J. Adv. Zool. 2021: 42(2) : 165-175 **ISSN-0253-7214**

A CHECKLIST OF BIRDS AND DIVERSITY OF AVIAN FAUNA IN MUDASARLOVA RESERVOIR OF VISAKHAPATNAM, INDIA

Sanchari Biswas[1], Venugopal Bhagyasree[2], Vivek N. Rathod[3]
[1]Ph.D., Department of Environmental Sciences, GITAM University, Visakhapatnam, India
[2]Conservation Biologist, Wildlife Conservation Through Research and Education (WCTRE), Visakhapatnam, Andhra Pradesh, India.
[3]Vizag Birdwatcher Society, Visakhapatnam, India. for Correspondence ***biswasanchari@gmail.com***

ABSTRACT: The objective of this study was to enumerate a checklist of birds of the Mudasarlova Reservoir, which is man-made reservoir situated in the district of Visakhapatnam, Andhra Pradesh, India. It is used as a storage reservoir for drinking water and commercial purposes by the urban community. This area has always been blessed with diversity of flora, fauna (including avian fauna) since many years. The reservoir has also been a home and mating ground for various water birds, parakeets etc. It has also been a feeding and gliding ground for raptors. It is also accessed by the local community as a point of unsustainable fishing activities. But of late, this reservoir and the surrounding areas have been a witness to various developmental activities and simplification of natural landforms and the adjoining hills, due of urbanisation. As a result of this, the natural flow of the runoff water coming from various adjacent hills have been affected. This has not only triggered environmental and landform changes, but also has affected the avian fauna to certain extent.

KEYWORDS: Mudasarlova reservoir, avian fauna, urban community, development, reservoir, unsustainable, landform changes.

INTRODUCTION

Birds, are one the most powerful indicators in determining ecosystem health as they provide us with information more than that which meets the eye. Using "birds" as bio monitors to study the health of the environment is one of the powerful tools in not just studying the above but also in accessing the quality of the environment[9].

Around the globe, birds play a crucial role in the systemic functioning of various ecosystems either by directly influencing human health, world economy and other production services too or vice-versa. They are envoys of pest control and act as great scavengers to our environment. Birds of prey or raptors are supreme bio-monitors because of their position in the food chain. Raptors are top level consumers in the food chain, and because of their distribution over a vast geographical area[7]. According to BirdLife International 2020, birds acts as our early-warning system for emerging concerns over Climate Change. It has been also observed that birds swiftly respond to changes in the environment.

The topography and climatic regimes of the Indian landscape supports diverse and unique wetland habitats which roughly occupies an area of 15260000 sq. km.[14]. With an estimated 20 % of the known biodiversity supported by natural wetlands, a large number of man-made wetlands contribute to the rich flora and fauna in our

country. Panigrahy *et al.*[14] estimated around 5, 55,557 small sized wetlands (<2.25 hectares) in the form of village tanks/ ponds in India.

Wetlands are useful tools of sustenance which are used by birds for foraging and mating purposes[1,13,17]. Praveen *et al.* 2016 had reported over 1263 species of birds in India, out of which 310 species are known to be sustained by wetlands[13]. However, various wetlands in India, are under the influence of tremendous anthropogenic stress which includes industrial and agricultural runoff, heavy metal poisoning, encroachment of wetland habitat, eutrophication, harvesting of unsustainable resources, siltation, and invasion of alien species[13,15]. Gradually, these changes can lead to impacting birds in several ways which includes changes in community structure of birds and decline in population[13].

Wetland bird communities depend on several factors such as landscape, terrain, nest, song and other sites (other animals and food)[10]. The abundance of aquatic birds in various habitats in India has witnessed a decreasing trend in the recent years which is supported by several studies[4,6,11].

Chandra & Gajbe stated that "Biodiversity inventories or checklists serve as repositories of baseline information on species occurrences, biogeography, and their conservation status". The significant instrument for enhancing and sharpening our knowledge on biodiversity and the initial step to produce suitable long term strategy of conservation of birds including their habitats[13].

The Mudasarlova Reservoir (17.7653° N, 83.2954° E) is a man-made reservoir that is situated between the Kailasagiri, Kambalakonda and Simhachalam Hills. The catchment area of this reservoir also contains several residential colonies. Effluent discharge is one of the grave concerns which is arising because of these residential colonies. Catchment area of the reservoir basin is 17.06 sq. km. (1706.364 hectares or 4216.518 acres)[8]. The population of the area is approximately 40,000 and is served by the reservoir. Perennially, hot and humid climate (ranging between 23.3°C to 31.7°C) prevails in this area with an annual average of 27.9°C. The relative humidity of this region is generally high (highest being 75-100 % range which is observed during the period July to September) with a narrow range of variation. The lowest is observed during November and December with 50-57%[8]. The catchment receives southwest monsoon with average to slight heavy rainfall during the period June to September but also becomes scanty during October to December because of Northeast monsoon[8].

The objective of this study was to put together a checklist of birds of a previously unstudied area, Mudasarlova Reservoir and to record the various avifauna species of the region. The reservoir located at Arilova, Visakhapatnam has frequently been associated with one of the diversified hotspots of various winter migratory birds, especially owing to the fact that it is

surrounded by adjacent hills of Simhachalam, Kailasagiri, and Kambalakonda. But unfortunately, because of simplification of landforms and due to the pressure of urbanisation, over the years, the population density of various birds and the bird count has severely declined because of rapid industrialization, lack of initiatives by local communities, improper water storage and maintenance of reservoir cleaning operations, impoverished management of water storage in the tank, interrupted cleaning and weeding in the tank by local settlements. This paper serves as a useful tool for documentation of bird diversity of the particular habitat and also discusses about the various effects of changing land patterns on the declining bird count which can additionally help in enumerating conservation efforts and future management plans.

MATERIALS AND METHODS

Regular surveys between September 2017 and February 2020 were done by walking on fixed routes in and around the reservoir. Surveys were usually done in the morning (0630 hrs - 1000hrs) and evening (1600hrs - 1830hrs), and also frequently at night time for nocturnal birds. Birds were recorded following imaginary grid method and line transect method as outlined by Ali & Ripley[3] and Ali[2]. Photographic records were taken for future reference purposes. We followed Praveen et al.,[16] for the scientific names and taxonomic classification of birds.

Figure 1: Map showing the Study Area, Mudasarlova Reservoir, (Source: Google Earth).

RESULTS AND DISCUSSIONS

A total of 106 species of birds belonging to 17 orders and 49 families were recorded from the study site (Table 1). Apart from our observations, previous records of few birds were retrieved from the e-bird repository (only those with photographic support).

Table-1. Checklist and diversity of birds from Mudasarlova Reservoir

S.No	Common Name	Scientific name	Family	Order
1	Alexandrine parakeet	*Tachybaptus ruficollis (Pallas, 1764)*	Psittaculidae	Psittaciformes
2	Ashy Drongo	*Dicrurus leucophaeus (Vieillot, 1817)*	Dicruridae	Passeriformes
3	Ashy Prinia	*Prinia Socialis (Sykes, 1832)*	Cisticolidae	Passeriformes
4	Ashy Woodswallow	*Artamus fuscus (Vieillot, 1817)*	Artamidae	Passeriformes
5	Asian Koel	*Eudynamys scolopaceus (Linnaeus, 1758)*	Cuculidae	Cuculiformes
6	Asian Openbill	*Anastomus oscitans (Boddaert, 1783)*	Ciconiidae	Pelecaniformes
7	Asian Palm Swift	*Cypsiurus balasiensis (J.E. Gray, 1829)*	Apodidae	Caprimulgiformes
8	Asian Pied Starling	*Gracupica contra (Linnaeus, 1758)*	Sturinidae	Passeriformes
9	Barn Swallow	*Hirundo rustica (Linnaeus, 1758)*	Hirundinidae	Passeriformes
10	Black Drongo	*Dicrurus macrocercus (Vieillot, 1817)*	Dicruridae	Passeriformes
11	Black Kite	*Milvus migrans (Boddaert, 1783)*	Accipitridae	Accipitriformes
12	Black-headed Bunting	*Granativora melanocephala (Scopoli, 1769)*	Emberizidae	Passeriformes
13	Black-headed Ibis	*Threskiornis melanocephalus (Latham, 1790)*	Threskiornithidae	Pelecaniformes
14	Black-naped Oriole	*Oriolus chinensis Linnaeus, 1766*	Oriolidae	Passeriformes
15	Lesser Golden-backed Woodpecker	*Dinopium benghalense (Linnaeus, 1758)*	Picidae	Piciformes
16	Black-winged Kite	*Elanus caeruleus (Desfontaines, 1789)*	Accipitridae	Accipitriformes
17	Black-winged Stilt	*Himantopus himantopus (Linnaeus, 1758)*	Recurvirostridae	Charadriiformes
18	Blue-tailed bee-eater	*Merops philippinus (Linnaeus, 1767)*	Meropidae	Coraciiformes
19	Blyth's Reed Warbler	*Acrocephalus dumetorum Blyth, 1849*	Acrocephalidae	Passeriformes
20	Booted Warbler	*Iduna caligata (M.H.C. Lichtenstein, 1823)*	Acrocephalidae	Passeriformes
21	Brahminy Kite	*Haliastur indus (Boddaert, 1783)*	Accipitridae	Accipitriformes
22	Brahminy Starling	*Sturnia pagodarum (J.F. Gmelin, 1789)*	Sturinidae	Passeriformes
23	Bronze-winged Jacana	*Metopidius indicus (Latham, 1790)*	Jacanidae	Charadriiformes
24	Brown Shrike	*Lanius cristatus (Linnaeus, 1758)*	Laniidae	Passeriformes
25	Cattle Egret	*Bubulcus ibis (Linnaeus, 1758)*	Ardeidae	Pelecaniformes
26	Citrine Wagtail	*Motacilla citreola (Pallas, 1776)*	Motacillidae	Passeriformes
27	Clamorous Reed Warbler	*Acrocephalus stentoreus (Hemprich& Ehrenberg, 1833)*	Acrocephalidae	Passeriformes
28	Common Babbler	*Argya caudata (Dumont, 1823)*	Leiothrichidae	Passeriformes
29	Common Hawk Cuckoo	*Hierococcyx varius (Vahl, 1797)*	Cuculidae	Cuculiformes
30	Common Kingfisher	*Alcedo atthis (Linnaeus, 1758)*	Alcedinidae	Coraciiformes
31	Common Myna	*Acridotheres tristis (Linnaeus, 1766)*	Sturinidae	Passeriformes
32	Common Sandpiper	*Actitis hypoleucos (Linnaeus, 1758)*	Scolopacidae	Charadriiformes
33	Common Tailorbird	*Orthotomus sutorius (Pennant, 1769)*	Cisticolidae	Passeriformes
34	Coppersmith Barbet	*Psilopogon haemacephalus (Statius Muller, 1776)*	Ramphastidae	Piciformes

35	Cotton Pygmy-Goose	*Nettapus coromandelianus (J.F. Gmelin, 1789)*	Anatidae	Anseriformes
36	Eurasian Coot	*Fulica atra (Linnaeus, 1758)*	Rallidae	Gruiformes
37	Eurasian Hoopoe	*Upupa epops (Linnaeus, 1758)*	Upupidae	Bucerotiformes
38	Eurasian Kestrel	*Falco tinnunculus (Linnaeus, 1758)*	Falconidae	Falconiformes
39	Eurasian Moorhen	*Gallinula chloropus(Linnaeus, 1758)*	Rallidae	Gruiformes
40	Green Sandpiper	*Tringa ochropus Linnaeus, 1758*	Scolopacidae	Charadriiformes
41	Grey Francolin	*Francolinus pondicerianus (J.F.Gmelin, 1789)*	Phasianidae	Galliformes
42	Grey Heron	*Ardea cinerea Linnaeus, 1758*	Ardeidae	Pelecaniformes
43	Grey Wagtail	*Motacilla cinerea (Tunstall, 1771)*	Motacillidae	Passeriformes
44	Grey-headed Swamphen	*Porphyrio porphyrio (Linnaeus, 1758)*	Rallidae	Gruiformes
45	Great Egret	*Ardea alba Linnaeus, 1758*	Ardeidae	Pelecaniformes
46	Greater Coucal	*Centropus sinensis (Stephens, 1815*	Cuculidae	Cuculiformes
47	Greater Painted Snipe	*Rostratula benghalensis (Linnaeus, 1758)*	Rostratulidae	Charadriiformes
48	Green Bee-eater	*Merops orientalis Latham, 1801*	Meropidae	Coraciiformes
49	Greenish Leaf Warbler	*Phylloscopus trochiloides (Sundevall, 1837)*	Phylloscopidae	Passeriformes
50	House Crow	*Corvus splendens (Vieillot, 1817)*	Corvidae	Passeriformes
51	House Sparrow	*Passer domesticus (Linnaeus, 1758)*	Passeridae	Passeriformes
52	Indian Golden Oriole	*Oriolus kundoo (Sykes, 1832)*	Oriolidae	Passeriformes
53	Indian Pond-Heron	*Ardeola grayii (Sykes, 1832)*	Ardeidae	Pelecaniformes
54	Indian Robin	*Saxicoloides fulicatus (Linnaeus, 1766)*	Muscicapidae	Passeriformes
55	Indian Roller	*Coracias benghalensis (Linnaeus, 1758)*	Coraciidae	Coraciiformes
56	Indian Silverbill	*Euodice malabarica (Linnaeus, 1758)*	Estrildidae	Passeriformes
57	Indian Spot-billed Duck	*Anas poecilorhyncha (J.R. Forster, 1781)*	Anatidae	Anseriformes
58	Grey headed Lapwing	*Vanellus cinereus(Blyth, 1842)*	Charadriidae	Charadriiformes
59	Great Thick-knee	*Esacus recurvirostris (Cuvier, 1829)*	Burhinidae	Charadriiformes
60	Grey Wagtail	*Motacilla cinerea (Tunstall, 1771)*	Motacillidae	Passeriformes
61	Intermediate Egret	*Ardea intermedia (Wagler, 1829)*	Ardeidae	Pelecaniformes
62	Jerdon's Bushlark	*Mirafra affinis Blyth, 1845*	Alaudidae	Passeriformes
63	Jungle Babbler	*Turdoides striata (Dumont, 1823)*	Leiothrichidae	Passeriformes
64	Large-billed Crow	*Corvus macrorhynchos (Wagler, 1827)*	Corvidae	Passeriformes
65	Laughing Dove	*Streptopelia senegalensis (Linnaeus, 1766)*	Columbidae	Columbiformes
66	Little Cormorant	*Microcarbo niger (Vieillot, 1817)*	Phalacrocoracidae	Pelecaniformes
67	Little Egret	*Egretta garzetta (Linnaeus, 1766)*	Ardeidae	Pelecaniformes
68	Little Grebe	*Tachybaptus ruficollis (Pallas, 1764)*	Podicipedidae	Phoenicopteriformes
69	Little Swift	*Apus affinis (J.E. Gray, 1830)*	Apodidae	Caprimulgiformes
70	Oriental Darter	*Anhinga melanogaster (Pennant, 1769)*	Anhingidae	Pelecaniformes
71	Oriental Magpie-Robin	*Copsychus saularis (Linnaeus, 1758)*	Muscicapidae	Passeriformes

72	Osprey	*Turdoides striata (Linnaues, 1758)*	Pandionidae	Accipitriformes
73	Paddyfield Pipit	*Anthus rufulus (Vieillot, 1818)*	Motacillidae	Passeriformes
74	Paddyfield Warbler	*Acrocephalus agricola (Jerdon, 1845)*	Acrocephalidae	Passeriformes
75	Painted Stork	*Mycteria leucocephala (Pennant, 1769)*	Ciconiidae	Pelecaniformes
76	Pheasant-tailed Jacana	*Hydrophasianus chirurgus (Scopoli, 1786)*	Jacanidae	Charadriiformes
77	Pied Kingfisher	*Ceryle rudis (Linnaeus, 1758)*	Alcedinidae	Coraciiformes
78	Plain Prinia	*Prinia inornata (Sykes, 1832)*	Cisticolidae	Passeriformes
79	Purple Heron	*Ardea purpurea (Linnaeus, 1766)*	Ardeidae	Pelecaniformes
80	Purple Sunbird	*Cinnyris asiaticus (Latham, 1790)*	Nectariniidae	Passeriformes
81	Purple-rumped Sunbird	*Leptocoma zeylonica (Linnaeus, 1766)*	Nectariniidae	Passeriformes
82	Red-vented Bulbul	*Pycnonotus cafer (Linnaeus, 1766)*	Pycnonotidae	Passeriformes
83	Red-wattled Lapwing	*Vanellus indicus (Boddaert, 1783)*	Charadriidae	Charadriiformes
84	Red-whiskered Bulbul	*Pycnonotus jocosus (Linnaeus, 1758)*	Pycnonotidae	Passeriformes
85	Rock Pigeon	*Columba livia (J.F. Gmelin, 1789)*	Columbidae	Columbiformes
86	Rose-ringed Parakeet	*Psittacula krameri (Scopoli, 1769)*	Psittaculidae	Psittaciformes
87	Rosy Starling	*Pastor roseus (Linnaeus, 1758)*	Sturinidae	Passeriformes
88	Rufous Treepie	*Dendrocitta vagabunda (Latham, 1790)*	Corvidae	Passeriformes
89	Scaly-breasted Munia	*Lonchura punctulata (Linnaeus, 1758)*	Estrildidae	Passeriformes
90	Shikra	*Accipiter badius (J. F. Gmelin, 1788)*	Accipitridae	Accipitriformes
91	Spotted Dove	*Streptopelia chinensis (Scopoli, 1786)*	Columbidae	Columbiformes
92	Spotted Owlet	*Athene brama (Temminick, 1821)*	Strigidae	Strigiformes
93	Syke's Warbler	*Iduna rama(Sykes, 1832)*	Acrocephalidae	Passeriformes
94	Tricoloured Munia	*Lonchura malacca (Linnaeus, 1766)*	Estrildidae	Passeriformes
95	Western Yellow Wagtail	*Motacilla flava (Linnaeus, 1758)*	Motacillidae	Passeriformes
96	White-bellied Drongo	*Dicrurus caerulescens (Linnaeus, 1758)*	Dicruridae	Passeriformes
97	White-bellied Sea-Eagle	*Haliaeetus leucogaster (J. F. Gmelin, 1788)*	Accipitridae	Accipitriformes
98	White-breasted Waterhen	*Amaurornis phoenicurus (Pennant. 1769)*	Cuculidae	Cuculiformes
99	White-browed Bulbul	*Pycnonotus luteolus (Lesson, 1841)*	Pycnonotidae	Passeriformes
100	White-browed Wagtail	*Motacilla maderaspatensis (J.F. Gmelin, 1789)*	Motacillidae	Passeriformes
101	White-throated Kingfisher	*Halcyon smyrnensis (Linnaeus, 1758)*	Alcedinidae	Coraciiformes
102	Wood Sandpiper	*Tringa glareola (Linnaeus, 1758)*	Scolopacidae	Charadriiformes
103	Yellow Bittern	*Ixobrychus sinensis (J.F. Gmelin, 1789)*	Ardeidae	Pelecaniformes
104	Yellow-billed Babbler	*Turdoides affinis (Jerdon, 1845)*	Leiothrichidae	Passeriformes
105	Yellow- wattled Lapwing	*Vanellus malabaricus (Boddeart, 1783)*	Charadriidae	Charadriiformes
106	Zitting Cisticola	*Cisticola juncidis (Rafinesque, 1810)*	Cisticolidae	Passeriformes

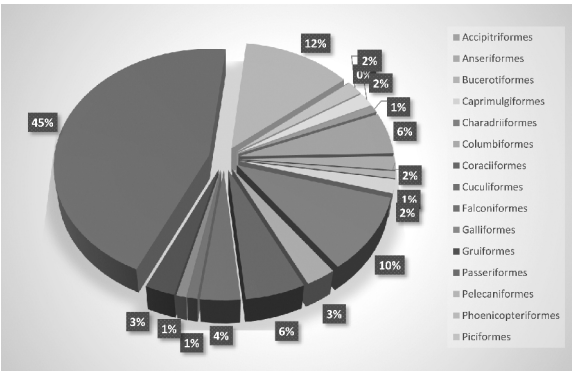


Fig.-2: Pie-Chart showing the observed diversity of birds with respect to order

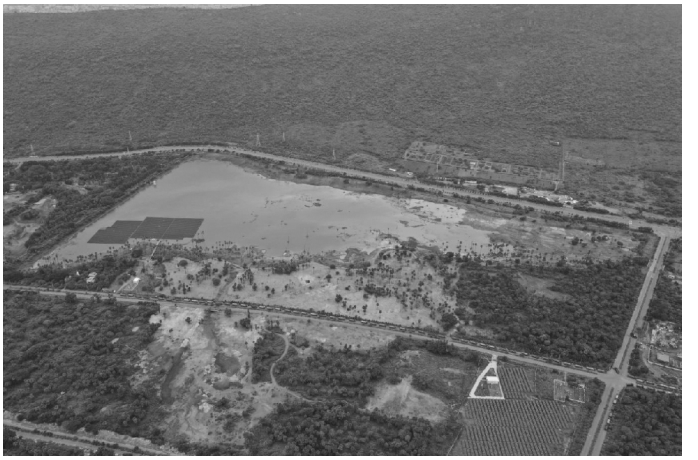
Table-2. Table showing No. of Families and No. of Species recorded

S. No.	Order	No. of Families	No. of Species
1	Accipitriformes	2	6
2	Anseriformes	1	2
3	Bucerotiformes	1	1
4	Caprimulgiformes	1	2
5	Charadriiformes	6	11
6	Columbiformes	1	3
7	Coraciiformes	3	6
8	Cuculiformes	1	4
9	Falconiformes	1	1
10	Galliformes	1	1
11	Gruiformes	1	3
12	Passeriformes	19	47
13	Pelecaniformes	5	13
14	Phoenicopteriformes	1	1
15	Piciformes	2	2
16	Psittaciformes	2	2
17	Strigiformes	1	1
	Total	**49**	**106**

The study area supports 46 passerines and 56 non-passerine bird species. The highest represented order was Passeriformes with 19 families followed by Charadriiformes and Pelecaniformes with 6 and 5 families respectively (Table 2). Out of the 106 species, all the 6 species under Accipitriformes are included under Schedule-I of the Indian Wildlife (Protection) Act, 1972. Species such as Painted Stork, Alexandrine Parakeet, Black-headed Ibis and Oriental Darter are Near Threatened as per the International Union for Conservation of Nature and Natural Resources (IUCN).

The Cotton-pygmy Goose, Black winged Stilt, Blue-tailed Bee-eater, Black headed Bunting, Greenish Leaf Warbler, Grey-headed Lapwing, Paddyfield Warbler, Rosy Starling, Syke's Warbler, Wood Sandpiper are some important winter migrants to this reservoir and are usually seen between mid November and early February.

Plates



Drone shot of Mudasarlova reservoir, Visakhapatnam

Flock of Cotton Teal in flight

An Asian Openbill Stork amongst a flock of Cattle Egret

Osprey

Black Kite

Indian Roller

Green Bee-eater

Pied Kingfisher

Plain Prinia

Citrine Wagtail

White browed Wagtail

Alexandrine Parakeet

Green Sandpiper

Paddyfield Pipit

Eurasian Coot

CONCLUSION

The fate of a universally balanced ecosystem is basically determined by the extent of avian diversity existing in the place. Mudasarlova Reservoir, located at Arilova, in the heart of the city, accounts for around 106 bird species and it continues to play a significant role in sheltering the feathered occupants existing in the region. This owes it to the fact that it is surrounded by the adjacent hill ranges of Simhachalam, Kailasagiri and Kambalakonda. But due to the pressure of urbanisation, and over simplification of naturally available resources, in the recent past and over the years, the population density and bird count has severely declined because of rapid urbanisation industrialization, unsustainable fishing activities, lack of initiatives by local communities etc. Thus, it is an urgent need to take steps towards the conservation of this reservoir and to prevent it from any more deterioration. In order to do the same, proper water storage and maintenance of reservoir cleaning operations is the need of the hour along with levelled up management of water storage in the tank and weed removing practices. Given these conditions being taken care of, the avian fauna of this region will continue to flourish even more and bring back more species of birds in the near future.

REFERENCES

1. Ali, A.M.S., S.B. Shanthakumar, S.R. Kumar, R. Chandran, S.S. Marimuthu & P.R. Arun, 2013. Birds of the Sálim Ali Centre for

Ornithology and Natural History Campus, Anaikatty Hills, southern India. *Journal of Threatened Taxa*, 5(17): 5288-5298.

2. Ali, S., 1996. The Book of Indian Birds. 12 Edition. Oxford University Press. Delhi, pp. 326.
3. Ali, S. and S.D. Ripley, 1983. Handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka. Compact ed. Oxford University Press, pp. 288.
4. Azous, A.L. & R.M. Horner, 2001. *Wetlands and urbanization: implications for the future*. Lewis Publishers, Boca Raton, USA.
5. Badola, H.K. and S. Aitken, 2010. Biological resources and poverty alleviation in the Indian Himalayas. *Biodiversity*, 11(3-4):8-18.
6. Bhagyasree, V., V.N. Rathod & C. Selvam, 2020. A checklist of birds from Kondakarla Ava, a freshwater lake in Visakhapatnam, Andhra Pradesh, India. Bird-o-soar #59, In: *Zoo's Print,* 35(11): 06–15.
7. Castro, I., J.R. Aboal, J.A. Fernández & A. Carballeira, 2011. Use of raptors for biomonitoring of heavy metals: gender, age and tissue selection. *Bulletin of Environmental Contamination and Toxicology*, *86*(3): 347-351.
8. Chandraiah, V., B. Pathi Lakshmi and V. Mahamood, 2011. "Investment grading audit of pumping machinery at Mindi, one of the water treatment plants of Visakhapatnam city-A case study." *International Journal of Environmental Sciences,* 1.5, pp. 1019.
9. Furness, Robert W., 1993. "Birds as monitors of pollutants." *Birds as monitors of environmental change*. Springer, Dordrecht, pp. 86-143.
10. Hilden, O., 1965. Habitat selection in birds. *Ann. Zool. Fenn.*, 2: 53-75.
11. Kumar, P. & S.K. Gupta, 2009. Diversity and abundance of wetland birds around Kurukshetra, India. *Our Nature,* 7: 212–217.
12. Kumar, P. and S.K. Gupta, 2009. "Diversity and abundance of wetland birds around Kurukshetra, India." *Our Nature,* 7(1),: 212-217.
13. Kumar, Parmesh and Archna Sharma, 2018. "Diversity and status of avifauna in man-made sacred ponds of Kurukshetra, India." *Journal of Threatened Taxa,* 10(9): 12173-12193.
14. Panigrahy, S., T.V.R. Murthy, J.G. Patel and T.S. Singh, 2012. "Wetlands of India: Inventory and assessment at 1: 50,000 scale using geospatial techniques" *Current Science,* 102(6): 852-856.
15. Prasad, S.N., T.V. Ramachandra, N. Ahalya, T. Sengupta, A. Kumar, A.K. Tiwari, V.S. Vijayan & L. Vijayan, 2002. Conservation of wetlands of India - a review. *Tropical Ecology,* 43(1): 173–186.
16. Praveen, J., R. Jayapal and A. Pittie, 2016. A checklist of the birds of India. *Indian Birds*, 11(5&6):113-172.
17. Stewart, Gavin B., Andrew S. Pullin and Christopher F. Coles, 2007. *Conservation*, "Poor evidence-base for assessment of windfarm impacts on birds." *Environmental,* pp. 1-11.