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## **Birds and their conservation status at Nandur Madhmeshwar bird Sanctuary near Nasik, India**

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### **Abstract**

Nandur Madhmeshwar Bird Sanctuary (NMBS) near Niphad, district Nasik, Maharashtra State established as one of the unique natural habitat for local resident and migratory species over a period of one hundred years. Wetlands, small atolls, marshy lands, trees, agriculture land and a small patch of forest provides multiple habitat conditions for the birds especially water birds. During this study 105 species belongs to 14 Orders and 40 Families were recorded in winter season, year 2018, out of that the distribution and characteristics was 64 (60.9%) migratory, 41 (39.0%) Resident, 04 (3.8%) Near Threatened, 6 (5.17%) Abundant, 36 (34.2%) Occasional, 43 (40.9%) Common, 20 (19.0%) Rare. Winter migratory species were 16 (15.2%). Maximum number was of different duck species (Anseriformes) with species diversity 14 (14.3%). Winter season is population and diversity rich period for the occurrence of birds. It is nearly pollution free zone for the birds and protected under the Department of Forest and Wild life, Government of Maharashtra. The visitors have to take care not perform any activity or behave that disturb the life and ecological processes of birds and the habitat.

**Keywords:** IBA, Nandur Madhmeshwar Bird Sanctuary, Nasik, India

### **1. Introduction**

Aves are advanced, adapted descendents of extinct reptiles. Majority of birds have ability to fly, which they use to fulfil their survival needs. Flight is one of the unique specialities of birds in animal kingdom. Birds are well known for their international migration to avoid unfavourable harsh weather conditions like snow fall, heat wave, high rainfall, shortage of food the birds migrate. Birds also migrate to new places or at the same place for years together. The important issues related to bird study includes species diversity and distribution pattern, nesting material, nesting patterns, habitat ecology, population dynamics, habitat conservation, species conservation, importance in agriculture pest control, pathogen carriers, markers of ecosystem health and several other. Jaikwadi reservoir near Paithan, Aurangabad area and Nandur Madhmeshwar Bird Sanctuary are one of the important bird areas (IBA) in Maharashtra. It is essential to monitor the IBA's to determine the current status and suggest improvements for the conservation and sustainable management of these areas. Nandur Madhmeshwar Bird Sanctuary (NMBS) located near Villages Nandur, Khangaon Thadi and Chapadgaon near Tahesil place Niphad in District Nasik of Maharashtra State, India. It is developed in to a biodiversity rich area due to specific zoogeographical pattern of the landscape. The sanctuary is not much larger than total 19-20 Km<sup>2</sup> area. There are various types of microhabitats naturally get developed which favours the life of birds as ideal habitats. Due to declaration of this wetland cum reservoir and surrounding area to this water body as Bird Sanctuary it is haven for the birds. As compared to all other habitats the wetlands and water bodies with vegetation, hydrophytes and surrounding scrub, tree cover was most suitable for congregating diversity of bird species (Islam and Rahmani, 2004) <sup>[16]</sup>. Water bodies also support wide range of biodiversity hence most suitable for birds to get variety of food, due to varied microhabitat availability it is good and safe place to lay the eggs (Islam and Rahmani, 2004) <sup>[16]</sup> as the case found at this sanctuary. There are about 10,000 species of birds in the world. India harbours 1318 species of which 57 are endemic, 03 breeding endemic and 85 species are threatened (TH) (IUCN, Birdlife International, 2018) <sup>[17]</sup>. Avibase (2017) <sup>[4]</sup> reported the existence of 616 species of birds in Maharashtra State of which 33 are threatened (TH) and 01 is introduced species. Chavan *et al.* (2015) <sup>[23]</sup> prepared annotated checklist with all possible details of sighted birds from Godavari river basin at Nanded and area around in Maharashtra.

There is no comprehensive report and updated information available for the researchers, birders, ecologists and environmental planners on this bird sanctuary hence the present study was planned. The aim is to make available all essential information and current situation of bird life at this place for the common man and the tourists too.

## 2. Materials and Methods

To study the Nandur Madhmeshwar Bird Sanctuary (NMBS) a field trip was planned in the month of January, 2018; this month was end of winter season in this area. By considering the availability of major avian species and maximum population density the sanctuary was visited to record the density and diversity of birds. To determine the migratory, transit and local species in this sanctuary was main aim of this study. The types of microhabitats, feeding guilds of the species, the predatory fauna in aquatic food chain was also recorded. The data was recorded from backwater of the project, from downstream area and outskirts of the reservoir. We also noted the activities of visitors and the sincere efforts from the Department of Forest and wild life on the management and conservation of this sanctuary.

### A. Study area

Nandur Madhmeshwar Bird Sanctuary is named after village Nandur located in the area and name Madhmeshwar is after the God Shiva, a temple around 250 years old construction that located in downstream rocky area of reservoir. It is also a pilgrimage centre for Mahanubhav Pantha worshipers. Due to draught and famine situation in the period of British Indian Governance, the British had built a stone pickup weir in year 1907-1913 on the confluence of two rivers the main river Godavari and its tributary Kadva. Later on in year 1950 it had been rejuvenated and reconstructed as Nandur Madhmeshwar Project. There are two lateral gates to control water level and outlet canals as left and right canals for irrigation to agriculture. In 1986 it has been declared as bird sanctuary by Government of Maharashtra State Department of Forest and Wild Life. The sanctuary has three parts or components the reservoir and its backwater area, downstream rocky area around Madhmeshwar temple and a patch of 14 ha. thick forest in downstream region to right outlet canal. The entire area under the sanctuary is 19.6 Km<sup>2</sup>. Similarly the area of sanctuary also gets mixed with agriculture crop fields. Since construction of gates to control water level for this project river Godavari remained a source of water and suspended silt and organic matter drifted through flood from upstream catchment area and finally get deposited in to the reservoir. Hence due to long term deposition of silt and organic matter various kinds of microhabitats are developed that includes wetlands, marshy area, swamps, islets, small bogs. In the backwater area between two rivers there is moderate forest that also an important microhabitat as a part of this sanctuary. On the right flank of river Godavari especially a large wetland of around 1000 ha. is developed where the maximum population, diversity and activities of the bird species can be observed.

In upstream part of this project through River Godavari the excess water released from Gangapur and Darna reservoirs hence the water level in Nandur Madhmeshwar project is maintained. There are reports on presence of 24 species of fishes, some molluscs, prawns and crabs in the reservoir, which is main food for the birds. Similarly several visiting

bird species depend on the aquatic submerged vegetation as their food especially ducks. The safe place with rich food might be reason for such a large gathering of birds in this Sanctuary.

### B. Location of the sanctuary

Nandur Madhmeshwar Bird Sanctuary (NMBS) located 20° 00' 43' N and 74° 06' 24' E, 12 Km. SE to Niphad town in Nasik district of Maharashtra State. The sanctuary area is connected to Niphad by road from two routes one is via Shivraphata-Nandur-Khangaoon (Thadi) and another route is Niphad to Chapadgaon. Chapadgaon village is located near backwater of the reservoir (NMBS). The Village council of Chapadgaon and Department of Forest and Wildlife jointly developed a observation centre near Chapadgaon. The entry fees in to the sanctuary at this centre was Rs. 60.00 (INR), Camera charges INR 100 and on rent the binocular to watch the birds was also available. In the periphery of water body five towers of 20-25 ft. height are constructed to watch the birds and for photography. Due to thick fringe of *Typha angustifolia* a weed around the wetland area of reservoir, the distance between observers or bird watchers and bird habitat is 20-500 meters. Hence practically without binoculars or an ultra zoom camera it is difficult to identify the bird species. Hence the scene for a common man without any tool for observation will be a crowd of birds and their activities in long distance area. There is a facility of eco-friendly rooms to stay overnight, food, coffee-tea and a small recreational garden centre for the tourists and bird watchers at Chapadgaon Forest Centre.

In the downstream of the reservoir there is a guest house under the control of State Forest Department. Two rooms for few days stay on rent charges INR 500/24 hrs/02 person are available. Online booking facility was not available, it was available on spot booking if vacant. For the students during their stay for study tour a common hall for 20-30 students was available without bed. At the same guest house the State Forest Department has also developed a Centre for Nature Interpretation (CNI). At CNI to educate the common man on avian diversity and bird life the information is displayed in the form of charts and digital photo boards. A documentary on species diversity of birds and their activities in the reservoir of NMBS was also shown on digital TV screen. In various galleries of CNI the models are displayed about types of eggs, feathers, nest types, types of beak and foot, evolution of birds and some important species of birds. For common man and students it is very informative. Similarly details on NMBS and the reservoir are also displayed on charts. In short NMBS is one of the best natural destination for tourists and naturalists for 1-2 days stay for birding and wild life study for all season especially good during winter. The place is well connected by tar roads from Niphad town, railway junction Manmad (MMR) and Airport at Aurangabad (AUX).

### C. Methods and equipments used

The study was conducted mainly to determine the avian diversity, distribution pattern, population density across the microhabitats in backwater. A study tour was carried out for three days to visit NMBS in the month of January, 2018. The selected points were visited by walk to record the data. At each point 02 hrs. were spent. Using NIKON P900 digital auto-zoom camera of 2000 mm range the avian diversity was digitally recorded by photo and Video. NIKON p510 auto-

zoom, 14 Mega pixel camera was also used. 1.0 to 1.5 km. Range Olympus Binocular was used to watch the birds and their activities. Morning 6.00 a.m. to 11.00 a.m. and evening 3.00 p.m. to 6.00 p.m. was observation time. For the observations on birds we could not enter into the reserved forest area due to safety reason by not having forest safety vehicle whereas in rest of the area the guidance and support from the forest guards and officials was most helpful. Birds were observed scientifically and by following all the rules of biodiversity safety. Due to deep muddy area and swamps in the reservoir area where the peak activities of birds were observed, such area is unsafe for human entry and also not permitted.

The observation points selected to record the birds were four observation towers located around the southern side of the wetlands, three points at 50 meter distance on the reservoir embankment wall and five points at 100 meter distance in the downstream rocky area up to Madhmeshwar temple. At all these twelve different points random line point count method was used (Chao A., 1984; Bibby *et al.*, 2000) <sup>[10, 6]</sup>; Buckland *et al.*, (2001, 2006) <sup>[7]</sup>. The data collected was tabulated and graphically represented. The data was analyzed for determination of population count, species diversity, feeding guilds, migratory and local species, richness etc. (Abdulali, 1981; Ali, 1996; Ali and Replay, 1983) <sup>[1-3]</sup>. Birds were classified as per the conservational status (Gaston, 1973; Birdlife International, 2017) <sup>[15, 9]</sup>. Birds sited were categorized as per ACOR rules (Avibase, 2017) <sup>[4]</sup>. The enlisted birds are only those which we could site or photograph at this sanctuary during our short stay of this study.

### 3. Results and Discussion

During the present study 105 species of birds were recorded from 12 different count points, they were belongs to 14 orders and 40 families. 64 (60.9%) species were migratory of that 48 (45.7%) were Local Migratory and 16 (15.2%) were winter migratory have reached here from Northern Himalaya, China and parts of Europe. Resident species 41 (39.0%). 02 were breeding migrant. Of the recorded 105 species 04 were Near Threatened, 01 Critically Endangered (0.9%) and 01 belongs to Endangered category (0.9%) it was red crested Pochard and Critically Endangered (CR) White bellied Heron was recorded. The Painted storks population was moderate and a common scene they were few in number and in resting posture on small islets in the backwater in a group of 3-6. Chavan *et al.*, (2016) <sup>[12, 13]</sup> reported that painted storks have modified to herbivory in Godavari river basin as an adaptation to non availability of required food. Maximum population density of water birds was in the wetlands and marshy area of reservoir backwater near the observation towers. Lowest density of birds was near the embankment wall of reservoir. It was due to high depth of water and anthropogenic activities of visitors, vehicle noise on the road of embankment wall. Common cranes were sited near the fringe of semi-submerged aquatic weed at interior small islet of the reservoir about 400-500 meters away from observation towers. At the observation points 1 and 4 the common scene was ducks were diving partially in to the shallow water of wetland with weeds during feeding in early morning. Northern showlers, Wigeon, Spotbill duck and Gadwit were found undisturbed up to 5-10 meter distance from the observers (Visitors) and they were in resting posture on the floating bed of thick weeds at

observation point 1 and 2. Majority of birds especially duck species (Anseriformes) 14 species (14.3%) found fearless and undisturbed indicating the safety feeling behaviour of these species in the sanctuary. In the downstream rocky terrain of river Godavari two colonies of cliff swallow each containing 300-350 nests of gourd shaped mud nests attached to rock cliff was found near Madhmeshwar temple. Chavan *et al.*, (2016. b) <sup>[13]</sup> reported that the presence of wire tailed swallow nest colony is an indication of healthy ecosystem in a study of nest colony in Nanded District, Maharashtra similarly a nest colony of Cliff swallow was found in a non polluted area near Nandur Madhmeshwar temple of this bird sanctuary during this study. The swallow were busy in nest construction using mud pellets (Chavan *et al.*, 2016. b) <sup>[13]</sup>. The mud pellets were carried in their mouth from river area to the nesting site. There was no impact of fishing activity by local fishermen on the nest construction process. The fishermen reported that, colony of swallow exists since last 50-60 years indicating this area has remained pollution free since many years and need to remain same for the survival of biodiversity and ecosystem functioning. In the interior of backwater there is agriculture land and some trees of *Acacia species* in the confluence area of two river where few nests of Baya weaver were found. Achegave *et al.*, (2016) <sup>[21]</sup> extensively studied the nesting patterns of Baya weaver a common passerine in Godavari river but in the sanctuary the nest number was restricted to patches only. The diving pintails, Gadwit, Wigeon and other ducks was common scene in the backwater wetland area indicates presence of there is molluscan diversity in the weedy area that was also useful for openbill storkes and Painted storks (Sharda *et al.*, 2017; Urfi, 2011) <sup>[22, 25]</sup>.

There are few reports on avifaunal diversity studies of Godavari river basin in Maharashtra, especially these are localized at Nathasagar wetland near Paithan, Aurangabad, Maharashtra. Kulkarni, *et al.*, (2006a) <sup>[18]</sup>; Balkhande *et al.*, (2012) <sup>[5]</sup>; Kulkarni and Kanwate (2010) <sup>[19]</sup> reported the avian fauna from river Godavari, the tributaries of this river and the backwater of reservoirs in Nanded region. The studies are localized to specific habitats covering the minor area either a small pond or a few bird sighting points along Godavari River. The avifaunal diversity study is one of the essential parameter to determine the habitat ecology (Chavan *et al.*, 2015) <sup>[23]</sup>. In Nanded region of Maharashtra it was observed that the Black neck Ibis, Painted Storks, Spoon Bill and Woolly/White neck stork flocking in large number near most polluted water areas in Godavari river as compared to their gathering in the clean and non-polluted water bodies of parts of Godavari river and isolated minor water bodies in Godavari river basin. Therefore to correlate the occurrence of birds to the quality of habitat water will be new study of avian assemblage (Chavan *et al.* (2015) <sup>[23]</sup>. The ACOR type of status and ecological categorization was also reported. Recently Chavan *et al.* (2015) <sup>[23]</sup> has published a comprehensive list of avifauna from Godavari river basin in Nanded area of Maharashtra. The winter migrant comb duck was sighted at Derla Tank (Chavan *et al.*, 2015) <sup>[23]</sup> near Nanded in Godavari river basin. Decreased rainfall, increasing anthropogenic activities, surface water and running water pollution are major disturbing activities for decrease in the avifauna from Western Ghats region was reported. Prasad *et al.*, (2014) <sup>[20]</sup> extensively studied the avifaunal diversity of Manjeera Wildlife Sanctuary, Andhra Pradesh, India. He reported the occurrence of 164 species of birds belonging to

53 different families. It was an avifaunal diversity study from a different kind of habitat that include part of Manjeera river (Tributary of Godavari River), Manjeera reservoir and the typical scrub forest around. He has also applied the Simpson's Index and Index of Diversity, Shannon's Index, Evenness Index and equitability Index whereas in the NMBS 105 species belongs to 14 Orders and 40 families are recorded. Balkhande (2010) [5]; Chavan *et al.*, (2015) [23] reported occurrence of Common tern (*Sterna hirundo*) in very rare number along the river margin. Prasad *et al.*, (2014) [20] reported the occurrence of whisker tern as winter migrant. More investigation for sighting these species is essential to correlate the species assemblage at NMBS. Manral and Khudsar (2013) [24] reported 53 species of water birds at wetland near Delhi. Chavan and Dhamani (2014) [11]

identified 76 species of birds belongs to 39 families of the species from Chaprala Wildlife Sanctuary, District Gadchiroli, Maharashtra and found dominant species group was from family Accipitridae. Das *et al.* (2013) reported 157 species of birds belongs to 56 families of these 85.9% were residents and 14.1% were migratory, whereas in the present study 60.9% species were migratory and 39.0% species belong to resident category indicates that NMBS is one of the most preferred sanctuary by the migratory bird species as compared to other sanctuaries in India in terms of species diversity. Most dominant bird species were ducks and teals comprise 14 species (14.3%). The predatory hawks, Harriers, kites and other members of Accipitridae were rarely found hence naturally the area is a paradise for young ones and adults of water birds from safety point of view.

**Table 1:** Checklist of Birds recorded from Nandur Madhmeshwar Bird Sanctuary (Jan. 2018).

Sr. No.	Order, Family, Common Name	Zoological Name, Authority	Population, IUCN status	Ecological Status
1]	<b>Podicipediformes</b> <b>1. Podicipidae</b> 1. Little Grebe	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	C (LC)	MC
2]	<b>Ciconiformes</b> <b>2. Ardeidae</b> 2. Grey Heron	<i>Ardea cinerea</i> (Linnaeus, 1758)	C (LC)	MU
	3. Indian Pond Heron	<i>Ardeola grayii</i> (Sykes, 1832)	A (LC)	RC
	4. Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus, 1758)	A (LC)	RM
	5. Little Egret	<i>Egretta garzetta</i> (Linnaeus, 1766)	C (LC)	RM
	6. Median Egret	<i>Mesophoyx intermedia</i> (Wagler, 1829)	A (LC)	RM
	7. Large Egret	<i>Casmerodius albus</i> (Linnaeus, 1758)	O (LC)	Mr
	8. Purple Heron	<i>Ardea purpurea</i> (Linnaeus, 1766)	R (LC)	Mr
	9. White Bellied Heron	<i>Ardea insignis</i> (Hume, 1878)	R (CR)	Mr
	10. Night Heron	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	C (LC)	Rr
	<b>3. Ciconidae</b>			
	11. Painted Stork	<i>Mycteria leucocephala</i> (Pennant, 1769)	C (NT)	MC
	12. Asian Open bill Stork	<i>Anastomus oscitans</i> (Boddaert, 1783)	R(LC)	Mr
	13. Black Necked Stork	<i>Ephippiorhynchus asiaticus</i> (Linn.,1790)	R (NT)	WMr
	14. White Necked/Wooly Stork	<i>Ciconia episcopus</i> (Boddaert, 1783)	O (LC)	WMr
	<b>4. Threskiornithidae</b>			
	15. Oriental White/Black Head Ibis	<i>Threskiornis melanocephalus</i> (Latham, 1790)	R(NT)	MU
	16. Indian Black Ibis	<i>Pseudibis papillosa</i> (Temminck, 1824)	R (LC)	MU
	17. *Glossy Ibis	<i>Plegadis falcinellus</i> (Linnaeus, 1766)	C (LC)	MC
	18. Euresion Spoonbill	<i>Platalea leucorodia</i> (Linnaeus, 1758)	C (LC)	WMU
3]	<b>Phoenicopteriformes</b>			
	<b>5. Phoenicopteridae</b>			
	19. Greater Flamingo	<i>Phoenicopterus ruber</i> (Linnaeus, 1758)	R (LC)	WMr
4]	<b>Ansariformes</b>			
	<b>6. Anatidae</b>			
	20. Bar Headed Goose	<i>Ansar indicus</i> (Latham, 1790)	O (LC)	WMr
	21. Lesser Whistling Duck	<i>Dendrocygna javanica</i> (Horsfield, 1821)	C (LC)	WMC
	22. Brahminy/Ruddy-Shellduck	<i>Tadorna ferruginea</i> (Pallas, 1764)	M (LC)	WMC
	23. Euresian Wigeon	<i>Anas penelope</i> (Linnaeus, 1758)	C (LC)	WMU
	24. Northern Pintail	<i>Anas acuta</i> (Linnaeus, 1758)	C (LC)	MU
	25. Spot Billed Duck	<i>Anas poicillorhyncha</i> (Forster JR,1781)	C (LC)	RMC
	26. Northern Shoveller	<i>Anas clypeata</i> (Linnaeus, 1758)	O (LC)	WMU
	27. Garganey	<i>Spatula querquedula</i> (Linnaeus, 1758)	O (LC)	WMU
	28. Red Crested Pochard	<i>Netta rufina</i> (Pallas, 1773)	O (E)	WMr
	29. Common Pochard	<i>Aythya farina</i> (Linnaeus, 1758)	O (LC)	WMr
	30. Tufted Pochard	<i>Aythya fuligula</i> (Linnaeus, 1758)	O (LC)	WMr
	31. Gadwall	<i>Anas trepera</i>	O (LC)	WMr
	32. Comb Duck	<i>Sarkiaiornis melanotos</i> (Pennant, 1789)	O (LC)	RMU
	33. Marbled teal	<i>Marmaronetta anguistrostris</i> (Pennant, 1789)	R (LC)	RMr
5]	<b>Falconiformes 7. Accipitridae</b>			
	34. Black Shouldered Kite	<i>Elanus caeruleus</i> (Desfontaines, 1789)	C (LC)	Rr
	35. Black Kite	<i>Malvus migrans</i> (Boddaert, 1783)	C (LC)	RU
6]	<b>Gruiformes 8. Gruidae</b>			

	36. Demoiselle Crane	<i>Antropoides virgo</i> (Linnaeus, 1758)	O (LC)	Mr
	37 Common crane	<i>Grus grus</i>	O (LC)	Mr.
	<b>09. Phasinidae</b>			
	38. Indian Peafowl	<i>Pavo cristatus</i> (Linnaeus, 1758)	A (LC)	RC
	39. Gray Francolin	<i>Francolinus pondicerianus</i> (Linnaeus, 1766)	C (LC)	RC
	<b>10. Rallidae</b>			
	40. Common Coot	<i>Fulica atra</i> (Linnaeus, 1758)	C (LC)	RC
	41. White Breasted Water hen	<i>Amauromis phoenicurus</i> (Pennant, 1769)	C (LC)	RC
	42. Purple Moorhen	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	O (LC)	RC
7]	<b>Pelecaniformes 11. Phalacrocoracidae</b>			
	43. IndianShag/ Cormorant)	<i>Phalacrocorax fuscicollis</i> (Stephans, 1826)	R (LC)	RMU
	44. Little Cormorant	<i>Phalacrocorax niger</i> (Vieillot, 1817)	A (LC)	RMC
	45. Greater Cormorant	<i>Phalacrocorax carbo</i> (Vieillot, 1817)	R (LC)	RMU
8]	<b>Charadriiformes 12. Recurvirostridae</b>			
	46. Black Winged Stilt	<i>Himantopus himantopus</i> (Linnaeus, 1758)	A (LC)	WMC
	<b>13. Charadriidae</b>			
	47. Red Wattled Lapwing	<i>Venellus indicus</i> (Linnaeus, 1758)	C (LC)	RC
	48. Little ringed plover	<i>Charadrius dubius</i> (Scopoli, 1786)	C (LC)	WMU
	<b>14. Scolopacidae</b>			
	49. Common Sandpiper	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	C (LC)	WMU
	50. Curlew Sandpiper	<i>Calidris ferruginea</i> (Pontappin, 1763)	R (LC)	WMU
	51. Wood Sandpiper	<i>Tringa glareola</i> (Linnaeus, 1758)	O (LC)	WMU
	52. Marsh Sandpiper	<i>Tringa stagnalis</i> (Bechstain, 1803)	O (LC)	WMU
	<b>15. Sternidae</b>			
	53. River Tern	<i>Sterna aurantia</i> (J. E. Gray, 1831)	R (NT)	RMU
	54. Common Tern	<i>Sterna hirundo</i> (Linnaeus, 1758)	C (LC)	WMC
9]	<b>Columbiformes</b>			
	<b>16. Columbidae</b>			
	55. Blue Rock Pigeon/Dove	<i>Columba livia</i> (J. F. Gmelin, 1789)	C (LC)	RC
	56. Eurasian Collared Dove	<i>Streptopelia decaocto</i> (Frisvaldszky, 1838)	C (LC)	RC
	57. Spotted Dove	<i>Streptopelis chinensis</i> (Scopoli, 1786)	O (LC)	RU
	58. Laughing Dove	<i>Streptopelia senegalensis</i> (Linnaeus, 1766)	C (LC)	RU
	59. Oriental turtle Dove	<i>Streptopelia orientalis</i> (Latham, 1790)	R (LC)	RMC
10]	<b>Psittaciformes 17. Psittacidae</b>			
	60. Rose Ringed Parakeet	<i>Psittacula krameri</i> (Scopoli, 1769)	O (LC)	RC
	<b>18. Cuculiformes</b>			
	61. Pied Crested Cuckoo	<i>Clamator jacobinus</i> (Baddaert, 1783)	O (LC)	BMr
	62. Common koel	<i>Eudynamis scolopacea</i> (Linnaeus, 1758)	C (LC)	RC
	63. Indian Roller	<i>Hierococcyx varius</i>	C (LC)	BMU
	64. Greater Coucal	<i>Centropus sinensis</i> (Stephens, 1815)	O (LC)	RU
11]	<b>Stigiformes 19. Strigidae</b>			
	65. Spotted Owlet	<i>Athene brama</i> (Temminck, 1821)	C (LC)	RC
12]	<b>Apodiformes 20. Apodidae</b>			
	66. Common Swift	<i>Apus apus</i> (Linnaeus, 1758)	C (LC)	Rr
13]	<b>Coraciiformes 21. Alcedinidae</b>			
	67. Lesser Pied Kingfisher	<i>Ceryle rudis</i> (Linnaeus, 1758)	C (LC)	RU
	68. Common Kingfisher	<i>Alcedo atthis</i> (Linnaeus, 1758)	C (LC)	RU
	69. White Breasted Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	C (LC)	RU
	<b>22. Meropidae</b>			
	70. Little Green Bee eater	<i>Merops orientalis</i> (Latham, 1801)	C (LC)	RMC
	71. Blue tail Beater	<i>Merops philippinus</i> (Linnaeus, 1766)	C (LC)	RMU
	<b>23. Coraciidae</b>			
	72. Indian Roller	<i>Coracias benghalensis</i> (Linnaeus, 1758)	O (LC)	Rr
	<b>24. Upupidae</b>			
	73. Common Hoopoe	<i>Upupa epops</i> (Linnaeus, 1758)	R (LC)	RMU
14]	<b>Passeriformes 25. Alaudidae</b>			
	74. Black crown sparrow lark	<i>Eremopterix nigriceps</i> (Gould, 1839)	O (LC)	RU
	75. Bengal Bush Lark	<i>Mirafra assamica</i> (Horsfield, 1840)	O (LC)	WMU
	76. Ashy crown sparrow Lark	<i>Eremopteryx grisea</i>	O (LC)	WMU
	<b>26. Hirundinidae</b>			
	77. Cliff Swallow	<i>Petrochelidon pyrrhonota</i> (Linnaeus, 1758)	O (LC)	RMC
	78. Red Rumped Swallow	<i>Cecropes daurica</i> (Laxmann, 1769)	O (LC)	RMC
	<b>27. Dicruridae</b>			
	79. Black Drongo	<i>Dicrurus macrocercus</i> (Vieillot, 1817)	C (LC)	RC
	<b>28. Laniidae</b>			
	80. Great Gray Shrike	<i>Lanius excubitor</i> (Linnaeus, 1758)	O (LC)	WMU
	<b>29. Sturnidae</b>			

81. Common Myna	<i>Acedothis tristic</i> (Linnaeus, 1766)	C (LC)	RC
82. Brahminy Starling	<i>Sturnia pagodarum</i> (J F Gmelin, 1789)	C (LC)	RC
<b>30. Corvidae</b>			
83. House Crow	<i>Corvus splendens</i> (Vieillot, 1817)	O (LC)	RC
84. Large Billed/Jungle Crow	<i>Corvus macrorhynchos</i> (Wagler, 1827)	O (LC)	RU
<b>31. Pycnonotidae</b>			
84. Red-Vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	C (LC)	RC
<b>32. Timaliidae</b>			
85. Yellow Eyed Babbler	<i>Chrysomma sinense</i> (Gmelin, 1789)	O (LC)	Rr
86. Pin Stripped Tit/Yellow Breasted Babbler	<i>Macronus gularis</i> (Horsfield, 1822)	O (LC)	WMr
<b>33. Sylviinae</b>			
87. Asian Paradise Flycatcher	<i>Terpsiphone paradise</i> (Linnaeus, 1758)	O (LC)	RMr
<b>34. Sylviinae</b>			
88. Plain Prinia	<i>Prinia inornata</i> (Sykes, 1832)	O (LC)	RU
89. Ashy Wren Prinia/ Warbler	<i>Prinia socialis</i> (Sykes, 1832)	O (LC)	RC
<b>35. Turdinae</b>			
90. Indian Robin	<i>Saxicoloides fulicata</i> (Linnaeus, 1776)	C (LC)	RU
91. Indian Chat	<i>Cercomela fusca</i>	C (LC)	RU
92. Oriental Magpie Robin	<i>Copsychus saularis</i> (Linnaeus, 1758)	C (LC)	RC
<b>36. Motacillidae</b>			
93. Yellow wagtail	<i>Motacilla flava</i> (Linnaeus, 1758)	C (LC)	WM
94. Grey Wagtail	<i>Motacilla cinerea</i> (Tunstal, 1771)	R (LC)	Mr
95. White browed wagtail	<i>Motacilla aderspatensis</i> (J F, Gmelin, 1789)	R (LC)	RM
96. White Wagtail	<i>Motacilla alba</i> (Linnaeus, 1758) (J F, Gmelin, 1789)	R (LC)	MU
<b>37. Nectariniidae</b>			
97. Purple Rumped sunbird	<i>Leptocoma zeylonica</i> (Linnaeus, 1766)	R (LC)	RU
98. Crimson Backed/ Purple Sunbird	<i>Nectarina minima</i> (Sykes, 1832)	C (LC)	RU
<b>38. Passeridae</b>			
99. House Sparrow	<i>Passer domesticus</i> (Linnaeus, 1758)	C (LC)	RC
<b>39. Ploceidae</b>			
100. Baya weaver	<i>Ploceus philippinus</i> (Linnaeus, 1766)	O (LC)	RC
<b>39. Estrildidae</b>			
101. White throated Munia	<i>Lonchura malabarica</i> (Linnaeus, 1758)	O (LC)	RC
102. Scaly Breasted Spotted Munia	<i>Lonchura punctulata</i> (Linnaeus., 1758)	O (LC)	RC
103. Red Munia/Amandava	<i>Amandava amandava</i> (Linnaeus, 1758)	C (LC)	WM
<b>40. Campephagidae</b>			
104. Common Wood Shrike	<i>Tephrodornis pondicerianus</i> (J. F., Gmelin, 1789)	R (LC)	RU

(Abbreviation in ACOR are A = Abundant, C = Common, O = Occasional, r = Rare), (Abbreviation used for Ecological rating and status are WM = Winter Migrant, RU = Resident Uncommon, Rr = Resident Rare, RC = Resident Common, BM= Breeding Migrant, PM = Passage Migrant.), (\* Birds need to be photographed), (IUCN Status – NT = Nearly Threatened, T = Threatened, LC= Least Concern, NT = Near Threatened, T = Threatened, V = Vulnerable, EN = Endangered, CR = Critically Endangered. The enlisted birds are only those which we could site or photograph).

**Table 2:** Habitats selected for observation of birds at Nandur Madhmeshwar Bird Sanctuary.

Sr. No.	Bird Habitat	Area/ Length	No. of obs. points	Density
1.	Forest Office and Sanctuary Station at Chapadgaon, at Bird observation towers.	10 ha.	05	Maximum
2.	On the embankment wall of the Reservoir connecting two outlet sluice gates.	01 Km.	02	Medium
3.	Rocky terrain of Godavari river basin down stream to reservoir	25 ha.	03	Low/Minimum
4.	Area near Madhmeshwar Temple in rocky area downstream to reservoir.	28 ha.	01	Low/Minimum
5.	Area around Forest Department Guest House	07 ha.	01	Medium

(No. = Number, Obs.= Observations)

**Table 3:** Summary of status and characteristics of avifauna at NMBS.















N	IUCN Status				ACOR Status				Migratory Status		Migration specificity		Dominant families species number			
	LC	CR	NT	E	A	O	C	R	WMR	LMR	MR	R	CI	AN	CH	PA
105	98	01	04	1	6	36	43	20	16	48	64	41	17	14	09	32
%	93.3	0.9	3.8	0.9	5.7	34.2	40.9	19.0	15.2	45.7	60.9	39.0	16.1	13.3	8.5	30.4















(N=Number of species, LC=Least Concern, CR= Critically Endangered, NT=Near Threatened, E=Endangered, A=Abundant, O=Occasional, C=Common, R=Rare, WMR=Winter Migrant, LMR= Local Migrant, MR=Migratory, R=Resident, CI=Ciconiformes, AN=Ansariiformes, CH=Charadriiformes, PA=Passeriformes)

#### 4. Conclusion and Recommendations















NMBS is an important avian diversity area, need to be protected by the efforts of, researchers, planners and Government officials. The water level in the reservoir should

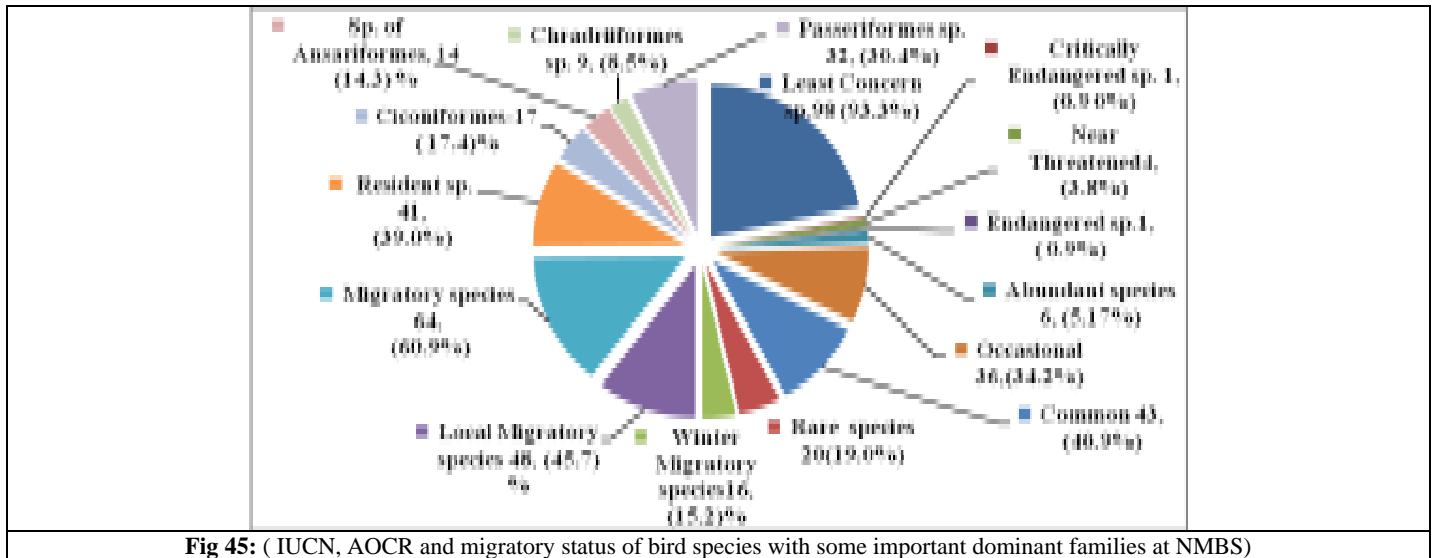
be maintained to prevent the destruction of microhabitats. The crowd of people should be prevented if disturbing the life of birds.

		
<p><b>Fig 1: Large Pied Wagtail</b></p>	<p><b>Fig 2: Wood Sandpiper</b></p>	<p><b>Fig 3: Yellow Wagtail</b></p>
		
<p><b>Fig 4: Common Coot</b></p>	<p><b>Fig 5: Pintail</b></p>	<p><b>Fig 6: Northern Shoveller</b></p>
		
<p><b>Fig 7: Wigeon</b></p>	<p><b>Fig 8: Marbled Teal</b></p>	<p><b>Fig 9: Grey Heron (<i>Ardea cinerea</i>)</b></p>
		
<p><b>Fig 10: Black Drongo</b></p>	<p><b>Fig 11: Purple Heron (<i>Ardea purpurea</i>)</b></p>	<p><b>Fig 12: Painted Stork (NT) (<i>Mycteria leucocephala</i>)</b></p>
		
<p><b>Fig 13: Great White Bellied Heron (Endangered)</b></p>	<p><b>Fig 14: White Necked/Woolly Stork (<i>Ciconia episcopus</i>)</b></p>	<p><b>Fig 15: Common. Stilt</b></p>

		
<p><b>Fig 16: Purple Moorhen</b></p>	<p><b>Fig 17: Glossy Ibis</b></p>	<p><b>Fig 18: Common Crane</b></p>
		
<p><b>Fig 19: Blue Rock Pigeon</b></p>	<p><b>Fig 20: Eurasian Wigeon (Anas Penelope)</b></p>	<p><b>Fig 21: Gadwall</b></p>
		
<p><b>Fig 22: Pied Kingfisher</b></p>	<p><b>Fig 23: Black Kite (Malvus migrans)</b></p>	<p><b>Fig 24: Red Crested Pochard</b></p>
		
<p><b>Fig 25: Yellow Headed Wagtail</b></p>	<p><b>Fig 26: Indian Pheasant Jacana</b></p>	<p><b>Fig 27: Little Cormorant (Phalacrocorax niger)</b></p>
		
<p><b>Fig 28: Bush Chat or Stone chat</b></p>	<p><b>Fig 29: Rosy Paster Starling</b></p>	<p><b>Fig 30: Spotted Owlet (Athene brama)</b></p>



		
<p><b>Fig 31:</b> Cliff Swallow</p>	<p><b>Fig 32:</b> Jungle Crow</p>	<p><b>Fig 33:</b> Common crow</p>
		
<p><b>Fig 34:</b> Common koel (<i>Eudynamys scolopacea</i>)</p>	<p><b>Fig 35:</b> Purple rumped sunbird <i>Leptocoma zeylonica</i></p>	<p><b>Fig 36:</b> Brahmany Myna</p>
		
<p><b>Fig 37:</b> White Wagtail</p>	<p><b>Fig 38:</b> Pied Bush Chat</p>	<p><b>Fig 39:</b> Hoopo hoopoe</p>
		
<p><b>Fig 40:</b> Study area Nandur Madhmeshwar Bird Sanctuary, Maharashtra, India for avifaunal diversity</p>	<p><b>Fig 41:</b> Satellite view of Nandur Madhmeshwar Bird Sanctuary, Khangao Thadi camp, Near Niphad, District Nasik, Maharashtra State.</p>	<p><b>Fig 42:</b> Diagramatic View of Nandur Madhmeshwar Bird Sanctuary.</p>
		
<p><b>Fig 43:</b> Bird observation tower and a view of Reservoir at NMBS</p>	<p><b>Fig 44:</b> Madhmeshwar Temple (God Shiva) in the down stream area of the reservoir at Nandur Madhmeshwar Bird Sanctuary (NMBS).</p>	



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## 7. Contribution of Authors

Shivaji Chavan (SPC), Arvind Kulkarni (ANK) and Jadhav Pavan (JP) surveyed and sited the birds in the selected study area. All photographs are by SPC and JP. SPC, JP and ANK drafted the manuscript. ANK and SPC critically evaluated the draft of manuscript.

## 8. References

- Abdulali H. Checklist of Birds of Maharashtra, BNHS, Mumbai, 1981, 1-35.
- Ali S. The Book of Indian Birds. BNHS, Mumbai, 1996, 1-354.
- Ali S, Repley SD. A Practical Guide to the birds of Indian sub-continent, 1983, 1-300.
- Avibase. The World Bird Database; 2017. (<http://www.avibase.org>).
- Balkhande JV, Bhowte CS, Kulkarni AN. Checklist of Birds of River Godavari, Dhangartakli near Purna, Dist. Parbhani, Maharashtra, Bionano Frontier, 2012, 5(2).
- Bibby CJ, Burgess ND, Hill DA, Mustoe SH. Birds census techniques. London: Academic Press, 2000, 302.
- Buckland ST, Anderson DR, Burham KP, Laake JL, Borchers DL, Thomas L. Introduction to distance sampling, Oxford University Press, Oxford, 2001, 432.
- Buckland ST, Anderson DR, Burham KP, Laake JL. Estimation of density from line transect sampling of biological population, Wildlife Monograph. 1986; 72:1-202.
- Birdlife International. IUCN Rd List for birds, 2017. (<http://www.birdlife.org>).
- Chao A. Nonparametric estimation of the number of classes in a population, Scan. J Stat. 1984; 14:61-69.
- Chavan PR, Dhamni AA. Avian diversity in and around Chaprala Wild Life Sanctuary District Gadchiroli, Maharashtra, India. International Journal of Fauna and Biological Studies. 2014; 6:90-95.
- Chavan Shivaji Prabhakar, Dilip Dudhmal. Population status, shift in food chain and behavioural ecology from isolated ponds of Godavari River basin in Nanded district, India. Science Research Reporter. 2016a; 6(1):50-57.
- Chavan Shivaji, Dilip Dudhmal, Deepak Walke. Mud nests of Wire-tailed Swallow (*Hirundo filifera*): Biomarkers of ecological Niche in Godavari River Ecosystem, Nanded, Maharashtra State. Advances in Bioresearches. 2016b; 7(2):170-175.
- Das Sumit K, Debi P Sahoo, Nibedita dash, Hemanta K Sahu. Avifaunal diversity of Baisipalli Wild Life Sanctuary, Odisha, India. Indian BIRDS. 2013; 8(4):90-92.
- Gaston AJ. Methods of estimating bird population. Journal of BNHS. 1973; 72(2):272-281.
- Islam ZU, Rahmani AR. Important Bird areas in India, Priority sites for conservation Network: Bombay Natural History Society and Bird Life International (UK), 2004.
- IUCN Red List of Birds. BirdLife International, 2018. (<http://www.birdlife.org>).
- Kulkarni AN, Bhowte CS, Kanwate VS. Bird census in Nanded region (Maharashtra). Bioinfolet. 2006a; 3(3):173-178.
- Kulkarni AN, Kanwate VS. Avian fauna of forest Jaldhara, Kinwat, Dist. Nanded, Maharashtra. Jr. of Aqua. Biol. 2010; 25(1):46-51.
- Prasad KK, Bagari RC, Bhargavi S. Avifaunal Diversity of Manjeera Wild Life Sanctuary, Andhra Pradesh, India, Jour of Threatened Taxa. 2014; 6(2):5464-5477.
- Rajesh M Achegave, Shivaji P Chavan, Priyanka V Patil, Shashikant H Tarte. Nesting of Baya weaver (*Ploceus philippinus*) in S. R. T. M. University, Nanded and Fields along Asana River at Nanded, Maharashtra, India. Int. J. Curr. Res. Aca. Rev. 2016; 4(6):51-60.
- Sharda padghane, Shivaji Chavan, Dilip Dudhmal, Deepak Walke. Mollusc diversity and its role as food for crabs and water birds in Godavari River basin, Nanded (MS), India. Int. J. Advanced scientific and Technical Research. 2017; 2(7):149-161.
- Shivaji Chavan, Dilip Dudhmal, Shrikrishna Hambarde, Kulkarni AN. Birds from Godavari River basin in

Nanded District of Maharashtra State, India: Annotated status and new reports. *Int. J Curr. Res. Aca. Rev.* 2015; 3(4):328-351.

24. Upma Manral, Faiyaz A Khudsar. Assessment of Wetland water quality and avian diversity of Human-modified floodplain wetland on River Yamuna; *Nature Scientia Biologia.* 2013; 5(1):25-33.
25. Urfi AJ. Foraging ecology of the Painted Stork (*Mycteria leucocephala*): A review, *Waterbirds.* 2011; 34(4):448-456.