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SEASONAL VARIATIONS IN AVIFAUNAL DIVERSITY OF MADHAV NATIONAL PARK, SHIVPURI, MADHYA PRADESH, INDIA

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Abstract: A survey was conducted in Madhav National Park, Shivpuri, Madhya Pradesh (India) from December 2017 to November 2018 to study the impact of seasonal variations in the avifaunal diversity. A total of 123 bird species, belonging to 19 orders and 49 families were observed and identified. The maximum species were observed in the winter season while minimum in the rainy season. The status of the birds was categorized as residential (R), summer migrant (SM) and winter migrants (WM). Out of 123 species, 74 species were resident, 45 species winter migratory and 4 species summer migratory. Passeriformes was the most dominant order, represented by 46 species. This study will definitely help to prepare a seasonal checklist of bird species.

Keywords: Birds, Diversity, Madhav National Park, Shivpuri, Summer migrant, Winter migrant.

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INTRODUCTION

Avian community is an important component of a dynamic ecosystem. The birds are homeothermic or warm-blooded egg-laying vertebrates characterized by the presence of feathers and modification of forelimbs as wings for flight (Verma and Prakash, 2020). They play a major role in the environment as pollinators and sometimes their abundance represent a healthy ecosystem (Verma and Prakash, 2017; Kumbhar and Mhaske, 2020). Birds might live on this earth even if there were no human beings, but human beings cannot live without the birds. Birds are an integral part of the whole system of life on this earth (Ali and Futehally, 2008).

Recently, water birds have become of interest as indicators of wetland quality and as parameters of restoration success and regional biodiversity (Kumar and Gupta, 2009). There are about 1314 species from the Indian subcontinent out of which 450 species are reported from central India (Raju and Ramachandran, 2016). Many other scholars have worked on avifaunal diversity from different parts of Madhya Pradesh, including Shivpuri, but for a long period of time

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not much information has been available about the various aspects of avian diversity of Madhav National Park. Therefore, the present study was conducted in Madhav National Park, Shivpuri to focus on not only preparing the checklist of birds, but also to find out their occurrence, status as well as to create awareness for their conservation.

MATERIALS AND METHODS

Madhav National Park is a protected area under Shivpuri town of Madhya Pradesh, India. It is situated in northern part of Madhya Pradesh and lies between latitude $25^0$20'-$25^0$38'N and longitude $77^0$38-$77^0$57'E and covers an area of about 354 km^2. It is considered to be one of the oldest National Parks of Madhya Pradesh, declared in the year 1956. The climate of the National Park is dry and hot in summer, humid and hot in rainy season while a cold winter. For conducting the survey, the study area was divided into five different sites. Out of these five sampling sites, two were aquatic sites *i.e.* Sakhya Sagar Lake and Madhav Lake (aquatic sites) and three sites were terrestrial: Ambakunj, Baradari and Gorge castle.

The sampling was done from 6:00 am to 12 pm (in the morning) and from 3: 00 pm to 6: 00 pm (in the evening) which varied according to the season. The sampling was done by using Point Count Method (Javed and Kaul, 2002) and the Line Transect Method. Photographs were taken using digital camera (Nikon D-3400) for identification and documentation while binocular (Olympus) was used for visual count. All seen birds were noted down and identified with the help of field guide books (Grimmett *et al.*, 1999 and Ali, 2006).

RESULTS

Total 123 bird species, belonging to 19 orders and 49 families were observed from study sites. These observed bird species have been enlisted in table 1 and table 2. Seasonal variations of avifaunal species during different seasons and site-wise avifaunal species at different study sites of Madhav National Park, Shivpuri (M.P.) have been shown in figures 1 and 2 respectively. The results showed that the distribution of birds was highly influenced by disturbance variables. Maximum number of birds were found under the order Passeriformes with 46 species, followed by Anseriformes, Ciconiiformes, Pelecaniformes (10 species each), Charadriiformes (9 species), Accipitriformes (6 species), Columbiformes and Coraciiformes (5 species each), Suliformes, Galliformes (4 species each), Gruiformes (3 species) and Psittaciformes, Cuculiformes, Caprimulgiformes (2 species each). There were four such orders described by single species *viz.* Podicipediformes, Strigiformes, Bucerotiformes and Piciformes.

DISCUSSION

A total 123 species of birds were observed at five different sites of Madhav National Park. The distribution of birds within the five habitats varied from each other. In the present study at two aquatic sites *i.e.,* Sakhya Sagar and Madhav lakes, authors found 94 and 80 bird species respectively, followed by three terrestrial sites, Ambakunj, Baradari and Gorge castle with 47, 40 and 33 species respectively.

The maximum diversity of birds, observed at aquatic site might be due to more diversity of plants (aquatic and terrestrial), which give more choice for the food preference of the bird species as well as nesting and breeding place. Almost similar findings were recorded by Puppalwar and Telkhade (2017) in their studies in and around Moharli Lake of Chandrapur (M.S). Passeriformes was found to be the most dominant order, represented by 46 species. Talmale *et al.* (2012) also reported Passeriformes as the most dominant order in Singhori Wildlife Sanctuary, Raisen District, Madhya Predesh with 68 species; Bagde (2015) also found highest number of Passerine birds from West Chhinwara Region of Madhya Pradesh with 45 species.

Seasonal abundance of bird species was recorded in three different seasons (winter, summer and rainy). A maximum of 91 species were recorded in winter season followed by 87 in summer season and 51 species during rainy season respectively. Earlier, more or less similar findings were reported by Deka and Nath (2013) from Chandubi tectonic lake, Assam and by Shakya and Lodhi (2021) in Ramakrishna Ashram Gwalior, Madhya Pradesh, India. They also recorded minimum number of species during monsoon season.

Table 1: Avifaunal diversity observed during different seasons at Madhav National Park, Shivpuri, Madhya Pradesh from December 2017 to November 2018.

S.No.	English Name	Scientific Name	Winter	Summer	Rainy
1.	Bar-headed Goose	*Anser indicus*	Y	Y	N
2.	Indian Spot-billed Duck	*Anas poecilorhyncha*	Y	Y	N
3.	Lesser Whistling-duck	*Dendrocygn ajavanica*	Y	Y	Y
4.	African comb Duck	*Sarkidiornis melanotos*	Y	Y	N
5.	Ruddy Shelduck	*Tadorna ferruginea*	Y	Y	N
6.	Common Teal	*Anas crecca*	Y	Y	N
7.	Gadwall	*Mareca strepera*	Y	Y	N
8.	Garganey	*Spatula querquedula*	Y	Y	N
9.	Eurasian Wigeon	*Mareca Penelope*	Y	Y	N
10.	Northern Shoveler	*Spatula clypeata*	Y	Y	N
11.	Little Grebe	*Tachybaptus ruficollis*	Y	N	N
12.	Common Moorhen	*Gallinula chloropus*	Y	Y	Y
13.	Eurasian Coot	*Fulica atra*	Y	N	N
14.	White-breasted Waterhen	*Amaurornis phoenicurus*	N	N	Y
15.	Bronze-winged Jacana	*Metopidius indicus*	N	Y	Y
16.	Black-winged Stilt	*Himantopus himantopus*	Y	Y	N
17.	Red-wattled Lapwing	*Vanellus indicus*	Y	Y	Y
18.	Little Ringed Plover	*Charadrius dubius*	Y	N	N
19.	Kentish Plover	*Charadrius alexandrinus*	Y	N	N
20.	Common Snipe	*Gallinago gallinago*	Y	N	N
21.	Small Pratincole	*Glareola lacteal*	N	Y	N
22.	Great Thick-knee	*Esacusrecu rvirostris*	Y	N	N
23.	River Tern	*Sterna aurantia*	Y	N	N
24.	Wood Sandpiper	*Tringa glareola*	Y	Y	N
25.	Common Sandpiper	*Actitis hypoleucos*	Y	N	N
26.	Green Sandpiper	*Tringa ochropus*	Y	Y	N
27.	Marsh Sandpiper	*Tringa stagnatilis*	Y	Y	N
28.	Common Greenshank	*Tringa nebularia*	Y	N	N
29.	Spotted Redshank	*Tringa erythropus*	Y	N	N
30.	Painted Stork	*Mycteria leucocephala*	Y	Y	N
31.	Woolly-necked Stork	*Ciconia episcopus*	N	Y	N
32.	Asian Openbill	*Anastomus oscitans*	Y	Y	N
33.	Eurasian Spoonbill	*Platalea leucorodia*	Y	Y	N
34.	Little Cormorant	*Microcarbo niger*	Y	Y	Y
35.	Indian Cormorant	*Phalacrocorax fuscicollis*	Y	Y	N
36.	Great Cormorant	*Phalacrocorax carbo*	Y	N	N
37.	Oriental Darter/ Snake bird	*Anhinga melanogaster*	Y	Y	N

38.	Indian Pond Heron	*Ardeola grayii*	Y	Y	Y
39.	Grey Heron	*Ardea cinerea*	Y	Y	Y
40.	Purple Heron	*Ardea purpurea*	Y	Y	Y
41.	Black-crowned Night Heron	*Nycticorax nicticorax*	Y	N	N
42.	Little Egret	*Egretta garzetta*	Y	Y	Y
43.	Intermediate Egret	*Ardea intermedia*	Y	Y	N
44.	Great White Egret	*Ardea alba*	Y	Y	Y
45.	Cattle Egret	*Bululcus ibis*	Y	Y	N
46.	Black-headed Ibis	*Threskiornis melanocephalus*	Y	Y	N
47.	Red-naped Ibis	*Pseudibis papillosa*	N	Y	N
48.	Spotted Owlet	*Anthene brama*	Y	N	Y
49.	Rock Dove	*Columba livia*	Y	Y	Y
50.	Yellow footed Green Pigeon	*Treron phoenicopterus*	Y	Y	N
51.	Western Spotted Dove	*Spilopelia suratensis*	Y	Y	Y
52.	Laughing Dove	*Spilopelia senegalensis*	Y	Y	Y
53.	Red turtle Dove	*Stigmatopelia tranquebarica*	N	Y	N
54.	Rose-ringed Parakeet	*Psittacula krameri*	Y	Y	Y
55.	Plum-headed Parakeet	*Psittacula cyanocephala*	Y	Y	Y
56.	Greater Coucal	*Centropus sinensis*	Y	Y	Y
57.	Jacobin Cuckoo	*Clamator jacobinus*	N	N	Y
58.	Little Swift	*Apus affinis*	N	Y	Y
59.	House Swift	*Apus nipalensis*	N	N	Y
60.	Lesser Kingfisher	*Ceryle rudis*	Y	Y	N
61.	Common Kingfisher	*Alcedo atthis*	Y	Y	N
62.	White-breasted Kingfisher	*Halcyon smyrnensis*	Y	Y	Y
63.	Asian Green bee-eater	*Meropusorientalis*	N	Y	Y
64.	Indian Roller	*Coracias benghalensis*	Y	Y	Y
65.	Indian Grey Hornbill	*Ocyceros birostris*	N	Y	Y
66.	Black-rumped Flameback	*Dinopium benghalense*	Y	Y	Y
67.	Bay-backed shrike	*Lanius vittatus*	Y	N	Y
68.	Long-tailed Shrike	*Lanius schach*	Y	Y	Y
69.	Indian Cuckooshrike	*Coracina macei*	Y	Y	N
70.	Small Minivet	*Pericrocotus cinnamomeus*	Y	N	Y
71.	Black drongo	*Dicrurus macrocerus*	Y	Y	Y
72.	White-bellied Drongo	*Dicrurus caerulescens*	Y	Y	N
73.	Brahminy Starling	*Sturnia pagodarum*	Y	Y	Y
74.	Common Myna	*Acridotheres tristis*	Y	Y	Y
75.	Common Iora	*Aegithina tiphia*	N	Y	N
76.	Rufous Treepie	*Dendrocitta vagabunda*	Y	Y	Y
77.	Indian Jungle Crow	*Corvus (macrorhynchos) culminates*	Y	Y	N

78.	House Crow	*Corvus splendens*	Y	Y	N
79.	Oriental Magpie Robin	*Copsychus saularis*	Y	Y	Y
80.	Indian Robin	*Saxicoloides fulicatus*	Y	Y	Y
81.	Black Redstart	*Phoenicurus ochruros*	Y	N	N
82.	Brown Rock Chat	*Cercomela fusca*	Y	N	N
83.	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*	Y	N	N
84.	White-browed Fantail	*Rhipidura aureola*	Y	Y	Y
85.	Red-breasted Flycatcher	*Ficedula parva*	Y	N	N
86.	Pied Bush Chat	*Saxicola caprata*	Y	N	N
87.	Blue Rock Thrush	*Monticola solitarius*	Y	N	N
88.	Indian Paradise-flycatcher	*Terpsiphone paradisi*	N	N	Y
89.	White Wagtail	*Motacilla alba*	Y	N	Y
90.	White-browed Wagtail	*Motacilla maderaspatensis*	Y	Y	Y
91.	Grey Wagtail	*Motacilla cinerea*	Y	N	N
92.	Citrine Wagtail	*Motacillacitreola*	Y	Y	N
93.	Western Yellow Wagtail	*Motacilla flava*	Y	N	N
94.	Tree Pipit	*Anthus trivialis*	Y	Y	N
95.	Red Avadavat	*Amandava amandava*	N	N	Y
96.	Indian Silverbill	*Euodice malabarica*	N	N	Y
97.	Red-vented Bulbul	*Pycnonotus cafer*	Y	Y	Y
98.	Great Tit	*Parus major*	Y	N	N
99.	Baya Weaver	*Ploceus philippinus*	N	N	Y
100.	Purple Sunbird	*Cinnyris asiaticus*	N	Y	N
101.	Streak-throated Swallow	*Petrochelidon fluvicola*	N	Y	N
102.	Asian Plain Martin	*Riparia chinensis*	N	Y	N
103.	Common Tailorbird	*Orthotomus sutorius*	Y	N	N
104.	Ashy Prinia	*Prinia socialis*	Y	Y	Y
105.	Grey-breasted Prinia	*Prinia hodgsonii*	N	Y	N
106.	Common Babbler	*Argya caudate*	Y	Y	Y
107.	Large Grey Babbler	*Argya malcolmi*	N	N	Y
108.	Jungle Babbler	*Turdoides striata*	Y	Y	N
109.	Chestnut-shouldered Bush-sparrow	*Gymnoris xanthocollis*	Y	Y	N
110.	House Sparrow	*Passer domesticus*	N	Y	Y
111.	Indian White-eye	*Zosterops palpebrosus*	N	Y	Y
112.	Common Woodshrike	*Tephrodornis pondicerianus*	N	Y	N
113.	Shikra	*Accipiter badius*	Y	N	N
114.	White-rumped Vulture	*Gyps bengalensis*	N	Y	N
115.	Griffon Vulture	*Gyps fulvus*	N	Y	N
116.	Red-headed Vulture	*Sarcogyps calvus*	N	Y	N

117.	Egyptian Vulture	*Neophron percnopterus*	N	Y	N
118.	Tawny Eagle	*Aquila rapax*	N	Y	Y
119.	Grey Francolin	*Francolinus pondicerianus*	Y	N	Y
120.	Jungle Bush Quail	*Perdicula asiatica*	N	Y	N
121.	Common Quail	*Coturnix coturnix*	N	Y	N
122.	Indian Peafowl	*Pavo cristatus*	Y	Y	Y
123.	Kestrel	*Falco tinnunculus*	N	Y	N

Table 2: Seasonal abundance of birds at different sites at Madhav National Park, Shivpuri, Madhya Pradesh during December 2017 to November 2018.

S. No.	SITES	Seasons		
		Winter	Summer	Rainy
(Aquatic sites)				
1.	Site- 1 (Sakhya Sagar)	67	70	32
2.	Site- 2 (Madhav Lake)	57	50	40
(Terrestrial sites)				
3.	Site- 3 (George castle)	25	24	15
4.	Site- 4 (Ambakunj)	30	25	24
5.	Site- 3 (Baradari)	23	31	23

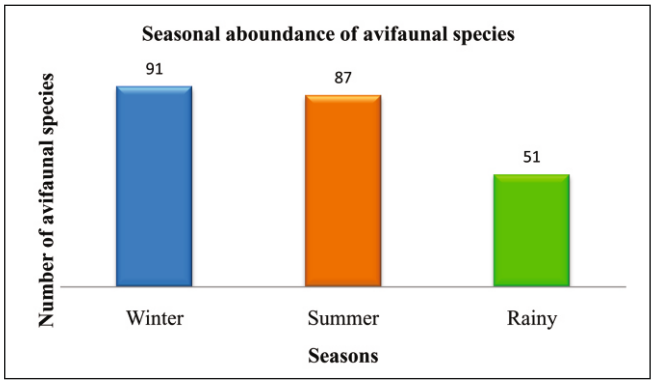

Fig. 1: Abundance of avifaunal species observed in different seasons in the study area.

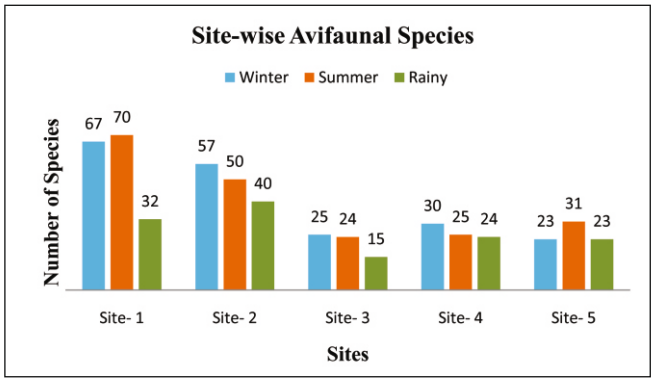

Fig. 2: Site-wise avifaunal species at Madhav National Park, Shivpuri, M.P.

Analysis of residential status indicates that out of 123 species, 74 species were resident, 45 species were winter migratory and 4 species were summer migratory. The summer visitor species were Jacobin Cuckoo (*Clamator jacobinus*), Asian Green bee-eater (*Meropus orientalis*), Black Redstart (*Saxicoloides fulicatus*) and Kestrel (*Falco tinnunculus*). Chopra *et al.* (2017). reported 67 species as resident, 32 as winter migrant species and 5 species as summer migrants in Bhindawas bird sanctuary. Muralikrishna *et al.* (2017) in Kondagai Village, Sivaganga District, South India reported maximum number of 17 bird species as resident, 11 species as local migrant and 3 species as migrant.

Rich bird biodiversity of this National Park is a certification of healthy ecosystem. The maintenance of healthy aquatic as well as terrestrial ecosystem is required for ecological balance, agriculture, widespread biodiversity and human survival (Ashok, 2017, 2018). Although enhanced anthropogenic activities create biodiversity threats that in turn influences sustainable management, conservation practices and environmental ethics (Verma, 2021; Prakash and Verma, 2022).

CONCLUSION

The present study indicates that Madhav National Park represents a good diversity of birds which is influenced by climatic conditions and also shows seasonal variations. Seasonal variations were found in the avifaunal species; the highest species diversity was recorded during the winter season, followed by summer season, while it was lowest during the rainy season. It is also an important area for migratory as well as globally red listed bird species such as Tawny Eagle, *Aquila rapax*, Egyptian Vulture, *Neophron percnopterus*, Woolly-necked Stork, *Ciconia episcopus*, Indian Vulture, *Gyps indicus*, White-rumped Vulture, *Gyps bengalensis*, Red-headed Vulture, *Sarcogyps calvus*, Great Thick-knee, *Esacus recurvirostris*, River Tern, *Sterna aurantia*, Oriental Darter, *Anhinga melanogaster*, Painted Stork, *Mycteria leucocephala* and Black-headed Ibis *Threskiornis melanocephalus*. Comparative data also shows that aquatic sites had a higher bird diversity as compared to terrestrial sites. It is found essential that some small ponds of water may be constructed at the terrestrial sites so that availability of water is ensured throughout the year.

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