



Enumeration of Herpetofaunal assemblage of Surajpur Wetland, National Capital Region (India)

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Abstract.—Surajpur wetland is an important wetland in the National Capital Region, India, known for its rich biodiversity. The present study was conducted from March 2010 to February 2013 to record the herpetofaunal diversity at the study area by applying standard methods and survey techniques. During the study period, a total of 19 species of herpetofauna belonging to 14 families and three orders were recorded. It comprised of six species of amphibians belonging to five families and 13 species of reptiles belonging to nine families. Family Dicroglossidae (Amphibians) and Colubridae (Reptiles) recorded maximum two and three species respectively. The relative abundance analysis showed that, among 19 species of herpetofauna, eight were common, four were uncommon, and seven were rarely recorded in the study area. The Indian Garden Lizard *Calotes versicolor* was most common during the study period. Of the 19 species recorded, 10 species are Least Concern and nine species are under Not Evaluated category in the IUCN Red List, while four species are listed in Schedule-I of the Indian Wildlife (Protection) Act, 1972.

Keywords. Amphibians, reptiles, biodiversity, conservation, abundance, survey

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Introduction

Amphibians and reptiles, collectively known as herpetofauna, comprise the highest proportion of threatened species among vertebrates in the world (Baillie et al. 2010; Böhm et al. 2013), and are found in a diverse range of habitats and microhabitats, from deserts to grass-lands, from forests to oceans, and from hills to our households. They are declining rapidly in both numbers and range in recent decades due to anthropogenic pressures like direct killing, habitat destruction, road killing, pesticides, diseases, and climate change (Stuart et al. 2004; Rodrigues et al. 2010). More than 9,700 species of reptiles and 6,800 species of amphibians are reported globally (Lesbarrères et al. 2014).

India hosts rich herpetofaunal diversity; about 518 species of reptiles and 342 species of amphibians, including 66% of amphibians and 37% of reptiles are reported to be endemic to India (Aengals et al. 2011; Dinesh et al. 2013). Herpetofaunal diversity studies have mostly concentrated in the Western Ghats (Chandramouli and Ganesh 2011; Nath et al. 2012; Ramesh et al. 2013; Vasanthi et al. 2014) and Central India (Ishaque and Sarsavan 2014; Narayana et al. 2014; Yadav et al. 2014; Fellow

2015; Radav and Yankanchi 2015; Rout et al. 2015; Solanki et al. 2015), with very few studies in northern India (Das et al. 2012; Kanaujia and Kumar 2013; Singh and Banyal 2013; Prasad et al. 2018). Studies on the herpetofauna have been made by several authors, but there is no such study in Surajpur Lake to address the conservation of herpetofauna. In context of this, this study was made to explore the diversity of herpetofauna at Surajpur wetland and to discuss the conservation and management implications in context of results, hitherto unreported.

Methods and Materials

The present study was conducted at Surajpur Lake (28°31'425"N, 77°29'714"E), an urban wetland located in district Gautam Budh Nagar, Uttar Pradesh under National Capital Region, India, which falls under the Gangetic Plain Biogeographic Zone (Rodger et al. 2002). The study area was located at an elevation of 184.7 meters above mean sea level (Fig. 1). Surajpur Lake has been protected under reserve forest and spreads over an area of 308 hectares. The lake is mainly rain-fed, and other sources for water recharge are Hawaliya drain, which is attached to Hindon River, and Tilapta irrigation canal.

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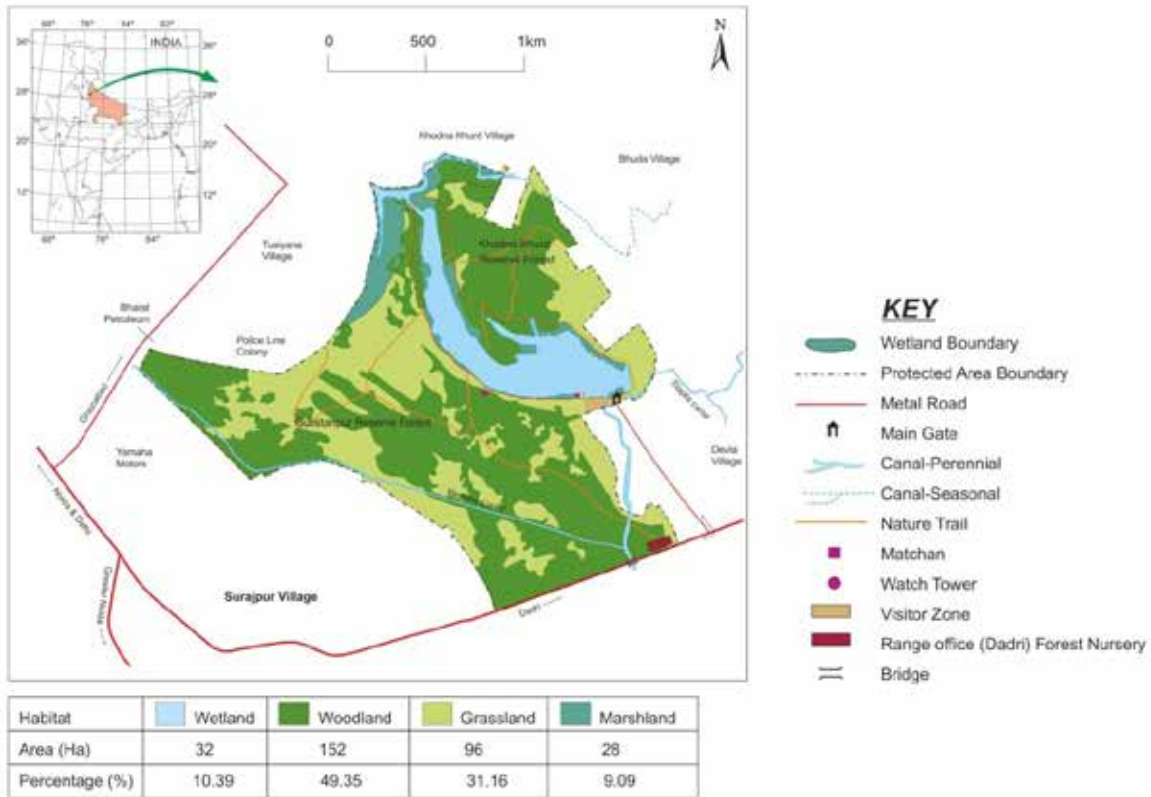


Fig. 1. Map of the study area showing terrestrial and aquatic habitats.

The mean monthly maximum and minimum temperature ranges between 17 °C to 41 °C and 6 °C to 30 °C, respectively, with the highest temperature observed during June and the lowest during January. The study area has been characterized into various major habitats: wetland, marshland, grassland and woodland. These major habitats have been further categorized in micro habitats on the basis of dominant vegetation, water availability, and soil type (Ansari and Ram 2016).

Data was collected in predominant terrestrial and aquatic habitats of Surajpur wetland. Ad-libitum records were maintained (Altmann 1974) on a monthly basis from March 2010 to February 2013 (total 36 surveys during 36 months). Extensive active surveys were made by direct search technique, visual encounter methodology (Campbell and Christman 1982; Heyer et al. 1994; Sutherland 1996) on all available microhabitats, mainly in leaf litter, under rocks, fallen and decaying logs, tree bark, grass clumps, on shrubs, on herbs, in tree holes, alongside forest nature trails, edges on wetland, marshy areas, and under water, between 0800–1600 hours. Opportunistic diurnal and nocturnal searches (1800–2000 hours) were also conducted along the nature trails, inside forest and open areas.

All species encountered were identified up to species level by consulting standard field guides such as Daniel (2002) and Datta (1997), and conservation status has been assigned according to IUCN Red List (IUCN 2016) and the Indian Wildlife (Protection) Act (1972). Nomenclature and taxonomic arrangement in the text follows

Frost (2009) for amphibians, and Aengals et al. (2011) for reptiles. The relative abundance categories were assigned as common (>16 times), uncommon (six to 15 times), and rare (one to five times), based on sighting frequencies (Walmiki et al. 2012). The photographic records were maintained by using Panasonic DMC FZ35 digital camera with close-up mode and were deposited to WWF- India Secretariat.

Results

During the study period, a total of 19 species of herpetofauna belonging to 14 families and three orders were recorded, of which amphibians represented six species belonging to five families, and reptiles represented 13 species belonging to nine families (Table 1). The relative abundance analysis showed that, among 19 species of herpetofauna, eight were common, four were uncommon, and seven species were rarely recorded in the study area.

Among amphibians, the family Dicroglossidae recorded maximum two species (Indian Bullfrog *Hoplobatrachus tigerinus* and Skittering Frog *Euphyctis cyanophlyctis*), followed by Bufonidae (Asian Common Toad *Duttaphrynus melanostictus*), Microhylidae (Ornamented Pygmy Frog *Microhyla ornate*), Ranidae (Field Frog *Fejervarya limnocharis*), and Rhacophoridae (Common Tree Frog *Polypedates maculatus*) with one species each. Asian Common Toad *Duttaphrynus melanostictus* was commonly seen in monsoon in wetland areas in calling

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Table 1. List of Herpetofauna recorded in Surajpur wetland.

Family	Common name	Scientific name	Habitat	Abundance		Conservation status	
				status+		IUCN#	IW(P) Act*
AMPHIBIANS							
Order: Anura							
Bufo	Asian Common Toad	<i>Duttaphrynus melanostictus</i> (Schneider 1799)	Marshland	C	LC	IV	
Dicroglossidae	Indian Bullfrog	<i>Hoplobatrachus tigerinus</i> (Daudin 1803)	Marshland	C	LC	IV	
Dicroglossidae	Skittering Frog	<i>Euphlyctis cyanophlyctis</i> (Schneider 1799)	Marshland	C	LC	IV	
Microhylidae	Ornamented Pygmy Frog	<i>Microhyla ornata</i> (Duméril and Bibron 1841)	Marshland	U	LC	Not Listed	
Ranidae	Field Frog	<i>Fejervarya limnocharis</i> (Gravenhorst 1829)	Marshland	R	LC	IV	
Rhacophoridae	Common Tree Frog	<i>Polypedates maculatus</i> (Gray 1830)	Woodland	U	LC	Not Listed	
REPTILES							
Order: Testudines							
Bataguridae	Indian Roofed Turtle	<i>Pangshura tectum</i> (Gray 1830)	Wetland	R	LC	I	
Trionychidae	Indian Flapshell Turtle	<i>Lissemys punctata</i> (Bonnaterre 1789)	Wetland	C	LC	I	
Order: Squamata (Sub-order Sauria)							
Agamidae	Indian Garden Lizard	<i>Calotes versicolor</i> (Daudin 1812)	Woodland	C	NE	IV	
Gekkonidae	Yellow Green House Gecko	<i>Hemidactylus flaviviridis</i> (Rüppell 1835)	Woodland	C	NE	Not Listed	
Scincidae	Common Keeled Skink	<i>Eutropis carinata</i> (Schneider 1801)	Grassland	R	LC	IV	
Scincidae	Spotted Supple Skink	<i>Lygosoma punctata</i> (Gmelin 1799)	Grassland	C	NE	I	
Varanidae	Bengal Monitor	<i>Varanus bengalensis</i> (Daudin 1802)	Grassland	U	LC	I	
Order: Squamata (Sub-order Serpentes)							
Boidae	Red Sand Boa	<i>Eryx johnii</i> (Russell 1801)	Woodland	R	NE	IV	
Colubridae	Indian Ratsnake	<i>Ptyas mucosa</i> (Linnaeus 1758)	Woodland, Grassland	U	NE	II	
Colubridae	Common Wolf Snake	<i>Lycodon aulicus</i> (Linnaeus 1754)	Woodland, Grassland	R	NE	IV	
Colubridae	Checkered Keelback	<i>Xenochrophis piscator</i> (Schneider 1799)	Wetland	C	NE	II	
Elapidae	Common Indian Krait	<i>Bungarus caeruleus</i> (Schneider 1801)	Woodland	R	NE	IV	
Elapidae	Spectacled cobra	<i>Naja naja</i> (Linnaeus 1758)	Woodland	R	NE	II	

mode, whereas Indian Bullfrog *Hoplobatrachus tigerinus* was mostly solitary and nocturnal in nature, and inhabited holes and bushes near permanent water sources. Skittering Frog *Euphlyctis cyanophlyctis* was often seen at the edge of wetland with their eyes above the water, and seen commonly round the year. Ornamented Pygmy Frog *Microhyla ornata* was observed while calling in aggregation in monsoon, not very common in the study area. Frog species were mostly documented in the edges of wetland, marshland, and occasionally in grassland habitats.

Among reptiles, family Colubridae recorded maximum three species (Indian Ratsnake *Ptyas mucosa*, Common Wolf Snake *Lycodon aulicus*, and Checkered Keelback *Xenochrophis piscator*), followed by Scincidae (Common Keeled Skink *Eutropis carinata* and Spotted Supple Skink *Lygosoma punctata*) and Elapidae (Common Indian Krait *Bungarus caeruleus* and Spectacled cobra *Naja naja*) with two species each. The rest of the

families, Bataguridae (Indian Roofed Turtle *Pangshura tecta*), Trionychidae (Indian Flapshell Turtle *Lissemys punctata*), Agamidae (Indian Garden Lizard *Calotes versicolor*), Gekkonidae (Yellow Green House Gecko *Hemidactylus flaviviridis*), Varanidae (Bengal Monitor *Varanus bengalensis*), and Boidae (Red Sand Boa *Eryx johnii*), recorded one species each. The photographic records of the most common species are represented in Fig. 2. Indian Flapshell Turtle *Lissemys punctata* was seen commonly in the wetland area whereas Indian Roofed Turtle *Pangshura tecta* was seen only twice during the study period. Indian Garden Lizard *Calotes versicolor* was one of the most commonly sighted herpetofauna recorded during the study period in the terrestrial habitats, whereas Yellow Green House Gecko *Hemidactylus flaviviridis* was seen commonly in huts of forest watchers. Common Keeled Skink *Eutropis carinata* was recorded only twice during the study period in the wet grassland area, whereas Spotted Supple Skink *Lygosoma punctata*

Fig. 2. (A-O) Photographs of selected Amphibians and Reptiles of Surajpur Lake.

AMPHIBIANS: ORDER ANURA



Fig. 2A. Asian Common Toad *Duttaphrynus melanostictus*.



Fig. 2B. *Hoplobatrachus tigerinus*.



Fig. 2C. Skittering Frog *Euphlyctis cyanophlyctis*.



Fig. 2D. Skittering Frog *Euphlyctis cyanophlyctis*.

REPTILES: ORDER TESTUDINES



Fig. 2E. Indian Roofed Turtle *Pangshura tectum*.



Fig. 2F. Indian Flapshell Turtle *Lissemys punctata*.

Fig. 2. (A-O) Photographs of selected Amphibians and Reptiles of Surajpur Lake.

REPTILES: ORDER SQUAMATA



Fig. 2G. Indian Garden Lizard *Calotes versicolor*.



Fig. 2H. Indian Garden Lizard *Calotes versicolor*.



Fig. 2I. Common Keeled Skink *Eutropis carinata*.



Fig. 2J. Spotted Supple Skink *Lygosoma punctata*.



Fig. 2K. Bengal Monitor *Varanus bengalensis*.



Fig. 2L. Red Sand Boa *Eryx johnii*.

Fig. 2. (A-O) Photographs of selected Amphibians and Reptiles of Surajpur Lake.

REPTILES: ORDER SQUAMATA



Fig. 2M. Indian Ratsnake *Ptyas mucosa*.



Fig. 2N. Checkered Keelback *Xenochrophis piscator*.



Fig. 2O. Checkered Keelback *Xenochrophis piscator*.

and Bengal Monitor *Varanus bengalensis* were seen occasionally in the study area. Among snakes, Checkered Keelback *Xenochrophis piscator* was recorded very often in the edges of wetland habitat followed by Red Sand Boa *Eryx johnii*, which was seen occasionally in woodland habitat, whereas Common Wolf Snake *Lycodon aulicus*, Common Indian Krait *Bungarus caeruleus*, and Spectacled Cobra *Naja naja* were recorded seen rarely during the study period. Among reptiles, turtles were mostly documented in the edges of wetland, marshland, and occasionally in grassland habitats, whereas other reptiles, including lizards and snakes, were recorded in woodland and grassland habitats in the study area.

According to the IUCN Red List Criteria (IUCN 2016), 10 species were listed as Least Concern (LC) and nine species as Not Evaluated (NE). According to the Indian Wildlife (Protection) Act (1972), four species have been listed in Schedule I (Indian Roofed Turtle *Pangshura tectum*, Spotted Supple Skink *Lygosoma punctata*, Indian Flapshell Turtle *Lissemys punctate*, and Bengal Monitor *Varanus bengalensis*), three species in Schedule II (Indian Ratsnake *Ptyas mucosa*, Checkered Keelback *Xenochrophis piscator*, and Spectacled cobra *Naja naja*), three species were not listed (Ornamented Pygmy

Frog *Microhyla ornate*, Common Tree Frog *Polypedates maculates*, and Yellow Green House Gecko *Hemidactylus flaviviridis*), while the other nine species were listed in Schedule IV.

Discussion

The present communication highlights results of the first systematic survey of herpetofauna in Surajpur wetland. The study provides baseline information on the diversity of herpetofaunal communities in Surajpur wetland. The inclusion of smaller vertebrates in management plans for any particular region is necessary for overall conservation of biodiversity at the local as well as the landscape level (Pawar et al. 2007). The present study observed 19 herpetofaunal species, which is a first significant scientific contribution in Surajpur wetland, National Capital Region, India. Some similar studies have been done in Northern India. Das et al. (2012) reported 53 species of herpetofauna from Katarniaghat wildlife sanctuary, spread over an area of 400 km² in Terai forest landscape. Singh and Banyal (2013) reported only six species of herpetofauna from Khajjiar Lake (Himachal Pradesh), which is spread over an area of 20.69 km² in Himalayan Landscape. Kanaujia and Kumar (2013) listed 24 species of amphibians from Uttar Pradesh. The present study indicates that the species count at Surajpur wetland will be likely to increase with additional detailed explorations and systematic work.

Amphibians and reptiles are good ecological indicators, and in recent decades there has been a dramatic decrease in their populations (Singh and Banyal 2013). Habitat loss and fragmentation are likely the most serious threats to herpetofauna, while roads, pesticides, infectious diseases, and climate change are other threats (Lesbarrères et al. 2014). Awareness programs are needed to make people acquainted with herpetofauna and their importance for a balanced ecosystem. Snake bite management is another issue which must be taken up

more seriously among local communities. Illegal hunting and poaching of turtles in the area by local communities needs to be taken up seriously by the Forest Department for the conservation of these highly threatened reptiles and management of the area. Training is required at various levels for various target groups like school students, local communities, visitors, and frontline staff. Awareness programs may include identification of common herpetofauna species, their importance, protection measures, and government interventions.

Surajpur wetland area is very important in biodiversity conservation, as it provides an opportunity to conserve and preserve the native flora, fauna, and biodiversity amidst a densely populated urban area without hindering the development of social and economic structures (Bura et al. 2013). The urban and industrial development across the Greater Noida city which is resulting in habitat destruction of herpetofauna is a matter of great concern. This small piece of marshy land with stagnant water has a very rich diversity of herpetofauna, creating a small biodiversity hotspot. This area should therefore be conserved and kept pollution-free across the city limits, as it supports a good congregation of aquatic/semi-aquatic vertebrates. Further investigations are necessary for utilizing this group of vertebrates as indicator species for the management of various habitats in the study area.

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