



Major Sustainability Issues and Comparative Sustainability Assessment of Wild Caught Indigenous Ornamental Fishes Exported from Kerala, India

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Abstract

India has an unenviable status as far as ornamental fish industry is concerned. The export of ornamental fish from India, during the year 2010-2011, was only 1.26 million US\$. About 90% of the freshwater ornamental fish species exported from India are wild caught. Though the industry is in its infancy stage, there are numerous environmental and sustainability issues related to it. The study examines the chain of custody of wild caught indigenous ornamental fish exported from Kerala and highlights the various sustainability issues along the chain of custody. A comparative sustainability assessment was also done for the three major exported indigenous species which are, *Tetraodon travancoricus*, *Dario dario* and *Puntius denisonii*, using sustainability indicators. The study shows that absence of reliable scientific data and presence of an unorganized sector hamper the conservation efforts.

Keywords: India, Kerala, ornamental fish, sustainability indicators, chain of custody, Garret ranking

Received 21 August 2012; Revised 18 January 2013; Accepted 30 January 2013

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Introduction

Ornamental fish keeping is becoming a popular and a favourite way to relax. The art of aquarium fish keeping has been practised from centuries back. Now it is one of the most popular hobbies in the world, the popularity transformed it into an international trade affair. According to Axelrod

(1973), the retail value of global ornamental fish trade including accessories was 4000 million US\$. The figure has crossed more than 8 billion US\$ (Silas et al., 2011) and the global exports are around 342 million US\$ (Tissera, 2012). Conroy (1975) in his report, has mentioned that there was no information available on the exports and imports of ornamental fish from India. In 2010-2011, the exports from India were worth 1.26 million US\$ (Nair, 2012). Though there has been a commendable progress in terms of value since 1975, the Indian exports are only 0.3% of the global ornamental fish trade. Eventhough India has an enviable status in the global ornamental fish sector, as far as the freshwater ornamental fish sector is concerned, around 90% of the exported fish are wild caught indigenous fish (Silas et al., 2011). This is one important area where the industry poses a sustainability threat.

The need for measuring and assessing the sustainability of fishery activities has acquired great importance and should be undertaken at various levels involving all aspects in fishery system (Adrianto et al., 2005). Management measures and regulations can be best implemented if the industry is studied well and is strongly supported by database. These measures can be effective only if they never turn out to be a disguised measure to protect the domestic industry and should not operate as barriers to market access (Deere, 1999).

The term sustainability has become very common due to the increasing environmental consciousness and responsibility. In an economic perspective, fisheries actually exist to meet the social and economic demands (Cochrane, 2000) while the impact on the resources rarely gets converted to economic gains (Christy, 1994). In terms of sustainability issues, some of this economic crisis should be considered in order to come up with the solution for economic sustainability in the system

(Whitmarsh et al., 2003) and the ornamental fish sector in India has a great potential as a source of employment.

Kerala, the southern state of India has its own place in the Indian ornamental fish sector. The state is bestowed with 44 rivers and also is home to parts of the Western Ghats, one of the global biodiversity hotspots. Out of the 20 most exported indigenous ornamental fish species from India, *Tetraodon travancoricus*, *Carinotetraodon imitator*, *Eetroplus maculatus* and *Pseudosphromenus dayi* are endemic to Kerala. *Puntius denisonii*, *Puntius filamentosus*, *Puntius jerdoni* and *Barilius bakeri* are found in Kerala along with other states (MPEDA, Personal Communication). As per the quantity of ornamental fish exported from different ports in 2010-2011, Kerala stands second after Kolkata (Nair, 2012). Thus it would be appropriate to study the sustainability issues along the chain of custody of wild caught ornamental fish exported from Kerala. The study aims to (i) find the chain of custody of wild caught ornamental fish exported from Kerala (ii) highlight the major sustainability issues along the chain of custody and (iii) compare the sustainability assessment of the three major exported wild caught indigenous species viz., *Tetraodon travancoricus*, *Dario dario* and *Puntius denisonii*, from India. This will be the first work to investigate the sustainability issues in the ornamental fish sector and also to explore the available database for the three most sought after wild caught indigenous ornamental fish which has a position in the Red Data Book of IUCN.

Materials and Methods

To find out the prevailing conditions in the ornamental fish industry, a pre-survey was carried out among the stakeholders which included fish collectors, fish dealers and exporters. Based on the observations and results of the pre-survey, a primary survey adopting personal interview method (Churchill, 1995) with the help of a structured questionnaire was carried out. The survey was carried out along three CoC's starting from Kannur, Chalakuddy and Alappuzha. The sustainability issues, identified from the pre-survey, were evaluated in terms of their degree of importance by ranking each issue. Twenty five stakeholders (5 fish collectors, 8 fish collectors cum exporters, 6 fish dealers and 6 exporters) at various stages of the chain of custody were asked to rank these issues based on their rating of the issue and also in terms

of marking the most prioritized issue according to each stakeholder. The stake holders were asked to give the most prominent issue rank 1 and to give subsequent ranks in the decreasing order of prominence. These ranks were then analyzed using Garrets Ranking Technique (Garret & Woodworth, 1966) using the formula,

$$\text{Percent Position} = [100 (R_{ij} - 0.5)] / N_j$$

where,

R_{ij} represents the rank given to i^{th} variable by j^{th} respondent

N_j represents number of variables ranked by j^{th} respondent

Export data for the years 2005-2010 (unpublished) were collected from MPEDA and the three most exported species were identified. These three species were then subjected to sustainability assessment against the sustainability indicators formed according to IOC Manual, 2006. Based on the information collected, the indicators for the three species were given scores as suggested by Huntington et al. (2004) viz., score '?' denotes insufficient information/grey literature; '0' denotes no information; '1' denotes partial information available but still information gaps exist; and '2' denotes almost all informations available. Primarily, a desk based study was carried out to gather the available information and structured personal interviews were conducted to confirm the same.

Results and Discussion

Different stages in the chain of custody of wild caught ornamental fish exported from Kerala are depicted in Fig.1. At stage one, different types of fishing gears such as cast nets, seine nets, and even electric methods were used to collect fish. Fish collectors usually stay near the rivers from where the fish is collected. The first holding area is usually a place in the premises of the house of the fish collector or a place adjacent to the river from where the fish is collected. Second holding areas are not a compulsory part in the chain of custody. Second holding areas come in the CoC when the fish has to be transported from the first holding area to a facility prior to the exporting facility. Usually they are provided by the wholesalers or fish collectors from far off places. Though quarantine facilities were available in these holding areas, infrastructural facilities were poor with no proper sanitary mea-

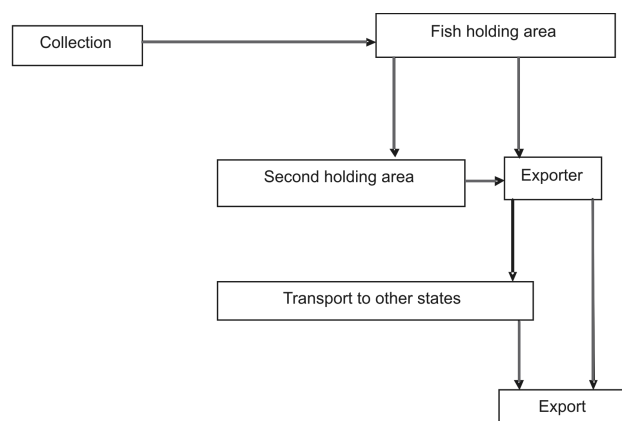


Fig. 1. Stages in the chain of custody of wild caught ornamental fish exported from Kerala

asures. Water quality was tested rarely, especially in the first holding area. From these holding areas, the fish were transported to the exporting facility based on the orders placed by the exporter. The fish were transported mostly in trains for long distances and in motor vehicles for short distances. No air-conditioning was provided in trains and was provided rarely in motor vehicles. The fish were packed in polythene bags filled with oxygen and placed in cartons with no thermocol packing. The cartons were sealed and tied. It was noticed that, on arrival in the exporting facility, most of the cartons were damaged and seals almost broken. The bags were insufficiently aerated, with high packing density and as a result, the fish was found to be in stress on arrival. The fish was then kept for quarantine for nearly 10 days at the exporting facility. During this period, water quality was checked, disease outbreaks were noted and appropriate medicines were given. More chances of disease outbreaks were seen at this stage than at the holding area. Exporters advocate that high incidence of disease was due to improper transportation, poor packing, and poor handling at the initial stages. From the exporting facility, the fish were packed for exports. For fish like *Puntius denisonii*, before packing for exports, a process called pre-packing was done. Pre-packing was found to reduce the stress and resultant mortality. The fish was pre-packed in polythene bags with water containing 10 ppm tetracycline and vitamin B capsules. After pre-packing, they were kept in lower temperatures. Just before shipment, UV sterilized freshwater was filled in aerated polythene bags and packed for exports.

Along the CoC, 18 major sustainability issues were identified. Of these, poor water quality was identified to be the biggest threat causing mortality and degrading the quality of the ornamental fish (Mean Garret Score of 74.76). Major sustainability issues along the chain of custody and results of Garret ranking are given in Table 1.

Table 1. Major sustainability issues along the Chain of Custody and Garret ranking

Rank	Sustainability Issues	Mean Score
1	Poor water quality	74.76
2	Lack of technical knowledge	73.08
3	Improper transportation (high packing density, less aeration, improper timing, stress)	71.36
4	Mortality due to improper handling	66.32
5	Improper gears	63.92
6	Disease outbreak	63.44
7	No proper infrastructure	58.16
8	No proper guidelines	50.96
9	Collecting juvenile fish	49.68
10	No basic information available	48.32
11	No standard sanitary measures	47.40
12	No effort for captive breeding of indigenous species while breeding of abroad	45.52
13	By-catch	43.88
14	No proper quarantine	43.68
15	Exports during breeding time	39.20
16	Use of impermissible antibiotics while packing	31.48
17	No organizations for collectors	29.32
18	Poisoning of water for catching food fish	29.20

Poor water quality, lack of technical knowledge and improper transportation were the issues with maximum scores. Some issues like by catch and exports during spawning time, though they were persistent, fetched low scores as stakeholders were reluctant to admit such incidences. Many issues like water quality, lack of technical knowledge, improper transportation, improper handling, disease outbreaks, lack of proper guidelines, infrastructure and sanitary measures were common in all stages of CoC. The maximum issues were at the collection stage which included by catch, catching fish during breeding time, use of improper gears, collecting

juveniles, poisoning water for catching food fish, lack of technical knowledge, improper transportation, improper handling, disease outbreaks, no proper guidelines, infrastructure and sanitary measures.

Comparative sustainability assessment of three major indigenous wild caught ornamental fish

species is given in Table 2. On comparing the sustainability, it was found that either the information was in the form of grey literature or no work has been done. More scientific works have been done in the case of *Puntius denisonii* than the other two species. This may be due to its high demand in the export market (Mittal, 2009; Prasad et al., 2008). When sustainability issues are debated on one

Table 2. Comparative sustainability assessment

Criteria	Indicators	<i>Tetraodon travancoricus</i>	<i>Dario dario</i>	<i>Puntius denisonii</i>
Ecological	Distribution	2	2	2
	Stock assessment	0	0	0
	Species biology	0	0	1
	Reproduction biology	0	0	1
	Spawning	?	?	1
	Exploitation rate	0	0	1
	Impact of ecosystem factors relevant to target species	0	0	0
	Interaction with other species	?	0	0
	Use and impacts of gear	0	0	0
	Fishing grounds	2	2	2
	Risk factors known and understood	1	?	1
Governance	Specific fisheries management objectives	0	0	1
	Measures to discourage destructive fishing practices	0	0	0
	Economic instruments for management policies like certification	1	1	1
	International recommendations or guidelines influencing the industry	1	1	1
Socio-economic	Value of catch	1	1	1
	Quantity of catch	0	0	0
	Quality of catch	0	0	0
	Income at each stage	0	0	0
	Fishery contribution (domestic, exports)	1	1	1
	Total employment	?	?	?
	Fisher demographics	0	0	0
	Management by local and indigenous communities	?	?	?
Technical	Manifestation of traditional knowledge	?	?	?
	Measures to reduce transport stress and mortality	?	?	1
	Optimum physical and chemical properties of water suitable for the target species	1	1	1
	Captive breeding technology	0	?	1

'?': Insufficient information/grey literature

'0': No information

'1': Partial information available but still information gaps exist

'2': Almost all information available

side, it is to be noted that on the other side there is no baseline information on *Tetraodon travancoricus* assessed as vulnerable, *Dario dario* assessed as data deficient and *Puntius denisonii* assessed as endangered (IUCN, 2012) which are also the three most important indigenous wild caught ornamental fishes of India (MPEDA, Personal Communication).

The results of the Garret ranking showed that the major reasons for mortality and stress of ornamental fish was poor water quality, lack of trained personnel and improper transportation. The sustainability assessment shows that there are still questions over the wider sustainability of the species, given the lack of information on stock size, management regimes, and on the impact of the fisheries on socio-economic aspects. It is therefore impossible to conclude whether the fishery is sustainable or not.

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