EXECUTIVE SUMMARY

1. Major Objective of this report is to provide a comprehensive analysis of the resourcefulness of Ornamental Fish Species (OFS) in the North Eastern Region (NER) and to explore the commercial possibilities both in the domestic market and the international market. Accordingly this report and Album (attached separately) highlights NER OFS and Exotic Fishes, their traits, market analysis, technical analysis, SWOT Analysis, strategic options, species selections, packaging of projects, product mix, location, incentive schemes, infrastructure and organizational requirements, statutory and regulatory measures, master plan and project profiles. It should be noted that only the important findings and recommendations have been highlighted here and hence reference should be made to detailed report (Chapter1 to Chapter12) for a clear understanding of findings and recommendations made therein.
2. The chapters of the report have been organized in order of the agreed scope of the study with minor modification to fit the presentation into the procedural steps generally involved in the preparation of a feasibility report.
3. The findings and recommendations made in this report are based on our primary survey at regional, national and international level. Our regional survey covered all the eight States of NER; national survey covered West Bengal, Tamil Nadu and Kerala and International survey covered Singapore, Hong Kong and Shanghai.
4. The ideas and opinions expressed in the report are the result of our interactions with large number of exporters, importers, concerned organizations & subject experts from India & abroad; and from observations of export houses, quarantine centers and breeding farms of Kolkata, Chennai and Singapore. (For detail Refer to Chapter 3)
5. Aquarium or ornamental fishes are called the "living jewels " due to their diversity of species, vibrant colour, shape, behavior and origin .All these factors determine their value in the market. Ornamental fish keeping and rearing have now turned out to be a commercial aqua business both in national and international markets.
6. The extensive field study and samples collected from 624 sites covering all the eight States reveals that the North Eastern Region has 196 number of ornamental fish species, which could be profitably exploited for commercialization (Refer Annex. 4.2). Of them, 123 belong to classified OFS group and the remaining 73 are of non-classified category (Refer Chapter.4, Annex. 4.1- 4.3). Congregation of such large number of OFS in clusters of lotic and lentic water bodies, and attractive coloration exhibits the potentialities and prospects of NER in Ornamental Fish Trade. Besides, most of these OFS are yet to be exhibited in global market, which is another feature of their trade prospect. More than 20 OFS have very peculiar body morphology (Refer Album). These OFS will have great demand in international market to fetch high value.
7. Out of 196 OFS of NER as many as 154 have been identified as viable for export. It is a very significant feature for the regional OFS trade to flourish in international market especially because to date around 50 freshwater OFS are exported from India of which only 27 OFS are procured from the NER States (Refer Sec. 5.8) on a limited scale from

four districts of Assam and a few rivers of Meghalaya. Thus vast water bodies of NER remain unexplored to tap the remaining 127 viable OFS of NER for export.

8. Among the classified OFS Assam contains the highest number (99) and Sikkim the lowest (15) .The detail list has been given in Table 4.1. Concomitantly, Meghalaya and Assam contains the maximum non-classified OFS, with Sikkim again at the lowest level. (Refer. Table 4.2 & 4.3). Hill stream OFS are maximum in most of the states of NER as revealed through habitat cluster analysis (Refer sec.4.3.1). Besides, state wise area cluster showed high density OFS in Assam followed by Meghalaya and Manipur (Refer Cartogram, Figure 4.1)
9. Water chemistry, environmental compatibility, feeding habits and habitat requirements of all the OFS identified were examined at the laboratory of Gauhati University and found compatible for rearing in the aquarium environment. Extended discussion with the Indian exporters who have been exporting NER-OFS for the last two decades to overseas countries reveal that they have never received any complaints from the importers regarding inhospitable water chemistry, habitat incompatibility or even on fish malady.
10. During the bionomics study in the laboratory of Gauhati University it has been established that most of the NER-OFS prefer animal live feed while some lentic and bottom dwelling lotic OFS feed on algae, phytoplankton and aquatic vegetation (Refer Table 6.3). It is pertinent to state that the natural components of food on which the NER-OFS sustains are very common and widely available in all the importing countries, which are why, there will be no deleterious impact on the aquarium maintenance of NER--OFS in those countries.
11. Essential scientific requirements for commercial ornamental fish farming have been established in the experimental studies made at the laboratory of Gauhati University (Refer. Chapter 6). Even various hill stream OFS are cultured and maintained in the laboratory aquariums of Gauhati University over years with proper feeding and maintenance of water quality. Thus there will be fruitfulness of the target NER- OFS for culture and maintenance in the OF farm tanks.
12. Gap analysis shows that low gap exits between the actual and desirable state in respect of water chemistry, feed, environmental compatibility and habitat requirements of the OFS in the identified location for their farming.
13. There exists scope and demand for exotic OFS in the entire NER states and beyond due to non-availability of any fish breeders in the region. Altogether 40 imported (exotic) OFS containing 72 varieties are traded in NER. The detail description with breeding profile and other required parameters are explicated in Sec.4.5. Out of 72 varieties of exotic OFS traded in NER through aquarium house outlet as many as 65 are found economically viable for production in the NER.
14. Mass production of exotic OFS in the NER for trade will be possible due to the availability of the reliable technology at the Gauhati University as well as within India for their culture, breeding, raising, feeding, stocking and harvesting (For detail Refer Sec.6.6). Besides, scientific technique for culture of natural food organisms so essential for the fry and adult exotic OFS during their farming and also for the feeding of NER-OFS in the aquariums are also locally available (Refer Sec.6.6.3).

15. The present world wide trade of Ornamental Fish (OF) is about Rs. 30,000 crores of which exported volume is about Rs.5000 crores. The export is growing at a rate of 3 to 5 % and with this growth rate the volume of export is likely to double by 2010. (Refer

Sec 5.2). South East Asian Countries contribute 65% of the Ornamental Fish Market with Singapore in the lead (26% market share). While country like Srilanka has captured 4.48% market share, India does not figure in the global list of exporter of Ornamental Fish (market share of India is only 0.033%). There are 25 prominent exporters in India who export freshwater ornamental fish currently valued at Rs 1.65 crores only .For details Refer to Table 5.6.

16. USA is the major export market followed by Japan and Germany (Table 5.2). The number of buyers in USA and European Countries is very high but most of them spend little amount on Ornamental Fish in these countries. As a result there is a good demand for low value OF. In contrast, the oriental countries prefer high value Ornamental Fish with Feng Shui characteristics, the price of which may be as high as Rs 20 lakhs per piece (Refer to Sec 5.1). Indian consumers prefer small to medium size fishes mainly the colourful exotic fishes. Because of strong colour preferences the demand for freshwater indigenous OFS is low in India.

17. There is no uniformity in the pricing of OFS. It varies widely across suppliers and over time. We have highlighted species wise FOB price in Sec 5.6. None of the species exported from India appears to command very high price because of poor colouration and small size. The highest quoted price is Rs 225 for *Sisor rabdophorus* and Rs 115 for *Channa barca.*

18. Exported OFS must contain four dimensions of quality- uniform size, good quarantine, colour and rarity (Sec 5.7) to meet the international quality standard

19. There are three suppliers (Refer Sec. 5.8) but no direct exporter from the North East. They are supplying wild caught NER-OFS to exporters of Kolkata and Chennai. In the current supply chain, as many as six middlemen are involved between fisherman and the ultimate foreign customer (Figure 5.1). Analysis shows that exporters reap the highest benefit (70.46% of FOB) while our local fish collectors and suppliers get the lowest margin [5.74 % for suppliers and 2.37% for fish collector (Sec. 5.10)]. A serious thinking is warranted in this context to encourage the local suppliers and even progressive entrepreneurs to accept the trade and become direct exporters of OFS.

20. Ornamental Fish Market can be divided into three relevant segments (i) High value low volume, (ii) Medium value medium volume and (iii) Low value high volume .The level of competition is very severe in the 1st segment and dominated by very strong and experienced players from Singapore, China and Japan.(Sec 5.11). Players from Japan, Singapore, Malaysia and China dominate the medium segment. The last segment is also dominated by Singapore and China but due to their recent shift in focus it has been left open for new players and this is the right segment for India to enter.

21. As new entrants in this OFS trade, entrepreneurs may face various types of business risk. As many as 13 risk factors have been identified (Sec 5.12) which can make the OFS trade unviable / risky. These risk factors should be taken into consideration before venturing into the OF business. Project viability is highly sensitive to selling price, demand and cost of production (Fig 5.2 to 5.7). Overall analysis reveals that the small-scale unit has low business risk compared to medium and high scale, hence it is advisable to start the project in small scale.

22. The demand for exotic fish in Indian market is estimated at Rs.20 crores and growing at a rate of 20% and with the present growth rate, the market of exotic fishes will cross Rs.100 crores by 2011. While the growth rate is high in national market, it is quite low in NER region (Rs 12.8 lakhs) due to high price of exotic fishes, aquatic accessories

and fish feed cost. Besides, there is no breeder in the North Eastern region for exotic fish, which is why, customers are to pay high price.

23. Prices of exotic fish in the international market are at least 50% higher than that of the Indian market. It fluctuates widely across the importers, exporters and over time. Price cut competition is more frequent especially in the low valued species. Though price is high in international market, it is preferable for the Indian breeders of exotic fishes to confine their trade in the national market due to low competition and price stability.
24. There are more than 2500 breeders of exotic fishes in India producing 60-70 varieties only (more than 1000 varieties in International market) with an approximate value of Rs.20crores. Hence there is good potentiality for exotic fishes in those varieties, which are not yet produced or produced in low volume.
25. Competition in the international market for exotic fish is very high relative to that of domestic market. As many as 140 countries are exporting exotic fishes to various countries. Hence, for new players like India it will be difficult to enter the International market in ornamental exotic fish trade.
26. SWOT analysis is carried out for exotic and freshwater OFS of NER separately both for domestic and International market (Sec 7.1, 7.4,7.5). Major strength for NER - OFS is availability of high variety at low cost. Major weaknesses are poor technical knowledge and market experience.
27. Considering weaknesses in market exposure and technical knowledge in breeding and farming, the best strategic option for our entrepreneurs is to have strategic alliance / joint venture with the firms of Singapore for export of OFS, and with firms from Chennai and Singapore for breeding of exotic fishes (Refer to 7.3 and 7.5)
28. Out of 196 species identified 154 species of FW OFS were found to be viable for export to other countries based on profit margin, availability, and demand, transportation cost and species-wise SWOT analysis. Export house may be established in as many as five places, namely, Guwahati, Dibrugarh, Imphal, Agartala and Aizwal. Though effort has been made to suggest at least one project in each state, no export house could be suggested in Meghalaya, Nagaland, Sikkim and Arunachal Pradesh due to non- meeting of two locational criteria namely, availability of wild caught within transportable range and the Airport facilities. (Refer to Sec. 8.2)
29. Export house may be of any scale with revenue above Rs.20 lakhs but most economical range is above Rs.40 lakhs (Figure 12.1 and 12.2.)
30. 65 exotic fish species were found viable for production in the North East based on profit margin, demand supply, gap and level of competition (Refer Sec 8.5). Three projects of different scale of operation (medium, small and tiny) were suggested for implementation in different places. While Guwahati and Dibrugarh are the best place for medium and small scale, all the cities in the North Eastern Region are suitable for setting up of exotic fish farm in the Tiny / Household level.
31. There are three incentive schemes for ornamental fish trades available in India. (i) Export subsidies at the rate of 10% of FOB value subject to a maximum of Rs. 3 lakhs per annum (ii) Subsidies for breeders at 50% of the cost of setting up of farm subject to a maximum of Rs.40, 000 and (iii) Subsidies for attending International Fair are 50% of the rental charges and 30% of return air ticket and freight. (Sec 8.7). Many Trade Fairs and Exhibitions (Refer Sec 9.1 for the list) are being organized in different importing countries, which provide avenues for marketing collaboration, introduction of new varieties and collaborations with importers.

32. There is no regulation of the State Govt. .Of the North Eastern States and Govt. of India for the Export of ornamental fish trade (Sec 10.1) At International level, Convention of International Trade for Endangered Species (CITES) imposes some restriction on the export of endangered and threatened species (Refer Sec 10.2). Since only 17 species of endangered species are included in our product mix, any ban on endangered species is not likely to have any adverse impact on the viability of the project.
33. Indian exporters require license from three Govt. agencies for export of ornamental fishes namely, from Marine Products Export Development Authority (MPEDA), Director General of Foreign Trade (DGFT) and RBI (For details Refer sec 10.4).
34. Importing countries are highly conscious about the quality of OFS, which is why, all prospective exporters take Singapore as their bench mark for ensuring International Quality Standard. The salient features of the Quality Assurance program for the exporter of Singapore is highlighted in the report which our entrepreneurs may implement to meet the international quality standard (Refer Sec 10. 5).
35. ISO 9000 and ISO 14000 are not mandatory quality requirements for global OFS trade. However acquisition of ISO certificate could enhance the image of the exporter and marketability of Indian OFS in the international market.
36. Though OF trade is labour intensive it does not require large work force. Each of the proposed projects will require manpower of 5 – 9 depending upon the scale of operation (Sec 11.1). OF industry is knowledge and skill based industry. All the personnel including the owner manager must be well trained in all the areas of operation before implementation of the project. A 22 days training programme is recommended in Sec11.2.
37. Though some knowledge and skill for breeding, marketing and packaging can be acquired through extensive training programmes, they require continuous learning in the business for a long period. New entrepreneurs may require collaborations in some of the critical operations for their easy entry into the market. The entrepreneurs / NEDFi may explore the collaborative possibilities with the following organizations with whom the study team had already made initial discussion in this regard- Archana Exports (India), Sunbeam Aquarium, Dream Fish Incorporated Pte. Ltd and AVA of Singapore. For details Refer to Sec 11.5
38. We propose five export houses one in each location namely, Guwahati, Dibrugarh, Imphal, Agartala and Aizwal. The total cost of the project would be Rs. 200.94 lakhs. (refer table 12.1). Since the scale of operation is not a major determinant of cost and quality after certain level of revenue i.e Rs.40 lakhs (for details Refer to Figure 12.1& 12.2) the proposed project at Guwahati and Dibrugarh can be started at a lower scale of operation. The IRR, NPV, DSER are high for all the suggested projects and increase with the scale of operations (Refer Table 12.1).
39. We also suggest a few breeding farms for production of exotic fishes in medium, small and tiny scales. The project cost for medium, small and tiny sector is estimated as Rs.50.6 lakhs, Rs. 23.5 lakhs and Rs. 0.082 lakhs respectively (Refer Table 12.2).
40. We further suggest that an aqua-technological park in the line of six agro-technological parks of Singapore may be implemented preferably in Guwahati in collaboration with AVA of Singapore. Preliminary discussion with AVA was held during our visit to Singapore and AVA got interested in the 2nd round of discussion. The proposed aqua-technological park would cost approximately Rs 5.02 crores and will house eight units of ornamental breeding farms, one fish feed unit, one ornamental hydrophytes unit, one

aquarium fabrication unit, one marketing unit, one training cum demonstration center and one R& D laboratory.

41. Further, a public aquarium can be set up in Guwahati for promotional awareness of the trade through display of both exotic & NER-OFS and also for amusement of children and adults. The cost of the project will be Rs 21.2 lakhs.
42. Since all the suggested ventures are surrounded by many risk factor, and product, volume and expansion flexibility is very high; it is advisable to implement the project phase wise and to start with small scale. We recommend four phases for implementation of the Master Plan including breeding and colouration of freshwater ornamental fish. If all the phases are implemented effectively the OFS from North East can position themselves prominently in the International OF Market.
43. The entrepreneurs may select any of the three competitive strategies for entering national and international market namely, Cost strategy, Differentiation strategy and Focus strategy. Considering the limitation of the proposed project / entrepreneurs, we suggest that entrepreneurs follow cost as an entry strategy (for details Refer to Sec 12.6) and move judiciously to other strategies after acquiring the required skill and experience in the respective field.
44. We prepare nine project profiles covering all the proposed projects in the master plan to enable the prospective entrepreneurs select a project and prepare the detail project report for its implementation. Each profile, among others, covers tentative project cost, benefits and other salient features of the project. Since product mix, volume and expansion flexibility is high; the promoters / entrepreneurs may modify the scale of operation and facility requirements. Though they are independent of scale of operations our extensive analysis shows that higher the scale of operation, higher is the profitability of the project (Refer Tables 12.1 and 12.2).
45. The overall analysis and synthesis of the present study reveal that there is tremendous scope and potentialities for the wild caught NER – OFS as well as for the mass bred population of the exotic OFS to venture into the Ornamental Fish Farming and trade in both National and International market in no time. When country like Sri Lanka can capture more than 4% of the global trade (above Rs. 200 crores) in ten years time there cannot be any reason or justification why India (with NER in particular) should not cross Rs. 100 crores mark per year from the present export level of a meager Rs. 1.65 crores. What is needed now is to develop Ornamental Fish Farming and trade as an Industry with active participation of financial institutions, entrepreneurs, promotional agencies and research institutions.