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## Diversity of birds in some ecological niches of Western Ghats in Maharashtra (India)

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### ABSTRACT

A comparative study of avifaunal diversity in selected locations of Western Ghats in Maharashtra was undertaken during winter and summer seasons in 2010. Total 50 different species of birds were encountered in four sites out of which 30 and 46 species were observed during winter and summer seasons respectively. Of these, 26 species were common in both the study periods. Species diversity was significantly more in site C than that recorded in sites A and B in both the seasons. Indian myna and house sparrow were most dominant during winter, while little cormorant, purple sunbird and redvented bulbul outnumbered others in summer. Majority of birds were insectivores in habits followed by frugivores and piscivores birds. Indian myna and redwhiskered bulbul, followed by house crow, were ranked at top levels on the basis of habitat index in winter and summer seasons respectively. © 2012 Trade Science Inc. - INDIA

### KEYWORDS

Avifaunal diversity;  
Western Ghats;  
Species diversity;  
Habitat index.

### INTRODUCTION

Population of birds is a sensitive indicator of pollution in both terrestrial and aquatic ecosystem<sup>[14,20]</sup>. The estimation of local densities of avifauna helps to understand the abundances of various species of other organisms<sup>[33]</sup>. Birds are often used as monitors of pollutants<sup>[9]</sup> to indicate possible impacts of industrial interference in the ecosystems<sup>[3]</sup>. Noise pollution in metropolis caused physical irritation and disturbance in normal physiological processes of birds<sup>[29]</sup>. An assemblage of large number and diverse bird species is an indication of less species competition due to diverse niche requirements<sup>[25]</sup>. Some birds are sensitive to noise or traffic and their movements get disturbed<sup>[34]</sup> in such situations.

They are one of the best indicators of ecosystem, health, pollution problems and function as early warning system<sup>[3,4,8,26,28,31]</sup> Western Ghats of Maharashtra shows the high habitat diversity for birds. Due to presence of aquatic and swampy vegetations in Dasve and Warasgaon reservoirs, the study area was most preferred by the avifauna during summer season.

The purpose of our study was to record the diversity of bird population during winter and summer seasons in selected four sites of Western Ghats in Maharashtra and to evaluate their relationship with different habitats viz. forest, aquatic and urban locations. The bird communities of the Western Ghats region are important bioindicators of ecosystems which should be protected to conserve the biodiversity and environment. Hence,

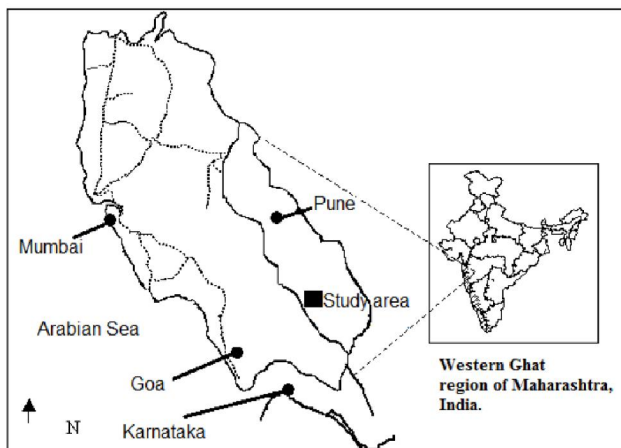
## Regular Paper

we evaluated avian composition, abundance and diversity in this region.

### STUDY AREA

Geographical location of the study area is 73° 25' 8" to 73° 37' 22" East longitude and 18° 26' 38" to 18° 22' 10" North latitude. The location map of study area is shown in Figure 1.

The area is known for receiving 5400 mm annual rainfall. The summer months are hot with mean daily temperature between 13 and 42°C, while in winter the temperature varies from 35 to 9°C. However, the temperature in monsoon season fluctuates between 30 and 9°C. The average relative humidity of the region varies be-



**Figure 1 : Study area in Western Ghats within Maharashtra, India.**

tween 70 and 80%. Site A is located in and around Dasve and Warasgaon reservoirs representing dominance of aquatic birds while site B is a nature trail area as well as a tourist place, sites C and D are forest covered areas.

This area had tropical evergreen to tropical moist deciduous vegetation about a decade back. Recent mass plantation of fruit bearing indigenous trees in this area is likely to provide food, habitat and breeding zone to the birds. Some dominant trees recorded in study area are *Acacia catechu*, *Ficus racemosa*, *Emblica officinalis*, *Magnifera indica* and *Sygygium cumini*. While shrubs comprise of *Hibiscus rosa-chinensis*, *Adhatoda vasica*, *Carrisa carandus*, *lantana camara* and *Vitex negundo*, dominant herbs are represented by *Alternanthera sessilis*, *Argemone maxicana*, *Dysophylla stelata* and *Tridax procumbens*. Vegetation, present in this area, is somewhat dense at some locations and showed seasonal

changes in their growth pattern. Contemporary forest bird community structure fluctuated rapidly over a relatively short period of time.

### MATERIALS AND METHODS

Field observations of avifauna in the study area were carried out during winter and summer seasons in 2010. The roadside counts of birds were undertaken following standard procedures<sup>[6,27]</sup> by traversing a given distance through designated sampling areas. The milometer of the vehicle was used to measure the stretch of the study area. Birds were studied by direct observation with the help of 7x-15x35 "Optima Zenith" binocular and were identified by adopting available literature<sup>[1,35]</sup>. Birds were counted at their point of first detection and care was taken to ensure that same birds were not counted again. Call notes of the birds were used for identification. The check list of species was prepared as per references available<sup>[2,22,13]</sup>. The data were subjected to detailed analysis and following indices were applied<sup>[21,12,16]</sup>.

1. Dominance Index (D)  $D = (n_i / N) \times 100$ .
2. Census Index (C)  $C = n_i / M$ .
3. Species Richness Index, It is expressed as total number of species recorded at each region.
4. Species Diversity Index (d) (Margalef 1951)  $d = (S-1) / \ln N$ .
5. Habitat index

Preference and availability are the key characteristics for evaluating the habitat of birds in natural ecosystem. These were estimated through density and frequency of their occurrence of birds at different sampling points during two seasons. The density measurement reflects as to how many individuals were present in each sampling points and frequency measurement indicate how species is distributed among the sampling points<sup>[15]</sup>. The mean of these two aspects is denoted as habitat index which is a reasonable measure to assess the overall significance of species. The following steps were followed for calculating the habitat index.

**Relative density = (density of species A x 100) / total density value of all species**

Relative frequency = frequency value of species A x 100 / total frequency value of all species

Habitat index = (relative density + relative frequency) / 2

## RESULT AND DISCUSSION

There was considerable variation in the population of birds during the study period. The density of bird population in all the four sites during winter season was in the decreasing order of site A, site C, site D and site B. This might be attributed to the fact that site A is sur-

rounded by large water bodies and the vegetations attracted birds. However, during summer it was site C, site A, site B and site D, because site C comprises of bushes, hills and large trees providing better habitat for the birds. Dominant and sub-dominant bird species were categorized depending upon their availability in field area during study period. Total 50 bird species were observed during the survey, of which 8 are aquatic, namely little cormorant, pond heron, grey heron, barheaded geese, night heron, cattle egret, Indian reef heron and white ibis (TABLE 1).

TABLE 1 : Census of Avifauna and their rankings, based on habitat index, in select areas of Western Ghats in Maharashtra

| Sr. no. | Common name            | Scientific name                | Site               | Dominance index |       | Census index |     | Relative density |   | Relative frequency |       | Habitat Index(HI) |      | HI of two seasons | Ranking based on (HI) |      | Overall ranking based on two seasons |    |   |
|---------|------------------------|--------------------------------|--------------------|-----------------|-------|--------------|-----|------------------|---|--------------------|-------|-------------------|------|-------------------|-----------------------|------|--------------------------------------|----|---|
|         |                        |                                |                    | W               | S     | W            | S   | W                | S | W                  | S     | W                 | S    |                   | W                     | S    |                                      |    |   |
| 1       | Indian myna            | <i>Acridotheres tristis</i>    | A                  | 10.66           | 4.58  | 600          | 125 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | B                  | 15.78           | 7.44  | 225          | 175 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | C                  | 12.5            | 7.14  | 350          | 200 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | D                  | 9.21            | 5.55  | 175          | 100 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | mean of four sites |                 |       |              |     |                  |   |                    | 11.73 | 6.09              | 5.40 | 3.70              | 8.56                  | 4.89 | 6.72                                 | 1  | 4 |
| 2       | Redwhiskered bulbul    | <i>Pycnonotus jocosus</i>      | A                  | 9.33            | 6.42  | 525          | 175 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | B                  | 12.28           | 7.44  | 175          | 175 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | C                  | 7.14            | 8.92  | 200          | 250 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | D                  | 7.89            | 8.33  | 150          | 150 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | mean of four sites |                 |       |              |     |                  |   |                    | 9.13  | 8.31              | 5.40 | 3.70              | 7.26                  | 6.00 | 6.63                                 | 2  | 1 |
| 3       | House crow             | <i>Corvus splendens</i>        | A                  | 7.55            | 3.66  | 425          | 100 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | B                  | 10.52           | 5.43  | 150          | 125 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | C                  | 9.82            | 6.25  | 275          | 175 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | D                  | 7.89            | 6.94  | 150          | 125 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | mean of four sites |                 |       |              |     |                  |   |                    | 8.69  | 5.81              | 5.40 | 3.70              | 7.04                  | 4.75 | 5.89                                 | 3  | 5 |
| 4       | Redvented bulbul       | <i>Pycnonotus cafer</i>        | A                  | 4.44            | 3.66  | 250          | 100 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | B                  | 8.77            | 8.69  | 125          | 200 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | C                  | 5.35            | 4.46  | 150          | 125 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | D                  | 11.84           | 16.66 | 225          | 300 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | mean of four sites |                 |       |              |     |                  |   |                    | 6.52  | 8.03              | 4.05 | 3.70              | 5.29                  | 5.86 | 5.57                                 | 9  | 2 |
| 5       | House sparrow          | <i>Passer domesticus</i>       | A                  | 3.11            | 7.33  | 175          | 200 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | B                  | 3.50            | 2.12  | 50           | 50  |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | C                  | 6.25            | 10.71 | 175          | 300 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | D                  | 15.78           | 13.88 | 300          | 250 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | mean of four sites |                 |       |              |     |                  |   |                    | 5.43  | 8.31              | 5.40 | 2.77              | 5.41                  | 5.54 | 5.47                                 | 8  | 3 |
| 6       | Tickell's flowerpecker | <i>Dicaeum erythrorhynchos</i> | A                  | 4.00            | 8.25  | 225          | 225 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | B                  | 5.26            | 6.52  | 75           | 150 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | C                  | 3.57            | 8.03  | 100          | 225 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | D                  | 6.57            | 6.94  | 125          | 125 |                  |   |                    |       |                   |      |                   |                       |      |                                      |    |   |
|         |                        |                                | mean of four sites |                 |       |              |     |                  |   |                    | 4.56  | 8.03              | 5.40 | 3.70              | 4.98                  | 5.86 | 5.42                                 | 10 | 2 |

# Regular Paper

| Sr. no.            | Common name           | Scientific name              | Site               | Dominance index  |                          | Census index |      | Relative density |      | Relative frequency |      | Habitat Index(HI) |      | HI of two seasons | Ranking based on (HI) |    | Overall ranking based on two seasons |  |  |
|--------------------|-----------------------|------------------------------|--------------------|------------------|--------------------------|--------------|------|------------------|------|--------------------|------|-------------------|------|-------------------|-----------------------|----|--------------------------------------|--|--|
|                    |                       |                              |                    | W                | S                        | W            | S    | W                | S    | W                  | S    | W                 | S    |                   | W                     | S  |                                      |  |  |
| 7                  | Purple sunbird        | <i>Nectarinia asiatica</i>   | A                  | 4.88             | 6.42                     | 275          | 175  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | 7.01             | 10.86                    | 100          | 250  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 7.14             | 6.25                     | 100          | 175  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | 5.26             | 6.94                     | 100          | 125  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              |      | 5.86             | 5.26 | 5.40               | 2.77 | 5.63              | 4.01 | 4.82              | 6                     | 6  | 7                                    |  |  |
| 8                  | Little cormorant      | <i>Phalacrocorax niger</i>   | A                  | 9.77             | 12.84                    | 550          | 350  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 4.78 | 3.87             | 1.35 | 1.85               | 6.13 | 2.86              | 4.49 | 5                 | 10                    | 8  |                                      |  |  |
| 9                  | White wagtail         | <i>Motacilla alba</i>        | A                  | 6.22             | 4.58                     | 350          | 125  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | 3.50             | 1.06                     | 50           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 5.35             | 5.35                     | 150          | 150  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | 5.26             | 5.55                     | 100          | 100  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 5.65 | 4.15             | 5.40 | 2.77               | 5.52 | 3.46              | 4.49 | 7                 | 9                     | 8  |                                      |  |  |
| 10                 | Jungle crow           | <i>Corvus macrorhynchus</i>  | A                  | 4.44             | -                        | 250          | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | 7.01             | 4.25                     | 100          | 100  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 10.71            | 2.67                     | 600          | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | 9.21             | 2.77                     | 175          | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 7.17 | 2.49             | 5.40 | 2.77               | 6.28 | 2.63              | 4.45 | 4                 | 11                    | 9  |                                      |  |  |
| 11                 | Common swallow        | <i>Hirundo rustica</i>       | A                  | 6.22             | 5.50                     | 350          | 150  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | -                | 6.52                     | -            | 150  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 8.03             | 4.46                     | 225          | 125  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | -                | 2.77                     | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 5.00 | 4.59             | 2.70 | 2.77               | 3.85 | 3.68              | 3.76 | 12                | 7                     | 10 |                                      |  |  |
| 12                 | Indian robin          | <i>Saxicoloides fulicata</i> | A                  | 5.33             | 3.66                     | 300          | 100  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | 12.28            | -                        | 175          | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 3.57             | 6.25                     | 100          | 175  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | 3.94             | -                        | 75           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 4.13 | 3.04             | 5.40 | 1.85               | 4.76 | 2.44              | 3.6  | 11                | 13                    | 11 |                                      |  |  |
| 13                 | Magpie robin          | <i>Copsychus saularis</i>    | A                  | -                | 3.66                     | -            | 100  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | 5.26             | 4.25                     | 75           | 100  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 6.25             | 1.78                     | 175          | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | 5.26             | 4.16                     | 100          | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 3.04 | 3.60             | 4.05 | 3.70               | 3.54 | 3.65              | 3.59 | 14                | 8                     | 12 |                                      |  |  |
| 14                 | Small blue kingfisher | <i>Alcedo atthis</i>         | A                  | 0.49             | 0.91                     | 25           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | B                  | 1.75             | 1.06                     | 25           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 0.89             | 0.89                     | 25           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | 2.63             | 0.07                     | 175          | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 1.08 | 1.38             | 5.40 | 3.70               | 3.24 | 2.54              | 2.89 | 15                | 12                    | 13 |                                      |  |  |
| 15                 | Small green bee eater | <i>Merops orientalis</i>     | B                  | 1.75             | 3.19                     | 25           | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | C                  | 0.89             | 0.89                     | 25           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | D                  | -                | 0.07                     | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                       |                              | mean of four sites |                  |                          |              | 0.43 | 1.66             | 2.70 | 2.77               | 1.56 | 2.21              | 1.88 | 19                | 15                    | 14 |                                      |  |  |
|                    |                       |                              | 16                 | Blackheaded myna | <i>Sturnus pagodarum</i> | A            | 8.00 | -                | 450  | -                  |      |                   |      |                   |                       |    |                                      |  |  |
| C                  | 2.67                  | -                            |                    |                  |                          | 75           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
| mean of four sites |                       |                              |                    |                  |                          |              | 4.78 | -                | 2.70 | -                  | 3.74 | -                 | 1.87 | 13                | -                     | 15 |                                      |  |  |

| Sr. no.            | Common name             | Scientific name                | Site               | Dominance index    |      | Census index |      | Relative density |      | Relative frequency |      | Habitat Index(HI) |      | HI of two seasons | Ranking based on (HI) |    | Overall ranking based on two seasons |  |  |
|--------------------|-------------------------|--------------------------------|--------------------|--------------------|------|--------------|------|------------------|------|--------------------|------|-------------------|------|-------------------|-----------------------|----|--------------------------------------|--|--|
|                    |                         |                                |                    | W                  | S    | W            | S    | W                | S    | W                  | S    | W                 | S    |                   | W                     | S  |                                      |  |  |
|                    |                         |                                |                    | mean of four sites |      |              |      | W                | S    | W                  | S    | W                 | S    |                   | W                     | S  |                                      |  |  |
| 17                 | Common babbler          | <i>Turdoides caudatus</i>      | B                  | 1.75               | 3.19 | 25           | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | 0.89               | -    | 25           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | 1.31               | -    | 25           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.65 | 0.27             | 4.05 | 1.85               | 2.35 | 1.06              | 1.70 | 16                | 24                    | 16 |                                      |  |  |
| 18                 | Indian great horned owl | <i>Bubo bubo</i>               | B                  | 1.75               | -    | 25           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | 0.89               | -    | 25           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | 1.31               | 1.33 | 25           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.65 | 0.27             | 4.05 | 1.85               | 2.35 | 1.06              | 1.70 | 16                | 24                    | 16 |                                      |  |  |
| 19                 | Barheaded geese         | <i>Anser indicus</i>           | A                  | 6.22               | 1.83 | 350          | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 3.04 | 0.55             | 1.35 | 1.85               | 2.19 | 1.2               | 1.69 | 17                | 23                    | 17 |                                      |  |  |
| 20                 | Pond heron              | <i>Ardeola grayii</i>          | A                  | 3.11               | 6.42 | 175          | 175  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 1.52 | 1.93             | 1.35 | 1.85               | 1.43 | 1.89              | 1.66 | 20                | 16                    | 18 |                                      |  |  |
| 21                 | Jungle myna             | <i>Acridotheres fuscus</i>     | A                  | 4.00               | -    | 225          | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | B                  | -                  | 2.12 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | -                  | 1.78 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | -                  | 2.77 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
| mean of four sites |                         |                                |                    | 1.95               | 0.16 | 1.35         | 2.77 | 1.65             | 1.46 | 1.55               | 19   | 21                | 19   |                   |                       |    |                                      |  |  |
| 22                 | Indian shikra           | <i>Accipiter badius</i>        | B                  | -                  | 2.12 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | 0.89               | -    | 25           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | 2.63               | 1.33 | 50           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.65 | 0.83             | 2.70 | 1.85               | 1.67 | 1.34              | 1.50 | 18                | 22                    | 20 |                                      |  |  |
| 23                 | Grey heron              | <i>Ardea cinerea</i>           | A                  | 0.88               | 5.50 | 50           | 150  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.43 | 1.66             | 1.35 | 1.85               | 0.89 | 1.75              | 1.32 | 23                | 18                    | 21 |                                      |  |  |
| 24                 | Cattle egret            | <i>Bubulcus ibis</i>           | A                  | -                  | 4.58 | -            | 125  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | 1.78               | -    | 50           | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.43 | 1.35             | 1.35 | 1.85               | 0.89 | 1.61              | 1.25 | 23                | 19                    | 22 |                                      |  |  |
| 25                 | White ibis              | <i>Threskiornis aethiopica</i> | A                  | -                  | 2.75 | -            | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | B                  | -                  | -    | -            | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | 7.14               | -    | 100          | -    |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.86 | 0.83             | 1.35 | 1.85               | 1.10 | 1.34              | 1.22 | 22                | 22                    | 23 |                                      |  |  |
| 26                 | Indian black drongo     | <i>Dicrurus adsimilis</i>      | B                  | -                  | 3.91 | -            | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | -                  | 2.67 | -            | 75   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | -                  | 1.33 | -            | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | -    | 1.93             | -    | 2.77               | -    | 2.35              | 1.17 | -                 | 14                    | 24 |                                      |  |  |
| 27                 | Night heron             | <i>Nycticorax nycticorax</i>   | A                  | 0.88               | 1.83 | 50           | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.21 | 0.55             | 1.35 | 1.85               | 0.78 | 1.2               | 0.99 | 24                | 23                    | 25 |                                      |  |  |
| 28                 | House swift             | <i>Apus affinus</i>            | B                  | -                  | 4.25 | -            | 100  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | -                  | 4.46 | -            | 125  |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | -                  | 2.72 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | -    | 1.93             | -    | 1.85               | -    | 1.89              | 0.94 | -                 | 16                    | 26 |                                      |  |  |
| 29                 | Red jungle fowl         | <i>Gallus gallus</i>           | B                  | 1.75               | 1.06 | 25           | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | 0.21 | 0.27             | 1.35 | 1.85               | 0.78 | 1.06              | 0.92 | 24                | 24                    | 27 |                                      |  |  |
| 30                 | Pied crested cuckoo     | <i>Clamator jacobinus</i>      | B                  | -                  | 2.12 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | C                  | -                  | 0.89 | -            | 25   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | D                  | -                  | 0.07 | -            | 50   |                  |      |                    |      |                   |      |                   |                       |    |                                      |  |  |
|                    |                         |                                | mean of four sites |                    |      |              | -    | 0.83             | -    | 2.77               | -    | 1.8               | 0.9  | -                 | 17                    | 28 |                                      |  |  |



| Sr. no. | Common name         | Scientific name                  | Site | Dominance index    |                  | Census index         |    | Relative density |      | Relative frequency |      | Habitat Index(HI) |      | HI of two seasons | Ranking based on (HI) |      | Overall ranking based on two seasons |
|---------|---------------------|----------------------------------|------|--------------------|------------------|----------------------|----|------------------|------|--------------------|------|-------------------|------|-------------------|-----------------------|------|--------------------------------------|
|         |                     |                                  |      | W                  | S                | W                    | S  | W                | S    | W                  | S    | W                 | S    |                   | W                     | S    |                                      |
|         |                     |                                  |      | 47                 | Blue rock pigeon | <i>Columba livia</i> | C  | -                | 2.67 | -                  | 75   | -                 | 0.83 |                   | -                     | 0.92 |                                      |
|         |                     |                                  |      | mean of four sites |                  |                      |    |                  |      |                    |      |                   |      |                   |                       |      |                                      |
| 48      | Grey shrike         | <i>Lanius excubitor</i>          | C    | 0.89               | -                | 25                   | -  | 0.21             | -    | 1.35               | -    | 0.78              | -    |                   | 24                    | -    | 36                                   |
|         |                     |                                  |      | mean of four sites |                  |                      |    |                  |      |                    |      |                   |      | 0.39              |                       |      |                                      |
| 49      | Large pied wagtail  | <i>Motacilla maderaspatensis</i> | C    | -                  | 0.89             | -                    | 25 | -                | 0.27 | -                  | 0.92 | -                 | 0.59 |                   | -                     | 26   | 37                                   |
|         |                     |                                  |      | mean of four sites |                  |                      |    |                  |      |                    |      |                   |      | 0.29              |                       |      |                                      |
| 50      | Indian spotted dove | <i>Streptopelia chinensis</i>    | C    | -                  | 1.78             | -                    | 50 | -                | 0.27 | -                  | 0.92 | -                 | 0.59 |                   | -                     | 26   | 37                                   |
|         |                     |                                  |      | mean of four sites |                  |                      |    |                  |      |                    |      |                   |      | 0.29              |                       |      |                                      |

TABLE 2 : Dominance and diversity of avifauna at different sites within the study area of Western Ghats in Maharashtra

| Sr. No. | Site                                | General Features of site   | Seasons | Dominant         |       | Subdominant                         |       | S.R.I. | S.D.I. | C.I for total Population (No./km <sup>2</sup> ) |
|---------|-------------------------------------|----------------------------|---------|------------------|-------|-------------------------------------|-------|--------|--------|---|
|         |                                     |                            |         | Species          | Index | Species                             | Index |        |        |   |
| 1       | Dasve thicket area (site A)         | Around large water bodies  | Winter  | Indian myna      | 10.66 | Little cormorant                    | 9.77  | 20     | 6.99   | 5625  |
|         |                                     |                            | Summer  | Little cormorant | 12.84 | Tickell's flowerpecker              | 8.25  | 22     | 7.72   | 2725  |
| 2       | Nature trail area (site B)          | park, large trees          | Winter  | Indian myna      | 15.78 | Indian robin & Red whiskered bulbul | 12.28 | 16     | 5.51   | 1425  |
|         |                                     |                            | Summer  | Purple sunbird   | 10.86 | Redvented bulbul                    | 8.69  | 27     | 9.56   | 2350  |
| 3       | Hill street area (site C)           | bushes, hills, large trees | Winter  | Indian myna      | 12.5  | Jungle crow                         | 10.71 | 22     | 7.72   | 3100  |
|         |                                     |                            | Summer  | House sparrow    | 10.71 | Redwhiskered bulbul                 | 8.92  | 28     | 9.93   | 2750  |
| 4       | Around Mugaon Village area (site D) | bushes, scattered trees    | Winter  | House sparrow    | 15.78 | Redvented bulbul                    | 11.84 | 17     | 5.88   | 2025  |
|         |                                     |                            | Summer  | Redvented bulbul | 16.66 | House sparrow                       | 13.88 | 19     | 6.62   | 1800  |

The most common species were Indian myna, house sparrow, little cormorant, Indian robin, redwhiskered bulbul, jungle crow, tickell's flowerpecker, and redvented bulbul in the study area (TABLE 2).

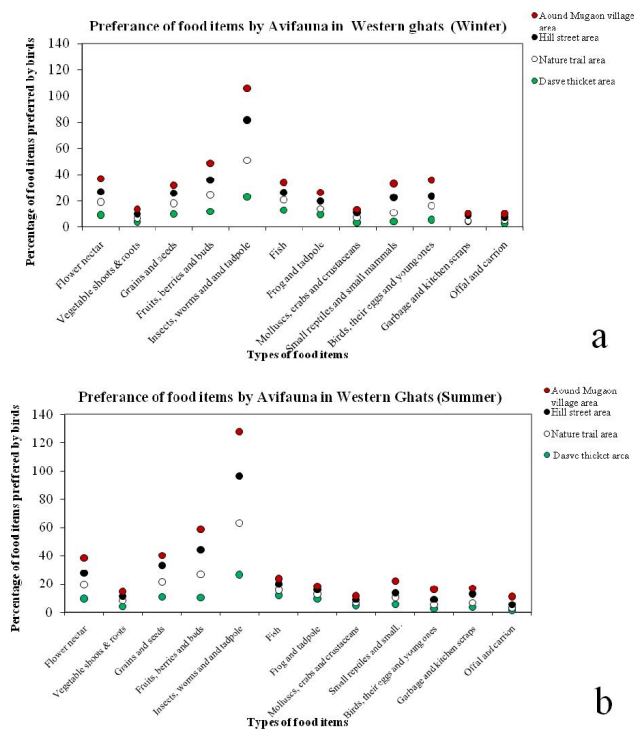
Food limitation is an important factor influencing the migratory behavior of birds. However, in the case of altitudinal migration, it is unlikely to be the only important process responsible for seasonal movements. The abundance of food probably interacts with a bird's nutritional needs, physiological traits, and local climatic factors to shape the diversity of bird migration patterns. Habitat index of each species, estimated during two seasons, indicates that this region is mostly preferred by Indian myna in winter and redwhiskered bulbul in

summer (TABLE 1). Avifauna recorded from the study area was grouped on the basis of their feeding habits. Altogether 12 groups of foods were preferred by these birds. It has been observed that the majority of birds (45.67%) were insectivores in habit while preferring insects during both the seasons, followed by frugivores (17.59%), piscivores (12.44%), omnivores (11.98%), grainivores (8.75%) and nectarivores (3.57%) respectively (Figure 2).

Insectivore birds may control insect populations<sup>[17,18]</sup> frugivores are most important plant dispersal agents<sup>[24,31,32]</sup>. They may also be important pollinators, especially in tropical environments<sup>[5,7,8,32]</sup> Plantation of fruit trees within residential areas attracted

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many frugivorous and insectivorous birds for dwelling. Since these areas are gradually being converted to commercial zone, it may be difficult for avifauna to find the nesting locations and sheltering place or foraging habitats. Prior to anthropogenic activities these areas were covered by thick forest without any human intervention. However, it has now been turned into residential and commercial areas. Thus, many species of birds either migrated to other places or gradually declined their population as nesting sites were destroyed.



**Figure 2 : Preference of food items by Avifauna (a) winter and (b) summer 2010**

## CONCLUSION

The data generated show considerable fluctuations in population of birds in all four sites of the study area. Dasve and Warasgaon reservoirs make this area a good habitat for attracting birds in winter and summer seasons. The abundance in bird population during summer may be attributed to its hilly region as human migration is common providing better food availability as compared with winter season. The survey of study area shows high avifaunal diversity and the majority of birds were insectivores, frugivores and piscivores.

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