

Distribution of Avian Diversity in Different Habitats from Gangetic Plains of West Bengal, India

Kausik Ghosh

Department of Zoology, Bejoy Narayan Mahavidyalaya, Itachuna, Hooghly 712 147, West Bengal, India

(Received 20 September, 2021; Accepted 21 October, 2021)

ABSTRACT

A preliminary survey was conducted during September 2018 to May 2019 in three districts of West Bengal, namely Hooghly, Howrah and Burdwan. During this study seven spots were selected spanning three districts. The selection criteria was determined by the fact that they must be in the Gangetic basin region. A total of 129 species were documented belonging to 18 different orders and 46 different families. Among all the species recorded, species diversity was significantly high in Boshipota Village of Hooghly district but the total count was higher in Chupi Char, Purbasthali, Burdwan District. Though all the study places were surrounded by villages yet the bird species count in those regions were very high negating intense anthropogenic activities. As expected, the total count as well as the species richness of birds was significantly high during the winter season, mainly because of winter migration. During this study period 20 comparatively rare species were sighted and photographed.

Key words : *Species diversity, Winter migration, Resident birds,*

Introduction

Out of 8650 species of birds in the world, India has only 1200, out of which 142 are endemic species (Inskipp and Inskipp, 1995). In today's context, when bird populations are declining because of their habitats are being destroyed, polluted, and reduced on a large scale, a proper understanding about habitats and current diversity status would be quintessential.

Community ecology is the study of the manner in which groupings of species are formed and distributed in nature and the ways in which these can be influenced by interactions between and among the species and the physical and biological factors of their environment (Weins, 1989). Birds occupy a wide range of ecological positions and in many respects biodiversity. Both present and past, is better

understood for birds than for any other major group of organisms (Sekercioglu, and Cagan Hakki, 2006). The avian populations have a direct relationship with the structure and nature of habitat. Measuring diversity through time and in changing habitats could be a good approach in generating an indicator where species gain or loss could be used to gauge the trends in biodiversity (Van Strien, 1997) (Cody, 1974), (Cody, 1978). Being ecologically diverse and very much sensitive to various kinds of perturbation, bird community always acts as a better predictor of the quality and health of the habitat than a single species (Ripley, 1978). Traditionally, the population studies have been used to monitor large scale, long term changes in avian population and to assess both habitat quality and the responses of bird to both natural and human caused environmental changes (Weins, 1989). Recently the climatic and an-

thropogenic changes of nature showed adverse effects in bird life and ecological balance. So it is necessary at this hour, to save the bird species from the threats in order to maintain the biodiversity. Biodiversity conservation in urban areas has become significant not only because of increasing anthropogenic activities in urban centres but also because it is one of the innovative ways to conserve biodiversity as suggested by various global environmental conventions (Kheraa *et al.*, 2009). Progressive urbanization often leads to biotic homogenization whereby a few widespread and successful species replace a diverse avifauna (Mc Kinney, and Lockwood, 2001), (Crooks *et al.*, 2004).

For the purpose of this study, three districts of south Bengal namely Hooghly, Howrah and Burdwan were selected. The locations for studying avian fauna were selected in such a manner that various types of habitats were covered. Beta Village and Boshipota Village were predominantly agricultural lands with little bit of trees here and there, Purbasthali, Chupi Char, Santragachi Jheel and Bandel Water Spot were mainly wetland habitat, Debanandapur, Bandel was woodland habitat with a dense canopy of different trees, and lastly, Baidyabati Khal was a shared habitat. We considered woodland habitat as one having a dense grouping of hardwood trees (Abdul Jamil Urfi, 2004). Wetland can be defined as areas which have sufficient water long enough to support the growth of hydrophytic vegetation (Abdul Jamil Urfi, 2004). It has been proved that the birdlife can be quite diversified in the manmade agricultural field as these areas receive the benefits of the edge effect.

Till date, no diversity of bird species was estimated for this part of geographic land, therefore, the present study was initiated to determine the structure of bird communities to bring out the diversity pattern in different habitats (mixed dry deciduous forest, wet land, and agricultural ecosystems) in this part of South Bengal.

Materials and Methods

Study Area

Geographically the study regions are located within a radius of 250 km centering 22°53'51.18" and 88°22'22.02" Latitude and Longitude, in the Gangetic plains of Southern West Bengal, India. For this project seven different locations were selected (Figure 1).

Some of these study areas are primarily grasslands and agricultural lands, some having large water bodies, still others have thick vegetation covering. Each location is assigned a particular site number which will follow in rest of the paper.

- Site 1. Beta Village, 10 Km west of Chinsurah Railway Station, mostly agricultural lands.
- Site 2. Debanandapur, 5 K.M west of Bandel Railway Station, mainly dense canopy of deciduous trees and bamboo trees.
- Site 3. Boshipota Village, in Dankuni Hooghly, mostly agricultural lands.
- Site 4. Badyabati Khal, located in between Bhadreswar and Badyabati railway station, in south of river Ganges, Agricultural and marshy area.
- Site 5. Chupi Char, Purbasthali, Burdwan, 4.5 K.M north of Purbasthali railway station, located on the true right bank of river Ganga, Primarily large waterbody.
- Site 6. Santragachi Jheel, Howrah, located near Santragachi Railway station well known for its large waterbody.
- Site 7. Bandel Water spot, located just adjacent to Bandel Railway Station, Hooghly, relatively large waterbody mostly filled with water Hyacinth.

Study Summary

The Study was conducted between September 2018 to May 2019. A total of 21 strips were used to carry out the field study in 09 months time. A total of 21 days and 224 hours were spent on the field for data collection. Field works were carried out on foot at an average speed of 1.5 to 2 km/hour. The visiting hours were from 6 a.m. to 11.30 a.m, and from 2 p.m to 6 p.m. For this purpose two pairs of binoculars (PORO Prism) (8X40 and 10X50 magnification) made by Olympus, and one dSLR camera Model D80, NCanon, (with 400mm prime lens), and other relevant materials were used. The birds flying from behind were also noted. In woodland habitat the more emphasis were given to birds call rather than their sight. The recorded bird species were identified, followed nomenclature using the books of 'The Birds of Indian Subcontinent, By Grimmitt *et al.*, (Grimmit *et al.*, 1998) and 'The book of Indian birds' by Salim Ali and Ripley (1983). (Ali, and Ripley, 1983).

Line Transect Method

Line transect survey method were used following Johnsing 1983 and Gregory, R.D. (2000). (Johnsingh,

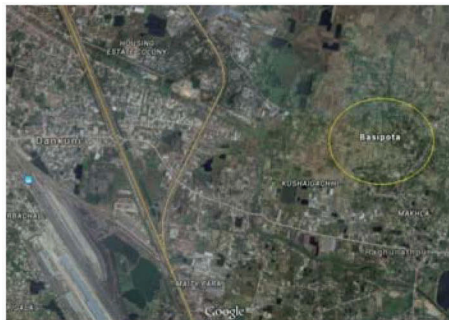
Site 1



Site 2



Site 3



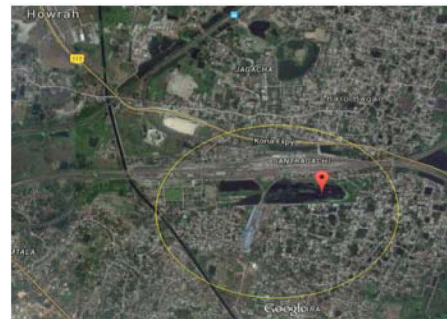
Site 4



Site 5



Site 6



Site 7

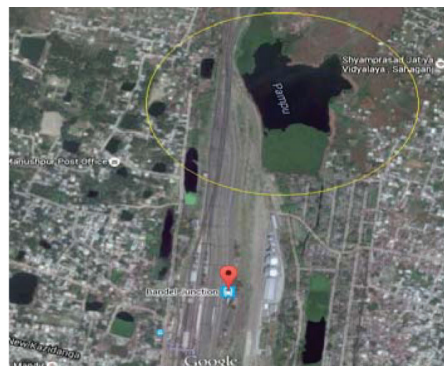


Fig. 1. Satellite images of Different habitats, study areas are encircled in yellow colour.

1983),(Gregory, 2000) for the density estimation of avian species. This method is increasingly preferred for the formal population estimation method based on visual detection of birds (Burhamet *al.*, 1980). For the density estimation in a difficult terrain like wetlands the traditional method was slightly modified in this present study. All the data were accumulated and analysed following standard methods through various computer models.

Point Transect Method

This method is variations of line transect method (Bibby *et al.*, 1992). In this method the surveyor stood at one place and counts the birds, seen and heard. Unlike line transect method here the observer stood in the centre of a circle and count the birds within that circle. This method was used mainly in dense vegetational area.

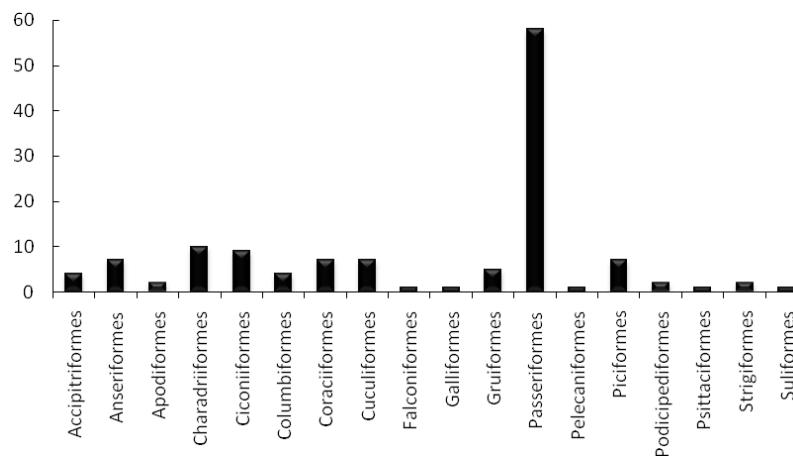
Block Count Method:

This block count method was practiced attempting to estimates large flocks of Lesser Whistling Ducks (*Waterfowl Census Technique as prescribed in AWC report.* 1992).

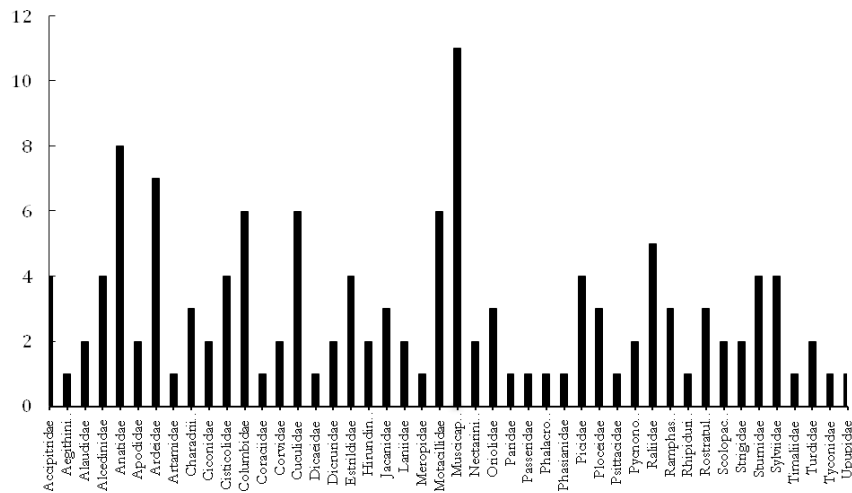
Results

During the present study, 132 bird species were identified belonging to 18 different orders and 46 different families (Appendix). Among the 18 different orders Order Passeriformes is the dominant one with 58 different species, Charadriiformes being the second largest order with only 10 different species (Graph 1).

Among the 46 families, Muscicapidae was predominant one having 11 different species and fam-



Graph 1. Number of bird species composition based on Orders in study areas.

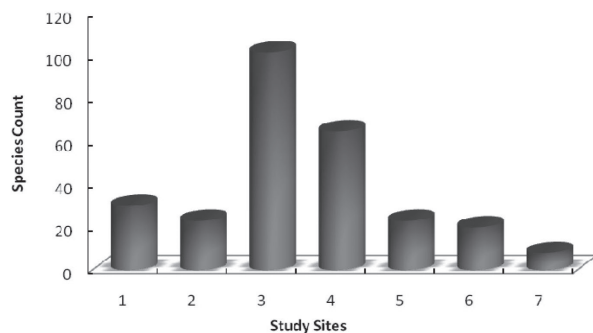


Graph 2. Number of bird species composition based on Families in study areas.

ily Anatidae being the second with 8 different species (Graph 2).

The seven spots selected in this study were visited 21 times spanning the entire time period (Sept-18 to May-2019), Each habitat was surveyed three times keeping equal time gap between individual survey (Table 1).

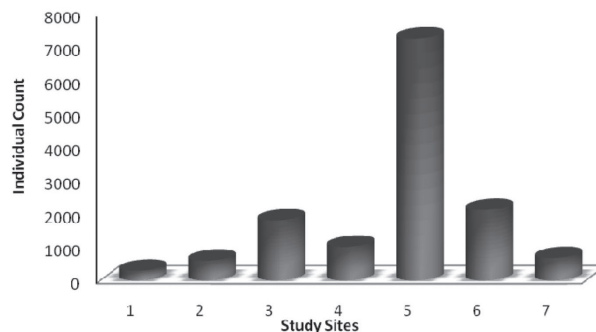
Among the seven places selected for this study, Site 3 was the richest so far as the diversity of bird species is concerned, with 102 different bird species. Site 4 ranked second regarding Bird diversity, with only 65 different bird species. In this present study Site 7 identified as the least diverse, having only 8 different bird species (Table 1, Graph 2). Site 1, Site 2, Site 5 and Site 6 ranked 3rd to 6th respectively, so far the species diversity is concerned. (Table 1, Graph 3).



Graph 3. Number of different species identified in each locations.

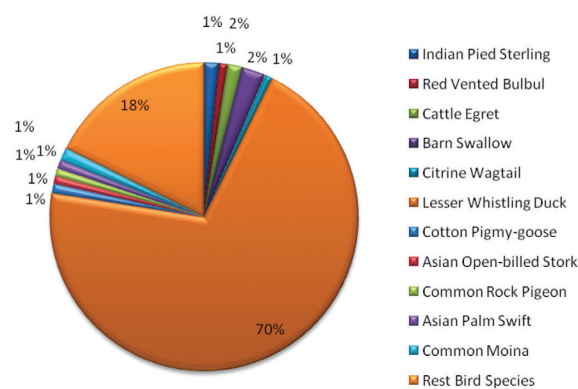
In the whole study period we have encountered a hefty number of individuals reaching the figure of 13734. Of these only purbasthali, Chupi Char, Burdwan District donated 7261, having 54.90% of total individuals identified. Santragachi Jheel, Howrah District ranked second in this respect with 2114 individuals, nearly 16% of total bird count. Though Boshipota Village was the most diverse regarding bird species, yet it comes third in this list having only 1801 individuals, only 14% of total count. Baidyabati Khal, Hooghly ranked second in diversity list but it comes 4th in the list of abundance list, having only 1006 individuals, merely 8% of to-

tal count. Debanandapur, Hooghly, Bandel Water Spot, Bandel and Beta Village Hooghly ranked 5th, 6th, and 7th in this list with 591, 472 and 89 individuals respectively (Table 1, Graph 4).



Graph 4. Total number of individuals observed in each locations.

The study data confirms that the avian population of the selected ecosystems were dominated by Indian Pied Sterling, Red Vented Bulbul, Cattle Egret, Barn Swallow, Citrine Wagtail, Asian Open-billed Stork, Common Rock Pigeon, Asian Palm Swift, Common Myna, Cotton Pigmy-goose, and Lesser Whistling Duck (Graph 5). Out of these 10 different species only Lesser Whistling Duck occupies a mammoth 71% of total count, remaining 09 bird species contributes 1-2% each of total counts. Rest 122 bird species contributes only 18% of total counts (Graph 5).

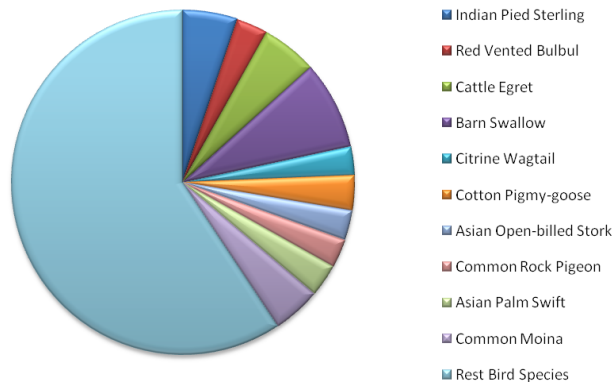


Graph 5. Percentage occurrence of dominant bird species.

Table 1. A summarised form of the outcome of the study.

Locations	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Number of Visit	3	3	3	3	3	3	3
Total Number of Species	30	24	102	65	23	20	8
Total Number of Individual	89	591	1801	1006	7261	2114	472

To get a more precise picture when the data for Lesser Whistling Duck was kept aside it was found that those 9 dominant bird species contributed 03% to 09% of total population and rest 122 species occupies rest 62% (Graph 6).



Graph 6. Contribution of dominant bird species in avian population, data not provided for Lesser Whistling Duck.

Surprisingly it was found that out of 10 dominant bird species only two of them, namely Lesser Whistling Duck and Cotton Pigmy Goose were winter migrant, rest 08 species are resident to this locality.

In our present study we were surprised to see the hefty number of uncommon/ unfamiliar birds in

this region. In Table 2, some of those rare birds are listed. Some of them are winter migrant in this locality like Grey Headed Canary Flycatcher, Tickell's Thrush, Verditer Flycatcher etc. Some are summer migrant like Asian Paradise Flycatcher.

Discussion

In this study we performed sampling of birds in seven different places and almost equal number of sampling was performed in each place. From the data it was clear that the diversity of species is considerably higher in Boshipota Village, Dankuni, Hooghly District, which is mainly agricultural land intermingled with few deciduous trees. Baidyabati Khal, Hooghly District ranked second so far as species diversity is concerned with 65 different species. This place enjoyed a shared habitat for agricultural, woodland and wetland ecosystems. The total number of species observed in other 4 locations were considerably lower, ranging from 8 to 24 different species. Species abundance was highest in Agricultural system than the other two. Another explanation is that, it was very difficult to count the number of birds in forest due to the dense canopy. In contrary to the above said data, surprisingly it was found that the total number of individuals counted in those locations did not tally with the data ob-

Table 2. Important and not so common species cited during this study.

Sl.no.	Name Of Bird	Scientific Name	Sighting Locations
1	Pale billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	2
2	Golden Oriole	<i>Oriolus kundoo</i>	2
3	Lineated Barbet	<i>Megalaima lineata</i>	3
4	Red-throated Flycatcher	<i>Ficedula parva</i>	2
5	Forest Wagtail	<i>Dendronanthus indicus</i>	1
6	Tickell's Thrush	<i>Turdus unicolor</i>	1
7	Grey-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>	1
8	Grey-headed Lapwing	<i>Vanellus cinereus</i>	3
9	Ruddy-breasted Crake	<i>Porzana fusca</i>	1
10	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	1
11	Indian Roller	<i>Coracias bengalensis</i>	1
12	Eurasian Wryneck	<i>Jnyx torquilla</i>	1
13	White Throated Faintail	<i>Rhipidura albicollis</i>	1
14	Zitting Cisticola	<i>Cisticola juncidis</i>	1
15	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	1
16	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	1
17	Bluethroat	<i>Luscinia svecica</i>	1
18	Red Avadavat	<i>Amandava amandava</i>	1
19	Verditer Flycatcher	<i>Eumyias thalassinus</i>	1
20	Indian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	1

tained for total number of species found. We have counted a massive total of 7261 individuals in Chupi Char, Purbasthali, Burdwan, mostly due to the enormous presence of Lesser Whistling Duck during winter season. Accompanied by Little Grebe, Common Coot, Red Crested Pochard and Cotton Pigmy Goose. All of them are winter visitors. These five birds accounted for nearly 99% of total individuals observed. Rest 18 species donated the remaining 1% of bird population. Similar situation was observed in Santragachi Jheel also where Lesser Whistling Duck alone was responsible for nearly 95% of individuals counted. Remaining 22 species contributed for rest 5% population structure. The situation was not much different in Bandel Water Spot, Bandel where 95% of birds were from 3 species, mainly Lesser Whistling Duck along with Cotton Pigmy Goose and one resident bird Common Moina. This is for the first time in the history of this place that winter migrant like Lesser Whistling Duck, Cotton Pigmy Goose were found here. Next few years study will be important to determine that weather this place is selected by those birds periodically or this year was an exception?

In tune with the previously reported data obtained from other parts of the country, the order Passeriformes stands the most dominant Order (Salahudeen *et al.*, 2013) with nearly 44% of total families found. The Order Charadriiformes listed second in abundance with only 10 species. Among the 46 families observed, Family Muscicapidae ranked first with 11 different species. Anatidae ranked second having 8 different species.

Water birds that dominated the winter season in wet land were mostly migratory in nature. Previously it was reported that Ferruginous Pochard was disappearing from Santragachi jheel (Roy *et al.*, 2011) but we fortunately found three of them in winter. Another important observation was the finding of 20 different rare species in this region (Table 2). The data suggests that though the study areas are not protected by laws yet the diversity of birds are very much comparable to those protected areas, so proper care has to be taken to maintain the diversity.

Some birds are known to exist in Agricultural/ Grassland habitat yet we encountered them in wet land habitat along with their natural habitat. This indicates that the birds are exploiting their available habitats utmost.

The winter season experienced the highest abun-

dance of birds population in every community, mostly due to infiltration of winter migrants and few resident species. Similar results have been shown by Gokula (Gokula, 1998) Gaston's (Gaston, 1978) study on the New Delhi ridge also showed similar result where diversity was high during winter and low in summer

One severe problem we experienced during this study was that, the natural habitats for these avian species are destroying at an alarming rate due to anthropogenic activities. The trees are being cut for household and commercial purposes.

It is clear from the figure that these marked trees



Fig. 2. Awaiting deforestation.

are waiting to be cut in near future. The water bodies are being filled regularly for construction purposes. The agricultural systems are being disturbed by large scale grazing, courtesy domestic animals of the villagers. This preliminary study shows that still some diversity is left as far as avian community is concerned. But we will have to take some immediate action to protect them. This study should continue for few years to get the precise picture of the avian diversity of this locality.

Conclusion

This study shows tremendous ecological potential of almost all the study sites. In spite of enormous anthropogenic activities the diversity of avian population is exceptionally well. But off late, the habitats are destroying rapidly leading to decrease in bird populations. So, competent authority should take care of the fact and act immediately.

Acknowledgements

The author personally thank Sri Asim Halder, Sri Ayanendu De, Sri Binoy Shee, for sharing many hours in the fields and help tirelessly in many ways. I also thank Dr. Goutam Bit, Principal, Bejoy Narayan Mahavidyalaya for constantly supporting in all probable ways. The author would like to thank the villagers of the study areas, who entirelessly helped in collecting data. And last but not the least, I would also thank www.earth.google.com for providing me the satellite images of the study areas.

References

- Abdul Jamil and Urfi, 2004. *Birds beyond watching*, Universities Press India (Pvt.) Limited, page-42.
- Ali, S. and Ripley, S.D. 1983. *A Pictorial Guide to the Birds of the Indian Subcontinent*. Bombay Natural History Society and Oxford University Press, Bombay, India. 175 pp.
- Bibby, C., Burgess, N.D. and Hill, D.A. 1992. *Bird Census Techniques*, Academic press, London.
- Burham, K.P., Anderson, D.R. and Laake, J.L. 1980. Estimation of Density from line transect sampling of biological populations. *Wildlife Monographs*. 72: 1-202 pp.
- Cody, M.L. 1974. *Competition and the Structure of Bird Communities*. Princeton Mongor. In. Population Biology, Princeton Univ. Press, Princeton, New Jersey, P- 7.
- Cody, M.L. 1978. Habitat selection and interspecific territoriality among the sylviid warblers of England and Sweden. *Ecol. Monogr.* 48(4) : 351-396.
- Crooks, K..R, Suarez, A.V. and Bolger, D.T. 2004. Avian assemblages along a gradient of urbanization in a highly fragmented landscape. *Boil. Conserv.* 115 : 451-462.
- Gaston, A.J. 1978. Seasonal occurrence of birds on New Delhi ridge. *J Bombay Nat Hist Soc.* 75 : 115-128.
- Gokula, V. 1998. *Bird communities of the thorn and dry deciduous forest in Mudumalai Wildlife Sanctuary*, South India. Ph.D. Thesis. Bharathiyar University. Coimbatore.
- Gregory, R.D. 2000. Development of breeding bird monitoring in the United Kingdom and adopting its principles elsewhere. *The Ring.* 22 : 35-44.
- Grimmit, R., Inskipp, C. and Inskipp, T. 1998. *Birds of the Indian Subcontinent*, Second Edition, Oxford University Press.
- Inskipp, C. and Inskipp, T. 1995. Birds of the Indian Subcontinent: An Overview. *Sanctuary Asia.* 25/5: 16-27.
- Johnsingh, A.J.T. 1983. Large mammalian prey-predators in Bandipur. *J.Bombay nat. Hist. Soc.* 80(1): 1-57.).
- Kheraa, N., Mehtaa, V. and Sabatab, B.C. 2009. *Interrelationship of birds and habitat features in urban greenspaces in Delhi*, India. Urban Forestry & Urban Greening, 8 : 187-196.
- Mc Kinney, M.L. and Lockwood, J.L. 2001. Biotic homogenization: a sequential and selective process. *Biotic Homogenization*. Kluwer, New York, 1-17.
- Ripley, S.D. 1978. Changes in the bird fauna of a forest area: Simlipal Hills, Mayurbhanj district and Dhanakannal district, Orissa. *J Bombay Nat Hist Soc.* 75 : 570-574.
- Roy, U.S., Goswami, A.R., Aich, A. and Mukhopadhyay, S.K. 2011. Changes in densities of waterbird species in Santragachi lake, India: Potential effects on Limnochemical Variables. *Zoological Studies.* 50(1) : 76-84.
- Salahudeen, M., Saranya, E., Gunasekaran, C., Vadivalagan, C. 2013. Studies on the Abundance and Distribution of Birds in Three Different Habitats of Karur District, South India. *Journal of Entomology and Zoology Studies.* 1(3) : 57-63.
- Sekercioglu, and Cagan Hakki. 2006. *Handbook of Birds of the World*. In Josep del Hoyo, Andrew Elliott and David Christie (eds.), Volume 11: Old World Flycatchers to Old World Warblers. Barcelona: Lynx Edicions, ISBN 84- 96553-06-X.
- Sr, Nirmala, T. 2013. Diversity of Avifauna in Anaikatty Hills, Coimbatore. *Journal of Biological and Food Science Research.* 2 (8) : 97-108.
- Van Strien, A.J. 1997. *Biodiversity declining in the Netherlands: an indicator to describe the changes in the number of wild species*. Netherlands Official Statistics, Winter, 45-49.
- Waterfowl Census Technique as prescribed in AWC report.* 1992. published by IWRB & AWB (Reprinted in: Bihang Newsletter, Vol 1/1, Nov-Dec, 1992.
- Weins, J.A. 1989. *Ecology of bird communities*. Cambridge University Press, Vol-I & II; Cambridge.