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A note on Fish diversity in the major Lagoons of Bundala National Park- A Ramsar wetland in Sri Lanka- An insight to Wetland degradation

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Abstract

This short report explains the status of fish diversity in the major lagoons of Bundala National Park (Malala, Embillakala and Bundala) according to a study conducted thirteen years before with a note to the fish diversity in recent past. Diversity and density of fishes inhabiting these lagoons and their feeding habits were studied weekly from June 2000 to May 2001 and November to December 2013. Fishes were identified and classified as bentho-pelagic, dermersal, pelagic and reef associated guilds according to ichthyological literature. Highest fish diversity was recorded in Embillakala lagoon and Malala lagoon. Dermersal fish guild was prominent in Malala and Embillakala lagoons. Omnivore and picsivore guilds were prominent in BNP lagoons. Two fish species associated with reefs were found only in Malala lagoon. As for the survey conducted in 2013, it has been noted that fish diversity has declined and lagoon habitats have been changed immensely. This report highlights a possible loss of fish diversity over time in the major lagoons of BNP indicating loss of biodiversity and wetland degradation.

Keywords: Fishes, diversity, Ramsar wetlands, Bundala National Park, lagoons, wetland degradation.

Introduction

Identification of factors affecting wetland degradation can be assessed using biodiversity data. Declining fish stocks in relation to wetland degradation has been noted in previous reports[1,2].

In 1993, Bundala National Park (BNP) was declared as the first Ramsar wetland in Sri Lanka. BNP is situated within the south eastern arid zone of Sri Lanka. The park spreads over an area of 6216 ha, is situated about 250 km southeast of capital city Colombo, in Hambantota District (6º08' – 6º14'N, 81º08'-81º18'E) (figure 1)[3,4]. Koholankala (390 ha), Malala (650 ha), Embillakala (430 ha) and Bundala (520 ha)[3,5] (figure. 1) are the major lagoons located within Bundala National Park.

Fish species inhabiting Bundala water bodies have been recorded previously[3,6]. Nevertheless extensive studies on fish diversity and their feeding habits specific to each lagoon have not been reported. BNP lagoons are gradually degrading for various reasons such as accumulation of agricultural run-off, salt water intrusion, over fishing, grazing, and spread of invasive plants[5]. In this context, identification, characterization and monitoring of fish species diversity and their feeding habits are essentially useful in the management of BNP lagoons.

Hence the objective of this report was to reveal the fish species diversity and their feeding habits in major lagoons of Bundala National Park according to a study conducted thirteen years before with a note to fish diversity in BNP lagoons in the recent past.

Material and Methods

Fishes were sampled once a week in Embillakala, Malala and Bundala lagoons using multi mesh gill nets (150 m length; Eye sizes were 1 x 1 cm^2 2 x 2 cm^2, 3 x 3 cm^2, 4 x 4cm^2, 5 x 5 cm^2) from June 2000 to June 2001, November to December 2013. The nets were laid vertically over the fixed sites perpendicular to the selected transect (figure 1) in the morning (07.00-08.30 hours) and fish catch was obtained. In each sampling day three catches were taken. Total number of fishes and species composition was recorded. Fishes were identified using standard taxonomic keys[7]. Fishes were classified as bentho-pelagic, dermersal, pelagic and reef associated guilds according to ichthyological literature of fish guild classifications[7-9]. Shannon Diversity Index (H) was calculated as previously described[10] to determine the fish diversity. Mean total catches per month per visit were also calculated.

Standard lengths of all sampled fishes were measured to the nearest mm and they were weighed to the nearest gram. Stomach content analysis was carried out using same size fishes for each species (n=42) as described previously and in cases where distinct stomach cannot be found anterior portion of the gut was considered[11]. Stomach contents were identified to the nearest taxonomic category in the laboratory using standard phytoplankton and invertebrate keys[12-17]. Mean values of % dietary components were recorded. All the analysis was carried out in the Department of Zoology, Faculty of science, University of Ruhuna.

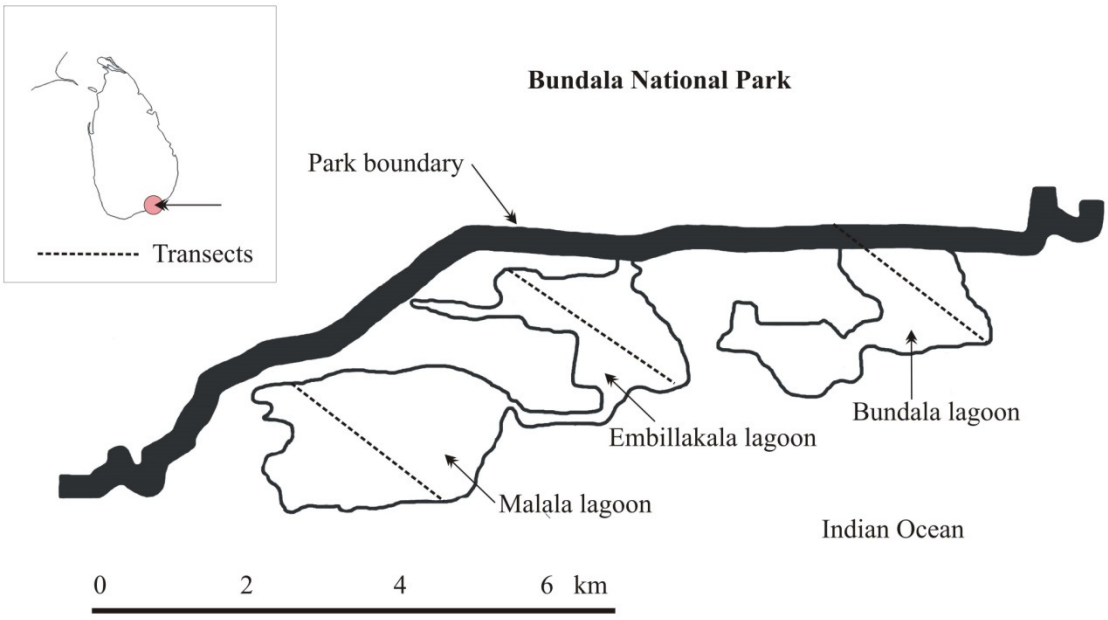

Figure-1
Major lagoons of the Bundala National Park and study tarnsest

Results and Discussion

As for the Shannon Index (H) most diverse fish community was recorded in Malala lagoon (mean H: 3.2 ± 1.2) and Embillakala (mean H: 3.1 ± 0.6) lagoons. Bundala lagoon accommodated the least diverse fish community (mean H: 0.7 ± 0.1).

A total of 32 species belonging to 20 families of fishes (table 1) were recorded during the study period (2000-2001). Engraulids, Gobiids, Cyprinids and Cichlids were the most abundant families. Fishes belonging to pelagic guild, dermersal guild, bentho-pelagic guild and reef associated guild are given in the table 1.

Sarotherodon mossambicus, *Hyporhamphus limbatus* and *Zenarchopterus dispar* were key species recorded from Bundala Lewaya.*Chela laubuca* and *Ehirava fluviatilis* were only recorded from Embillakala lagoon. *Puntius sarana* and *Puntius dorsalis* were recorded only from Embillakala lagoon. *Arothron hispidus and Mene maculata* were reef-associated species caught and recorded only in Malala lagoon. *Caranx spp* were only recorded in Malala lagoon. Main feeding guilds of fishes recorded in this study were given in table 2.

As for the survey carried out in 2013, there were 500 families living in the vicinity of BNP lagoons and most of them engaged in lagoon fisheries. Catla catla and Lebio rohita were newly recorded fish species in BNP lagoons when compared to the study conducted in 2000-2001. At present Mugil cephalus, Liza macrolepis, Gerres limbatus, Ophiocephalus striatus, Etroplus suratensis, Sarotherodon mossambicus are dominant fish species in BNP lagoons and Therapon jarbua, Chanos chanos, Glossogobius giurus, Arius dussumieri, Arius caelatus, Caranx talamparoideus, Charanx praeusteus were less abundant in BNP lagoons systems (table-3).

With the overwhelming environmental degradation world's fishery resources are under threat and parks have been recognized as places for fish conservation[18,19]. As for the study conducted in years 2000 and 2001 low diversity of fishes in Bundala Lewaya may be due to hyper saline condition, which is unfavorable for brackish water fishes[20]. High fish diversity of Embillakala lagoon and Malala lagoon may be attributed to the high productivity of these water bodies. However dermersal fish guild, which comprised of 14 species, was the most prominent guild in Malala and Embillakala lagoons. This may indicate the importance of the nature of the benthic environment to the fish productivity in lagoons (table 1).

BNP lagoons are severely degraded to an extent where freshwater aquatic weeds thrive especially in Malala and Embillakala lagoons. Number of families engaging in fishing in BNP lagoons has also increased. As for the survey conducted in 2013 fish stocks have declined in BNP lagoons. Over fishing and lagoon habitat degradation might have affected fish diversity. This implicates the need of strong conservation measures to protect the lagoon fish resources and biodiversity.

Table-1
Major fish species recorded in Malala, Embillakala and Bundala Lewaya (during 2000-2001)

Scientific name	Highest and lowest standard length recorded (cm)
Pelagic guild	
Stolephorus indicus (Engraulidae) (van Hasselt, 1823)	6-10.5
Elops machnata (Elopidae) (Forskal, 1775)	10-14
Thryssa hamiltoni (Engraulidae) (Gray, 1835)	6-10
Zenarchopterus dispar (Hemiramphidae) (Valenciennes, 1847)	6-15.3
Hyporhamphus limbatus (Hemiramphidae) (Valenciennes, 1847)	5-13.2
Thryssa mystax (Engraulidae) (Bloch and Schneider, 1801)	6-12
Chela laubuca (Cyprinidae) (Hamilton & Buchanan, 1822)	6-10
Ehirava fluviatilis (Clupeidae) (Deraniyagala, 1929)	3-7
Bentho Pelagic Guild	
Etroplus suratensis (Cichlidae) (Bloch, 1785)	4-8
Mugil cephalus(Mugilidae) (Linnaeus,1758)	15-12
Sarotherodon mossambicus (Cichlidae) (Trewevas, 1983)	3-18
Puntius dorsalis(Cyprinidae) (Jerdan, 1849)	14-22
Puntius sarana(Cyprinidae) (Hamilton and Buchaman, 1822)	6-8
Liza macrolepis(Cyprinidae) (Smith, 1846)	12-18
Chanos chanos (Channidae) (Forskal, 1905)	12-24
Ophiocephalus striatus(Channidae) (Bloch, 1793)	12-26
Reef associated Guild	
Arothronhispidus (Tetraodontidae) (Linnaeus j k , 1758)	8-10
Mene maculate (Menidae) (Bloch &Schnieder, 1801)	8-12
Dermersal Guild	
Johnius maculates (Sciaenidae) (Schneider, 1801)	10-16
Caranx praeusteus (Carangidae) (Bennett, 1830)	6-12
Caranx talamparoides (Carangidae) ((Bleeker, 1852))	6-12
Macrones gulio (Bagridae) (Hamiltoni&Buchanam, 1822)	*13-20*
Arius caelatus (Ariidae) (Cuvier &Valenciennnes, 1840)	12-20
Arius dussumeri (Ariidae) (Cuvier & Val, 1875-1878)	11-18
Anguilla bicolor bicolor(Anguillidae) (McClelland, 1845)	130-160
Glossogobius giurus (Gobiidae) (Hamilton &Buchaman, 1822)	13.8-20.2
Glossogobius bicoelatus (Gobiidae) (Valenciennes, 1837)	12-16
Ambassis commersoni(Ambassidae) (Cuvier, 1828)	5-7.5
Therapon jarbua(Terapontidae) (Forskal, 1775)	8.6-13.3
Gobius grammepomus(Gobiidae) (Bleeker, 1849)	7-14
Silago sihama(Sillaginidae) (Forskal, 1775)	6-18

Table-2
Main feeding guilds of fishes identified during the study period in Malala and Embillakala lagoons as for the study conducted in 2000-2001

Piscivore	Zooplanktonivore	Molluscivore	Omnivore
Ophiocephalus striatus	*Stolephorus indicus*	*Arothron hispidus*	*Mugil spp.*
Glossogobius giurus	*Thryssa mystax*	*Pertica filamentosus*	*Sarotherodon mossambicus*
Arius spp	*Chanos chanos*	*Puntiussarana*	*Hemirhamphus spp*
Elops machnata	*Thryssa hamiltoni*		*Johnius maculates*
Macrones gulio			*Caranx spp*
Gerres limbatus			*Ambassis commersoni*
			Oreochromis niloticus
			Mene maculate
			Gobius grammepomus

Table-3
Present day fish composition of BNP lagoons as for the survey carried out in 2013

Newly recorded fish	Dominant fish	Lesser abundant fishes
Lebio rohita	*Sarotherodon mossambicus*	*Charanx praeusteus*
Catla catla	*Etroplus suratensis*	*Caranx talamparoideus*
	Ophiocephalus striatus	*Arius caelatus*
	Gerre slimbatus	*Arius dussumieri*
	Liza macrolepis	*Glossogobius giurus*
	Mugil cephalus	*Chanos chanos*
		Therapon jarbua

Conclusion

This report indicates fish diversity and their feeding guilds in the major lagoons of the Bundala National Park according to a study conducted during 2000-2001. As for the survey conducted in 2013 in BNP, it has been revealed that fish diversity and abundance have declined. Overfishing and lagoon habitat degradation might be the key factors affecting the fish diversity and abundance.

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