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Species Diversity and Habitat Characteristics of Freshwater Fishes in the Similipal Biosphere Reserve, Odisha with Some New Records

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ABSTRACT: A systematic, updated checklist of freshwater fishes of the Similipal Biosphere Reserve is provided with notes on status, distribution and habitat characteristics. It includes 66 species of fishes belonging to 42 genera, 19 families and 6 orders. A total of 24 species are reported here for the time from the reserve. As per IUCN status the fish fauna of the Biosphere Reserve includes one endangered, one vulnerable, 6 near threatened, 42 least concern, and 3 data deficient. The Similipal Biosphere Reserve harbours rich diversity of fishes and water quality of the rivers and streams are suitable for fish and wild life propagation.

Keywords: Fish diversity, habitat characteristics, Similipal Biosphere Reserve.

INTRODUCTION

The Similipal is one of the important biosphere reserves of India, which is situated in the Mayurbhanj district of Odisha (20°17′-22°34′ N and 35°40′-87°10′E). It covers a total area of 5569.00 sq km, which includes core area of 1194.75 sq. km., buffer zone of 1335.86 sq. km. and a transitional zone of about 3038.38 sq. Km. The biosphere reserve is considered as one of the mega biodiversity zones of India with rich population of flora and fauna (Mishra *et al.*, 2011). There are 10,000 people living in 61 villages in the forest of Similipal Biosphere Reserve. The tribal people depend on the resources of the Similipal for their day to day livelihood (Rout and Panda, 2010).

Similipal is naturally endowed with a rich rivers, streams and magnificent waterfalls like Bareipani, Joranda and Uski. There are many perennial streams flowing in different directions. The streams like Khadkei, Gangahar, Sono, East Deo, Sanj, Palpala flows towards the east, joining the river Budhabalanga which finally drains into the Bay of Bengal. On other hand Khairi, Bandhan, West Deo streams originates from Similipal and joins river Baitarani and Salandi, which drains into Bay of Bengal. There are few streams which drain into river Subarnarekha (Sahu, 1985). Similipal Biosphere Reserve is also blessed with reservoirs like Badajora and Haldia.

The Similipal Biosphere Reserve has not been extensively surveyed for fish diversity and information about the fish resources of the biosphere reserve is very scanty (Ramakrishna *et al.*, 2006). Dutta *et al.* (1993) reported *Tor putitora*, *Amblyceps mangois* and *Clarias batrachus* from the Baripada, Similipal Hills. However, knowledge of the diversity and distribution of the fish fauna is essential for designing and implementing conservation strategies (Jadhav *et al.*, 2011). In this paper a systematic checklist of fishes of the Similipal Biosphere Reserve is prepared based on the present study and available literatures. The habitat characteristics of five streams are provided.

MATERIALS AND METHODS

Fishes were recorded from 7 water bodies namely Lulung, Joranda, Barehipani, Uski, Devkund, Budhabalanga and Khairi during Sept., 2008 to Aug., 2009 (Fig. 1) and identified following Jayaram (1999), Talwar and Jhingran (1991) and by consulting relevant literatures. Species which were not recorded in the present survey but reported earlier from the Similipal Biosphere Reserve are also included in this report. The families have been arranged phylogenetically and species under a genus followed alphabetic sequence. The correct scientific name with author citation, local name, economic value and status based on IUCN (2010) are shown against each species.

Water samples were collected on quarterly basis from all the 7 water bodies during Sept., 2008 to Aug., 2009. For each season 4 replicate of water samples were collected and the physico-chemical parameters were analysed following standard methods (APHA, 1989, Trivedy and Goel, 1986). The average of four samples for each parameters studied was considered as one reading. The water temperature, dissolved oxygen, pH, were determined in the field and the other parameter like, inorganic phosphorus, nitrate-nitrogen were analysed in the research laboratory of Central Institute of Freshwater Aquaculture, Bhubaneswar within 48 hours of collection.

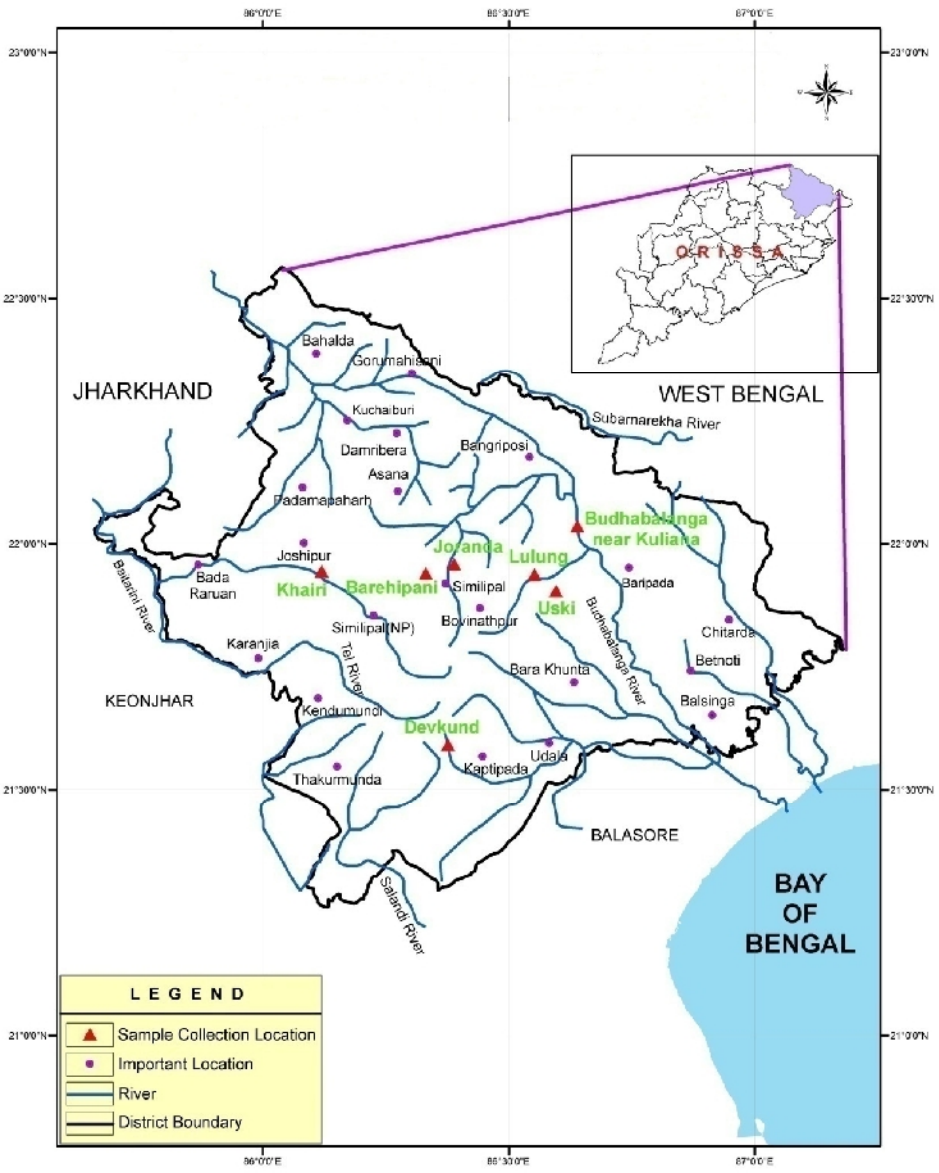

Fig. 1. Drainage map of Similipal Biosphere Reserve, Mayurbhanj district, Odisha showing collection sites.

RESULT AND DISCUSSION

Fish Diversity: A systematic, updated checklist of freshwater fishes of Similipal Biosphere Reserve has been prepared base on present collection and those reported by the earlier workers (Table 1). There are all together 66 species which belong to 42 genera and 19 families and 6 orders. Of these, 42 species belonging to 35 genera and 16 families were recorded during the present study. Cypriniformes has highest diversity with 3 families, 20 genera and 35 species followed by Siluriformes (7 families with 10 genera and 14 species), Perciformes (5 families with 5 genera and 10 species), Synbranchiformes (2 families with 3 genera and 3 species), Osteoglossiformes and Beloniformes (1 families with 2 genera and 2 species each) (Fig. 2). Among the families highest species diversity was observed in the Cyprinidae (43.9%) followed by Bagridae (9.1%). As per the IUCN (2010), the fish fauna of the biosphere reserve includes one endangered (EN), one vulnerable (VU), 6 near threatened (NT), 42 least concern (LC) and 3 data deficient (DD).

Table 1: A checklist of fishes known from the Similipal Biosphere Reserve with their local name and IUCN status. LC = Least Concern; NT = Near Threatened; VU = Vulnerable; EN = Endangered; DD = Data Deficient; NRS = New record from Similipal Biosphere Reserve; * = Not recorded in the present study but reported by Ramakrishna *et al.* (2006).

Scientific Name	Local name	IUCN Status	Remarks
Order: Osteoglossiformes			
Family: **Notopteridae**			
1. *Notopterus notopterus* (Pallas)	Flai	LC	NRS
2. *Chitala chitala* (Hamilton)	Chitala	NT	_
Order: Cypriniformes			
Family: **Cyprinidae**			
3. *Amblypharyngodon mola* (Hamilton)	Pathari	LC	NRS
4. *Barilius vagra* (Hamilton)	Jhalli	LC	NRS
5. *Danio rerio* (Hamilton)	Jaradi	LC	NRS
6. *Catla catla* (Hamilton)	Bhakur	-	-
7. *Cirrhinus fulungee* (Sykes)	Dumala	LC	NRS
8. *Cirrhinus mrigala* (Hamilton)	Mira	LC	-
9. *Crossocheilus latius* (Hamilton)	Kalabatuli	LC	NRS
10. *Cyprinus carpio* (Linnaeus)	Mirkha	VU	-
11. *Devario aequipinnatus* (McCelland)	kulia	LC	NRS
12. *Esomus danricus* (Hamilton)	Jhai	LC	-
13. *Garra gotyla* (Gray)	Patharachatta	LC	NRS
14. *Garra mullya* (Sykes)	Gentu	LC	-
15. *Labeo bata* (Hamilton)	Pohala	LC	-
16. *Labeo calbasu* (Hamilton)	Kalabanisi	LC	-
17. *Labeo rohita* (Hamilton)	Rohi	LC	-
18. *Laubuca* sp.	Jodda	-	-
19. *Osteobrama vigorsii* (Sykes)	Chilanti	LC	-
20. *Puntius amphibius* (Valenciennes)	Kerandi	DD	NRS
21. *Puntius conchonius* (Hamilton)	Pitakerandi	LC	NRS
22. *Puntius sarana* (Hamilton)	Sema	LC	-
23. *Puntius sophore* (Hamilton)	PatiaKerandi	LC	-
24. *Puntius ticto* (Hamilton)	Kujikerandi	LC	-
25. *Puntius* sp. 1	Kerandi	-	-
26. *Puntius* sp. 2	Kerandi	-	
27. *Rasbora daniconius* (Hamilton)	Jilo	LC	-
28. *Rasbora* sp.	Mino	-	-
29. *Salmophasia bacaila* (Hamilton)	Baunsapatri	LC	NRS
30. *Tor putitora* (Hamilton)*	Mahaseer	EN	-
31. *Tor tor* (Ham)*	Mahaseer	NT	-
Family: **Nemacheilidae**			
32. *Acanthocobitis botia* (Hamilton)	Patharachatta	LC	NRS
33. *Schistura* sp.1	Patharachatta	-	-
34. *Schistura* sp.2	Patharachatta	-	-
Family: **Cobitidae**			
35. *Lepidocephalichthys guntea* (Hamilton)	Jimani	LC	-
36. *Lepidocephalichthys thermalis* (Val.)	Balijimani	LC	-
37. *Lepidocephalichthys* sp.	Jimani	-	-
Order: Siluriformes			
Family: **Bagridae**			
38. *Sperata aor* (Hamilton)*	Singla	LC	-
39. *Sperata seenghala* (Sykes)	Singhi	LC	-
40. *Mystus bleekeri* (Day)	Kujikantia	LC	NRS
41. *Mystus cavasius* (Hamilton)	Baikantia	LC	NRS
42. *Mystus gulio* (Hamilton)	Kantia	LC	NRS
43. *Mystus vittatus* (Bloch.)	Kantia	LC	NRS
Family: **Siluridae**			
44. *Ompok bimaculatus* (Bloch)	Baisilia	NT	NRS
45. *Wallago attu* (Schneider)	Balia	NT	-
Family: **Schilbeidae**			

46. *Alia coila* (Hamilton)*	Puttuli	NT	-
47. *Eutropiichthys vacha* (Hamilton)*	Batbacha	LC	-
Family: **Ambiycipitidae**			
48. *Amblyceps mangois* (Hamilton)*	Jhilikantia	LC	-
Family: **Erethistidae**			
49. *Hara* sp.	-	-	-
Family: **Claridae**			
50. *Clarias* sp.	Magur	-	-
Family: **Heteropneustidae**			
51. *Heteropneustes fossilis* (Bloch)	Singi	LC	-
Order: Beloniformes			
Family: **Belonidae**			
52. *Strongylura strongylura* (Vanhasselt)	Gania	-	NRS
53. *Xenentodon cancila* (Hamilton)	Gangeitodi	LC	NRS
Order: Synbranchiformes			
Family: **Synbranchidae**			
54. *Monopterus cuchia* (Hamilton)	Cuchia	LC	-
Family: **Mastacembelidae**			-
55. *Macrognathus aculeatus* (Bloch)	Todi	-	-
56. *Mastacembelus pancalus* (Hamilton)	Gomitodi	LC	-
Order: Perciformes			
Family: **Badidae**			
57. *Badis badis* (Hamilton)	Kalileep	LC	NRS
Family: **Cichlidae**			
58. *Oreochromis mossambicus* (Peters)	Tilapia	NT	NRS
Family: **Anabantidae**			
59. *Anabas cobojius* (Hamilton)	Kau	DD	NRS
60. *Anabas testudineus* (Bloch)	Rajakau	DD	-
Family: **Belontiidae**			
61. *Trichogaster fasciata* (Bloch and Schneider)	Raja kau	LC	NRS
62. *Trichogaster lalius* ((Hamilton)	Raja kau	LC	NRS
Family: **Channidae**			-
63. *Channa marulius* (Hamilton)	Sahala	LC	
64. *Channa punctata* (Bloch)	Gadisa	LC	-
65. *Channa striata* (Bloch)	Seola	LC	-
66. *Channa* sp.	-	-	

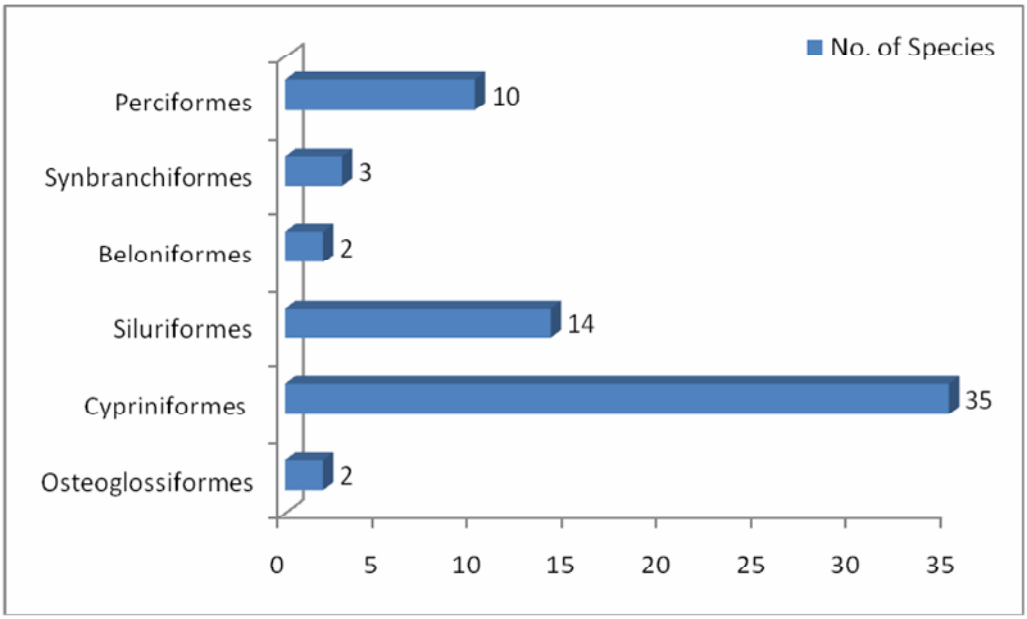

Fig. 2. Fish diversity of the Similipal Biosphere Reserve, Odisha.

Table 2: Water quality of 7 water bodies of Similipal Biosphere Reserve, Odisha (Sept 2008 to August 2009). The total number of season studied = 4, the numbers of samples used for each season = 4. Data are arranged as range (mean) ±sd.

Parameters	Stations						
	Lulung	**Joroda**	**Bareipani**	**Uski**	**Devkund**	**Budhabalanga**	**Khairi**
Temp. (°C)	21.1-33.8 (27.9) ± 5.7	20.4-33.8 (26) ± 5.06	22-36 (27.6) ± 5.5	20.0-34.0 (26.2) ± 5.1	20.3-34.6 (27.6) ± 7.02	24.0-35.1 (30.0) ± 4.9	23-36 (29.6) ± 5.9
DO (ppm)	4.8-8.5 (6.3) ± 1.4	4.8-8.0 (6.3) ± 1.23	4.6-8.0 (6.2) ± 1.66	6.0-8.0 (7.2) ± 0.7	5.6-7.7 (6.6) ± 0.83	6.5-7.3 (6.9) ± 0.30	4.7-7.3 (5.9) ± 1.3
pH	7.0-7.9 (7.3) ± 0.3	7.1-7.9 (7.4) ± 0.25	7.0-7.4 (7.1) ± 0.14	7.2-7.8.0 (7.2) ± 0.72	7.0-7.8 (7.5) ± 0.24	7.2-7.5 (7.3) ± 0.11	7.2-7.9 (7.5) ± 0.30
CO_2(mg/l)	2.0-10.0 (6.1) ± 3.1	11-14 (20.8) ± 2.74	11.0-18.0 (14.1) ± 2.82	4.8-8.0 (6.0) ± 1.2	7.0-12.0 (9.18) ± 1.8	12.0-16.0 (14.4) ± 2.03	3.0-15.0 (8.3) ± 5.04
Nitrate-Nitrogen(mg/l)	0.01-0.007 (0.014) ± 0.010	0.01-0.018 (0.01) ± 0.009	0.06-0.079 (0.07) ± 0.009	0.01-0.019 (0.016) ± 0.004	0.01-0.019 (0.016) ± 0.004	0.01-0.009 (0.008) ± 0.003	0.02-0.021 (0.024) ± 0.007
Inorganic Phosphorus (mg/l)	0.01-0.012 (0.02) ± 0.027	0.01-0.028 (0.021) ± 0.005	0.01-0.013 (0.009) ± 0.003	0.01- 0.026 (0.021) ± 0.005	0.01-0.016 (0.010) ± 0.004	0.02-0.019 (0.016) ± 0.002	0.01-0.028 (0.01) ± 0.006

A total of 24 species of freshwater fishes namely *Notopterus notopterus, Amblypharyngodon mola, B. vagra, Danio rerio, Cirrhinus fulungee, Crossocheilus latius, Devario aequipinnatus, Garra gotyla, Puntius amphibius, Puntius conchonius, Salmophasia bacaila, Acanthocobitis botia, Mystus bleekeri, Mystus cavasius, Mystus gulio, Mystus vittatus, Ompok bimaculatus, Strongylura strongylura, Xenentodon cancila, Badis badis, Oreochromis mossambicus, Anabas cobojius, Trichogaster fasciata* and *Trichogaster lalius* are reported here for the first time from the Similipal Biosphere Reserve.

Out of the 37 species reported by Ramakrishna *et al.* (2006), 9 species namely *Laubuca fasciata, Puntius punctatus, Tor putitora, Tor tor, Sperata aor, Alia coila, Eutropiichthys vacha, Amblyceps mangois, Channaorientalis* were not recorded during the present study. Of which 3 species may have ambiguous taxonomic status and their identities needed to be verified. Ekaratne (2000) and Pethiyagoda (1991**)** remarked that *Channa orientalis* is considered as an endemic species to Sri Lanka and is often confused with *Channa gachua* (Hamilton). Courtenay Jr. and Williams (2004) noted that *C. orientalis* differs from *C. gachua* in lacking pelvic fins and report of the former species from southern India and elsewhere are erroneous. *Puntius punctatus* was described from Cochin, Kerala by Day (1865). It is considered endemic to the Western Ghats of India (Dahanukar, 2011). Similarly, *Laubuca fasciata* was described by Silas (1958) from Anamalairiver at Vannanthurai, Kerala. Raghavan and Ali (2011) remarked that the fish is endemic in Kerala, India. Therefore, distributions of these species in the Similipal Biosphere Reserve are doubtful and need to be verified.

Habitat Characteristics: Similipal is naturally endowed with a rich rivers, streams and magnificent waterfalls. The water current is usually high and rapid in all the streams with rate of flow varies during different seasons. The beds of the streams and rivers are generally rocky or sandy. The small sized fishes like *Acanthocobitis, Crossocheilus, Garra, Schistura* etc. hide themselves below the pebbles and rocks in the shallow water bodies. On the other hand, larger species like *Labeo, Cyprinus, Cirrhinus, Chitala, Oreochromis* etc. inhabit deeper waters where water currents are comparatively slow.

The physico-chemical characteristics inside Similipal Biosphere Reserve in different station are summarized in Table 2. It indicates that surface water temperature ranged from 20 to 36.6°C with an average value of 28.3°C. The pH value ranged from 7 to 7.9 with an average of 7.4. High concentration of dissolved oxygen was observed throughout the study period which ranged from 4.6 to 8.5 mg/l with an average value 6.3 mg/l which is within the permissible limit (I.S.I., 1982). However, level of CO_2 was slightly high which ranged from 2 to 18 mg/l with an average value 13mg/l.

Nitrogen and phosphorus are the basic nutrients, which determine the productivity of water. The river water was moderately enriched with these nutrients and shows well marked seasonal variations. The concentration of dissolved inorganic phosphorus was observed to vary from 0.001 to 0.028 mg/l with an average value of 0.018 mg/l. The nitrate-nitrogen varied between 0.01 to 0.079 mg/l with an average value of 0.045 mg/l. The sources of nutrients in the rivers water may be erosion of fertile soil from the catchment areas and inflow of fertilizers from the surrounding agricultural fields.

The present findings indicate that the Similipal Biosphere Reserve is blessed with diverse fish fauna including numerous economically important fishes. The water quality of the rivers and streams are not contaminated as the values of pH and DO are within the tolerance limit of Class 'D' water prescribed by the I.S.I. (1982) for fish culture and wild life propagation. Therefore, a detail study on the morphology, hydrology and biodiversity of Similipal Biosphere Reserve may be useful for conserving the fish genetic resources.

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