



FRESHWATER ICHTHYOFAUNA IN THE MULLEGAMA-HABARAKADA AREA, COLOMBO DISTRICT, SRI LANKA

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Abstract: The diversity of fishes in a small stream in the Mullegama-Habarakada area of Sri Lanka was studied. A total of 16 species belonging to nine families were recorded, of which three are endemic and two are exotic to the country. The threats to the area include habitat degradation as a result of release of waste water, unmanaged waste disposal, sand mining and algal blooms. The abundance of Cherry Barb *Puntius titteya* was very low during the study period. This species is likely to be extirpated from Habarakada, unless urgent conservation measures are taken.

Keywords: Conservation, fish, *Puntius titteya*, threats.

Sri Lanka has a high diversity of vertebrate fauna (IUCN Sri Lanka & MENR 2007), including 93 native freshwater fishes (53 endemics) (MoE 2012; Batuwita et al. 2013). Of these, 21 are listed as Critically Endangered, 19 as Endangered and five as Vulnerable in the National Red List (MoE 2012). In addition, 24 exotic species have been introduced to the island, mainly to boost aquaculture and inland capture fisheries (Goonatilake 2007).

Habitat degradation is the major threat affecting the survival of Sri Lanka's freshwater fishes (Senanayake & Moyle 1982). For example, in Colombo District, increased urbanization has resulted in the decline of natural fish habitats. Thirty-three species of freshwater fish were recorded at the Bellanwila-Attidiya Sanctuary during

1980 to 1988 which is located close to the suburbs of Colombo (Nalinda 1988), while this number decreased to 22 species in 2005–2006 (Karunaratna et al. 2010) and to a mere eight species in 2012 (Goonatilake 2012). Kotalawala (1994) recorded 28 species from Wak Oya, a tributary of the Kelani River on the outskirts of Colombo. The outskirts of Colombo still provide important habitats for the persistence of native freshwater fishes with ~40+ species having high endemism (Hiranya Sudasinghe, pers. obs. 2013). Therefore, conserving these last remaining habitats is vital to ensuring the survival of freshwater fishes.

The main threats to the native fish fauna in Colombo District include water pollution, habitat loss, destruction of aquatic vegetation and exotic species (Karunaratna et al. 2010) together with deforestation, urbanization, gem mining, toxic spills and weirs (Kotalawala 1994).

The Cherry Barb *Puntius titteya* is an Endangered (MoE 2012) and endemic cyprinid which prefers heavily shaded streams in the lowland wet zone of the country. It is distributed from Kelani to Nilwala (Pethiyagoda 1991) and in Walawe basins (Batuwita et al. 2013). The status of *P. titteya* in the district of Colombo is however not clearly understood. Deraniyagala (1929) in his description of *P. titteya* recorded it from Wye

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Estate, Homagama which is close to Habarakada, on the outskirts of Colombo. *Puntius titteya* is still observed in small shady streams on the outskirts of Colombo District (Hiranya Sudasinghe, pers. obs. 2013). This study was conducted in Habarakada to understand the diversity of fish species and assess the status of, and threats affecting *P. titteya* and their habitats.

Materials and Methods

Study area: Mullegama-Habarakada area is located in Colombo District of the wet zone of Sri Lanka approximately 4km from Godagama Town (Fig. 1). The study was conducted at a small stream flowing in-between a paddy field and an area of human habitation. The study site is located at a distance of about 100m from the Meegoda-Athurugiriya Road (B240). Land use pattern in this region consists of paddy fields and residential areas. The stream flows along the side of the paddy fields for about 360m and then connects to a main canal running through the paddy fields. The closest major river to the study site is the Kelani River. Brief descriptions of the sampling sites are given in Table 1.

Fish Sampling: Our sampling sites consisted of habitats that differed in canopy shade, stream substrate,

relative visibility, marginal vegetation, surrounding, as well as type and intensity of human disturbances. Four such different habitats were selected along the stream and were named as Plot A, B, C and D (Images 1 a–e). Though the survey was started in the month of December 2009, field visits were carried out prior to the survey, beginning August 2009. Field visits were made twice a month for a period of one year from December 2009 to December 2010. Two night visits were organized in order to observe the nocturnal species. The fishes were caught using a hand net (60×30 cm), transferred to a glass tank, identified and released back to their habitat. Snorkeling was done at Plot C in order to observe the behavior of a few species. The species were identified following Pethiyagoda (1991), Goonatilake (2007) & Silva et al. (2010).

Results

A total of 16 fish species belonging to nine families (Table 2) were recorded during the study, i.e., 13.67% of the overall freshwater fish diversity of Sri Lanka. This includes three endemic and two exotic species. The three endemic species recorded during the study were Smooth-breasted Snakehead *Channa orientalis*, Horadandia *Horadandia atukorali* and Cherry

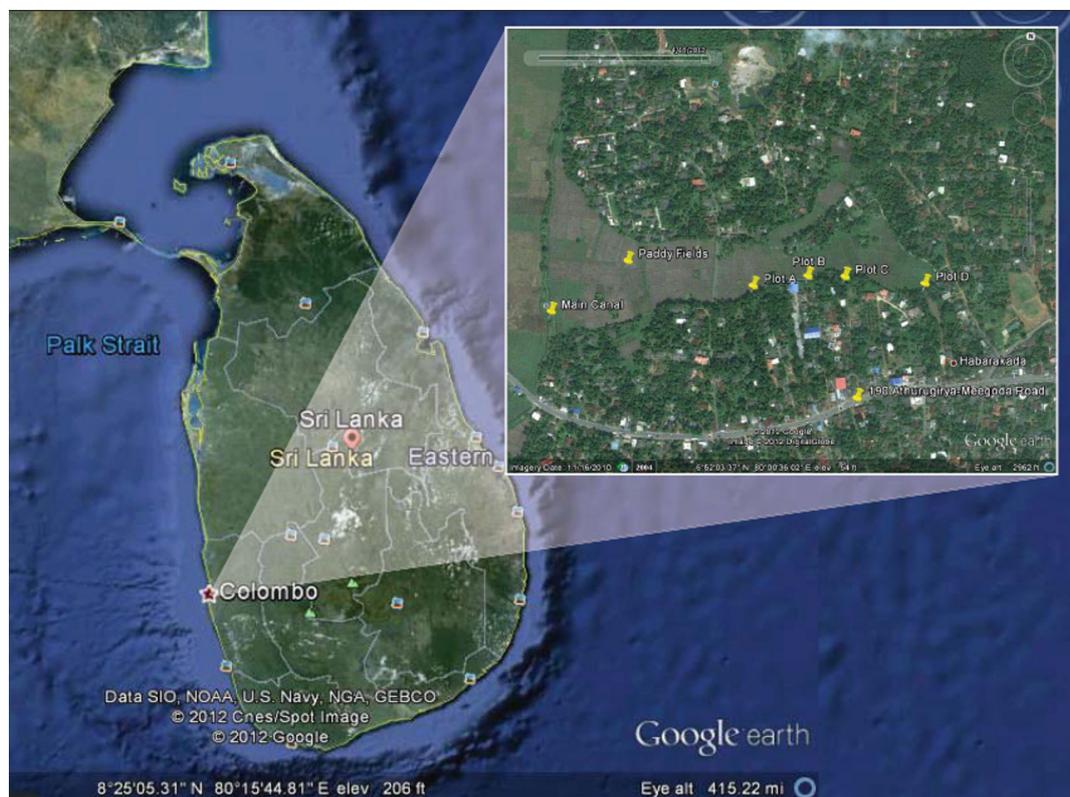


Figure 1. Map of Sri Lanka showing the study area

Table 1. Description of the sampling sites

| Sampling site | Canopy shade | Marginal vegetation | Relative visibility of stream | Stream substrate | Surrounding land use |
|---------------|--------------|---|-------------------------------|---|--|
| A | 60–70 % | Heavily margined by shrubs and bushes and ferns with few trees. | Clear, bottom visible | Mainly muddy with leaf debris and few pebbles | Paddy fields on one side and other side consists of a sparsely wooded undeveloped land |
| B | Open; 0% | Weeds and grasses | Clear, bottom visible | Mud, sandy | Human settlements and paddy fields |
| C | 90–100 % | Heavily margined by shrubs and bushes with ferns and trees. | Clear, bottom visible | Mainly leaf debris. Other than that sand and clay | Surrounded by several large trees and bushes. |
| D | 80–90 % | Weeds, grasses and few ferns and trees. | Clear, bottom visible | Mainly sandy followed by few leaf debris and mud. | Human settlements and paddy fields |

Table 2. Checklist of freshwater fish recorded from the four sampling sites.

| Family | Scientific name | Common name | Occurrence | | | | NCS |
|------------------|---|----------------------------|------------|---|---|---|--------|
| | | | A | B | C | D | |
| Anabantidae | <i>Anabas testudineus</i> (Bloch, 1792) | Climbing Perch | + | - | - | - | I/ LC |
| Bagridae | <i>Mystus vittatus</i> (Bloch, 1794) | Striped Dwarf Catfish | + | - | - | - | I/LC |
| Osphronemidae | <i>Pseudosphromenus cupanus</i> (Cuvier, 1831) | Spike Tailed Paradise Fish | - | - | + | - | I/LC |
| Channidae | <i>Channa orientalis</i> Bloch & Schneider, 1801 | Smooth Breasted Snakehead | + | - | + | + | E/VU |
| Cichlidae | <i>Oreochromis mossambicus</i> (Peters, 1852) | Tilapia | + | - | + | + | Ex |
| Cobitidae | <i>Lepidocephalichthys thermalis</i> (Valenciennes, 1846) | Common Loach | + | + | + | + | I/LC |
| Cyprinidae | <i>Devario malabaricus</i> (Jerdon, 1849) | Giant Danio | + | + | + | + | I/LC |
| | <i>Horadandia atukorali</i> Deraniyagala, 1943 | | + | - | - | - | E/VU |
| | <i>Puntius bimaculatus</i> (Bleeker, 1863) | Red Side Barb | + | + | + | + | I/LC |
| | <i>Puntius titteya</i> Deraniyagala, 1929 | Cherry Barb | + | - | + | + | E / EN |
| | <i>Puntius vittatus</i> Day, 1865 | Silver Barb | + | + | + | + | I/LC |
| | <i>Systemus sarana</i> (Hamilton, 1822) | Olive Barb | + | - | + | + | I/DD |
| | <i>Rasbora microcephalus</i> (Jerdon, 1849) | Cauvery Rasbora | + | + | + | + | I/LC |
| | <i>Rasbora dandia</i> (Valenciennes, 1844) | Striped Rasbora | + | + | + | + | I/LC |
| Heteropneustidae | <i>Heteropneustes fossilis</i> (Bloch, 1794) | Stinging Catfish | + | - | + | - | I/LC |
| Poeciliidae | <i>Poecilia reticulata</i> Peters, 1859 | Saree Guppy | + | + | + | + | Ex |

+ - Present; -- Absent; NCS - National Conservation Status (National Red List, MoE 2012); I - Indigenous; E - Endemic; Ex - Exotic; EN - Endangered; VU - Vulnerable; LC - Least Concern; DD - Data Deficient).

Barb *Puntius titteya*. The two exotic species were Mozambique Tilapia *Oreochromis mossambicus* and Guppy *Poecilia reticulata*. Family Cyprinidae dominated the fauna with eight species, i.e., 50% from the total number. All the other families were represented by a single species. *Rasbora dandia* (Image 2f), *Puntius bimaculatus* and *Devario malabaricus* (Image 2e) were the most abundant species inhabiting all the four habitats. *Channa orientalis* and *Heteropneustes fossilis* were the predatory fishes recorded from the stream. Of these two, *C. orientalis* was found in higher abundance than *H. fossilis*. The occurrence of each species in the four sampling sites is given in Table 2.

Plot A had the highest, and Plot B had the lowest species richness. *Anabas testudineus*, *Mystus vittatus*, *H. fossilis* and *S. sarana* were recorded in lesser numbers. The former two were recorded only in plot A while *H. fossilis* was recorded both in plot A and C and *S. sarana* was recorded in plot A, C and D. They were mainly recorded after heavy rain during which water levels were elevated. The majority of fish recorded in Plot B were *P. reticulata* that were able to survive in disturbed conditions. Of the seven species observed at Plot B, only *P. reticulata* was found throughout the year while other fish were recorded only when the water level was high post monsoon. *Pseudosphromenus cupanus* belonging

to the family Osphronemidae was only recorded from Plot C. This can be attributed to the habitat preference of this species, which includes an abundance of leaf debris, well shaded, with submerged roots and logs (see Pethiyagoda 1991).

Status of Cherry Barb in Mullegama-Habarakada area: Both adults and juveniles of *P. titteya* were recorded from August 2009 to February 2010. *Puntius titteya* was recorded from three sampling sites (Plots A, C and D). The abundance of adults and juveniles of *P. titteya* in each sampling site is given in Table 3. *Puntius titteya* was found mainly under submerged roots and logs, or around leaf debris as in the case of Plots C and D, and among overhanging plants of the bank in Plot A. The species occupied a level closer to the bottom of the water column in small groups (2–4 individuals), or was seen as solitary individuals near the edge of the stream with intra-specific interactions rarely observed. See Image 2a and 2b for the colour variety of Cherry Barb observed in the study site.

During the months of February and March, the whole stream dried up (Image 1b). After the short drought period which lasted for two months (February 2010 to March 2010), *P. titteya* was not recorded except

once in Plot C during May 2010, when a well grown adult female *P. titteya* was observed. However, following the heavy rains which started from April, the other common species of the stream like *R. dandia*, *D. malabaricus*, *Lepidocephalichthys thermalis* and *P. bimaculatus* were recorded, but not *P. titteya*.

On a subsequent visit to the area in July 2013, we recorded 15 adults of *P. titteya* (five males and 10 females) in Plot C, but were unable to record any individuals from Plot A and D which appeared more disturbed and polluted (especially Plot D). On the positive side, we observed about 20 individuals of adult *P. titteya* in a clean well (~2.5m in length and ~2m in depth) which is used for bathing by the villagers, located in between Plot C and B close to the stream (~3m) (Image 1f). This well could be a permanent site for *P. titteya* since it does not dry up during the drought periods. In addition to *P. titteya*, two adult *C. orientalis* were also observed from the well.

Threats: The main threats to Plot A were soap water entering from a nearby bathing area, and the slow flow rate of water resulting in the chemicals becoming stagnant. An algal bloom was also observed during the latter part of the study (Image 3d). The bank of the stream in Plot A was undisturbed during the initial days of the study period, but was seen to be disturbed during the latter part as several large trees were cut down, exposing the bottom to sunlight.

Plot B comprised the part of the stream that has been polluted due to human activities including directing wastewater from a nearby human settlement. Though Plot C was relatively undisturbed, it also faced several anthropogenic threats, the greatest being sand mining (Image 3c). Even in this very small stream, villagers indulged in sand mining and also built several dams along the stream thus reducing the water flow. This resulted in a lowering of depth, as well as the flow rate of Plot C thereby reducing its visibility.

When the survey began, Plot D was one of the most undisturbed habitats (Image 2c), but with time it gradually became polluted similar to Plot B (Image 2d). Anthropogenic impacts were the greatest around Plot D. Contamination with chemicals washed away from the paddy fields and disposal of household garbage directly into the water were the main threats (Image 3 a,b). Plot D is the best example to demonstrate how a very fragile habitat can change within a short period of time into a barren and polluted one.

Table 3. Abundance of *P. titteya* in Mullegama-Habarakada.

| Month and Year | Plot A | | Plot C | | Plot D | |
|----------------|--------|---|--------|---|--------|----|
| | A | J | A | J | A | J |
| August 2009 | 7 | 5 | 13 | 4 | 17 | 10 |
| September 2009 | 9 | 5 | 16 | 8 | 14 | 8 |
| October 2009 | 5 | 6 | 12 | 6 | 18 | 9 |
| November 2009 | 11 | 7 | 11 | 5 | 19 | 8 |
| December 2009 | 9 | 5 | 15 | 7 | 14 | 5 |
| January 2010 | 13 | 8 | 12 | 4 | 10 | 7 |
| February 2010 | - | - | 7 | 9 | 6 | 11 |
| March 2010 | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - |
| May 2010 | - | - | 1 | - | - | - |
| June 2010 | - | - | - | - | - | - |
| July 2010 | - | - | - | - | - | - |
| August 2010 | - | - | - | - | - | - |
| September 2010 | - | - | - | - | - | - |
| October 2010 | - | - | - | - | - | - |
| November 2010 | - | - | - | - | - | - |
| December 2010 | - | - | - | - | - | - |
| July 2013 | - | - | 15 | - | - | - |

A - Adults; J - Juveniles



Image 1a. Plot A during the rainy season



Image 1b. Plot A dried up during the drought period



Image 1c. Plot C



Image 1d. Plot D during the early stages of study



Image 1e. Plot B



Image 1f. The well in which *P.titteya* was observed

Image 2a. Male *P. titteya* with neon glow observed at Plot CImage 2b. Female *P. titteya* observed at Plot CImage 2c. Habitat of *P. titteya* in Plot D photographed in 2009Image 2d. Habitat of *P. titteya* shown in Image 2c photographed in 2013Image 2e. *Devario malabaricus* observed at Plot CImage 2f. *Rasbora dandia* observed at Plot C

Discussion

Though underestimated, small streams like those in Mullegama-Habarakada area are of great importance for endemic aquatic fauna.

Puntius titteya which was categorized as 'Vulnerable' (IUCN Sri Lanka & MENR 2007) has now been elevated to the status of an 'Endangered' species (MoE 2012). The main threats to the species being overfishing for aquarium trade, pollution of streams and deforestation (Pethiyagoda 1991). At our study sites, the latter two

were observed to be the main threats to the population of *P. titteya*. Mullegama-Habarakada area is one of the closest places to Colombo, where *P. titteya* can be found in the wild. However there is a possibility of extirpation of the species from this region if urgent conservation measures are not taken.

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Image 3a. Disposal of garbage at Plot D



Image 3b. The agro chemicals used in the paddy fields at Plot D



Image 3c. Sand mining at Plot C



Image 3d. An algal bloom observed at Plot B

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