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Short paper

Checklist of ichthyofauna of Madampa-Lake sanctuary in Ambalangoda, Southwest Sri Lanka

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Abstract. Coastal lagoons provide unique services for many kinds of aquatic and semi aquatic organisms. Madampa-Lake is a brackish water lagoon containing a dynamic mangrove ecosystem complex with extraordinary genetic diversity, which is located in the southwest coastal belt near Ambalangoda city, Galle District. Very little literature is available on the Madampa-Lake's fish and almost none of them have been published. A preliminary assessment on vertebrates and butterfly fauna was carried out during April 2009 to August 2010, and this article covers ichthyofaunal phase of the survey. Ichthyofauna diversity of Madampa is a combination of salt water (sea), brackish water and fresh water fish and their different life stages. During this study, a total of 49 species (33 families) were recorded, and this included two endemics and five alien species.

Keywords. Brackish-water fauna, conservation, lagoons, mangrove-ecosystem, Sustainable uses.

1 Introduction

The Madampa-Lake (henceforth, Madampa) (80º 03' 11.52"E - 80º 05' 21.12" E, and 6º 14' 32.64" N - 6º 13' 1.92" N, Google Earth 2015) is a coastal, brackish water lagoon which covers an area of 1.8 km^2 with surrounding mangrove ecosystem (Silva *et al.* 2013) (Figure 1). In September 2007, Madampa was declared a sanctuary in Sri Lanka due to its environmental and socioeconomic value. As such, livelihoods in the vicinity are intricately connected with this lagoon. Whilst most of residents are engaged in fishing, some people do agricultural farming or cultivate cinnamon. Raw materials for mask and puppet production are one of major

products of Madampa. Madampa ecosystem is linked with Madu-Ganga Ramsar site, thereby has an enriched biodiversity. As very little information is known about ichthyofaunal composition of this ecosystem, the current study will form the basis for further research.

2 Materials and Methods

2.1 Study area

Madampa contains rich density of mangrove vegetation such as *Sonneratia caseolaris*, *Cerbera odollam*, *Bruguiera sexangula*, and *Acrostichum aureum*. Introduced plants such as, *Annona glabra* and *Phragmites karka* also occur around Madampa (Figure 2). The temperature of Madampa lake waters is known to vary between 28°C-32°C, and pH 6.76-8.00.

Fig 1. **Aerial view of Madampa Lake and surrounding area** (Google Earth 2015).

2.2 Sampling and observations

As part of a biodiversity checklist assessment of Madampa, ichthyofaunal diversity was investigated from April 2009 to August 2010. Bankside observations (Sutherland 1996), random spotting, both day time and nocturnal observations with torching at night were done.

Fig 2. Vegetation in Madampa Lake, Ambalangoda, Sri Lanka

Observation was also made searching by hand net 3-6 ft in clear water by the bank in Godahena Thotupala (6° 14' 11.39" N - 80° 4' 15.15" E) and same practice was applied in Kobeyithuduwa Thota (6° 13' 27.97" N- 80° 3' 59.41" E), 10 m distance along left and 10 m along right in both plots.

Nagenahiru Environmental Education Centre (Ambalangoda) has provided a walking platform to explore the mangrove ecosystem, and this platform continues up to the lake waters, and this facility has been used to search high tide waters to identify many species. Most of the species could be instantly identified in the field but some species were transferred to glass tank to undergo detailed taxonomic identification. This practice was carried out repeatedly throughout January to July both day and night, fortnightly. Due to the limitations, it has not been possible to count numbers of specimens of each species, but the number of species is listed.

In addition to the terrestrial study sites, 21 boat expeditions were made along the south and west water edges of the Madampa for opportunistic spotting, during day time and there were 4 boat expeditions at night (average 45 minutes for each). This opportunistic spotting expedition was carried out during the first week of April 2009 to 15th of August 2010. A small hand net (30cm X 45cm) attached to 200 cm handle and a small cone-shaped drag net (100 cm diameter X 150 cm depth) were used to search for fish in shallow banks which was less than one meter deep, along the eastern bank of Madampa. Glass aquarium tanks were used to keep captured fish alive for the purpose of identification. Digital photograph were taken using Sony Cyber-shot DSC-HX300. Captured live specimens were released back to the

same habitats where they discovered and no voucher specimens were collected.

The deep open water specimens were collected and identified by examining in the fishermen's daily gillnet catches over the 6 days of 1st week of May 2010. The size of the gill net was 64 m X 3.8m (stretches mesh size 12.7 cm). Fish species were identified and classified using guide books, taxonomy keys (Day 1889a, 1889b; Deraniyagala 1952; Pethiyagoda 1991; Murdy and Shibukawa 2003; De Silva *et al.* 2015) and information from www.fishbase.org (Froese and Pauly 2016).

3 Results

A total of 49 fish species inhabiting brackish water, fresh water or migratory species were recorded from Madampa during this survey. Recorded Species belonged to 33 families, and included two endemic species, five exotic alien species (Table 1).

Nile tilapia *Oreochromis niloticus* (plate 4, H), Mossambique tilapia *Oreochromis mossambicus*, green chromid *Etroplus suratensis* (plate 1, M) and blue eyes *Oryzias melastigma* (plate 2, N) were the most common species observed. Of the introduced species recorded during the study, the iridescent shark catfish *Pangasianodon hypophthalmus* (plate 4, J) is the first record from Sri Lankan natural habitats (*see* also Jayaneththi 2015) and the record of scaleless worm goby *Caragobius urolepis* (Figure 3) and sharptail goby *Oligolepis cf. acutipennis* (plate 2, G) were other potential new island records from this study. The Werner's killifish *Aplocheilus werneri* (plate 1, D), and nationally 'Near Threatened' walking catfish *Clarias brachysoma* (plate 1, N) were noted as endemics. *A. werneri* were less abounded around the lake water, but small freshwater habitats supplies adequate habitats for them.

Fig 3. Live specimen of scaleless worm goby *Caragobius urolepis* recorded from Madampa

Table 1. Checklist of ichthyofauna recorded during the study; (LC= Least Concerned; DD= Data Deficient; NT= Near Threatened; E= Endemic, IN= Introduced species recorded; *= Potential island record by this study; LC= Least) (global status after The IUCN Red List of Threatened Species, 2016 and National status after MENR, 2012).

Family	Common name	Binomial nomenclature	Global status	National status
Ambassidae	Common Glassfish	*Ambassis ambassis*	LC	
Anabantidae	Climbing Perch	*Anabas testudineus*	DD	LC
Anguillidae	Level-finned Eel	*Anguilla bicolor*	NT	LC
Aplocheilidae	**Werner's Killifish**	***Aplocheilus werneri***		E
Aplocheilidae	Dwarf panchax	*Aplocheilus parvus*		LC
Apogonidae	Translucent Cardinalfish	*Apogon thermalis*		
Bagriidae	Long whiskered Catfish	*Mystus gulio*	LC	LC
Belonidae	Spottail Needlefish	*Strongylura strongylura*		
Belontidae	Spike-tailed Paradise-fish	*Pseudosphromenus cupanus*	LC	LC
Belontidae	Snake-skin Gourami	*Trichogaster pectoralis*		IN
Carangidae	Bigeye trevally	*Caranx sexfasciatus*	LC	
Channidae	Spotted Snakehead	*Channa punctata*	LC	LC
Channidae	Murrel	*Channa striata*	LC	LC
Cichlidae	Orange Chromide	*Etroplus maculatus*	LC	LC
Cichlidae	Green Chromid	*Etroplus suratensis*	LC	LC
Cichlidae	Mossambique mouth-brooder	*Oreochromis mossambicus*	NT	IN
Cichlidae	Nile Tilapia	*Oreochromis niloticus*		IN
Clariidae	**Walking Catfish**	***Clarias brachysoma***		E/ NT
Clupeidae	Bloch's gizzard shad	*Nematalosa nasus*	LC	
Cyprinidae	Stripped Rasbora	*Rasbora dandia*		
Cyprinidae	Silver Barb	*Puntius vittatus*	LC	
Eleotrididae	Brown Gudgeon	*Eleotris fusca*	LC	LC
Eleotrididae	Upside-down Sleeper	*Butis butis*	LC	LC
Gerreidae	Whip-fin Silver Biddy	*Gerres filamentosus*	LC	
Gerreidae	Saddleback Silver Biddy	*Gerres limbatus*	LC	
Gerreidae	Common Silver Biddy	*Gerres oyena*	LC	
Gobiidae	Bar-eyed Goby	*Glossogobius giuris*	LC	LC

Table 1 continued.

Family	Common name	Binomial nomenclature	Global status	National status
Gobiidae	Sharp-tail Goby	*Oligolepis cf. acutipennis*	DD	
Gobiidae	Speckled Goby	*Redigobius bikolanus*	LC	
Gobiidae	Rhino-horned Goby	*Redigobius balteatops*		
Gobiidae	Scaleless worm goby	*Caragobius urolepis*	LC	*
Haemulidae	Javelin grunter	*Pomadasys kaakan*		
Hemiramphidae	Halfbeak	*Zenarchopterus dispar*	LC	
Hemiramphidae	Congaturi Halfbeak	*hyporhamphus limbatus*	LC	
Heteropneustidae	Stinging Catfish	*Heteropneustus fossilis*		LC
Leiognathidae	Common Pony fish	*Leiognathus equulus*	LC	
Loricarridae	Glass Cleaner	*Pterygoplichthys multiradiatus*		IN
Megalopidae	Tarpon	*Megalops cyprinoides*	DD	
Monodactylidae	Mono	*Monodactylus argenteus*		
Mugilidae	Greenback mullet	*Chelon subviridis*		
Oryziidae	Spotted ricefish	*Oryzias carnaticus*	LC	LC
Pangasiidae	Iridescent Shark Catfish	*Pangasianodon hypophthalmus*	EN	IN / *
Scatophagidae	Scat	*Scatophagus argus*	LC	
Siganidae	Rabbit fish	*Siganus javus*	LC	
Soleidae	Oriental Sole	*Brachirus orientalis*		
Syngnathidae	Belly pipefish	*Hippichthys heptagonus*	LC	
Teraponidae	Crescent Perch	*Terapon jarbua*	LC	
Tetraodontidae	Common Puffer	*Tetraodon fluviatilis*	LC	
Tetraodontidae	Milkspotted puffer	*Chelonodon patoca*	LC	

Total of 32 species are categorized by Global IUCN red list, as three (3) species are 'Data Deficient' (*Anabas testudineus*, *Oligolepis cf. acutipennis* and *Megalops cyprinoides*), one indigenous species were 'Near Threatened' (*Anguilla bicolor*). Whilst most fish species were estuarine fish, there were also freshwater and saltwater species. *Trichogaster pectoralis*, *Oreochromis niloticus*, and *Pterygoplichthys multiradiatus* are well established invasive level species of the Madampa.

4 Discussion and Conclusion

Many of the brackish water fish species in Sri Lanka are migrating between sea and fresh waters. The incomplete checklist detailed more than 100 edible fin fish species from brackish water habitats in Sri Lanka, while 70 % of them Anadromous, Catadromous or Amphidromous and the remainder are restricted to brackish water (clarified after, Pillai, 1965; Froese & Pauly,

2016). It is obvious that the dynamic mangrove complex provides adequate services and facilities to all kind of stakeholders (Silva *et al.* 2013).

Table 02; comparison of ichthyofauna of Madampalake with Maduganga and Island records.

	Total	Freshwater related species	Introduced	Endemic
Sri Lanka	>200 (brackish water records)	137	24+	53
Madu-ganga	70	17	1	2
Madampa	49	21	5	2

(Reviewed from recorded data of Pillai (1965), Pethiyagoda (1991), Bambaradeniya *et al.* (2002), De Silva *et al.* (2015), Froese & Pauly (2016))

The current study revealed that Madampa contains a dynamic gene pool when compared with the catchment area (1.8 km^2) which is low, relative to other brackish water complexes in the Island. Maduganga complex and vicinity contains well over 70 species of ichthiyofauna (see Bambaradeniya et al. 2002) out of around 200+ of island brackish water fish species (incomplete) (see Table 02). Although recorded from Sri Lankan natural habitats for the first time (*see* Jayaneththi 2015), there is no evidence that *Pangasianodon hypophthalmus* is established in the lagoon. It may have been an escapee from an ornamental fish facility.

In comparison with other brackish water habitats, Madampa also displays multiplicity in the fish community through 33 families (see Table 03), of which none of them seems to dominate. The major minority was family Gobiidae with ~10% of relative diversity. Many potential new site records could be determined if further surveys covers in Madampa, and autecology of some 'Data Deficient' species could be important area to study.

This ecosystem has already come into conflict with humans, as many human activities have affected to the quality of the habitat and the biodiversity. Illegal liquor producing, deforestation, hunting and poaching, dumping and land filling were noted as common detrimental activities. Chemical and biological contamination are some prevalent issues of the Madampa. Invasive taxa are the one of many lines for further investigation. Unfortunately even fishing nets have a negative effect on animals other than fish, aquatic or semi aquatic reptiles such as *Varanus salvator* and *Cerberus rynchops* are regular victims of the fishing nets.

Table 03. Relative diversity of ichthyofauna families recorded by current study

Family	Number of species	Relative diversity
Ambassidae	1	2.04%
Anabantidae	1	2.04%
Anguillidae	1	2.04%
Aplocheilidae	2	4.08%
Apogonidae	1	2.04%
Bagriidae	1	2.04%
Belonidae	1	2.04%
Belontidae	2	4.08%
Carangidae	1	2.04%
Channidae	2	4.08%
Cichlidae	4	8.16%
Clariidae	1	2.04%
Clupeidae	1	2.04%
Cyprinidae	2	4.08%
Eleotrididae	2	4.08%
Gerreidae	3	6.12%
Gobiidae	5	10.20%
Haemulidae	1	2.04%
Hemiramphidae	2	4.08%
Heteropneustidae	1	2.04%
Leiognathidae	1	2.04%
Loricarridae	1	2.04%
Megalopidae	1	2.04%
Monodactylidae	1	2.04%
Mugilidae	1	2.04%
Oryziidae	1	2.04%
Pangasiidae	1	2.04%
Scatophagidae	1	2.04%
Siganidae	1	2.04%
Soleidae	1	2.04%
Syngnathidae	1	2.04%
Teraponidae	1	2.04%
Tetraodontidae	2	4.08%

The livelihood of many of the villagers is maintained by the selling of mangrove fruits such as those of *Sonneratia caseolaris* and leaves of the 'Mangrove fern' *Acrostichum aureum*. However, due to the belief that mangroves serve no purpose, the trees are used in a destructive manner. For example when collecting the fruits of these trees branches are cut haphazardly and entire trees may be cut to be used as firewood. Therefore public awareness programs and proper conservation management plans are required to protect these sensitive habitats in the near future.

Plate 1. Selected fishes from Madampa Lake, Sri Lanka
(All photos by H.B. Jayaneththi)

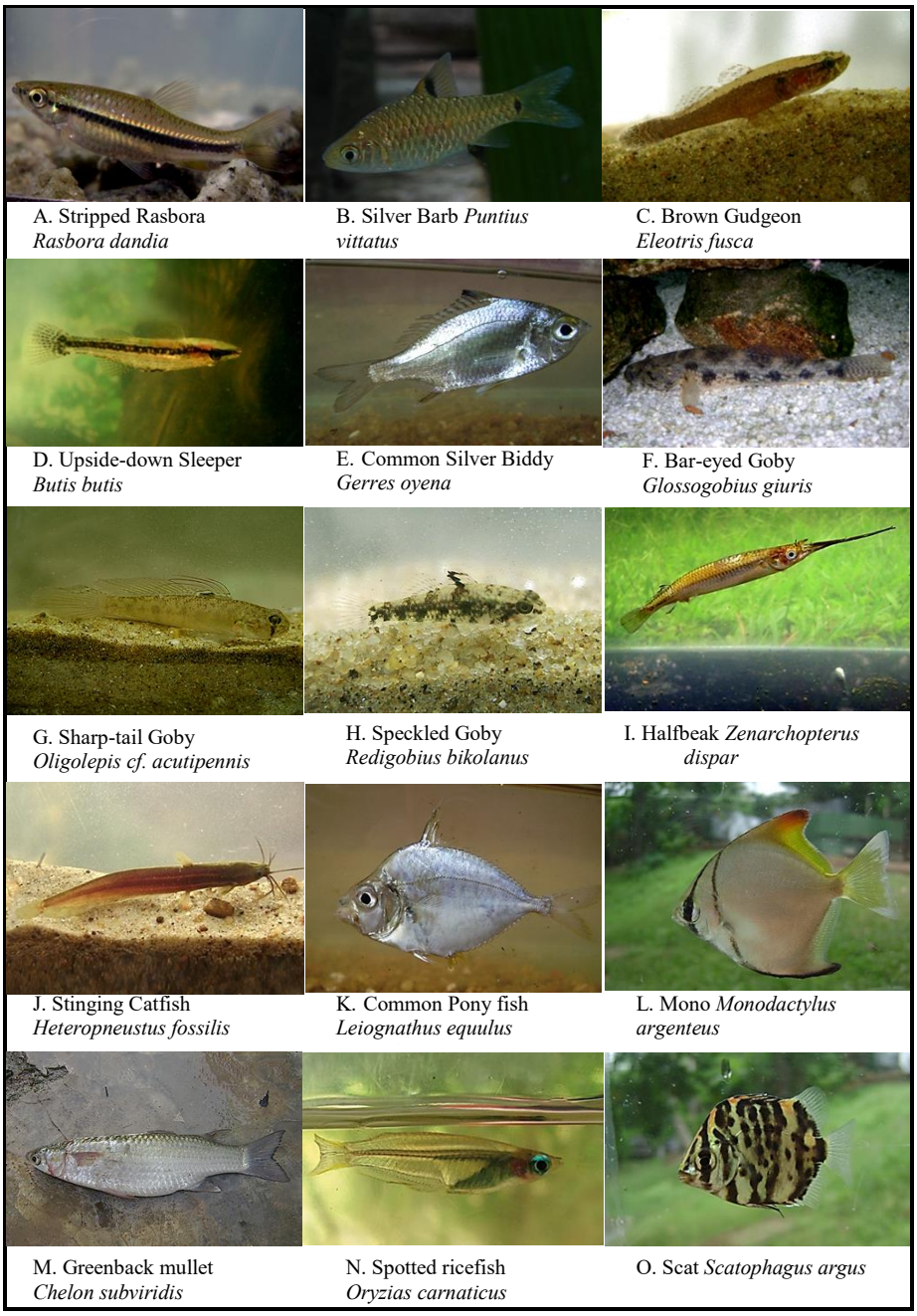

Plate 2. Selected fishes from Madampa Lake, Sri Lanka
(All photos by H.B. Jayaneththi)

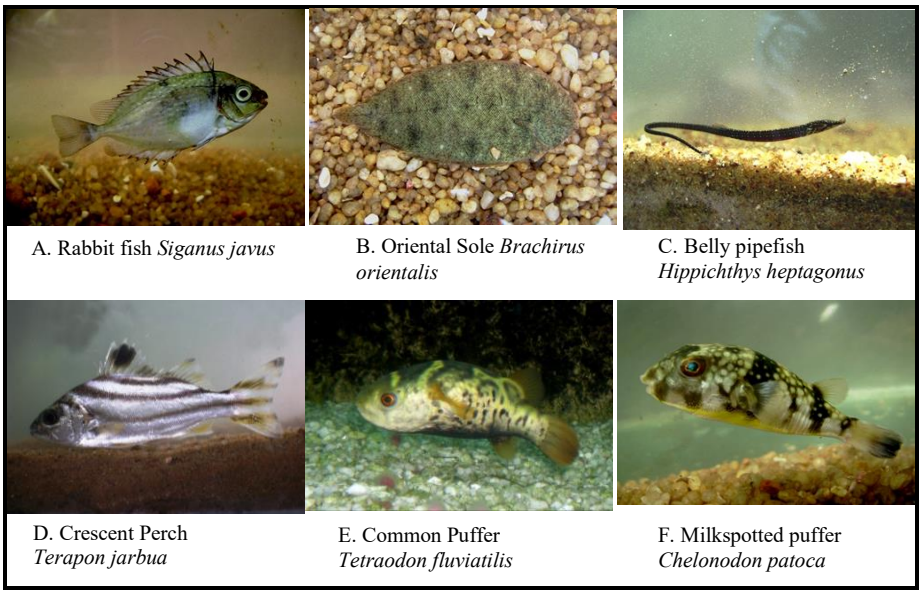

Plate 3. Selected fishes from Madampa Lake, Sri Lanka
(All photos by H.B. Jayaneththi)

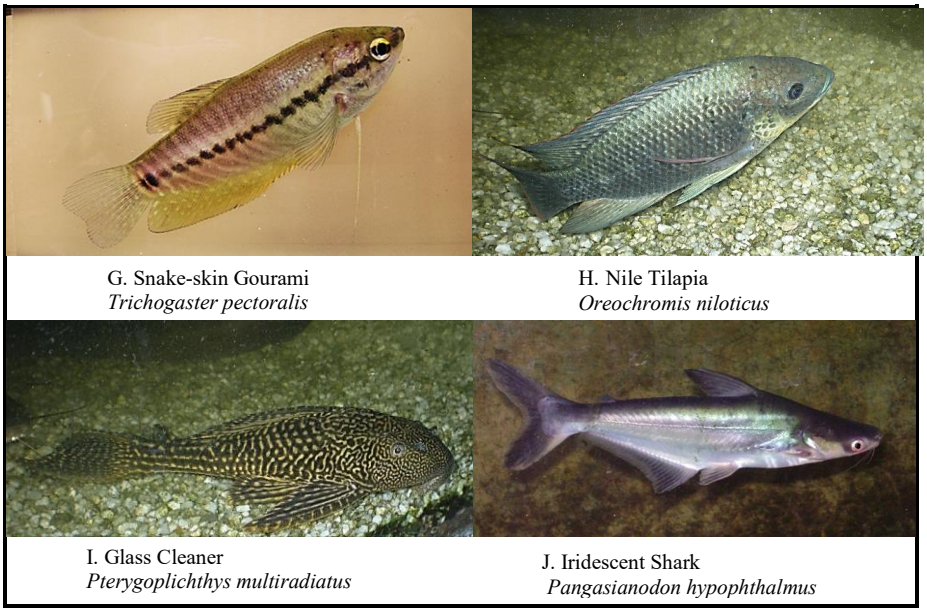

Plate 4. Selected alien ichthyofauna at Madampa-Lake, Sri Lanka
(All photos by H.B. Jayaneththi)

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