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Comparing avifaunal diversity around Pench Tiger Reserve, Maharashtra and Madhya Pradesh

Sonia Mondal¹ and Suman Bhattacharyya²

Post Graduate Department of Zoology, Ecology Unit, Bangabasi College, Kolkata – 700009, India

¹E-mail address: soniamondal680@gmail.com

²E-mail address suman_y26@yahoo.co.in/ durermita@gmail.com

ABSTRACT

Large tracts of natural habitat are being readily replaced by urban sprawl worldwide. We have limited knowledge about the anthropogenic activities on native species in these ecological regions. Human intervention has led to conversion of much of the global diversity by means of habitat alterations. Our conservation methods are also suffering from those superficial strategies. The present study was carried out to investigate the importance of habitat heterogeneity for the diversity, distribution and abundance of avifauna in and around Pench Tiger Reserve. In February 2014, a total of 79 bird species were recorded during the study period, applying the modified point count method. We compared species abundance and richness in Pench Tiger Reserve, considering four zones as metacommunity. Avifaunal community was distributed among Koltimara (Western Pench, Maharashtra), Sillari (Maharashtra), Mansinghdeo (Maharashtra) and Seoni, Pench (Madhya Pradesh). Site specific biodiversity indices reflect the occurrence pattern of avifauna. Shannon – Wiener and Species diversity Index scored highest (9.56 and 1.78 respectively) in Mansinghdeo Wildlife Sanctuary. But species dominance was found high (0.62) in and around Sillari. Study areas with dense canopy closure were found to have more habitat specialist bird species, while areas having human settlements showed more opportunistic ones. An overall negative impact of human settlements on avian diversity, distribution and abundance was evidenced from the present study but more intensive study is needed to infer on the dynamics. Moreover, intensive studies may enrich us about avian diversity and distribution pattern of the study zone.

Keywords: Habitat alterations, Habitat heterogeneity, Avifauna, Species abundance, Biodiversity indices

1. INTRODUCTION

Pench Tiger Reserve (PTR) (77°55'W to 79°35'E and 21°08' S to 22°00'N), lies in the south west region of the state of Madhya Pradesh. The Tiger reserve comprises of the sanctuary and the National park of the same name Covering an area of 757.85 sq.km. Zoo-geographically PTR is a part of Oriental region and floristically it belongs to the Indo-Malayan region. Among its huge fauna, avifauna includes 162 resident, 77 winter visitor, 5 summer visitor, 17 local migratory and 5 vagrant /straggler species of birds (Map 1).



Map 1. Pench Tiger Reserve

Diversity study was mainly confined to four areas, which are as follows: Site 1 – Koltimara (Western Pench, Maharashtra), Site 2 – Sillari (Maharashtra), Site 3- Mansingdeo Wildlife Sanctuary (Maharashtra) and Site 4 – Seoni Pench (Madhya Pradesh).

In 1977 an area of 449.39 sq.km. was notified as the Pench Game Sanctuary (vide Madhya Pradesh State Forest Department Memo No. F/15/77-10(3) Bhopal, dated 30.09.1977). In March 1983, the Government of Madhya Pradesh notified its intention to constitute an area of 292.85 sq.km. as Pench National Park, to be carved out of the pre- existing Pench Sanctuary area [vide notification No. 15/5/82-10(2) Bhopal dated 01.03.1983 (3)]. The present Pench Tiger Reserve was included into the stream of the Tiger Reserves in 1992. This was then the 19th Tiger Reserve of India.

The Pench River, from which the reserve derives the name, flows through the center of the park dividing it into the west Chindwara and the east Seoni block. The total area of the National Park is 292.85-sq. km. out of which 145.24 sq.km. lies in Seoni District and the rest in Chindwara District (Basu, 2012).

2. MATERIALS & METHODS

2. 1. Point Count for Bird Census

We collected data on the relative abundance of individual bird species at multiple point-count locations. Point locations (with an inter station distance of 150 m) were sampled between 22- 25 February, 2015. Birds flying over the station were not recorded because they were unlikely to be breeding in the area. All bird surveys were conducted by the primary author on clear days during the first 4 hrs following sunrise, to coincide with peak singing activity. According to Sutherland (2006) point count method is the most effective for estimating avifaunal diversity from varied habitat types. In the present study a fixed radius circular plot method was used. At each point count observations were made for 10 minutes for all the birds seen and photographed if not identified immediately.

Birds seen or heard within the fixed radius plot were counted separately from those detected outside the plot. Grimmett *et al.* (1999), Ali (2002) were followed for identification. Replication in space rather than performing multiple point counts at fewer locations can be an advantage, because such replication leads to more certainty about the species–habitat associations at the expense of certainty about a particular species’ presence at any individual point (Bolger *et al.* 1997; Goodinson, 2000).

2. 2. Diversity indices

Structural associations (% abundance) were also analyzed from pooled data and finally enumerating avifaunal diversity by applying biodiversity indices (Brower *et al.* 1997). These include- Shannon-Wiener index, Evenness index, Species diversity index and Species richness.

3. RESULTS AND DISCUSSION

Table 1. Recorded Avian Species.

Sl. No.	Name	Scientific Name	Family	Site 1	Site 2	Site 3	Site 4
1.	Lesser whistling-Duck	<i>Dendrocygna javanica</i>	Anatidae	✓			
2.	Ruddy Shelduck	<i>Tadorna ferruginea</i>	Anatidae	✓			
3.	Spot-billed duck	<i>Anas poecilorhyncha</i>	Anatidae	✓			
4.	Lesser yellownape	<i>Picus chlorolophus</i>	Pividae			✓	✓
5.	Malabar Pied Hornbill	<i>Anthracoseros coronatus</i>	Bucerotidae		✓	✓	
6.	Common Hoopoe	<i>Upupa epops</i>	Upuidae	✓	✓	✓	✓
7.	Indian Roller	<i>Coracias benghalensis</i>	Coraciidae	✓		✓	✓
8.	Common kingfisher	<i>Alcedo atthis</i>	Alcedinidae	✓		✓	✓

9.	Stork-billed Kingfisher	<i>Halcyon capensis</i>	Alcedinidae	✓		✓	
10.	White Throated Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	✓		✓	
11.	Pied Kingfisher	<i>Ceryle rudis</i>	Alcedinidae	✓	✓		
12.	Green Bee Eater	<i>Merops orientalis</i>	Meropidae	✓	✓		
13.	Indian Cuckoo	<i>Cuculus microptus</i>	Cuculidae	✓		✓	✓
14.	Asian Koel	<i>Eudynamys scolopacea</i>	Cuculidae	✓		✓	
15.	Greater Coucal	<i>Centropus sinensis</i>	Cuculidae			✓	
16.	Alexandrine Parakeet	<i>Psittacula eupatria</i>	Psittaculidae	✓	✓	✓	✓
17.	Rose Ringed Parakeet	<i>Psittacula krameri</i>	Psittaculidae	✓	✓	✓	✓
18.	Plum Headed Parakeet	<i>Psittacula cyanocephala</i>	Psittaculidae	✓	✓	✓	
19.	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	Apodidae	✓	✓	✓	
20.	House Swift	<i>Apus affinis</i>	Apodidae	✓		✓	
21.	Spotted Dove	<i>Streptopelia chinensis</i>	Columbidae	✓	✓	✓	✓
22.	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	Columbidae		✓	✓	
23.	Emerald Dove	<i>Chalcophaps indica</i>	Columbidae		✓	✓	
24.	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	Columbidae		✓	✓	
25.	White Breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	✓	✓		
26.	Common Coot	<i>Fulica atra</i>	Rallidae		✓	✓	
27.	Eurasian Thick-knee	<i>Burhinus oediconemus</i>	Burhinidae		✓	✓	✓
28.	Black Winged Stilt	<i>Himantopus himantopus</i>	Recurvirostridae		✓	✓	
29.	Little Ringed Plover	<i>Chararadioides dubius</i>	Charadriidae	✓		✓	
30.	Yellow- wattled Lapwing	<i>Venellus malabaricus</i>	Charadriidae	✓		✓	
31.	Red –wattled Lapwing	<i>Venellus indicus</i>	Charadriidae	✓		✓	
32.	River Tern	<i>Sterna aurantia</i>	Sternidae		✓	✓	
33.	Orient Honey-buzzard	<i>Pernis ptilorhyncus</i>	Accipitridae	✓			✓
34.	Black –shouldered Kite	<i>Elanus caeruleus</i>	Accipitridae	✓			
35.	Brahminy Kite	<i>Haliastur Indus</i>	Accipitridae	✓			

36.	Pallas's Fish Eagle	<i>Haliaeetus leucoryphus</i>	Accipitridae	✓			
37.	Egyptian Vulture	<i>Neophron percnopterus</i>	Accipitridae		✓		
38.	Crested Serpent Eagle	<i>Spilornis cheela</i>	Accipitridae		✓	✓	
39.	Shikra	<i>Accipiter badius</i>	Accipitridae		✓	✓	
40.	Little Grebe	<i>Tachybaptus ruficollis</i>	Podicipedidae	✓			
41.	Darter	<i>Anhinga melanogaster</i>	Anhingidae	✓			
42.	Little Cormorant	<i>Phalacrocorax niger</i>	Phalacrocoracidae	✓			
43.	Great Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	✓			
44.	Little Egret	<i>Egretta garzetta</i>	Ardeidae	✓	✓	✓	
45.	Grey Heron	<i>Ardea cinerea</i>	Ardeidae	✓	✓	✓	
46.	Purple Heron	<i>Ardea purpurea</i>	Ardeidae		✓	✓	
47.	Great Egret	<i>Casmerodius albus</i>	Ardeidae		✓	✓	
48.	Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	Ardeidae		✓	✓	
49.	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae		✓	✓	
50.	Painted Stork	<i>Mycteria leucocephala</i>	Ciconiidae		✓	✓	
51.	Asian Open Bill	<i>Anas tomusoscitans</i>	Ciconiidae			✓	
52.	Black Stork	<i>Ciconia nigra</i>	Ciconiidae		✓	✓	
53.	Woolly-necked Stork	<i>Ciconia episcopus</i>	Ciconiidae		✓		
54.	Brown Shrike	<i>Lanius cristatus</i>	Laniidae			✓	✓
55.	Long-tailed Shrike	<i>Lanius schach</i>	Laniidae			✓	✓
56.	Rufous Tree Pie	<i>Dendrocitta vagabunda</i>	Corvidae	✓	✓		✓
57.	Black-hooded Oriole	<i>Oriolus xanthornus</i>	Oriolidae	✓	✓	✓	✓
58.	Large Cuckooshrike	<i>Coraci namacei</i>	Campephagidae		✓		
59.	Small Minivet	<i>Pericrocotus cinnamomeus</i>	Campephagidae	✓		✓	
60.	Long-tailed Minivet	<i>Pericrocotus ethologus</i>	Campephagidae			✓	
61.	Scarlet Minivet	<i>Pericrocotus flammeus</i>	Campephagidae			✓	
62.	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae	✓	✓	✓	

63.	Orange-headed Thrush	<i>Zoothera citrina</i>	Turdidae		✓	✓	
64.	Oriental Magpie Robin	<i>Copsychus saularis</i>	Muscicapidae		✓	✓	
65.	Indian Robin	<i>Saxicoloides fulicata</i>	Muscicapidae		✓	✓	
66.	Black Redstart	<i>Phoenicurus ochruros</i>	Muscicapidae	✓			
67.	Common starling	<i>Sturnus vulgaris</i>	Sturnidae	✓			
68.	Asian Pied Sterling	<i>Sturnus contra</i>	Sturnidae		✓	✓	
69.	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	✓	✓	✓	✓
70.	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	✓	✓	✓	✓
71.	Common tailor Bird	<i>Orthotomus sutorius</i>	Cisticolidae	✓	✓	✓	✓
72.	Common Babbler	<i>Turdoides caudatus</i>	Leiothrichidae	✓	✓		
73.	Jungle Babbler	<i>Turdoides striatus</i>	Leiothrichidae		✓	✓	
74.	Forest Wagtail	<i>Dendronanthus indicus</i>	Motacillidae		✓	✓	
75.	White Wagtail	<i>Motacilla alba</i>	Motacillidae		✓	✓	
76.	Yellow Wagtail	<i>Motacila flava</i>	Motacillidae		✓	✓	
77.	Peacock	<i>Pavo cristasus</i>	Phasianidae				
78.	Grey Horn bill	<i>Ocyeros birostris</i>	Bucerotidae	✓		✓	
79.	Black sholdered Kite	<i>Elanus caeruleus</i>	Accipitridae			✓	✓

Table 2. Site specific biodiversity indices of recorded avian species

Diversity Indices	SITE 1	SITE 2	SITE 3	SITE 4
MARGALEF'S INDEX	4.61	1.107	4.29	3.32
PIELOU'S EVENNESS INDEX	0.79	4.29	6.89	0.99
SHANNON WIENER INDEX	1.553	1.293	9.563	0.692
SPECIES DIVERSITY INDEX	1.56	0.707	1.78	1.41
DOMINANCE DIVERSITY INDEX	0.4	0.625	0.4	-

The major objective of the study was to compare the avifaunal diversity (Table 2) in four different zones (sites) of Pench Tiger Reserve. These zones have little difference in respect to their topological characteristics or in ecological characters. The sites are different in terms of compactness of vegetation, canopy cover and most importantly the degree of human intervention and exploitation. The results show that Shannon - Wiener Index and Species Diversity Index (Fig. 1 & 2) are higher in case of Mansinghdeo Wildlife Sanctuary i.e., 9.56 and 1.78 respectively, as compared to other zones. It is to note that as compared to other sites, Mansinghdeo has less exploitation and less human activities with highest vegetation compactness causing more bird species to assemble; whereas Dominance Diversity Index (Fig. 3) of Sillari is 0.625 that appears much higher than other places. In Sillari, vegetation is less compact with more human activities, causing more of opportunistic species to take refuge. Though a little difference can be made in these zones, yet, more human activities has been observed in case of Kolitmara and Sillari. Such a situation might have led to more of opportunistic birds who mostly stay in close proximity to humans, resulting in decrease of heterogeneity and higher dominance index (Fig. 3). For example, Jungle Babbler, a completely opportunistic population, is much high in Sillari, as they basically depend on human leftovers (Table 1). Find of more of opportunistic species in Kolitmara may be related with the maximum human activity. High diversity recorded at Mansinghdeo speaks of habitat heterogeneity. Study areas with dense canopy cover were found to favour more habitat specialist bird species. An overall negative impact of human settlements on avian diversity, distribution and abundance was evidenced from the present study.

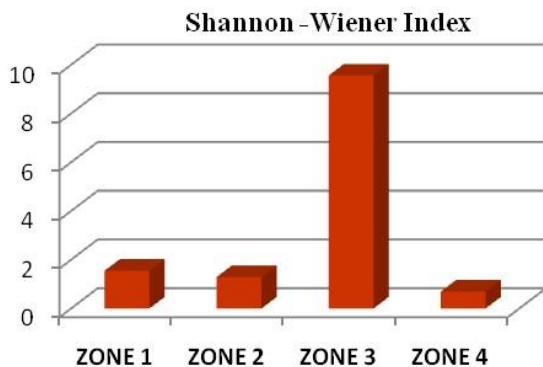


Fig. 1

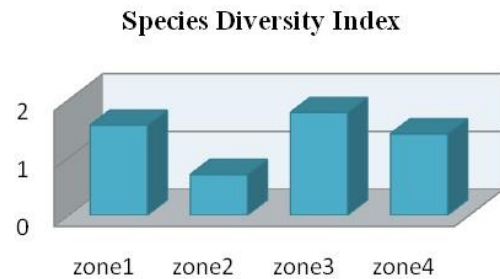


Fig. 2

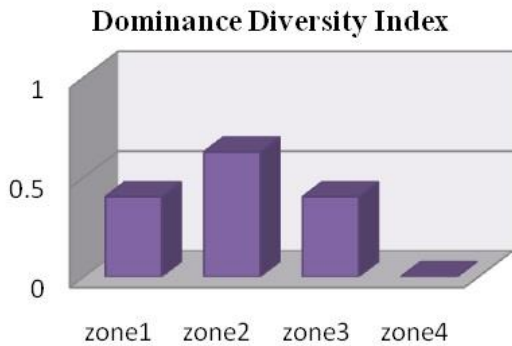


Fig. 3

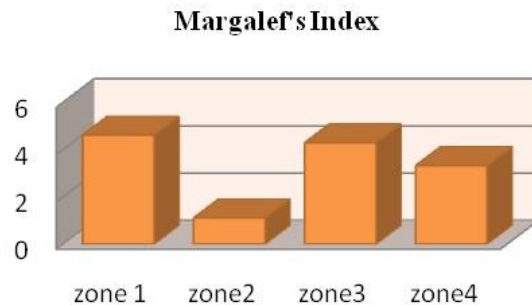


Fig. 4

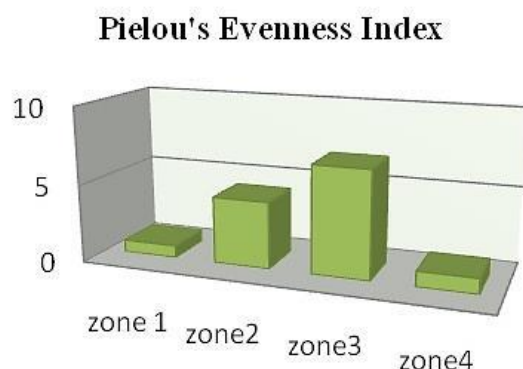


Fig. 5

However, more intensive study is needed to elaborate the explanation of diversity, distribution and abundance of avifauna in PENCH Tiger Reserve.

4. CONCLUSIONS

Unprecedented rates of species extinctions have prompted extensive research into the consequences of biodiversity losses on ecosystem functioning especially in our country. The consequences of species loss for the functioning of ecosystems have been addressed through several major research programmes in recent years, mostly in terrestrial environments (Kinzig *et al.* 2001; Loreau *et al.* 2002). Biodiversity loss in ecosystems is an increasing phenomenon, mainly due to human activity (Abell, 2002). The main causes are habitat destruction and defragmentation, exotic species introduction and global climate change impacts (Saunders *et al.* 2002).

Above study conducted leads to a conclusion that the entire park encompassing the area partly in Madhya Pradesh and Maharashtra have different canopy cover type. As in Kolutmara, the canopy is moderately dense where as in Seoni, PENCH (Madhya Pradesh) have low canopy cover, in contrast zones of Mangsingdeo Wildlife Sanctuary and Silliary have much denser canopy cover. The most highlighted part of the study is that due to high human movements these areas are losing their heterogeneity and birds of more opportunistic type are inhabiting these areas who also have negative influences on the rest of the avifauna that are not accustomed with humans. *Our short-term study involved only a few selected patches of forests; a more intensive study might unfold many more spectrum. Detailed study might improve the list of avian species and their characteristic distribution in different forest patches from the present location. The impact of anthropogenic alteration of the habitats in and around PENCH National Park also needs further intensive study.*

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