Fauna of Protected Areas - 30

NEW ADDITIONS TO THE ICHTHYOFAUNA OF KEOLADEO NATIONAL PARK, A WORLD HERITAGE SITE IN INDIA

B. Anjan Kumar Prusty [1], Rachna Chandra [2], P.A. Azeez [3] and L.L. Sharma [4]

[1,2,3] Environmental Impact Assessment Division, Sálim Ali Center for Ornithology and Natural History (SACON), Anaikatty, Coimbatore, Tamil Nadu 641108, India; [4] Department of Zoology, MSJ College, Bharatpur, Rajasthan 321001, India
Email: [1] anjaneia@gmail.com; [2] rachnaeia@gmail.com; [3] azeezpa@gmail.com

Abstract

Fish recruitment into Keoladeo National Park (KNP) with incoming water was examined for a period of three years -- 2003 to 2005. In total, 24 species were recorded during the survey. Six species were recorded as new records to KNP, and five species as new to the state of Rajasthan. None of the species reported from KNP till date are Critically Endangered as per the IUCN Red List. The species new to the KNP are *Cyprinus carpio communis*, *Brachydanio albolineatus*, *Danio dangila*, *Securicula gora*, *Clarias gariepinus* and *Mystus tengara*, while those new to the Rajasthan state are *Brachydanio albolineatus*, *Clarias gariepinus*, *Danio dangila*, *Mystus tengara* and *Securicula gora*. The present investigation has increased the number of fish species known from KNP to 58 belonging to 15 families and 39 genera. This revised list as a result of both loss and addition in number of species in KNP draws attention for a thorough review on the prevailing anthropogenic pressures in the catchment.

Keywords

Brachydanio albolineatus, checklist, *Clarias gariepinus*, *Cyprinus carpio communis*, *Danio dangila*, ichthyofauna, Keolado National Park, *Mystus tengara*, *Securicula gora*

A comprehensive knowledge on the different components of an ecosystem is a pre-requisite for its scientific management. Aquatic ecosystems are one of the most diversified systems in the world and highly vulnerable to adverse anthropogenic influences. Ichthyofauna plays a major role in the sustenance of aquatic systems and their status, composition and diversity provides impetus for the sustainable management of the system. Of the approximately 40,000 species of vertebrates 21,723 species are fishes (Jayaram, 1999). India alone contributes 11% of the 20,000 fish species reported worldwide (Dehadrai & Poniah, 1997). Of this, 930 belong to freshwater while 1570 are marine inhabitants (Jayaram, 1999; Kar, 2005). Rajasthan, with an area of 3,42,217km^2, ranks second in India on the basis of area and twelfth so far as annual fish catch is concerned (Johal *et al.*, 1990; Jhingran, 1991). The state consists of five river systems, namely, Chambal, Banas, Luni, northeastern river system and Western Ghats river system. Two non-perennial rivers, the Banganga and the Gambhir, originate from Karauli hills of Sawai Madhopur and Manoharpur, respectively (Fig. 1). Banganga is a mountain torrent with a coarse textured bed and Gambhir has a fine textured one.

Ali (1953) was the pioneer in emphasizing the importance of fish to the piscivorous birds about half-a-century ago. This was supported by long-term study, continued for a decade, about the ecology of Keoladeo National Park (KNP) by Vijayan (1991). This project and several other studies highlighted the diversity, status and composition of fish fauna in KNP (Saxena, 1975; Mahajan, 1980; Kumar & Vijayan, 1988; Kumar, 1991; Vijayan, 1991; Kumar & Mittal, 1993; Kumar & Asthana, 1994) and Rajasthan state (Datta & Majumdar, 1970; Johal *et al.*, 1990; Kumar *et al.*, 1995). After almost a decade, this study was conducted for three consecutive years (2003 to 2005) to assess the changes during the last decade and to make a comparative assessment of different ecosystem components to that of the earlier study (Vijayan, 1991). Hence, the present study, an offshoot of the Keoladeo National Park Ecosystem Monitoring Project, was intended to examine the fish recruitment into the Park and subsequently to assess the composition and status of the fish fauna.

Keoladeo National Park

Keoladeo National Park (Fig. 2), a World Heritage Site and a world famous wetland existing for 250 years is located on the southeastern part of Bharatpur city (27°7.6'-27°12.2'N & 77°29.5'-77°33.9'E) and is almost equidistant (about 180km) from Delhi and Jaipur on either side. KNP, a monsoonal natural reservoir of excess water from Karauli district *via* Gambhir River (Varshney, 2005) is unique in having aquatic and terrestrial (grassland and woodland) ecosystems functioning together (Azeez *et al.*, 2000) within an area of about 2900ha. It is mostly fed by natural rain and of the total water in the Park, a substantial amount comes from Ajan bund, an external earthen dam constructed for the purpose almost a kilometer upstream to the Park. The dam and the Park are situated in the catchment of the two major non-perennial river systems namely Banganga and Gambhir (Fig. 1), and thus, receive millions of fish fry, micro- and macro-invertebrates and debris (autochthonous materials) from the area and river. Water from the dam is released into the Park by end of August every year through the Ghana canal, which is connected to most of the wetland blocks on either side by sluice gates at strategic locations. Most of the area remains inundated during monsoon and post monsoon season, i.e. up to October, the turning point so far as the Park limnochemistry is concerned (Prusty & Azeez, 2004), after which water starts gradually drying up. The minimum and maximum recorded rainfall was 1.8mm (April 2004) and 659.9mm (July 2005). The total rainfall during 2003, 2004 and 2005 was 849.8, 630.0 and 873.8mm, respectively.

Methods

Fish Sampling: Fish, being one of the preferable diets of most of the birds, is recruited to the Park every year during and/or after the monsoon. Fish sampling was done using the modified version of stow net from a point called "Chital Van" gate in the main canal, about a kilometer before the water gets diverted to different blocks of the Park through sluice gates. The net was

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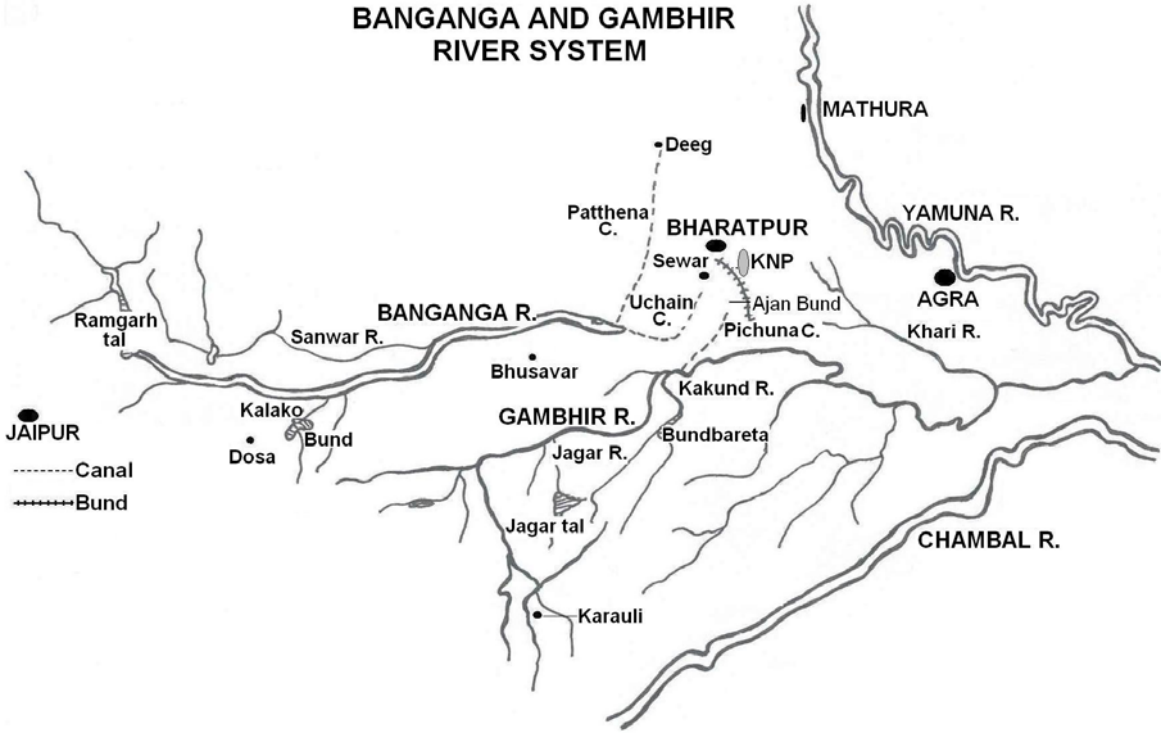

Figure 1. Banganga and Gambhir river system

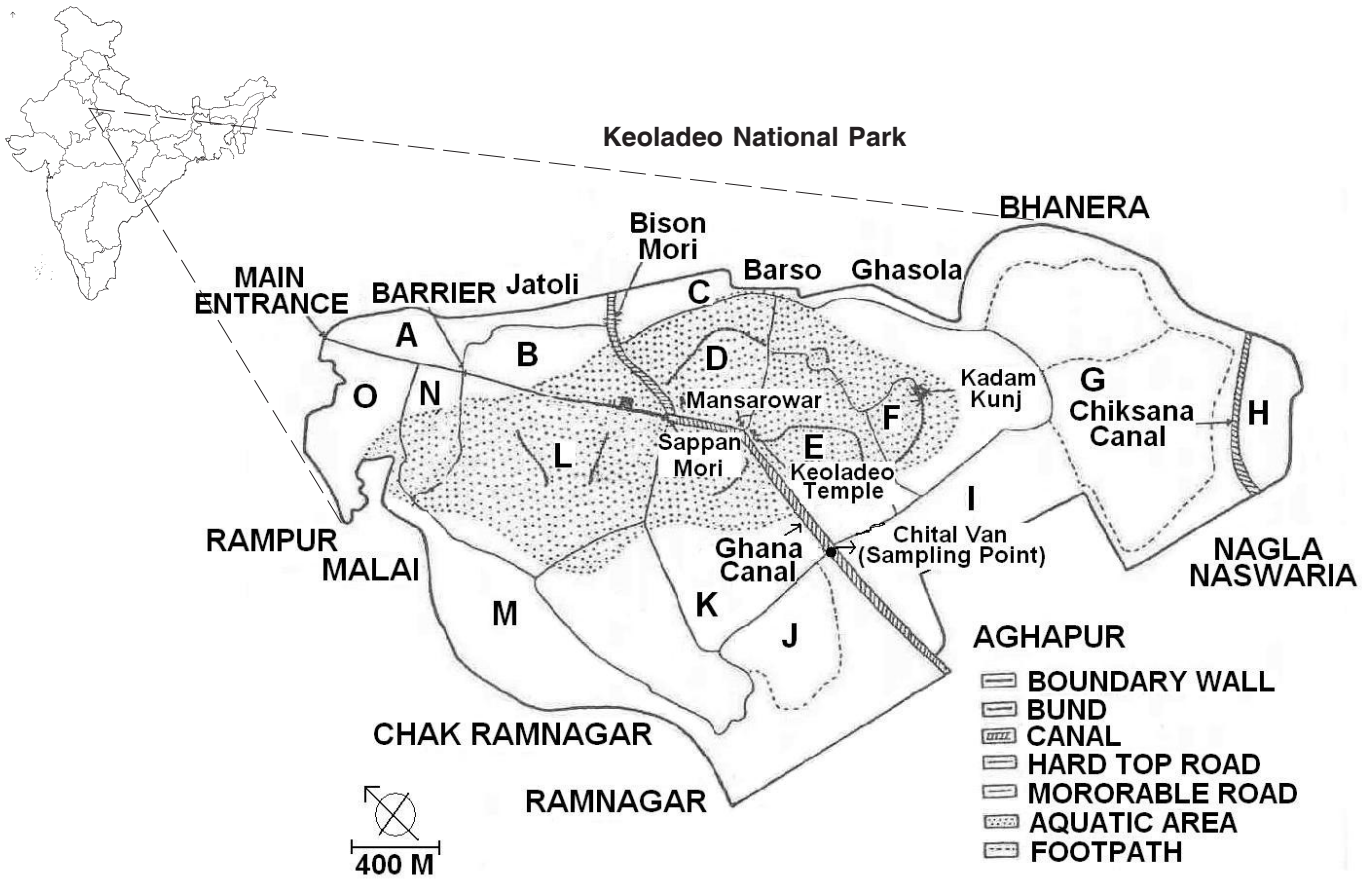

Figure 2. Study area map

Table 1. Comparative details of fish sampling protocol during 2003-2005

Parameters	2003	2004	2005
Total number of species recorded	12	5	19
Total number of nettings	17	4	52
Total number of fry	1356	905	38505
Total number of new arrivals	3	0	3
Total amount of water released to the Park (million m^3)	4.9	0.5	13.6

dipped into the water holding both sides close to the pillars, in the same position for 15sec and was then lifted up to collect the fry. The duration of netting was reduced to 5sec when the number of fry was high to reduce sampling related mortality. Species identification was done at the spot up to genus level and simultaneously counted; total live wt/biomass (g) was measured and then the fries were released back to water immediately. The specimen, which could not be identified, were marked, coded and were preserved in 10% formalin and brought to the laboratory for identification and confirmation by experts. Identifications were made after consulting several literatures, such as, Day (1986), Jayaram (1981, 1999), and Talwar & Jhingran (1991). The fish sampling was done for the whole period of water release and twice daily, during dawn and dusk. However, during the year 2005, sampling was done in two lots, during monsoon season in July and after monsoon in September. The sampling in July was twice daily, while in September it was for 24hr with an interval of 3hr for assessing the circadian variation of fish movement in the canal.

The annual variation in the species number, composition and diversity were assessed. All the species recorded so far by various workers along with their common name and IUCN status are included in this checklist. However, for the scope of this paper classification is given only for the new entries to the Park. Moreover, an exhaustive review has been done to assess the present status of fish recruitment into the Park and to compare with that of the earlier reports about the state of Rajasthan.

Results and Discussion

In total 40,766 individuals were recorded within a sampling duration of 54min and 45sec. Of the 73 nettings during the study period, 17 were during September 2003, four during September 2004 and the rest during 2005. Altogether 24 species have been recorded during the entire period of study, which was very less in comparison to the earlier findings by Kumar & Vijayan (1988) who had recorded 50 species. During the present study, maximum number of species were recorded during 2005, i.e. 19, 12 during 2003 and lowest, i.e. five during 2004 (Table 1). Some species recorded by earlier workers were not seen during the present study while some new records have been added both to

Table 2. Ichthyofaunal species recorded in KNP till date

Fish species	P R	2003	2004	2005	New to KNP	New to Rajasthan
Ailia coila	+					
Amblypharyngodon mola	+					
Aorichthys aor	+					
Aorichthys seenghala	+					
Botia lohachata	+					
Brachydanio albolineatus		+			+	+
Catla catla	+	+		+		
Chagunius chagunio	+					
Chanda nama	+	+	+	+		
Chanda ranga	+			+		
Channa marulius	+					
Channa punctatus	+	+		+		
Channa striatus	+					
Channa gachua	+					
Chela bacaila	+			+		
Chela cachius	+					
Cirrhinus mrigala	+			+		
Cirrhinus reba	+			+		
Clarias batrachus	+					
Clarias gariepinus				+	+	+
Clupisoma garua	+					
Colisa fasciatus	+	+				
Crossocheilus latius latius	+					
Cyprinus carpio communis		+			+	
Danio dangila				+	+	+
Esomus danricus	+	+				
Eutropiichthys vacha	+					
Gagata viridescens	+					
Gudusia chapra	+					
Heteropneustes fossilis	+					
Labeo bata	+					
Labeo calbasu	+					
Labeo fimbriatus	+					
Labeo gonius	+					
Labeo rohita	+	+	+			
Lepidocephalus guntea	+					
Macrognathus aculeatus	+					
Mastacembelus armatus armatus	+	+		+		
Mastacembelus pancalus	+					
Mystus cavasius	+					
Mystus tengara				+	+	+
Mystus vittatus	+	+	+	+		
Nangra viridescens	+					
Noemacheilus botia botia	+					
Noemacheilus corica	+					
Notopterus notopterus	+					
Notopterus chitala	+					
Ompok bimaculatus	+					
Osteobrama cotio cotio	+					
Pseudeutropius atherionoides	+					
Puntius sarana sarana	+		+	+		
Puntius sophore	+	+		+		
Puntius ticto	+					
*Rasbora daniconius**				+	+	
Salmostoma bacaila	+			+		
Securicula gora		+	+	+	+	+
Wallago attu	+			+		
Xenentodon cancila	+					

Source: Jayaram (1999); * Day (1986); P R - Previous Records; + - Presence

Table 3. Classification of new arrivals to the Keoladeo National Park during 2003-2005

Name	Order	Suborder	Family	Sub-family	Genus
Brachydanio albolineatus	Cypriniformes	Cyprinoidei	Cyprinidae	Rasborinae	*Brachydanio* Weber & de Beaufort
Cyprinus carpio communis	Cypriniformes	-	Cyprinidae	Cyprininae	*Cyprinus* Linnaeus
Danio dangila	Cypriniformes	-	Cyprinidae	Rasborinae	*Danio* Hamilton-Buchanan
Securicula gora	Cypriniformes	-	Cyprinidae	Cultrinae	*Securicula* Gunther
Clarias gariepinus	Siluriformes	-	Clariidae	-	*Clarias* Scopoli
Mystus tengara	Siluriformes	-	Bagridae	-	*Mystus* Scopoli

Table 4. Checklist of fish fauna of KNP with common name and status

	Fish species	Family	Common Name	IUCN status
1	*Ailia coila*	Schilbeidae	Gangetic ailia	VU
2	*Amblypharyngodon mola*	Cyprinidae	Mola carplet, Pale carplet	LRlc
3	*Aorichthys aor*	Bagridae	Long-whiskered catfish	DD
4	*Aorichthys seenghala*	Bagridae	Giant river-catfish	DD
5	*Botia lohachata*	Cobitidae	Y-loach	EN
6	*Brachydanio albolineatus*	Cyprinidae	Pearl danio	LRnt
7	*Catla catla*	Cyprinidae	Catla	VU
8	*Chagunius chagunio*	Cyprinidae	Chaguni	VU
9	*Chanda nama*	Chandidae	Elongated glass-perchlet	VU
10	*Chanda ranga*	Chandidae	Indian glassy fish	DD
11	*Channa marulius*	Channidae	Giant snakehead	LRnt
12	*Channa punctatus*	Channidae	Spotted snakehead	LRnt
13	*Channa striatus*	Channidae	Striped or Banded snakehead	LRlc
14	*Channa gachua*	Channidae	Asiatic snakehead	VU
15	*Chela bacaila*	Cyprinidae	Large razorbelly minnow	LRlc
16	*Chela cachius*	Cyprinidae	Silver hatchet chela	DD
17	*Cirrhinus mrigala*	Cyprinidae	Mrigal	LRnt
18	*Cirrhinus reba*	Cyprinidae	Reba-carp	VU
19	*Clarias batrachus*	Clariidae	Magur	VU
20	*Clarias gariepinus*	Clariidae	Thailand Magur, African Magur	NE (Intro)
21	*Clupisoma garua*	Schilbeidae	Garua Bachcha, Guarchcha	VU
22	*Colisa fasciatus*	Belontidae	Stripled Gourami, Giant Gourami	LRnt
23	*Crossocheilus latius latius*	Cyprinidae	Gangetic latia	DD
24	*Cyprinus carpio communis*	Cyprinidae	Scale-carp	NE (Intro)
25	*Danio dangila*	Cyprinidae	Dangila danio	NE
26	*Esomus danricus*	Cyprinidae	Flying barb	LRlc
27	*Eutropiichthys vacha*	Schilbeidae	Batchwa vacha	EN
28	*Gagata viridescens*	Sisoridae	Huddah nangra	LRnt
29	*Gudusia chapra*	Clupeidae	Indian River Shad	LRlc
30	*Heteropneustes fossilis*	Heteropneustidae	Stinging catfish	VU
31	*Labeo bata*	Cyprinidae	Bata labeo	LRnt
32	*Labeo calbasu*	Cyprinidae	Kalbasu, Black rohu	LRnt
33	*Labeo fimbriatus*	Cyprinidae	Fringed-lipped peninsula carp	LRnt
34	*Labeo gonius*	Cyprinidae	Kuria labeo	LRnt
35	*Labeo rohita*	Cyprinidae	Rohu	LRnt
36	*Lepidocephalus guntea*	Cobitidae	Guntea loach, Zebra fish	DD
37	*Macrognathus aculeatus*	Mastacembelidae	Spotted spinyeel	LRnt
38	*Mastacembelus armatus armatus*	Mastacembelidae	Tire-track spinyeel	LRlc
39	*Mastacembelus pancalus*	Mastacembelidae	Striped spinyeel	LRnt
40	*Mystus cavasius*	Bagridae	Gangetic mystus	LRnt
41	*Mystus tengara*	Bagridae	Tengara mystus	NE
42	*Mystus vittatus*	Bagridae	Striped dwarf catfish	VU
43	*Nangra viridescens*	Sisoridae	Huddah nangra	LRnt
44	*Noemacheilus botia botia*	Cobitidae	Stone Loach	LRnt
45	*Noemacheilus corica*	Cobitidae	Loach	LRnt
46	*Notopterus chitala*	Notopteridae	Humped featherback	EN
47	*Notopterus notopterus*	Notopteridae	Grey featherback	LRnt
48	*Ompok bimaculatus*	Siluridae	India butter-catfish	EN
49	*Osteobrama cotio cotio*	Cyprinidae	Cotio	LRnt
50	*Pseudeutropius atherinoides*	Schilbeidae	Indian potasi	EN
51	*Puntius sarana sarana*	Cyprinidae	Olive barb	VU
52	*Puntius sophore*	Cyprinidae	Spotfin swamp barb	LRnt
53	*Puntius ticto*	Cyprinidae	Ticto barb, Firefin barb, Two-spot barb	LRnt
54	*Rasbora daniconius*	Cyprinidae	Blackline rasbora	LRnt
55	*Salmostoma bacaila*	Cyprinidae	Chilwa	LRlc
56	*Securicula gora*	Cyprinidae	Gora-chela	NE
57	*Wallago attu*	Siluridae	Boal	LRnt
58	*Xenentodon cancila*	Belonidae	Freshwater garfish	LRnt

EN - Endangered; LRnt - Lower Risk-near threatened; LRlc - Lower Risk-least concern; VU - Vulnerable; DD - Data deficient; NE - Not evaluated; Intro - Introduced

the fish fauna of KNP and Rajasthan state. Altogether, the present study included six new additions to the existing fish fauna of the Park (Vijayan, 1991) increasing the total species of the Park to 58 with three new records during 2003 and three new records during 2005. In addition, there were five new entries to the fish fauna of Rajasthan state (Table 2). None of the recruited species breed inside the Park. The recruited species represented eight families and 17 genera, of which the family Cyprinidae ranked highest with 15 species. The families recorded during the three-year survey were Cyprinidae, Bagridae, Siluridae, Clariidae, Chandidae, Belontidae, Channidae, and Mastacembelidae. The detailed classification of the new arrivals is given in Table 3.

According to the status given by IUCN (Molur & Walker, 1998; Kumar *et al.*, 2000; Wakid & Biswas, 2005), seven species are Lower Risk-near threatened (LRnt), four Lower Risk-least concern (LRlc), five Vulnerable (VU), three Data Deficient (DD), three Not Evaluated (NE), two introduced (Table 4). *Securicula* was a new addition to both the Park and the Rajasthan state. The revised list of species after the present investigation represents 15 families, 39 genera and 58 species. The IUCN status of all of

Table 5. The status of fish from the Keoladeo National Park

	Family	Number of species							
		EN	VU	DD	LRnt	LRlc	NE	Intr	Total
1	Bagridae	0	1	2	1	0	1	0	5
2	Belonidae	0	0	0	1	0	0	0	1
3	Belontidae	0	0	0	1	0	0	0	1
4	Chandidae	0	1	1	0	0	0	0	2
5	Channidae	0	1	0	2	1	0	0	4
6	Clariidae	0	1	0	0	0	0	1	2
7	Clupeidae	0	0	0	0	1	0	0	1
8	Cobitidae	1	0	1	2	0	0	0	4
9	Cyprinidae	0	4	2	11	4	2	1	24
10	Heteropneustidae	0	1	0	0	0	0	0	1
11	Mastacembelidae	0	0	0	2	1	0	0	3
12	Notopteridae	1	0	0	1	0	0	0	2
13	Schilbeidae	2	2	0	0	0	0	0	4
14	Siluridae	1	0	0	1	0	0	0	2
15	Sisoridae	0	0	0	2	0	0	0	2

these species include five Endangered (EN), 24 Lower Risk-near threatened (LRnt), seven Lower Risk-least concern (LRlc), 11 Vulnerable (VU), six Data Deficient (DD), and five Not Evaluated (NE). None of the fish species reported from the Park fall under Critically Endangered (CR) as categorized by the CAMP (Molur & Walker, 1998).

Several external factors seem to be responsible for the observed variation in fish availability in the catchment and subsequently in KNP. The notable ones among them include the amount, duration and time of water release, and source of water and fry. Catchment processes and alterations may also influence the survivability of fish species in the water bodies. The probable local extinction of some of the species, as is evident from the complete absence in all the three years, might be due to prolonged drought years resulting in water scarcity in the catchment area. In addition, physico-chemical conditions (Kumar & Mittal, 1993), prey-predator availability, food availability (Lewin *et al.*, 2004) and movements in water column related to the Ajan bund or its catchment may decide the presence of fish in the canal. The alterations in the natural hydrological patterns by the construction of bunds, flow regulation by diverting for irrigation and channelization, ground water pumping and catchment conversion through urbanization, deforestation and agriculture (Saunders *et al.*, 2002) and such anthropogenic activities in the catchment areas (Kennard *et al.*, 2005) could be some of the causes of the change in the arrival pattern of fishes in comparison to the previous decade. The inter-riverine flow of water and aquatic to terrestrial flow also might result in the arrival of new species into the Park (Johal *et al.*, 1990). Hence, this revised list of fishes, as a result of new arrivals as well as absentees draws immediate attention towards a thorough and complete assessment about the ongoing anthropogenic activities in the Park catchment.

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