

Export trend of Indian ornamental fish industry

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ABSTRACT

In spite of having two hotspots of biodiversity India is way long back in the ornamental fish trade. Large number of species can only foster the needs of the industry. The study aims to (1) to find the various indigenous, exotic ornamental fish species and ornamental shrimp species being exported from India, (2) to provide an overview of the trends in the Indian ornamental fish export industry. 287 indigenous fish species, 92 exotic fish species and 44 ornamental shrimps have been found to get exported from India. The export trend of the industry for the past ten years shows a declining state which is also reflected in the annual and compound annual growth rate. Ornamental fish industry has enormous potential in tropical countries like India. To expand trade, new technologies and policies will have to be developed which will help in attaining a sustainable industry.

Keywords: India, Export, Annual Growth Rate, Compound Growth Rate

INTRODUCTION

Aquarium fish keeping as a hobby has a long history dating back to many centuries. Introduction of civil aviation after the Second World War expanded the hobby to a global industry (Tissera, 2010). Though the global ornamental fish trade is relatively small, it has a significant contribution to the trade in freshwater and marine aquatic products. The global ornamental fish trade in retail is worth more than US \$ 8 billion (MPEDA, 2010) while the exports was around US \$ 337 million (FAO, 2008). According to Rana (2007) Singapore continues to be the biggest exporter and also remains the Asian hub for ornamental fish while, US, EU and Japan are the major importers with Czech Republic having a prominent place in EU in ornamental fish trade.

In spite of having two hotspots of biodiversity, India is way long back in the ornamental fish trade with an export worth US\$ 1.17 million during 2009-2010 (MPEDA, 2010). Out of 274 freshwater fish species from north eastern states only 32% of native fish are exported (Mahapatra et. al, 2007) and among 287 freshwater species from western ghats (Shaji et al., 2000), only 114 species are exported (Anon, 2005).

In ornamental fish trade the need is for large number of species or varieties in large quantities (Sane, 2007). According to Kawada (2007) non-uniqueness and limited specimens discouraged the Japanese

importers to have trade with India initially. But the condition has changed with the introduction of Tetraodon travancoricus, Scarlet badis and Drape fin barbs as reported by the same author. The study aims to list the various indigenous and exotic ornamental fish species and ornamental shrimps getting exported from India and also to provide an overview of the trends in the Indian ornamental fish export industry. Though some workers have already listed the ornamental fish species exported from India, it mainly concentrates on the indigenous ornamental fish species.

METHODOLOGY

The study was carried out between 2009 and 2011. The method for data collection consisted of information gathering from various ornamental fish exporters in India using an e-mail survey (Malhotra, 2001). The survey was conducted every two months to get the details of the fish species getting exported. From about 59 registered exporters only 26 were ready to co-operate with the survey. Besides the survey, various documents such as databases, reports, manuscripts and articles were also used to collect information. Secondary data was also collected from Marine Products Export Development Authority (MPEDA), Kochi, India and also from Ministry of Commerce, Government of India. The export data obtained from Ministry of Commerce, Government of India, were used to compute the

annual growth and compound annual growth (Siegel, J.G., 1997). Annual growth and compound annual growth were computed to assess the growth of the ornamental export industry.

ANNUAL GROWTH RATE= (THIS YEAR-LAST YEAR)/LAST YEAR

COMPOUND ANNUAL GROWTH RATE= ((LAST YEAR/FIRST YEAR) ^(1/n-1))-1

Where,
n=number of years

RESULTS AND DISCUSSION

287 native fish species, 92 exotic fish species and 45 ornamental shrimps were found to be exported from India as ornamental fish. Among the 287 native fish species, 239 were freshwater fish and 48 were marine fish species. Among the indigenous freshwater species the largest number of species belongs to the family Cyprinidae. 98 species were found to belong to Cyprinidae. 16 species were found to belong to families Bagridae and Balitoridae. 12 species were found to belong to the families Channidae, Cobitidae and Sisoridae.

Table1: Native Freshwater Fish Species found to be exported

FAMILY	NATIVE SPECIES (FRESHWATER)
Adrianichthyidae	Oryzias dancena*
Ambassidae	Chanda nama*
	Chanda ranga
	Chanda thomassi*
	Chanda wolffii
	Parambassis lala*
	Parambassis ranga*
	Parambassis thomassi(Day, 1870)
Amblycipitidae	Amblyceps mangois
Anabantidae	Anabas cobojius*
	Anabas testudineus
Anguillidae	Anguilla bengalensis
Aplocheilidae	Aplocheilus blockii
	Aplocheilus lineatus(Valenciennes, 1846)
	Aplocheilus panchax
	Aplocheilus parvus*
Badidae	Badis badis
	Badis badis assamensis
	Badis blosyrus*
	Badis kanabos*
	Dario dario
Bagridae	Batasio batasio
	Batasio fasciolatus*
	Hemibagrus menoda*
	Hemibagrus punctatus*
	Horabagrus brachysoma
	Horabagrus nigricollaris
	Mystus bleekeri*
	Mystus carico*
	Mystus gulio (Hamilton, 1822)
	Mystus tengara (Hamilton, 1822)
	Mystus vittatus
	Rama chandramara
	Rita gogra
	Rita rita(Hamilton, 1822)
	Sperata aor (Hamilton, 1822)
Sperata seenghala	
Balitoridae	Aborichthys elongates*
	Aborichthys tikaderi*

	Acanthocobitis botia(Hamilton, 1822)
	Acanthocobitis rubidipinnis
	Mesonemacheilus guentheri*
	Mesonoemacheilus triangularis(Day, 1865)
	Nemacheilichthys rupelli
	Schistura barapaniensis
	Schistura beavani
	Schistura corica
	Schistura denisonii dayi
	Schistura rupecola*
	Schistura savona*
	Schistura scaturigina
	Schistura tigrinum*
	Schistura vinciguerrae*
Belonidae	Xenentodon cancila
Chacidae	Chaca chaca (Hamilton, 1822)
Channidae	Channa amphibious
	Channa aurantimaculata*
	Channa barca
	Channa bleheri
	Channa diplogramma*
	Channa gachua
	Channa Harcourt-Butleri
	Channa marulius issabella (Rao) 1997
	Channa punctata
	Channa special rainbow
	Channa stewarti
	Channa striata
Chaudhuriidae	Pillaia indica*
Cichlidae	Etroplus canarensis
	Etroplus maculatus
	Etroplus suratensis
Cobitidae	Botia almorhae*
	Botia Dario
	Botia lohachata
	Botia rostrata
	Botia striata (Gunther, 1868)
	Lepidocephalichthys gunthea (Hamilton, 1822)
	Lepidocephalichthys menoni*
	Lepidocephalus annandalei(Chaudhuri 1912)
	Lepidocephalus goalparensis
	Lepidocephalus thermalis (Valenciennes, 1846)
	Pangio pangia
	Somileptes gongota(Hamilton, 1822)
Cyprinidae	Barilius bakeri
	Barilius barila*
	Barilius barna
	Barilius bendalensis*
	Barilius canarensis
	Barilius dogarsinghi*
	Barilius evezardi*
	Barilius radiolatus *
	Barilius shacra
	Barilius tileo
	Barilius vagra
	Catla catla*
	Chagunius chagunio*

Chela cachius(Hamilton 1822)
Cirrhinus fulungee*
Cirrhinus mrigala*
Crossocheilus latius latius
Danio dangila
Danio rerio
Devario acuticephala*
Devario aequipinnatus
Devario assamensis*
Devario devario
Devario malabaricus*
Esomus barbatus*
Esomus danricus(Hamilton 1822)
Garra annandalei(Hora, 1921)
Garra bicornuta(Narayan Rao, 1920)
Garra gotyla (Gray, 1830)
Garra hughi(Silas 1955)
Garra kempfi*
Garra lampta*
Garra lissorhynchus (McClelland 1842)
Garra nasuta*
Gonoproktopterus curmuca*
Horadandia atukorali(Deraniyagala, 1943)
Hypselobarbus curmuca*
Hypselobarbus jerdoni*
Hypselobarbus lithopidos*
Labeo angra*
Labeo ariza*
Labeo bata*
Labeo boga
Labeo boggut*
Labeo calbasu*
labeo dero*
Labeo dyocheilus*
Labeo kontius*
Labeo nandina*
Labeo nigriscens*
Labeo rohita*
Laubuca dadiburjori
Laubuca laubuca
Neolissochilus hexagonolepis*
Neolissochilus wynaadensis *
Oreichthys cosuatis(Hamilton 1822)
Osteobrama belangeri*
Osteobrama cotio cotio
Osteochilus nashii(Day, 1869)
Puntius arenatus*
Puntius arulius (Jerdon, 1849)
Puntius arulius tambraparnie
Puntius assimilis 'Maskara'*
Puntius cauveriensis*
Puntius chalakudiensis
Puntius conchonius
Puntius denisonii
Puntius fasciatus (Jerdon 1849)
Puntius filamentosus (Valenciennes 1844)
Puntius filamentosus lepidus

	Puntius gelius
	Puntius guganio(Hamilton, 1822)
	Puntius jerdoni
	Puntius mahecola(Valenciennes, 1844)
	Puntius manipurensis*
	Puntius meingangbii*
	Puntius melanampyx
	Puntius mudumalaiensis*
	Puntius narayani(Hora, 1937)
	Puntius phutunio(Hamilton 1822)
	Puntius sahyadriensis(Silas, 1953)
	Puntius setnai*
	Puntius shalynius (Yazdani & Talukdar 1975)
	Puntius sophore (Hamilton 1822)
	Puntius tambraparniei*
	Puntius terio (Hamilton 1822)
	Puntius ticto(Hamilton 1822)
	Puntius vittatus(Day 1865)
	Rajamas bola*
	Rasbora daniconius (Hamilton, 1822)
	Rasbora rasbora(Hamilton, 1822)
	Rohtee ogilbi*
	Salmophasia phulo*
	Tor khudree
	Tor mosal*
	Tor musullah
	Tor progeneius*
	Tor putitora*
	Tor tor*
Erethistidae	Erethistes pusillus *
	Erethistoides montana*
	Hara hara
	Hara horai(Misra, 1976)
	Hara jerdoni
	Laguvia kapoori
	Laguvia ribeiroi
	Laguvia shawi
	Pseudolaguvia muricata*
Gobiidae	Brachygobius nusus
	Glossogobius giurus (Hamilton 1822)
	Gobiopterus chuno
	Pseudapocryptes elongatus
	Stigmatogobius sadanundio
Heteropneustidae	Heteropneustes fossilis
Mastacembelidae	Macrognathus aral
	Macrognathus pancalus*
	Mastacembalus armatus
Moringuidae	Moringua raitaborua
Mugilidae	Rhinomugil corsula
Nandidae	Nandus andrewi*
	Nandus nandus
	Pristolepis malabaricus
	Pristolepis marginata(Jerdon, 1849)
Notopteridae	Chitala chitala*
	Notopterus notopterus
Olyridae	Olyra longicaudata(McClelland, 1842)

Osphronemidae	Ctenops nobilis(McClelland, 1845)
	Polyacanthus fasciatus*
	Polyacanthus lalius*
	Polyacanthus sota*
	Pseudosphromenus cupanus
	Pseudosphromenus dayi*
Pangasiidae	Pangasius pangasius(Hamilton, 1822)
Schilbeidae	Neotropius atherinoides*
Siluridae	Ompok bimaculatus(Bloch, 1794)
	Ompok pabda (Hamilton, 1822)
	Wallago attu(Bloch & Schneider, 1801)
Sisoridae	Bagarius bagarius(Hamilton, 1822)
	Bagarius yelleri
	Exostoma labiatum*
	Gagata cenia
	Gagata gagata*
	Gagata sexualis*
	Glyptothorax cavia(Hamilton 1822)
	Glyptothorax housei*
	Glyptothorax lonah*
	Glyptothorax telchitta *
	Gogangra viridescens
Sisor rhabdophorus(Hamilton, 1822)	
Synbranchidae	Monopterus albus*
	Monopterus cuchia*
Syngnathidae	Microphis deocata*
Tetraodontidae	Carinotetraodon imitator*
	Carinotetraodon travancoricus
	Tetraodon cutcutia
	Tetraodon fluviatilis

* new species added after list by Sekharan(2006)

Among the native marine water fish, 13 species were found to belong to the family Gobiidae , 4 species in the family Muraenidae and 3 species in the family Ariidae.

Among the exotic ornamental fish that were exported from India, 19 species belonged to the family Cyprinidae , 9 species belonged to the family Cichlidae and 5 species belonged to the family Osphronemidae.

Ramachandran (2002) had listed 172 indigenous freshwater fish species as being exported and Sekharan (2006) had listed 319 indigenous freshwater fish species as being exported. Works of authors like Ponniah & Gopalakrishnan (2000), Ramachandran (2002), Sekharan (2006), Remadevi and Indra (2009) and the website Fishbase were reviewed to classify the exported ornamental fish as indigenous and exotic.

Table2: Native Marine Fish Species Found to be exported

Family	NATIVE SPECIES (MARINE WATER)
Ariidae	Arius dussumieri (Valenciennes 1840)*
	Arius sagor*
	Arius sona
Batrachoididae	Allenbatrachus grunniens*
Blenniidae	Istiblennius edentulus*
	Omobranchus zebra*
Carangidae	Gnathanodon speciosus*
Chaetodontidae	Chaetodon collare*
Cynoglossidae	Cynoglossum semifasciatus*
Eleotridae	Eleotris fusca
	Ophiocara aporos*
Gobiidae	Acentrogobius viridipunctatus(Valenciennes, 1837)*
	Apocryptes bato
	Boleophthalmus boddarti
	Drombus globbiceps*
	Gobiopsis macrostoma
	Odontamblyopus rubicundus (Hamilton, 1822)
	Oligolepis acutipennis (Valenciennes, 1837)
	Oxyurichthys microlepis*
	Periophthalmus dipus*
	Periophthalmus pearsei
	Pseudapocryptes lanceolatus*
	Scartelaos histophorus
	Taenoides Cirratus*
	Trypauchen vagina *
Hemiramphidae	Hyporhamphus limbatus*
Lactidae	Lates calcarifer
Lutjanidae	Lutjanus argentimaculatus*
Monodactylidae	Monodactylus argenteus*
Muraenesocidae	Congrosox talabon 'hi-fin conger eel'*
	Congrosox talabonoides*
Muraenidae	Gymnothorax sathete*
	Gymnothorax tile*
	Lycodontis tile

	Siderea thyrsoides*
Ophichthidae	Pisodonophis boro
Ostraciidae	Lactoria cornuta*
Platycephalidae	Platycephalus bengalensis*
	Platycephalus indicus*
Plotosidae	Plotosus canius
Ptereleotridae	Parioglossus pillipinus*
Scatophagidae	Scatophagus argus argus
Sillaginidae	Sillaginopsis panijus
	Sillago sihama*
Soleidae	Euryglossa pan*
Sparidae	Acanthopagrus berda(Forsskal, 1775)*
Syngnathidae	Syngnathus spicifer*
Tetraodontidae	Chelondon patoca

Table2: Native Marine Fish Species Found to be exported

* new species added after list by Sekharan(2006)

Table 3: Exotic fish species

Family	EXOTIC FISH SPECIES
Acanthuridae	Zebrasoma veliferum
Actiniidae	Anthopleura xanthogrammica
Ampullaridae	Pomacea bridgesii
Anostomidae	Anostomus ternetzi
Ariidae	Hexanematichthys seemanni
Atyidae	Typhlatya iliffei
Auchenipteridae	Ageneiosus marmoratus
Badidae	Badis burmanicus
Balitoridae	Schistura macrocephalus
Blenniidae	Ecsenius axelrodi
Callichthyidae	Corydoras aeneus
	Corydoras julii
	Corydoras paleatus
Centrarchidae	Lepomis gibbosus
Channidae	Channa pulchra
Characidae	Gymnocorymbus ternetzi
	Hemigrammus anisitsi
	Hyphessobrycon serape
Cichlidae	Astronotus ocellatus

	Cichlasoma severum
	Hemichromis paynei
	Herichthys cyanoguttatus
	Julidochromis
	Pseudotropheus greshakei
	Pseudotropheus zebra
	Pterophyllum scalare
	Thorichthys meeki
Clariidae	Clarias batrachus
	Clarias macrocephalus
Cobitidae	Botia kubotai
	Chromobotia macracanthus
	Cobitis striata
Cyprinidae	Barbus apleurogramma
	Barbus quadripunctatus
	Brachydanio kerri
	Carassius auratus
	Crossocheilus siamensis
	Danionella translucida
	Epalzeorhynchus frenatus
	Epalzeorhynchus bicolor
	Garra rufa
	Hypsibarbus wetmorei
	Labeo chrysophekadion
	Laubuca caeruleostigmata
	Puntius lineatus
	Puntius nigrofasciatus
	Puntius orphoides
	Puntius semifasciolatus
	Puntius tetrazona
	Rasbora trilineata
	Tanichthys albonubes
Dorariidae	Platydoras costatus
Eleotridae	Eleotris marmorata
Erethistidae	Hara filamentosa
Gnathophyllidae	Hymenocera picta
Gobiidae	Brachygobius doriae
	Gobiodon ceramensis

	Gobiosoma oceanops
	Gobius tigrellus
Haemulidae	Plectorhinchus vittatus
Helostomatidae	Helostoma temminckii
Loricariidae	Hypostomus plecostomus
	Rineloricaria fallax
Lutjanidae	Lutjanus campechanus
Mastacembelidae	Macrognathus siamensis
Muraenidae	Gymnothorax moringa
Mysidae	Praunus flexuosus
Nothobranchiidae	Epiplatys chevalieri
Ocypodidae	Uca perplexa
Osphronemidae	Betta splendens
	Trichogaster leerii
	Trichogaster microlepis
	Trichogaster trichopterus
	Trichopodus trichopterus
Osteoglossidae	Scleropages jardinii
Pangasiidae	Pangasius sutchi
Parathelphusidae	Austrothelphusa transversa
Pimelodidae	Leiarius pictus
Poeciliidae	Poecilia latipinna
	Poecilia sphenops
	Xiphophorus helleri
Pomacanthidae	Centropyge aurantia
Potamonidae	Parathelphusa martens
Ptereleotridae	Parioglossus palustris
Rhynchocinetidae	Rhynchocinetes rigens
Scyliorhinidae	Apristurus gibbosus
Sebastidae	Helicolenus percoides
Stichodactylidae	Stichodactyla haddoni
Stomidae	Stomias boa boa
Syngnathidae	Indian pipefish/ichthyocampus carce
Tetraodontidae	Takifugu niphobles
	Tetraodon mbu

Table 3: Exotic fish species

Table 4: Ornamental shrimps being exported

SHRIMPS
Caradina Sp./Zigzag Shrimp
Caradina tiwari
Caridina babaulti
Caridina gracileps
Caridina gracilirostris
Caridina hodgarti
Caridina new 'Black Beauty'
Caridina Sp./Black banded Green Shrimp
Caridina Sp./Black banded Shrimp
Caridina Sp./Black Shrimp
Caridina Sp./Dwarf Green Shrimp
Caridina Sp./Fire Head shrimp
Caridina Sp./Green Shrimp
Caridina Sp./Ivory Shrimp
Caridina Sp./Zebra Shrimp
Macrobrachium assamensis
Macrobrachium banjare(Tiwari 1958)
Macrobrachium duarii
Macrobrachium dulichodctileus
Macrobrachium idella
Macrobrachium kulsienne
Macrobrachium naso
Macrobrachium peguensis
Macrobrachium pilimanus
Macrobrachium scabriculum(Heller, 1862)
Macrobrachium sp. 'Himalayanus'
Macrobrachium sp. 'Ivory'
Macrobrachium Sp./Bicolour Shrimp
Macrobrachium Sp./Black Leaf Shrimp
Macrobrachium Sp./Green Leaf Shrimp
Macrobrachium Sp./Pigeon Blood Shrimp
Macrobrachium Sp./Red Claw shrimps
Macrobrachium Sp./Redtail Fancy Shrimp
Macrobrachium tiwari
Palaemon emerald
Palaemon hendersoni

Palaemon scabriculus
Palaemon scarletti
Palaemon sp. 'green needlenose'
Palaemon sp. 'Yellow fluorescent'
Palaemon Sp./Blue Band Shrimp
Palaemon Sp./Green Rocket Shrimp
Penaeus brasiliensis
Zico Shrimp

Recent trade statistics from Ministry of Commerce, Government of India, indicates that the export demand for ornamental fish is declining (Fig 1.). The annual growth rate and compound annual growth rate also indicates a decline in the exports (Table 5)

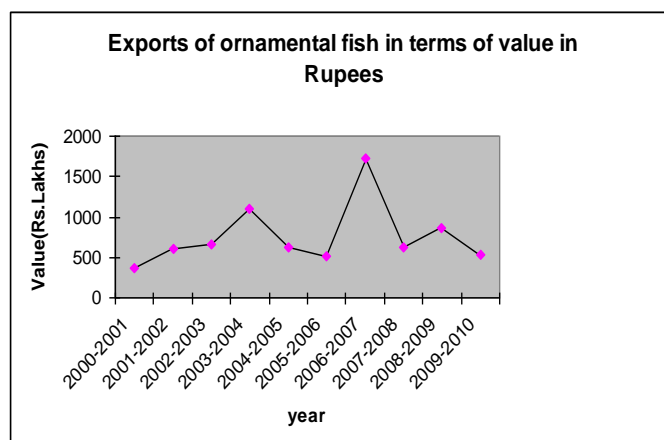


Fig 1: Exports of Ornamental fish in Terms of Value in Rupees (Lakhs)

Source: Compiled using data from the Ministry of Commerce, Gol.

Though the exports increased twice it substantially declined after 2007-2008. The reasons could be due to drastically reduced exports to Singapore, which is considered to be the main importer of Indian ornamental fish (Rana, 2007), from Rs.1079.22 lakhs in 2006-2007 to Rs. 252.42 lakhs (Table 6). Another reason could be the regulation imposed by Government of Kerala, regarding the catching of *Puntius denisonii*. According to fbas (2009), it is one of the most sought after ornamental fish from India and accounted for almost 60-65% of India's total live ornamental fish exports during the year 2007-2008.

Table 5: Annual Growth Rate and Compound Annual Growth Rate of Ornamental fish Exports in Terms of Value in Rupees

Year	Annual Growth (%)	Compound Annual Growth Rate (%)
2000-2001		
2001-2002	63.93	63.94
2002-2003	9.2	33.8
2003-2004	66.48	43.91
2004-2005	-43.84	13.74
2005-2006	-16.69	6.87
2006-2007	234.38	29.25
2007-2008	-64.04	7.66
2008-2009	38.94	11.14
2009-2010	-39.2	3.936

Source: Computed by the author

Table 6: Annual Growth Rate and Compound Annual Growth Rate of Ornamental fish Exports in Terms of Value in Rupees

Country	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
France	1.94	3.83	4.18	3.06	1.62	1.53	2.52	1.01	0.02	7.86
Germany	27.31	16.45	26.31	28.09	37.01	30.36	27.99	34.8	41.67	54.02
Hongkong	69.59	104.89	10.18	59.44	80.55	60.49	52.96	45.1	42.58	47.72
Japan	100.29	58.25	198.17	406.47	56.82	48.08	52.59	40.46	67.21	46.69
Malaysia	7.99	1.71	2.97	224.35	25.23	87.05	52.23	53.4	38.53	39.07
Netherlands	8.92	4.26	7.48	7.49	8.51	12.36	18.05	15.49	12.35	14.58
Singapore	60.01	50.99	66.89	82.14	140.53	134.9	1,079.22	252.42	265.43	172.01
Srilanka	0.66	11.54	4.4	5.56	2.28	3.62	2.18	4.13	0.33	0.56
Taiwan	3.64	252.34	3.17	34.64	19.87	7.93	3.2	2.1	5.08	6.42
Thailand	14.24	3.43	80.49	3.3	9.47	7.17	39.45	0.6	1.21	16.06
UAE	1.34	6.09	20.08	40.26	14.1	3.55	205.05	40.5	232.69	1.43
UK	11.33	12.58	73.83	21.93	24.08	10.65	21.56	33.49	13.44	15.27
USA	53.87	69.79	72.62	93.93	66.73	58.45	44.59	37	46.11	56.96

Table 6: Exports in terms of Value in Rupees (Lakhs)

Source: Computed using data from the Ministry of Commerce, Gol.

CONCLUSION:

Ornamental fish industries have enormous potential in tropical countries. Avenues are unlimited to India. For the trade to prosper three pre-requisites are quality, quantity and sustainability (MPEDA, 2010). Therefore, the exploitation of wild fish stocks for the aquarium trade may become restricted due to a trend towards conserving the country's natural resources. So to expand the trade, new technologies will need to be developed in order to commercially breed rare species, as well as marines. Proper fish health management and quarantine regimes will also have to be adopted. Besides these, to achieve an ornamental fish industry which is sustainable, policies

should also take into care the interests and welfare of the stakeholders associated with the industry.

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