

# INDIGENOUS FRESHWATER FISH SPECIES AND THEIR EXPORT TRADE

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## Introduction

According to published sources, a total of 113 scientifically described species of fish, belonging to 38 families, occur in freshwater habitats of Sri Lanka (Deraniyagala, 1952; Mendis, 1954; Munro, 1955; Senanayake, 1980; Pethiyagoda 1991, 1994, 2006). These include 76 species of indigenous freshwater fishes (33 endemic species), 16 species of saltwater dispersants, and more than 30 species of exotics. In addition, Pethiyagoda (2006) has stated that a further 13 species remain to be identified and / or described.

The diverse drainage system of the island has greatly influenced the diversity of fish fauna of the country (Senanayake, 1980). Based on the distribution pattern of freshwater fish, Senanayake and Moyle (1982) have identified three ichthyofaunal provinces in Sri Lanka; the Southwestern Province (covering the river basins of the Kelani, Kalu, Gin and Nilwala); the Mahaweli Province (covering the Mahaweli river basin); and the Dry Zone Province. A majority of the endemic freshwater fish species is restricted to the Southwestern ichthyofaunal region. The fish fauna in the first peneplain of the Mahaweli province is largely identical to that in the Dry Zone Province.

Many species of freshwater fishes in Sri Lanka are collected from wild habitats for export – a serious conservation issue. Wild collection of freshwater fishes for the ornamental fish trade has severe impact on the survival of these species (Andrews, 1990; Gunasekera, 1994; Ekaratne, 2000; Shirantha, 2004; Pethiyagoda, 2006). Unsustainable exploitation has resulted in many fish being added to the threatened list of species (Gunasekera, 1996), with endemic freshwater fish suffering major exploitation (Gunasekera, 1998). Collectors target the most colourful varieties, which results in the local extinction of their population from several habitats (Gunasekera, 1996).

This article is based on the post-graduate research conducted by the author to highlight some facts related to the trade and export of indigenous freshwater fish. The data has been extracted from 5, 313 Customs Goods Declaration Forms (Customs 53) submitted to the Customs Department at the Bandaranaike International Airport, Sri Lanka by ornamental fish exporters between January 1, 2005 and December 31, 2006. Following are the main findings of this survey:

## Freshwater Ornamental Fish Exported from Sri Lanka

52 species of fish from 21 families were collected from freshwater habitats and exported from Sri Lanka between the above dates (Table 1). 41 of the species (14 families) were indigenous, and these included 15 endemic species (5 families).

**Table 1:** Freshwater Ornamental Fish Species exported from Sri Lanka in 2005 & 2006

Origin: Ex – Exotic; E – Endemic

Conservation Status (IUCN & MOENR, 2007): CR – Critically endangered; EN – Endangered; VU – Vulnerable

Family	Species; Origin and Conservation Status	2005	2006
Aplocheilidae	<i>Aplocheilus weneri</i> (Werner's killifish) (E, VU)	4, 873	2, 677
	<i>Aplocheilus dayi</i> (Day's killifish) (E)	3, 442	2, 040
	<i>Aplocheilus parvus</i> (Dwarf Panchax)	1, 368	1, 189
Bagridae	<i>Mystus gulio</i> (Long whiskered catfish)	60	56
	<i>Mystus keletius</i> (Yellow catfish)	125	195
	<i>Mystus vittatus</i> (Striped dwarf catfish)	100	325
Balitoridae	<i>Acanthocobitis urophthalmus</i> (Tiger loach / Tiger goby) (E, VU)	9, 741	3, 819
	<i>Schistura notostigma</i> (Spotback loach / Banded mountain loach) (E)	1, 269	2, 880
Belonidae	<i>Xenentodon cancila</i> (Freshwater garfish)	100	90
Belontiidae	<i>Belontia signata</i> (Combtail, Paradisefish) (E)	2, 197	2, 502
	<i>Pseudophromenus cupanus</i> (Spiketaiked paradise fish)	1, 280	597
	<i>Trichogaster pectoralis</i> (Snake-skin gouramy) (Ex)	0	100
	<i>Trichogaster trichopterus</i> (Three spot gouramy) (Ex)	42, 639	67, 369
Cichlidae	<i>Etroplus maculatus</i> (Orange chromide)	3, 939	1, 083
	<i>Etroplus suratensis</i> (Green chromide / Pearl spot)	2, 067	790
Claridae	<i>Clarias brachysoma</i> (Walking catfish) (E)	472	146
Cobitidae	<i>Lepidocephalichthys thermalis</i> (Common spiny loach / Spotted loach)	6, 445	2, 580
Cyprinidae	<i>Cyprinus carpio</i> (Common carp / Golden carp) (Ex)	20, 629	37, 443
	<i>Danio aequipinnatus</i> (Giant danio) (E)	55	200
	<i>Danio malabaricus</i> (Malabar danio)	10, 211	3, 817
	<i>Danio pathirana</i> (Barred danio) (E, CR)	420	170
	<i>Esomus thermoicus</i> (Flying barb) (E)	60	200
	<i>Garra ceylonensis</i> (Stone sucker) (E)	62, 486	50, 370
	<i>Horadandiya atukorali</i> (Horadandiya)	0	25
	<i>Labeo dussumieri</i> (Common labeo)	175	0
	<i>Puntius bimaculatus</i> (Redside barb)	5, 362	2, 555
	<i>Puntius cumingii</i> (Two spot barb) (E, VU)	7, 891	4, 069
	<i>Puntius dorsalis</i> (Long snouted barb)	50	0
	<i>Puntius nigrofasciatus</i> (Black ruby barb / Nigger barb) (E, VU)	16, 427	8, 727
	<i>Puntius singhala</i> (Blackspot barb / Filamented barb) (E)	10, 450	8, 500
	<i>Puntius ticto</i> (Ticto barb / Tic-tac-toe barb)	205	0
	<i>Puntius titteya</i> (Cherry barb) (E, VU)	2, 780	440
	<i>Puntius vittatus</i> (Greenstripe barb / Silver barb)	75	1, 065
<i>Rasbora daniconius</i> (Slender rasbora / Striped resiom)	300	0	
<i>Rasbora vaterifloris</i> (Pearly rasbora / Golden rasbora) (E, EN)	15, 870	14, 825	
Eleotrididae	<i>Butis butis</i> (Duckbill sleeper / Upside-down sleeper)	210	90
	<i>Eleotris fusca</i> (Dusky sleeper / Brown gudgeon)	0	20
Gobiidae	<i>Awaous grammepomus</i> (Welougouwa)	150	0
	<i>Glossogobius giuris</i> (Tank goby / Bar-eyed goby)	60	0
	<i>Redigobius balteatops</i> (Rhino horn goby / Goby valimosa)	500	280
	<i>Sicyopterus grisseus</i> (Gal welougouwa) (EN)	0	50
Helostomatidae	<i>Helostoma temminckii</i> (Kissing gourami) (Ex)	15, 022	19, 638
Heteropneustidae	<i>Heteropneustes fossilis</i> (Singing catfish)	850	622
Mastacembelidae	<i>Macrognathus aral</i> (One stripe spiny eel / Lesser spiny eel) (CR)	0	100
	<i>Mastacembalus armatus</i> (Zig zag eel / Marbled spiny eel)	603	831
Monodactylidae	<i>Monodactylus argenteus</i> (Mono)	91, 471	46, 909
Notopteridae	<i>Ptryeoplichthys multiradiatus</i> (Tank cleaner) (Ex)	6, 454	16, 682
Osphronemidae	<i>Osphronemus gourami</i> (Giant gourami) (Ex)	150	0
Scatophagidae	<i>Scatophages argus</i> (Scats)	14, 740	13, 218
Siluridae	<i>Ompok bimaculatus</i> (Butter catfish)	20	60
Syngnathidae	<i>Microphis brachyurus</i> (Short-tailed pipefish)	0	2
Tetrodonitidae	<i>Tetraodon fluviatilis</i> (Green pufferfish / Common puffer)	1, 813	2, 518

The most common species exported over the two years was the Mono (*Monodactylus argenteus* - 138, 380), followed by the endemic Stone Sucker (*Garra ceylonensis*) - 112, 856) and the exotic *Trichogaster trichopterus* (110, 008). Of the top 10 endemic species exported in 2005 and 2006, *Garra ceylonensis* topped the list in both years. It is also clear that a higher number of individual endemic species were exported in 2005, compared to 2006. *Garra ceylonensis* and *Rasbora vaterifloris* were exported in each month of 2005 and 2006. Other endemic species such as *Puntius nigrofasciatus* and *Puntius singhala* were also regularly exported over these two years.

### **Export Destinations of Freshwater Fish**

Freshwater fish are exported from Sri Lanka to 48 countries of which the United Kingdom, USA, France and Germany are the leading importers. Of these, 27 countries imported endemic fish species. The highest number of a single endemic fish species exported were of *Garra ceylonensis* to France - 4, 705 in 2005 and 5, 010 in 2006. Compared to 1994, there is a drastic reduction in the numbers of the five endemic species of *Puntius nigrofasciatus*, *Rasbora vaterifloris*, *Puntius titteya*, *Puntius cumingii* and *Belontia signata* exported in 2005 and 2006. At present, the ornamental fish trade of Sri Lanka contributes to about 4% of the world supply.

In 1994, 65 species of freshwater fish (25 endemics) were exported to 25 countries. By 2005 / 06, the number of species exported had dropped to 41 (15 endemic species), while the number of export destinations had almost doubled (48 countries)!

### **Foreign Revenue earned from the Export of Ornamental Fish**

The total income generated from the ornamental fish trade in 2006 was Rs. 929, 844, 220.00 (US \$ 8, 819, 541.12). This is an increase over 2005 (Rs. 733, 006, 524.00 / US \$ 7, 207, 537.11).

Rs. 2, 287, 985.00 (US \$ 22, 497.39) was earned from the export of endemic freshwater fish in 2005 and Rs. 1, 721, 015.00 (US \$ 16, 323.77) in 2006. This corresponds to 0.31% and 0.01% of the total earnings from the export of ornamental fish from Sri Lanka. The export of indigenous freshwater fish species contributes to about 2% of the country's total export trade. As such, the export of freshwater fish from Sri Lanka contributes a negligible amount when compared to the totality of the trade.

*Garra ceylonensis* earned the highest revenue of Rs. 937, 290.00 in 2005, while *Esomus thermoicus* earned the least revenue of Rs. 600.00. The lack of a minimum floor price for exported indigenous freshwater fish is a barrier to the earning of foreign revenue e.g. the Cherry barb (*P. titteya*) is sold at US \$ 0.12 to the UK where it is retailed at US \$ 40 per specimen.

The benefit - cost ratios indicate that the export trade of *Rasbora vaterifloris*, *Puntius titteya*, *Puntius cumingii* and *Belontia signata* are highly viable in purely financial terms. This high profit may be due to the existence of a monopoly in their trade among a few exporters, and that as much as 98% of these fish are collected from the wild where the collectors and suppliers are unaware of the actual value of these species in the world market and, as a result, are poorly paid by the exporters. On the whole, this trade has very low overhead costs. Over the next 10 years, however, the viability of the trade in these four species will decline considerably due to the sharp decline of their populations in the wild, caused by over-exploitation.

## Legal and Institutional Policy

There is considerable legislation available to regulate the freshwater ornamental fish trade in Sri Lanka; however, there are gaps and partial contradictions in it. A major drawback is the lack of the proper implementation of this legislation. Exacerbating this is the lack of a specified mechanism to monitor wild collections of freshwater fish. Inadequate coordination among the conservation (Department of Wildlife Conservation - DWC), regulating and enforcement (Customs Department), and trade facilitating (Export development Board & Fisheries Department) agencies is a major institutional issue that hinders the sustainable trade of freshwater fish. On the other hand, the institutions responsible for research into aquaculture development have not been able to determine suitable captive breeding techniques for endemic freshwater fish species that have high demand in the export trade.

## Conservation Status of Export Species

As per the data collected during the survey period, wild freshwater fish stocks cater to over 98% of the export numbers. Of the 52 species exported, nine are nationally threatened (IUCN Sri Lanka and MOENR, 2007). Of these, seven are endemic species (see Table 1). Two species – *Danio pathirana* and *Macrognaathus aral* – are critically endangered. The revenue from the export of endemic freshwater fish accounts for just 0.16% of the total ornamental fish trade. Considering this fact, and the current conservation status of endemic species in Sri Lanka, the collection of endemic ornamental species from the wild is a highly unsustainable activity which, if continued, will soon drive nationally threatened endemic species towards extinction!

## Recommendations for the Regulation of the Export of Indigenous Freshwater Fish Species

Based on the findings of the research, the following recommendations are made to ensure that the future of the trade in the export of indigenous freshwater ornamental fish species in Sri Lanka is conducted in a sustainable manner:

### 1. Policy and Legislation

- ❖ Formulate a national policy in conservation of indigenous freshwater fish species of Sri Lanka.
- ❖ The export of stocks of nationally threatened indigenous freshwater fish species collected from the wild should be banned.
- ❖ The relevant schedules of the Fauna & Flora Protection Ordinance (FFPO) should be revised, and the discrepancies between the Ordinance and the Fisheries Act addressed to fill the current legislative loopholes in the ornamental fish trade.
- ❖ The two critically endangered and endangered freshwater ornamental fish species captured for export should be included in CITES Appendix 1, and the vulnerable species included in Appendix 2. The DWC, as the CITES management authority, should lead this effort, with the support of the other relevant agencies and institutions. Such a proposal should be made at the very next CITES COP.
- ❖ The Fisheries Department should strictly regulate the issue of export permits on restricted fish species, and refrain from issuing permits for the transportation of endangered fish species.
- ❖ Countries suffering similar problems in the ornamental fish trade should make a proposal to the World Customs Organisation to create better Commodity Codes (HS

Codes) for ornamental fish, and change the unit of measurement for live fish from Kg to the number of fish exported.

- ❖ A cess (a form of tariff) should be charged from exporters of indigenous freshwater fish collected from the wild and this income should be diverted towards the implementation of conservation strategies for threatened freshwater species and their habitats.
- ❖ A minimum floor price for the export of indigenous freshwater fish should be established by the Department of Fisheries, in collaboration with the EDB and DWC, to ensure due foreign revenue from this trade.

## 2. Institutional Interventions

- ❖ A mechanism should be established for the monitoring the export of indigenous ornamental fish species with the participation of all relevant government (DWC, Customs, EDB, FD, NARA, NAQDA, Universities) and non-governmental (IUCN, YZA) organisations. Monitoring should consider the species, their numbers exported, and verify the source of their origin i.e. whether collected from the wild or captive-bred.
- ❖ The EDB should assist ornamental fish traders and breeders to initiate captive breeding programmes of indigenous freshwater fish for export. This could include concessionary loans and tax exemptions, etc. to establish the relevant infrastructure for captive breeding.
- ❖ The Customs Departments of South Asian countries should establish a better monitoring system for the trans-boundary movement of ornamental fish.
- ❖ A link should be made between the Customs Department and the Ministry of Environment to effectively utilize the revenue generated from the earlier proposed cess.

## 3. Research Interventions (to be promoted through NARA, NAQDA and Universities)

- ❖ Research should be initiated to assess the status of wild populations of *Monodactylus argenteus* and *Garra ceylonensis* which are heavily exploited at present.
- ❖ An island-wide survey should be conducted to determine the population status and distribution of the rare and threatened *Danio pathirana*, *Macrogathus aral* and *Sicyopterus griseus*.
- ❖ NARA, NAQDA and universities should initiate research (in partnership with foreign institutions that have the necessary technology) on the captive breeding of indigenous freshwater fish for whom there is a demand in the export markets. They should also focus on enhancing the ornamental quality of captive bred stocks, to capitalize on trade opportunities in the world market.

## 4. Conservation of the Habitats of Freshwater Fish Species

- ❖ Community based conservation programmes should be initiated to conserve the habitats of endemic (and 'point endemic') species occurring outside protected areas. Special attention should be paid to the following 'point endemics' - *Puntius asoka* in a tributary of the Kelani River (Kottelat et al., 1989), *Puntius bandula* in Galapitamada, *Danio pathirana* in Opatha, *Schismatogobius deraniyagala* in Yatiyantota, *Sicyopus jonklaasi* and *Stiphodon martensyeni* In Athweltota, and *Sicyopterus griseus* in Yogama (Pethiyagoda, 2006). The revenue generated from the proposed cess fund could be utilised for this.

- ❖ Ornamental fish exporters, who generate large profits from this trade, should be encouraged to invest in such conservation projects as part of their corporate social and environmental responsibility.

## **5. Recovery of Threatened Wild Populations**

- ❖ Scientific species recovery plans should be formulated for the nine species of nationally threatened freshwater fish species.
- ❖ As highlighted by previous researchers, a programme of re-introduction of captive-bred populations to the wild should be pursued. Such programmes, however, should be carefully planned to ensure that the existing wild populations are not subject to potential genetic changes and disease.

## **6. Capacity Development**

- ❖ The role of the Department of Wildlife Conservation, as well as that of the Customs Department, should be strengthened in the regulation of the freshwater fish trade. This can be achieved by developing the capacity of the respective officers to identify freshwater fish species and their habitats. Field Identification Manuals should be prepared to facilitate this process.
- ❖ The capacity and infrastructure of research agencies such as NARA and NAQDA should also be developed to implement research on captive breeding of indigenous freshwater fish in Sri Lanka.

## **7. Promoting Education and Awareness**

- ❖ The results of this research should be used to promote awareness among the relevant government departments (DWC, FD, NARA, NAQDA, Customs and EDB) in highlighting the issues related to this trade.
- ❖ A media campaign should be initiated to promote public awareness on the issues related to the collection of wild populations of freshwater fish species for export.
- ❖ Education programmes should be organized to target environmental groups (NGOs, CBOs, School Nature Clubs, etc.) who can play a major role in acting as points of vigilance in curbing the illegal collection of specimens from the wild.