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A Study on Biodiversity of Orchha Wildlife Sanctuary, Central India

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Abstract—*This research is an exploration of biodiversity of the Orchha Wildlife Sanctuary (OWS) in central India. The study consolidates information from field surveys. A total of 15 fish (6 families), 6 amphibians (3 families), 13 reptile (9 families), 98 bird (43 families) and 19 mammal (15 families) species are reported. It was found that the birds were the most dominant vertebrates, followed by mammals, fishes and reptiles whereas amphibians were represented least. Four species of turtle and rare species of vulture including king vulture were present in the OWS. The floristic composition was recorded by making visual observations. Forests in Orchha Sanctuary are Southern Tropical Dry Deciduous Forests and Kardhai Forests. The forests are predominately covered by Teak and Kardhai. Other species like Haldu, Sejha, Arjun, Saja, Khair, Achar and mahua are scattered all over the area. 42 genera of Angiosperms comprising 23 families occured in the Sanctuary. The prominently represented family in terms of highest number of genera is Leguminosae comprising 11 genera.*

1. INTRODUCTION

Biodiversity combining all the living forms of life is the essence of life on earth. Vertebrates are the most prominent and an important constituent of the biodiversity (Negi & Banyal 2016b). The vertebrates with a total of about 62000 species comprises only 3% of global biodiversity (Nameer et al. 2015) with about 32447 species of fishes, 6515 amphibians, 8734 reptiles, 9990 birds (Chapman 2009) and 5416 species of mammals (Wilson & Reeder 2005). These vertebrate species occupying all elevations and depths, inhabiting most of the major habitat types, and displaying remarkable variations in body size and life histories (Nameer et al. 2015). With only 2.4% of world's land area, India accounts for about 7.52% of recorded animal species of the world (MoEF 2011). India, a mega biodiversity country, is a home to 2,546 species of fish belonging to 969 genera, 254 families and 40 orders (Rainboth 1994). The amphibian in India are highly diverse with 342 species which includes 306 species of anura, 35 species of gymnophiona and 1 species of salamander (Dinesh et al. 2015). The reptiles in India are represented by 518 species which includes 3 species of crocodiles, 34 species of turtles and tortoises, 202 species of lizards and 279 species of snakes belonging to 28 families (Aengals et al. 2010). The fish, amphibian and reptiles of India make up about 12.23%, 6.59% and 8.8% of respective class of the world (Negi & Banyal 2016a). An updated checklist enlists 1263 species of birds from the country representing 12.5% of world avifauna belonging to 498 genera, 107 families and 23 orders (Praveen et al. 2016). The mammalian fauna of the country is also very rich, representing 7.81% of the global mammals with 428 species belonging to 48 families and 14 orders (Sharma et al. 2015). As per IUCN Red List (2015.4), a total of 521 vertebrate species of India are threatened which includes 216 fish species, 75 amphibians, 53 reptiles, 84 birds, and 93 species of mammals (Negi & Banyal 2016b). An estimated 369,000 species of flowering plants are known to science (State of the World's Plants, 2016). The Indian subcontinent has one of the world's richest floras, with more than 17,000 species of flowering plants alone (Arisdason & Lakshminarasimhan, 2017). India is recognized as one of the 12-megadivesity countries of the world and supports a diverse array of habitats or ecosystems such as forests, grasslands, wetlands, coastal, marine and desert and each with rich and unique floristic diversity. Champion & Seth (1968) have recognized 16 major forest types comprising 221 subtypes in the country. The forest cover of the country constitutes about 21.34% (70.17 MHa) of India's total geographical area (FSI, 2015)). To protect some forests areas from anthropogenic pressure, forests have been given legal status of Protected Areas. A network of 668 Protected Areas (PAs) has been established, extending over 16.12 MHa. (4.90% of total geographic area), comprising 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves (MoEF, 2011). Assessment of flora species which form an integral part of animal ecology, in wildlife based protected areas is necessary before any meaningful conservation work can commence (Edet & Ijeomah, 2012) .Understanding species diversity is also important for helping managers to evaluate the complexity and resources of these forests (Jayakumar & Nair, 2013). To protect these wild flora and fauna from anthropogenic pressure, forests have been given legal status of Protected Areas. A network of 668 Protected Areas (PAs) has been

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established, extending over 16.12 MHa. (4.90% of total geographic area), comprising 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves (MoEF 2011). Besides, India is the second largest populated country in the world and a majority of its people directly or indirectly depends on forests resources for livelihood (Wagh& Jain 2016). Assessment of flora and fauna species which form an integral part of animal ecology, in wildlife based protected areas is necessary before any meaningful conservation work can commence (Edet & Ijeomah 2012). Understanding species diversity is also important for helping managers to evaluate the complexity and resources of these forests (Jayakumar & Nair 2013).

2. MATERIAL AND METHODS

2.1 Study Area

Orchha Wildlife Sanctuary, also known as Orchha Nature Reserve, is bestowed with unique floral and faunal diversity of Bundelkhand region, which otherwise is on the verge of extinction. It has strategic location adjoining historical town of Orchha. This is the only area in the entire region blessed with lush green patch of Teak and Kardhai forests. Once this region was the home of carnivores like Tigers and Panthers, but now has totally lost these species. Orchha Sanctuary is situated between Betwa and Jamni rivers of Bundelkhand region of Madhya Pradesh. The two rivers along with their conjunctions and confluence form the boundary of the Sanctuary. The total area of the nature reserve is 45.86 square kilometer, which includes both land and water bodies. Geographical position of nature reserve is latitude 250 13’ 45’’N to 25 0 22’ 30’’ N and longitude 780 33’ 45’’ E to 780 40’ 15’’ E. the altitude of the sanctuary varies from 207 to 357 meters above Mean Sea Level.

2.2 Methods

The floristic and faunistic surveys were conducted at various locations in the Sanctuary. For recording the vertebrates from the study area, the standard methodologies were followed which are given in the “Handbook of Biodiversity methods Survey, Evolution and Monitoring” (Hill et al. 2005) and “Practical Methods in Ecology” (Henderson 2009). The vertebrate species were studied by visual observations, and vocal sounds. The standard field guides were referred for proper identification of the species. (Rainboth 1994; Daniel 2002; Manakadan et al. 2011; Prater 1990). Besides, specific methods were adopted for the study of different group of vertebrates. Fish fauna of the Sanctuary was studied by periodically trapping them using locally available fishing gears from different locations. Fishes collected during premonsoon, monsoon, and post-monsoon seasons. These specimens were identified and then transferred back to the water body. The Amphibians were recorded by visual encounter surveys, audio surveys and opportunistic records. Visual encounter survey was used for recording reptiles. This method involved searching for reptiles, examining all possible microhabitats such as boulders, fallen logs, holes in the cliffs etc. Apart from this some reptiles were observed especially on the large rocks sun basking during the early hours of day. Observations and sighting records of birds were taken from whole sanctuary. A pair of Binoculars, Digital Camera, and GPS were used for observations, photography as well as location record respectively. The other important factor considered was the activity of birds. Since peak activity in most birds lasts for 1 or 2 hours after sunrise or before sunset, the birds were recorded during the most active period of the day i.e., morning and evening hours. The mammals were recorded by using a combination of direct and indirect methods. The direct methods utilized sighting of animals as the main data whereas indirect methods relied on quantification of indirect evidences such as pellet groups, scats, pug marks and hoof marks at various locations in the Sanctuary. No specimens were killed or brought to laboratory during the present study. Identification was based on morphological characters.

The extensive floristic exploration of Orchha Wildlife Sanctuary was carried out. The floristic composition was noted by making visual observation. Specimen samples were collected at different reproductive stages viz. flowering, fruiting, to prepare herbarium (De Vogel, 1987; Jain S. K. and Rao R. R., 1926) and substantiate their correct identity. Specimens of trees and shrubs were collected with flowering and fruiting twigs; small herbs and shrubs were collected with the whole plant and sometimes with roots. Creepers were collected with flowering and fruiting; and grasses were collected with underground parts. Tall aquatic plants’ specimens were bent into M, N, and V shape to prepare a herbarium. Plant parts such as bark, root, leaves, and fruits were also collected for correct identification. The plants were identified with the help of literature viz. Flora of Madhya Pradesh (Verma et. al. 1994; Mudgal et.al. 1997; Singh et. al. 2001), Flora of British India (Hooker 1892-1897), other literature, field keys and monographs (Ray, 1984; Schmid, 1990; Khanna et. al.2001; Dallwitz et. al. 2007). The results were crossed checked with the traditional knowledge about flora and fauna of the people of the study area.

3. RESULTS AND DISCUSSION

OWS located in the Madhya Pradesh (M. P.), which is situated on the genetic highway connecting of Western Ghats and the North East, two of the biodiversity hotspots in the country, is one of the richest repositories of biological diversity. The State houses a diversity of ecosystems including plateaus, ravines, ridges, valleys, riparian areas and flat plains (Shrivastava et al. 2017). The present study revealed that total number of Vertebrate species was 151 in OWS. Fifteen species of fishes representing twelve genera over six families occurred in the OWS. Family Cyprinidae was represented by highest number (7 species) of species, followed by family Bagridae (4 species). Remaining four family were represented

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only one species each. Six species of Amphibians occurred in the OWS, representing six genera and three families. Family Ranidae represented by highest number of amphibian species (3) occurred in the OWS. Thirteen species of reptiles belonging to nine families occurred in the OWS. Highest number of species belongs to family Colubridae. Ninety eight species of birds belonging to eighty two genus and forty three family were occurred in the OWS. Family Accipitridae has highest number of species (8) followed by family Ardeidae (7). Nineteen species of mammals belong to nineteen genera and fifteen families occurred in the OWS.According to a study by Zoological Survey of India (ZSI) on faunal resources of national parks of M. P., Madhav National Park (Area 375 sq. KM), which is close to OWS (distance approx. 116 KM), inhabited by 347 species of Vertebrate (Ramakrishna et al. 2006), whereas OWS with an area of 45 sq. KM provides abode to 151 species. Another study by ZSI reveals that Madhya Pradesh freshwater fish fauna includes 172 species belonging to 68 genera, 27 families and 10 orders (The Director 2007). In this context, OWS accommodates about 9 percent of fish fauna of the state in terms of species number. A study of Jabalpur district, nearby to the OWS findings suggest similar diversity of amphibians (9 species), birds (194 species), mammals (50 species) (Zoological Survey of India 2008). The Amphibians largely represented by species of Anura including Indian Bullfrog, Common Toad and Common Tree Frog. The common toad Bufomelanostictus is very common. OWS is specially known for four species of turtle and four species of vulture. The Vulture species are rare and largely restricted to the Sanctuary. The most commonly seen birds are the House Sparrow, Common Crow, Common Myna and Red- vented Bulbul. Common water birds are represented by Grey Heron, Pond Heron, Cattle Egret, Little Egret, and Black winged Stilt. Other commonly occurring birds include kingfishers, orioles, babblers, wagtails, pipits and flycatchers. The common mammals in the Sanctuary are Chital, Nilgai, Wild boar, Fox and Monkey. Similar species diversity of mammals observed in nearby Panna National Park (Harshey& Chandra 2001).

Forests in Orchha Sanctuary are Southern Tropical Dry Deciduous Forests (5A/C1b) and Kardhai Forests (5/E1) as per Champion and Seth (1968) classification. The forests are predominately covered by Teak and Kardhai. Other species like Haldu, Sejha, Arjun, Saja, Khair, Achar and mahua are scattered all over the area. River banks and beds are occupied by jamun and Arjun. Present study revealed that 42 genera of Angiosperms comprising 23 families were present in the Orchha Wildlife Sanctuary. The prominently represented family in terms of highest number of genera is Leguminosae comprising 11 genera. Dominant species in the sanctuary is Tectonagrandis (Teak) covered the highest area in the sanctuary and followed by species Anogeissus pendula (Kardhai). North of the Sanctuary was dominated by Anogeissus pendula whereas southern part of the sanctuary was mostly occupied by Tectonagrandis. Remaining 40 species scattered across the sanctuary. 13 species of herbs and shrubs belonging to 12 families occurred in the Sanctuary. 9 species of climbers and creepers occurred in the sanctuary, some of them belong to the group of high value medicinal plants like Asparagus racemosus. 8 species of grasses recorded in the sanctuary including Vetiveriazizanioides, Cymbopogon martini. 13 Species of aquatic flora mainly consisted of Typha species, Stoneworts, Hydrilla and Diatoms.

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