beginners in aquarium '(CHIP BIGN) had a factor loading of 0.43. The fourth variable which loaded with the factor was 'I don't care about my child's preference for fish' (CHILD PRF) with factor loading of 0.42. In the earlier days when ornamental fish hobbyists were the main customers, aquarium fish was purchased for the pleasure of hobby. The study noted that in the present day context, even non hobbyists kept aquarium fish and esteem factor was noted to motivate the buying of fish to set an elegant aquarium. Majority of the customers believed that keeping of aquarium and costly fishes was a trend noted among the rich upper class and felt that cheap fishes were for beginners. Nayar (1996) contemplated that in India, ornamental fish keeping is considered to be a 'rich mans' hobby requiring not only money but also time and space. Childrens' preference was given importance by the customers. Child's influence is a reference group influence of social factor which motivate purchase behaviour (Kotler, 1995). Marketers

generally use the strategy of trying to identify the reference group of their target customers. People have an inclination to buy things purchased by people within their reference groups which may also be termed a social factor influence in purchase decisions (Kotler, 1995).

The third factor which explained 7.68% variance included items exhibiting 'unique appearance and size'. The first variable that loaded with the factor was 'Cheap fishes are for beginners in aquarium' (CHIP BIGN) and obtained a factor loading of 0.41%. 'Fishes in my aquarium should be rare and unique' (RARE UNIQ) formed the second variable with a factor loading of 0.77. The third variable in the factor was 'Fish having different behaviour pattern interest me' (BEHAVIOUR) and obtained a factor loading of 0.63. The fourth variable was 'I choose fish of size that suit my tank size' (SUT TNKSZ) and had a factor loading of 0.45. Customers searched for products with unique varieties, which set the product they purchased apart from others purchases and preferred different varieties during each purchase. People were under the notion that cheap varieties were for beginners and experienced hobbyists bought rare and unique varieties. Preference for big sized fish formed a new rage in the domestic ornamental fish marketing scenario. Most of the customers kept huge sized aquaria to match their large house and hence looked for big fishes that suited the size of their aquarium.

The fourth factor which explained 6.62% variance comprised three items and was labeled as 'colour and speed'. The first variable that loaded with the factor was 'I like bright coloured fishes in my aquarium' (BRIT

COLR) with a factor loading of 0.70. 'I am proud of the costly fish in my aquarium' (PROD COST) formed the second variable with a factor loading of 0.66. The third variable was 'Fishes moving slowly in a group are a good view' (SLOWFISH) with a factor loading of 0.42. Bright colour was given prime importance while choosing a fish for aquarium. A well chosen, costly product was considered by the customer as an added asset to be proud of. Bassleer (1994) aptly coined the term living jewels for ornamental fishes owing to their colour, shape behaviour and origin and added that these factors determined its value in the trade. Speed was a factor considered by consumers in ornamental fish purchase. There was preference for both active fish and slow moving fishes.

The fifth factor which explained 7.00 % variance included items reflecting product promotion. The first variable that loaded with the factor was 'Magazine show aquarium and fish as good house interior item '(MAGAZINE) with a factor loading of 0.77. The second variable that loaded with the factor was 'Fenghshui says that some fish bring luck' (FENGSHUI) and obtained a factor loading of 0.69. Promotional articles in magazine and the Chinese fenghshui were becoming important factor in aquarium fish purchase. Kuravamveli (2002) described that according to Fengshui principles, putting an aquarium in the northern part of ones room harmonise career prospects and putting certain number of specified species of ornamental fishes bring in prosperity.

The sixth factor which explained 5.54% variance included items reflecting 'design and behaviour'. The first variable that loaded with the

factor was 'High price fishes are good to see' (COSTL GUD) and had a factor loading of 0.75. The second variable was 'Aquarium fishes should have designs on their body' (DESIGN) had a factor loading of 0.62. The third variable 'I buy different variety aquarium fish during each purchase' (VARIETY) obtained a factor loading of 0.58. High priced fishes were considered by the respondents as fishes with good appearance and that good aquarium fishes offered good designs and variety. This demand for variety in behaviour indicated a significant albeit the less understood need of the customers for a variety in behaviour pattern in fishes for aquarium. Variety is the essence of life and customers seek variety in any product they purchased and the same was the case in the purchase of ornamental fishes too. Variety seeking behaviour was explained by Kotler as one among the different type of buying behaviour.

The seventh factor explained 4.29% variance and comprised items reflecting 'survival rate'. The first variable that loaded with the factor was 'I prefer fishes which live well in my aquarium' (LIV WELL) with a factor loading of 0.65. The second variable 'I choose healthy good quality fish '(HEALTHY) gained a factor loading of 0.57. The third variable that loaded with the factor was 'My fish should not die after few days' (NOT DIE SUN) attained a Factor loading of 0.50. The fourth variable that loaded with the factor was 'Fishes moving slowly in a group are a good view'(SLOWFISH) obtained a factor loading of 0.48. While purchasing ornamental fishes for aquarium, customers looked for healthy fishes that survived well in the aquarium and showed no signs of dying as soon as it was put in the
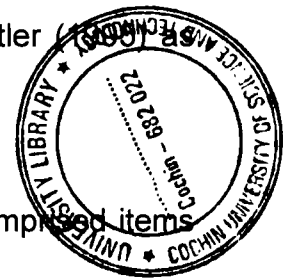
aquarium. Speed was also a factor considered by many ornamental fish customers. This item, which was loaded in fourth factor, was loaded with seventh factor also.

The eighth factor which explained 4.66% variance included items reflecting 'compatibility'. The first variable that loaded with the factor was 'I want fishes which won't harm/ kill/ bite other fishes in tank' (COMPATBL) obtained a factor loading of 0.69. The second variable that loaded with the factor was 'At least one fish that clean the tank is to be kept '(CLEANRFS) had a factor loading of 0.51. Purchase decisions were also made based on the attacking behaviour of the fish. Ornamental fish customers generally avoided fishes that attacked fellow fishes in the aquarium. Most of the consumers bought at least one fish which performed the function of cleaning the aquarium.

8.3.2 Indigenous ornamental fish purchase, age, income and experience.

The survey revealed that only 12% of the respondents were definitely not willing to purchase indigenous ornamental fishes for their aquarium and 7% replied to probably not buy. 33% were of the opinion of probably buy and 48% of the respondents were definitely willing to buy indigenous ornamental fishes for their aquarium. This is a positive note for the indigenous ornamental fish marketers and this market preference for indigenous fishes can be met with suitable marketing strategies in future marketing programmes, after carrying out a survey of the ornamental fish consumers from the whole state.

The data on indigenous ornamental fish purchase was cross tabulated (Aaker *et al.,* 1997) with age, income and experience to find if any relation existed between the factors with indigenous ornamental fish purchase, keeping of indigenous ornamental fish, willingness to buy indigenous ornamental fish in future and willingness to keep indigenous marine fish in aquarium. The study revealed that, there was no association between age and the keeping of indigenous ornamental fish, purchase of indigenous ornamental fish or the buying of marine ornamental fish as the as asymptotic significance was more than 0.05. The study also revealed that there was no association between income and the keeping of indigenous ornamental fish, purchase of indigenous ornamental fish or the buying of marine ornamental fish as the as asymptotic significance was more than 0.05.

Table: 8.4 Cross tabulation of indigenous ornamental fish keeping and experience

Count	Experience (Years)					Total
Indigenous Ornamental fish keeping	0-3	3-6	6-9	9-12	Above 12	
No	26	21	7	4	5	63
Yes	11	21	12	6	22	72
Total	37	42	19	10	27	135

Table 8.4 presents the Cross tabulation of indigenous ornamental fish keeping and experience and 8.5 presents Chi-Square Tests between

indigenous ornamental fish keeping and experience.

Table: 8.5 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.98(a)	4	0.001

From Table 8.4 and 8.5 it was inferred that there was some association between experience in aquarium keeping and keeping of indigenous ornamental fish as asymptotic significance is less than 0.05 (Null hypothesis that there was no association was rejected i.e. those customers with higher experience kept indigenous ornamental fishes.

Table 8.6 presents the Cross tabulation of willingness to buy indigenous ornamental fish and experience and 8.7 presents Chi-Square Tests between willingness to buy indigenous ornamental fish and experience

Table: 8.6 Cross tabulation of willingness to buy indigenous ornamental fish and experience

Count	Experience (Years)					Total
Buy river fish	0-3	3-6	6-9	9-12	Above 12	
Definitely not buy	8	4	3	0	1	16
Probably not buy	5	3	0	1	0	9
Probably buy	17	14	6	2	6	45
Definitely buy	8	22	10	7	20	67
Total	38	43	19	10	27	137

Table: 8.7 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.31(a)	12	.013

From Table 8.6 and 8.7 it was inferred that there was some association between experience in aquarium keeping and buying of indigenous ornamental fish as asymptotic significance is less than 0.05 i.e. 0.013 (Null hypothesis that there was no association was rejected. i.e, those customers with higher experience in aquarium keeping preferred buying indigenous ornamental fish.

Table 8.8 presents the Cross tabulation of willingness to buy marine aquarium and experience and Table 8.9 presents the Chi-Square Tests between willingness to buy marine aquarium and experience

Table: 8.8 Cross tabulation of willingness to buy indigenous marine ornamental fish and experience

Count	Experience (Years)					
Buy marine ornamental fish	0-3	3-6	6-9	9-12	Above 12	Total
Definitely not buy	16	11	2	0	1	30
Probably not buy	17	17	3	4	6	47
Probably buy	3	9	9	2	14	37
Definitely buy	2	6	5	4	6	23
Total	38	43	19	10	27	137

Table 8.8 and 8.9 revealed that, there was some association between experience in aquarium keeping and buying of marine

ornamental fish as asymptotic significance is less than 0.05 (Null hypothesis that there was no association was rejected i.e., those who had higher experience preferred marine fish.

Table: 8.9 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.36 (a)	12	.000

8.3.3 Consumer perceptions on indigenous and exotic ornamental fishes.

General attitude of the people in Kerala at present is that there is no preference for indigenous fishes of Kerala for their aquarium. A study was carried out to find the difference perceived by ornamental fish keepers between exotic and indigenous fishes by profile analysis. Profile analysis of the semantic scaled survey is given in figure 8.1. From the figure it was inferred that among the variables, availability in shop, awareness, colour and attention were the attributes of indigenous ornamental fishes which showed maximum distance from exotic ornamental fishes indicating the difference in consumer perception regarding exotic and indigenous ornamental fishes. The variables on survival and variety showed maximum similarity indicating that, the consumers did not have much difference of opinion on those attributes. The consumers felt that the Indigenous fishes had much variety to offer as exotic fishes and had good survival in aquaria as exotic fishes. This is a positive feature which can be promoted by marketers in the market penetration of indigenous ornamental fishes into the domestic market.

Profile of Exotic and Indigenous Fishes

High
—□—EX   ··O··IN
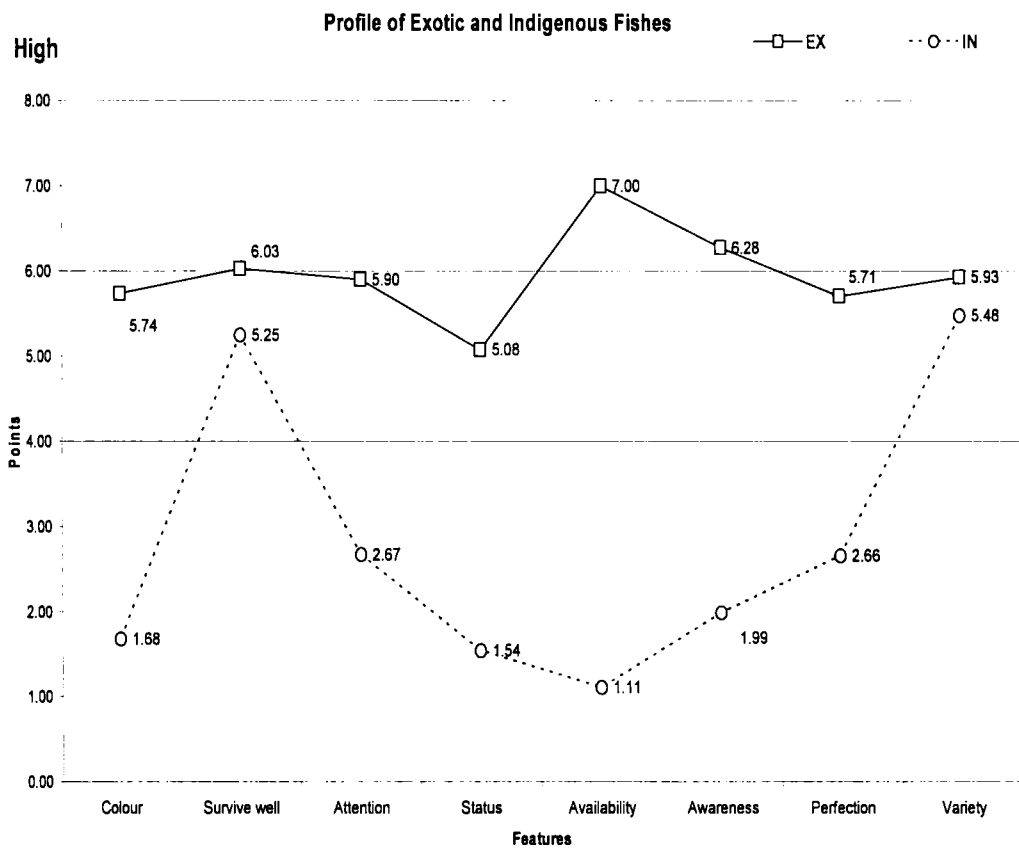
Figure: 8.1 Profile analysis of ornamental fishes

In the case of attributes for which consumers noted wide difference, product promotions can be taken up to minimize the distance so that the domestic market can be penetrated successfully by the indigenous ornamental fishes.

8.3.4 Reasons for not keeping marine aquarium fish.

During the last two decades, the marine aquarium hobby increased markedly in popularity and volume. Kvalvagnaes (1982) stated that official statistics do not distinguish freshwater from salt water fish but we do know that only about 1% of the total world trade is made up of salt water species. The annual C.I.F (Cost, insurance and freight) import value of world trade in marine ornamental fishes and invertebrates in the 1980s

was estimated at US $ 24-40 million (Wood, 1985). By 1990, the global wholesale value in marine ornamental fishes was estimated at US $ 250 million (Baratt and Medley, 1990). Estimates place the value of the marine ornamental fish trade at US $ 200-330 million per year (Chapman *et al.,* 1997). Based on the extrapolation from partial estimates the United Nations Environmental Programme (UNEP) estimates that the value of marine ornamental fish trade is US $ 200-300 per year, and accounted for about 10% of the total international ornamental fish trade, indicating that the trade could be as high as US $ 2-3 billion a year. Green (2003) added that according to 1.5 to 2 million people world wide keep marine aquaria. In international trade, in value terms, freshwater species represent about 90% against 10% for marine species (Olivier, 2001 b). In volume this 1% would be lower for marine species because of their stronger unit value. Consequently the species that dominate the market are all fresh water however marine species are becoming more and more popular. She also added that according to many experts, the marine aquarium with coral reefs is the trend of the 21st century.

In the consumer survey 98% of the consumers surveyed kept freshwater fishes and only the remaining 2% kept marine fish in aquaria. On enquiring about the willingness to keep marine fish, 22% of the respondents answered definitely not buy and 34% reported probably not buy. 27% of the respondents were of the opinion of probably buy and 17% said definitely buy. Hence, the section takes an initiative to probe into the low affinity toward marine ornamental fish keeping.

Table: 8.10 Variable and communalities for not keeping marine fish

Variable		INDIVIDUAL KMO STATISITICS Anti image Correlation	Communalities Extraction
For marine fishes expensive tank is needed	EXP TANK	0.62	0.76
The marine tank equipments are costly	COST EQUP	0.68	0.80
We have to pay high price for marine fishes	HI PRIC MF	0.77	0.69
The cost of marine fish food is high	COSTL FUD	0.87	0.51
We can keep gold fish at cheap rate	GOLD CHP	0.42	0.67
Marine Fishes are not beautiful	NOT BUTFL	0.50	0.78
Exotic Fishes are beautiful than marine fishes	EX BUTFL	0.52	0.70
Marine fishes have different shape	SHAP DESN	0.42	0.76
Marine fishes are not bright colored	NOT BRCOL	0.47	0.60
Marine fishes MF die very soon	MF DI SOON	0.73	0.68
Marine fishes won't eat fish feed	NO OD FOOD	0.74	0.59
Marine fishes get disease	GET DISIS	0.74	0.52
Marine fishes need more attention	MORE ATTN	0.74	0.63
Marine fishes will not adapt in home tank	NOT ADAPT	0.74	0.66
Marine fishes need sea water	SEA WATER	0.39	0.83
I don't have tech knowledge	TECK KNOW	0.68	0.73
MF die when salt content decrease	LESS SALT	0.78	0.67
MF tank is not common	NOTCOMON	0.51	0.76
MF is not available in local shop	NO LOCAL	0.55	0.65
MF are only at AP and research station	AP RESRCH	0.57	0.69
only Upper class keep MF aquarium	UPCLASS	0.62	0.61
MF aquarium is not easy to keep	NOT EASY	0.78	0.50

Extraction Method: Principal Component Analysis.

Table 8.10 shows the variable and communalities of reasons for not keeping marine ornamental fish. Table 8.11 shows the factors and their variances. The first factor explained a maximum variance of 18.79%. The cumulative variance percentage was 66.55 of the total variance. The rest

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of the variance was accounted by factors whose eigen values are less than 1. An eigen value represents the amount of variance in the original variable that is associated with a factor. In other words the sum of square of the factor loadings of each variable on a factor represents the eigen value, or the total variance explained by that factor.

Table: 8.11 Total Variance Explained

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.14	18.79	18.79	2.66	12.08	12.08
2	2.05	9.33	28.12	2.62	11.89	23.97
3	1.90	8.64	36.76	1.91	8.68	32.65
4	1.79	8.11	44.88	1.86	8.44	41.08
5	1.36	6.16	51.03	1.71	7.78	48.86
6	1.25	5.70	56.73	1.32	6.01	54.87
7	1.12	5.09	61.83	1.29	5.85	60.72
8	1.04	4.72	66.55	1.28	5.83	66.55

Extraction Method: Principal Component Analysis.

The most common approach to decide the number of factors is to generate a scree plot (Figure 8.4). A scree plot is a two dimensional graph of the eigen values (on the y-axis) against the number of factors (on the x-axis), in the order of extraction. Eigen values were produced by principal components analysis (PCA) and represented the variance accounted for by each underlying factor. The shape of the plot determines the number of factors. The eigen values were arranged in a scree plot in descending order. A plot had a distinct break between the steep slope of factors with large eigen values and a gradual trailing off associated with the rest of the

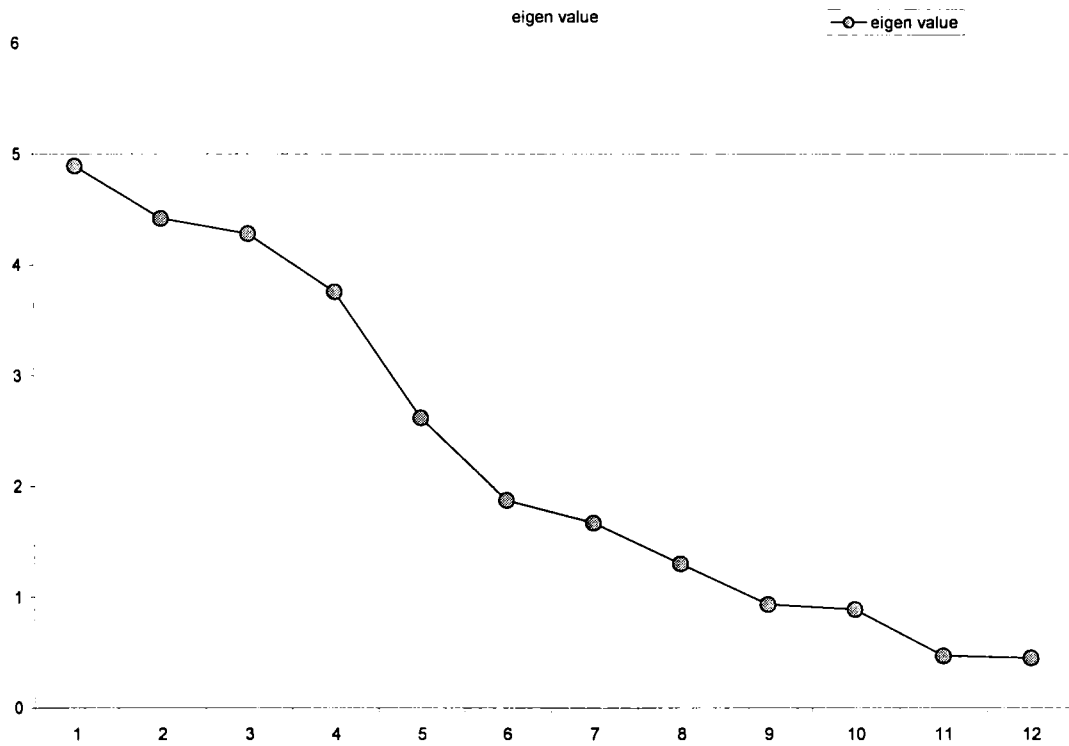factors. This gradual trailing off is referred to as the scree.

Figure: 8.2 Scree plot

Experimental evidence indicated that the point at which the scree began denoted the true number of factors. From the scree plot it was noted that the first couple of factors account for most of the variance, and the remaining factors have small eigen values. This approach to selecting the number of factors involves a certain amount of subjective judgement. The factor analysis revealed 8 factors due to which the respondents kept away from marine ornamental fish keeping and the factor loadings of each factor are presented in Table 8.12. The factors were, sensitiveness and attention seeking, expensive aquarium items, exclusive location, beautiful options available, lack technical knowledge, cheaper alternatives, requirement of seawater, different shape and fin types. The first five factors obtained from factor analysis comprised 6, 5, 5, 3 and 2 items

Table: 8.12 Rotated Component Matrix (a)

Variables	Factors							
	1	2	3	4	5	6	7	8
	Sensitive & attention seeking	Expensive aquarium items	Suit Exclusive Locations	Beautiful options available	Lack Technical knowledge	Cheap alternative available	Sea water requirement	Different shapes
MF DISOON	.75							
MORE ATTN	.69							
LESS SALT	.62				.43			
NOT ADAPT	.60				.35	-.31		
COSTL FUD	.46					.41		
GET DISIS	.40	.38						
COST EQUIP		.85						
EXP TANK		79						
HI PRIC MF		.69			.33			
NO ODFUD		.49						
NO LOCAL			.77					
AP RESRCH			.70				.32	
UPCLASS			.61					
NOT EASY			.39					
NOT BUTFL				.83				
EX BUTFL				.77				
NOT BRCOL				.66				
NOTCOMON					.84			
TECH KNOW	.50				.67			
GOLDCHP						.80		
SEAWATER							.88	
FINSHAPE								.67

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 9 iterations.

respectively and the 6th, 7th and 8th item contained an item each. The first factor which explained 18.79 % variance included items that reflected 'Sensitiveness and attention seeking'. The first variable that loaded with the factor was 'Marine fishes die very soon' (MF DI SOON) with a factor loading of 0.75. The second variable that loaded with the factor was 'Marine fishes need more attention' (MORE ATTN) and had a factor loading of 0.69.

The third variable in the factor was 'Marine fish die when salt content decrease' (LESS SALT) and obtained a factor loading of 0.62. The fourth variable was 'Marine fishes will not adapt in home tank' (NOT ADAPT), which obtained a factor loading of 0 .60. The fifth variable which had a factor loading of 0 .46 was 'The cost of marine fish food is high' (COSTL FUD). The sixth variable that loaded with the factor was 'Marine fishes get disease' (GET DISIS) and its factor loading was 0.40.

Ornamental fish customers abstained from buying marine ornamental fishes as they were under the impression that marine fishes were highly prone to fluctuations in salt content, temperature, feed etc and hence required constant observation which was not possible for people in the present day's hectic schedules. Respondents felt that in the absence of attention to these sensitive species there is a chance for the fish to die or catch disease if it does not get adapted to the tank.

The second factor named 'Expensive aquarium items', explained 9.33% variance. The first variable that loaded with the factor was Marine

fish get disease (GET DISIS) obtained a factor loading of 0.38. The second variable 'Marine tank equipments are costly (COST EQUP) had a factor loading of 0.85. 'For marine fishes expensive tank is needed' (EXP TANK) formed the third variable with a factor loading of 0.79. The forth variable 'We have to pay high price for marine fishes' (HI PRIC MF) obtained a factor loading of 0.69. 'Marine fish won't eat ordinary fish feed' (NO OD FOOD) formed the fifth variable with a factor loading of 0 .49. The requirement of expensive items for marine fish tank rendered them consumer unfriendly. The variable 'Marine fish gets disease' (GET DISIS) was loaded in factor two also and indicated that along with other costly items in aquarium such as equipments, tank and feed which are loaded in factor two, fish also added to the cost factor. When fish dies of disease there was a loss of money which indicated the cost factor.

The third factor which explained 8.64% variance included items reflecting 'Exclusive Location'. The first variable that loaded with the factor was 'Marine fish is not available in local shop' (NO LOCAL) had a factor loading of 0.78). The second variable "Marine fish are only seen only at airport and research station" (AP RESRCH) obtained a factor loading of 0.71. 'Only Upper class keep marine fish aquarium' (UPCLASS) formed the third variable with a factor loading of 0.61. The fourth variable was 'Marine fish aquarium is not easy to keep' (NOT EASY) and had a factor loading 0.39. As marine fish tanks were kept mostly in airports, research stations and upper class houses, consumers perceived that *marine aquarium keeping was a complex and difficult task for common man.*

The fourth factor which explained 8.11% variance consisted of items reflecting 'Beautiful options available'. The first variable that loaded with the factor was 'Marine fishes are not beautiful' (NOT BUTFL) obtained a factor loading of 0.83. Exotic fishes are more beautiful than marine fishes (EX BUTFL) had a factor loading of 0.77. Marine fishes are not bright colored (NOT BRCOL) had a factor loading of 0.66. People preferred keeping exotic fishes which were quite beautiful as compared to marine ornamental fishes.

The fifth factor which explained 6.16% variance included items reflecting 'Technical knowledge requirement'. The first variable that loaded with the factor was 'Marine fish tank is not common' (NOTCOMON) obtained a factor loading of 0.84). The second variable was 'I don't have tech knowledge' (TECH KNOW) and obtained a factor loading 0.67. Marine fish die when salt content decrease (SEA WATER) formed the third variable with a factor loading of 0 .43. The forth factor was 'Marine fish will not adapt in home tank' with a factor loading of 0.35. Marine aquarium fish tank was rarely kept as customers refrained from keeping marine fish due to the lack of technical knowledge. The variable high price factor was also loaded in the 5th factor, which depicted that for gaining technical know how for marine aquaria common man had to spend more money.

The sixth factor named 'Cheaper alternatives' explained 5.70 % variance. The first variable that loaded with the factor was 'We can keep gold fish at cheap rate' (GOLD CHP) and had a factor loading of 0.80. The second variable 'Marine fish will not adapt in home tank' gained a factor

loading of -0.31. The third variable 'High price for fish feed' gained a Factor loading of 0.41. As cheaper alternatives like colourful exotic fishes were available in the market customers did not bother to buy a fish which did not adapt in a home tank or whose feed prices itself incurred a great amount.

The seventh factor which explained 5.09% variance was termed as 'Requirement of seawater'. The first variable that loaded with the factor was 'Marine fish need sea water' obtained a factor loading of 0.88. The second variable loaded with the factor was 'Marine tanks are kept only at airports and research station' obtained a factor loading 0.32. Requirement of seawater was a difficulty felt by customers in setting marine aquaria in their homes and this was a reason why marine tanks were kept mainly in research stations and airports.

The eighth factor which explained 4.72% variance was named as 'Different shape and fin'. The variable that loaded with eighth factor was 'Marine fishes have different shape and fin types' (FINSHAP) with a factor loading of 0.70. If consumers can be influenced by creating awareness taking into consideration the factors evolved from the study, marine aquaria can become a demanded item in domestic ornamental fish market. Kvalvagnaes (1984) stated that a fresh water aquarium is easier to maintain and cheaper to stock, so there is no reason to expect radical changes here and added that there are reasons to believe that saltwater aquaria will become more popular in the future i.e. once the retail prices are more stable.

Chapter 9

SWOT Analysis

9.1 Introduction

SWOT analysis is a tool for auditing an organisation and its environment and it helps marketers to focus on key issues. SWOT stands for strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal factors whereas opportunities and threats are external factors. According to Tomey (1986) in the ornamental fish trade dealing with live aquarium fish and other aquatic organisms, the producer should make themselves familiar with all opportunities and threats in order to be able to take advantage of the visible and less visible opportunities and to avoid the hidden pitfalls with which every entrepreneur be it a breeder, exporter or wholesaler has to deal with some day or other. Tomey (1997) reviewed the developments in the world ornamental fish trade and attempted to look into the future of international, ornamental fish trade sector by the use of SWOT analysis and gave views on the commercial production of aquarium fish in developing countries. The study therefore aimed at carrying out a SWOT analysis of the indigenous ornamental fish industry of Kerala.

9.2 Methodology

The respondent marketers' answers regarding the indigenous ornamental fish marketing mix of the firm was cross tabulated with the category of marketers and the results were presented in the previous chapters. A SWOT analysis of the results were carried out which was consolidated in the chapter under four heads namely strengths, weaknesses, opportunities and threats.

SWOT analysis of indigenous ornamental fish sector in Kerala

STRENGTH	WEAKNESS
1. Unique species portfolio 2. High demand for indigenous fishes of Kerala 3. Experienced and educated marketers. 4. Institutional support for promotions	1. Backwardness in competitive position 2. Obsolete facilities and poor infrastructure 3. High DOA 4. Falling behind in R&D 5. Weak market image 6. Missing key skills or competencies 7. No association between marketers 8. Small culture species portfolio 9. High freight charge
OPPORTUNITIES	THREATS
1. Entry to new markets or segments 2. Faster market growth 3. Enhancement of product portfolio 4. Breeding of indigenous species 5. Increased awareness among consumers on variety and quality	1. Adverse government policies of product bans 2. Increasing airfreights 3. Competition from very small countries 4. Drastic drop in prices

Figure: 9.1 SWOT ANALYSIS

9.3 Results and Discussion

9.3.1 Strength

The strengths which the indigenous ornamental fish industry of Kerala could capitalise on as per the study were unique indigenous ornamental species portfolio, high demand for indigenous fishes of Kerala, experienced and educated marketers and institutional support, large number of indigenous fish sources. According to Tomey (1997) the strength and success of the wild caught ornamental fish sector lies in careful handling of the catch right from the fishermen to the exporters, giving the fish the opportunity to recover from the change in their environment. He noted the strengths in the industry in general as changing social structure in the industrialized countries, freshwater species that can be introduced for commercial production, regular supply of up to date pricelists complete with exact scientific name of fish species and varieties, knowledge of winter and summer period in importing countries etc. Wijesekara and Yakupitiyage (2001) carried out a SWOT analysis of the ornamental fish industry in Srilanka and noted the strengths of the ornamental fish industry of the country as favourable year round climatic condition, excellent geographic location, recognized international reputation for quality fish and widely distributed financial institutions.

9.3.1.1 Unique species portfolio

The export port folio of the country portrayed 319 indigenous fishes (Table: 3.9) which were marketed as ornamental fishes from India. Of the three hundred and nineteen fishes, 57 were noted from the water bodies of

Kerala (Table: 3.12).

9.3.1.2 High demand for indigenous fishes from Kerala

As per the study *P.denisonii, T.travancoricus, P.mahecola, C.dadyburjori,* *Mastacembelus armatus* and *P.fasciatus,* were the indigenous ornamental fishes that were highly preferred (HPE) in the export market (Figure: 3.2). These fishes were marketed in consistent numbers, very regularly from Kerala. The survey noted that the preference for the fishes was so high that the importers demanded any of the fishes (especially *Puntius denisonii* and *Tetraodon travancoricus*) in the HPE group to be included in all the consignments they imported from India.

9.3.1.3 Experienced and educated marketers

A general notion was that the marketers in this sector were not educated. According to the study (Table: 4.4) high percentage of the marketers (54.3%) had a bachelor degree and very less percentage (2.9%) of the marketers had less than secondary level education and for a good majority of them fish keeping was a passion right from their childhood and they attached much importance to the conservation of the species. On analysing the exporters of indigenous ornamental fishes of Kerala separately it could be seen that 46.2% had an experience of 10-15 years (Table: 4.5). The study also noted a rush of indigenous ornamental fish marketers in the 2000-2005 periods which depict the fact that, when a product has high demand and a boom in the market is sensed for that particular variety; along with licensed and reputed marketers many unscrupulous elements mushroom to make the best bargain out of the

situation.

9.3.1.4 Institutional support and promotions

Initiatives of the state government in conducting trade fairs on yearly basis, activities of the nodal agency MPEDA in market development assistance, export developmental assistance and culture oriented subsidy and role of research institutes such as CMFRI, ICAR Funded NATP Projects in Fisheries college, Panangad, NATP Project and MPEDA adhoc projects in School of Industrial fisheries and CUSAT in resource analysis and breeding played a significant role in the promotion of indigenous ornamental fishes of Kerala (Table 6.5) . The schemes of MATSYAFED and NABARD also played a key role for the development of ornamental fishery sector. The exhibitions taken up by the government of Kerala have increased the hobby which in turn has increased the demand for ornamental fishes. The websites of MPEDA and MPEDA adhoc project invited a lot of fish hobbyists to the Indian and Kerala fishes. The advertisements by MPEDA in international magazines were some examples of promotion tools.

9.3.2 Weakness

Weaknesses noted in the ornamental fish industry were, backwardness in competitive position, obsolete facilities, lack of quality product, falling behind in research and development, weak market image, missing key skills or competencies, small cultured fish species portfolio, lack of an association among the channel members. According to Tomey (1997) immune deficiency, culture derived diseases, quality and production

problems and artificial aquatic problems were the weaknesses in ornamental fish industry. Wijesekara and Yakupitiyage (2001) noted the weaknesses in the Srilankan ornamental fish industry as lack of technology transfer, poor knowledge on diseases, poor knowledge on advanced breeding techniques and insufficient air cargo facilities.

9.3.2.1 Backwardness in competitive position

In competitive position, India does not figure anywhere among the major ornamental fish exporting countries of the world. India's share in the world trade is to the tune of 0.25%. Export from Kerala started very recently in the year 1999 with an export of 6.39 lakhs and was 8.7 lakhs in the year 2002-2003 (Anon, 2003c). On comparing the position of Kerala in the Indian export trade, it was noted that Kerala occupied fourth position after the metropolitan cities like Calcutta, Bombay and Chennai with an export value far behind the metropolitan cities (Figure:4.2). An inhibition of Keralites in risk taking was one important reason for the backwardness in ornamental fish export from Kerala.

9.3.2.2 Obsolete facilities and poor infrastructure

Non-availability of direct overseas flight to major market destinations from the airports of Kerala and lack of adequate live fish handling and transport facilities formed a serious obstacle to efficient distribution (Figure: 4.6). Ornamental fish consignments from Kerala had to undergo several transshipments before it reached its final destinations as straight and frequent flights were not available from Kerala to the major ornamental fish marketing countries. In addition to this the flights from India were seen to

be reluctant to handle perishable traffic as they could not shoulder the responsibility. The flight authorities were also hesitant to charge commodity rate due to the small quantity of ornamental fish consignments compared to the other export items which were exported in large quantities. The two flights which carried the largest number of ornamental fish consignments from India were, Lufthansa and Singapore airlines, rather than the Indian airlines or air India. Yet another drawback concerning infrastructure was that, majority of marketers in the state did not have sufficient facility as in the case of exporters of India for storing or acclimatizing the fishes before transportation. Hence the channel members' rushed to dispose the fish at the earliest from the hands of the channel members which resulted in transport without acclimatisation and led to increased mortality rates.

9.3.2.3 Lack of quality product

Lack of quality product for export was mainly due to poor handling and shipping techniques. As per the response of the marketers' surveyed (Figure: 4.4), high percentage (34%) of marketers considered DOA as the major complaint (Figure 6.7) followed by it was deformity (29%), bad health (20%), dirty water (5%), size difference (5%), shortage (3%) and wrong fish (3%). Though DOA formed the major complaint by majority of the marketers DOA and its claims varied depending on importers. Sometimes loss of fish in transit up to 5-10% were ignored but above that it had to be generally borne by the trade i.e., exporter, even if the responsibility may sometime be of the airlines or any other sources.

Mortality while collecting and marketing have to be minimized as it will put extra pressure on the resource.

9.3.2.4 Falling behind in R&D

In the international level, research on ornamental fish has reached genome transgenic, compressed packing and feed technology but in India the technology to transport the live ornamental fish in good health and high survival rates during catching, handling and transportation is still in its nascent stage.

Marketers of the state did not have a clear strategic direction regarding marketing and do not obtain market information by means of consumer survey and market research (Table 4.13) regarding the demanded varieties, their price variations and latest market trends.

9.3.2.5 Weak market image

The study revealed that the Indian ornamental fish exports had a weak market image of broken contracts, lack of quality in product deliveries of products not to specification, short deliveries, unsatisfactory packaging, infrequency of delivery, unreliable and extended delivery times. Only a hand countable number of exporters marketed quality products to keep up the image of the country. Industry inattention to a quality product creates a weak market image.

9.3.2.6 Missing key skills or competencies

The number of skilled divers specialised in ornamental fish collection as in the case of neighbouring countries like Srilanka or Maldives were almost

nil in Kerala. Though the numbers of skilled fish breeders who have taken subsidies from MPEDA as per official records were to the tune of 782 in India and 295 in Kerala and the number of breeders in the state even exceeds this number but we have not been able to utilise their abilities for the betterment of exports.

An aspect which was noted while studying the export constraints (4.6) was that, in the case of marketers from Kerala language problem was high as many of them were not proficient enough to use English, for communicating with the importers of other countries. Hence many established and experienced traders in Kerala who had all facilities such as storage area, access to collectors experience and the willingness to expand their business had to restrain from taking up the export of indigenous ornamental fishes of Kerala.

9.3.2.7   Lack of an association between marketers

Marketers were noted to be diverse in their interests and there was disunity in their activities. Except for some scattered non functional associations no organised association of fish exporters were found in the state and the country. Associations can help in approaching the problems as one in regulating prices, monitoring activities within the industry and protecting its members against bad importers who take our shipment and forget to pay them.

9.3.2.8 Small cultured species portfolio

The product line of the export firms showed that the percentage of exotic fishes was less than 15%. Of the 360 ornamental fishes exported from

India only 41 were exotic fishes. Even though there was a good demand for exotic fishes in the export markets large varieties were not bred in sufficient quantities and those fishes bred here did not satisfy even the domestic demand. The captive bred indigenous ornamental fishes was also very less in number (3.3.1.6).

9.3.2.9 Exorbitant freight charge

Most inhibiting factor in ornamental fish export is the exorbitant freight rates to major important destinations. Freight formed almost 20-50% of the landed cost of fishes to the importer (depending on the size and the species of fishes) and such a situation existed because there were no specific commodity freight charges to most of the European and American destinations where the major buyers are located. Compared to the competitor countries such as Singapore, Thailand, Honking, Srilanka, Malaysia etc the freight rates from India were 2-3 times higher. Higher air freight charges in comparison to the freight being paid by other countries holds back the entrepreneurs from investing in this sector.

9.3.3 Opportunities

Opportunities that are in store for the marketing of indigenous ornamental fishes include, entry to new markets or segments, enhancement of species portfolio, faster market growth, culture of threatened or vulnerable ornamental fish species, increased awareness among International buyers of environmental issues and consistent quality. Wijesekara and Yakupitiyage (2001) noted the opportunities in Srilankan ornamental fish industry as international buyers who are aware of Srilankan fishes, wide

variety of wild collected fish species and breeding of indigenous fish species.

9.3.3.1 Entry to new markets or segments

India exports ornamental fishes to about 30 countries. The main countries importing Indian indigenous ornamental fishes are Japan, U.S.A, U.K, Germany, and Netherlands. Since the flight facilities from Kerala are more in number to the Middle East countries, those countries have emerged to be prospective markets for the state and the country. The study also noted prospects for the indigenous ornamental fishes of Kerala in the domestic market (8.2.2).

9.3.3.2 Enhancement of species portfolio

57 species of wild caught freshwater fish noted in the export market are presently catalogued in the report. The feasibility of maintaining these fishes in aquarium were studied during the MPEDA adhoc project period 2000-2001. Murthy (2002) described 165 indigenous marine ornamental fishes of which can be utilised for the ornamental fish purpose.

9.3.3.3 Faster market growth

The indigenous ornamental fishes of Kerala especially *Puntius denisonii* has shown a quantum leap in market growth. Rather than concentrating on one species consumer demand and tastes have to be found to increase the market growth of those species.

9.3.3.4 Breeding and culture of indigenous fishes

By breeding the indigenous varieties the marketing or export can be boosted. Breeders can pay more attention to the culture of threatened

and vulnerable varieties which have high demand in the markets. (As per the official unpublished records the benefit was availed by 782 units in India and 295 units in Kerala from 2000-2001 till 2003-2004.)

9.3.3.5 Increased awareness among International buyers

Of late an increased awareness was noted among the national and international buyers on environmental aspects and especially the consistent quality. Marketers who are able to supply quality fishes consistently will be able to obtain a position in the market.

9.3.4 Threats

Though ornamental fish trade provides revenue for developing countries the industry must be developed with a conservation ethic for it to be of lasting value. The possible threats in supporting and maintaining the sector on a long term include over-exploitation of the natural populations of commercial species, destructive collection methods , high post harvest mortalities, introduction of chemicals, in-fighting and price cutting among domestic producers and importers , introduction of non native organisms, adverse government policies, competition from neighboring countries who have strong government support to this sector, competitors having superior access to channels of distribution, Industry inattention to a quality product. The threats noted by Wijesekara and Yakupitiyage (2001) in the Srilankan ornamental fish industry were over exploitation of wild resources, lack of expertise on disease identification and treatment, rapid urbanization and environmental degradation, chemical pollution and quality control and various type of predators.

9.3.4.1 Over-exploitation of natural populations

Generally a tendency noted was that the marketers of indigenous fishes depended much on the harvest of few of the demanded species rather than on wide varieties. Even though more than 60 varieties were noted in the ornamental fish trade and there existed a scope for 60 more varieties to be introduced as ornamental fishes, there was an increased dependence on varieties such as *Puntius denisoni and Tetraodon travancoricus.* Dawes (1999a) makes a comparison of the quantity (in tones) of the marine fish for collected for food and ornamental purpose and value of the collected marine food fish and marine ornamental fish and states that marine ornamental fishes can be seen to represent a low volume but high value industry.

9.3.4.2 Destructive fish collection methods

The use of destructive fishing methods such as mass poisoning, dynamiting and electric fishing depleted the resource indiscriminately .introduction of exotic fishes in reservoirs which escape into rivers (tilapia have now become common in the lower, mid, as well as up streams of important rivers of Kerala) resulted in the replacement of ecological niche of native species from their habitat.

9.3.4.3 Introduction of non native organisms

Introduction of fishes such as *Tilapia mossambica, Clarius* sp and Piranhas can be detrimental to the indigenous ornamental fish resource of the native ecosystem.

9.3.4.4 Drastic drop in price

Indigenous fishes of Kerala fetch very low FOB price in the international market as marketers do not project a steady price for the fishes, either due to ignorance of the demand of the fishes in the market or due to the in fighting between the marketers (Table 5.4 and 5.5). The coefficient of variation was highest for *Anabas testudineus* followed by *Horababagrus brachysoma, Nandus nandus, Puntius denisonii, Tetraodon travancoricus* and *Barilius bakeri* indicating high fluctuations in their FOB prices (Table 5.7). The high fluctuations in the prices may be attributed to a number of reasons such as, high variations in demand, competition between the channel members, lack of market awareness among channel members or lack of a floor price. The high fluctuation in price may be due to the fact that some exporters who are desperate try to garner a large share of the market by dropping the established rates of fishes.

9.3.4.5 Adverse government policies

Restrictive import barriers to India for ornamental fishes do not facilitate the breeding of large varieties of exotic fishes even though there are good breeders in the country and the state. Legal implications deter marketers from judiciously exploiting the resources from the marine water bodies which is a lucrative collection site.

9.3.5.6 Competitions from very small countries

The country and the state faced competition from small neighboring countries that have strong government support to this sector, competitors having superior access to channels of distribution. The export

performances of our tiny neighbors, Sri Lanka and Maldives have improved tremendously due to the strong governments support to this sector.

9.3.5.7 Export to re exporting countries

From 2002-2003, a paradigm shift was noted in the export trend from India and the export share to Singapore which was 1.09 % during 1994-95, made quantum leap by the year 1999-2000 to 25.08% and in 2002-2003 it beat all the markets of India and achieved a market share of 34.7% of Indian exports. Though Singapore is the major exporter to developed nations this country imports aquarium fishes from other Asian countries at cheaper rate and in turn sells it at a higher profit for itself. Consignments that reach Singapore, Hong Kong and Holland are mostly re exported to other western countries. Sky rocketing exports to re exporter countries especially, Singapore compared to the snail paced growth of exports to consumer countries like USA, UK, Japan and Europe alarms of an impending threat in exporting ornamental fishes to Singapore. Re exporting countries acquire fishes from all parts of the world including India to expand its otherwise wide product portfolio to lure the importing countries who preferred acquiring fishes from countries which are able to supply maximum varieties of fishes and that too on a lesser airfreight. As a result the importers prefer obtaining even Indian fishes from Singapore rather than from India as Singapore has excellent logistical hub with free trade zone and better air cargo network in addition to their diversified product portfolio unlike that in India. Indian exporters export ornamental

fishes to Singapore aiming at short term benefits but they do not realize the fact that in the long run India would be losing their best markets destinations and lost markets are difficult to regain. Sane (1982a) had warned of the significant hazard and noted that Exporters of fish from Singapore and Bankok were too eager to import fish of India origin which could not be easily bred under captive condition, like *botia gagata*. If the government allows export of these fishes to far eastern exporting countries like Singapore and Thailand in particular we will be digging our own graves. The reason is that it is economical for the western countries to import these species from Singapore, Bangkok even by paying double or even 3 times the Indian prices considering the freight costs and small shipments from India.

Kerala has an excellent competitive advantage as strengths and opportunities which it can tap to its own benefit. If the marketers of Kerala and Keralites try to capitalise on the key strength, alleviate the major weaknesses, avoid significant threats and take advantage of the most promising opportunities the indigenous ornamental fish industry of Kerala can elevate the position of the industry of Kerala and can attain a prime position in India and elevate the position of India in the world trade.