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RESEARCH ARTICLE

# VERTEBRATE COMMUNITY RESPONSES TO THE CHANGING LANDSCAPE IN SAURASHTRA UNIVERSITY CAMPUS-RAJKOT

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**ABSTRACT**

Vertebrate faunal species preferred different landscape depending to their feeding and shelter. Species show many kinds of responses to habitat fragmentation: Some are advantaged and increase in abundance while other decline and become locally extinct. Understanding of these diverse patterns, and the processes underlying them, is an essential foundation for conservation. By using the line transect method the assessment of presence or absence of vertebrate faunal diversity was carried out and with random quadrate sampling method, the tree density and vegetation assessment in Saurashtra University campus has been done. The data has been collected from July-2013 to December-2013. The vertebrate biodiversity according to preferable habitat or landscape has been observed. More vertebrate species diversity found in forest habitat, while scatter distribution was found on open ground. Habitat and bird community indices were strongly correlated in an independent validation datasheet, suggesting that the habitat index can provide a reliable predictor of bird community status (Simpson and Shannon) according to seasonal changes in vegetation cover. The human interference was also measured as an effective factor for avian habitat and behavior (Unpaired t- test). These study also focus on an environmental spectral for monitoring local forest birds and migratory birds populations with associated habitat found on Saurashtra University campus.



## INTRODUCTION

Land-use practices act as a major factor of the decline in biodiversity in recent decades (Soule 1991). Landscape comprises the visible features of an area of land, including the physical elements of landforms such as mountains, hills, water bodies such as rivers, lakes, ponds and the sea, living elements of land cover including indigenous vegetation, human elements occupying different forms of land use, buildings and structures, and transitory elements such as lighting and weather conditions. The activity that modifies the visible features of an area of land is termed Landscaping. The 'habitat heterogeneity hypothesis' is the key corner-stones of ecology (Simpson, 1949; MacArthur and Wilson, 1967; Lack, 1969). The structurally complex habitats may provide more niches and diverse ways of exploiting the environmental resources and thus support more species diversity (Bazzaz, 1975). In most habitats, plant communities determine the physical structure of the environment, and which have a considerable influence on the distributions and interactions of animal species (reviews in Lawton, 1983; McCoy and Bell, 1991). Determination of the extent to which ecological systems are experiencing anthropogenic disturbance and change in structure and function is important for the long-term conservation of biotic diversity in the face of changing landscapes and land use. The ability to asses status and trends in the condition of ecological systems over broad geographic regions can allow identification of existing or developing problems prior to a crisis. Different species have different ecological attributes, according to their scale of movement, life history stages, longevity, and what constitutes habitat. This each attributes influenced on how a species "perceives" a landscape, as well as its ability to survive in a modified landscape. Consequently, the same landscape may be perceived by different taxa as having a different structure and different suitability, and quite differently from the way that humans describe the landscape. A "species-centered" view of a landscape can be obtained by mapping contours of habitat suitability for any species (Fischer *et al.*, 2004).

### Study Area

Saurashtra University campus, Rajkot (Latitude 22°17'23"N, Longitude 70°44'40"E) is located at the centre of peninsular Saurashta region in Gujarat State. Total area of University campus is spread across approximately 500 acres (2.0 km²) of lush green land with almost all Departments connected by network. The study was carried out from 05/07/2013 till 29/12/2013 except November month. According to different landmarks or vegetation features study area is mainly divided into five habitats namely- (1) Forest Habitat (2) Wetland Habitat (3) Plantations near buildings (4) Human Habitat (5) Grassland Habitat.

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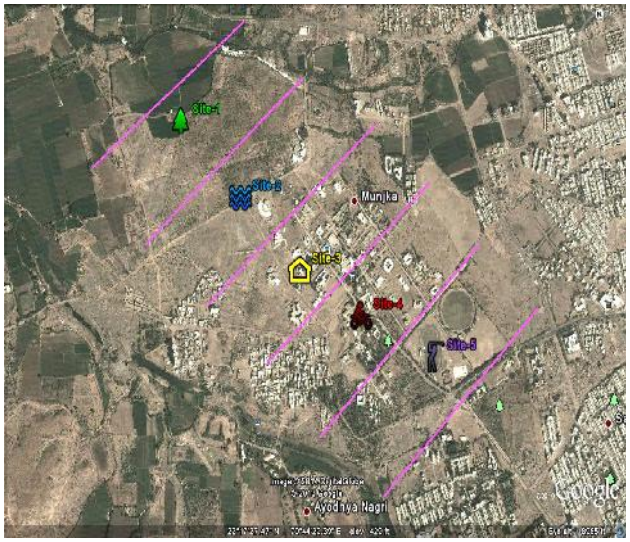


**Fig A**. Satellite map showing five different habitats of Saurashtra University Campus.

## MATERIALS AND METHODS

The study was carried out from 5 July- 2013 to 29 December-2013 for five months. We were visited twice in a month during which observation was carried out in early morning (7 to 10 AM) because the birds were observed most active at that time. The Line transect method was used with an attempt to cover all the vertebrates in the study area through presence or absence. The aquatic birds has not been enlisted in transect.

Amphibian and reptiles were studied by direct sighting in transect (Goldin quadros, 2009). Total 50 transects were laid with a variable length and fixed width about 30 m at the study area. The vegetation studies were carried out using quadrate method within terrestrial vegetation covered region. The quadrate plots were laid randomly at each fragment. Identified plant species and calculated their density along 70 quadrates of 20 x 20 $m^2$. The aquatic floral species has not been enlisted. The photographs were taken wherever necessary to identify the birds with the help of digital camera.

The identification of bird species was done visually and by recording of their call. The birds were identified on the basis of standard field guide, (Grimmett, R., C. Inskipp & T. Inskipp, 1998). Quadrates were taken with the help of rope. Location of each fragment was taken by GPS (Global Positioning System).

## RESULT AND DISCUSSION

***Total Vertebrate fauna recorded in Saurashtra University Campus-Rajkot.***

**Table 1** Residential status of vertebrate fauna.

| No. | Class | Order | Family | Species | Residential Status |
|---|---|---|---|---|---|
| 1 | Amphibian | 1 | 1 | 1 | R |
| 2 | Reptilians | 1 | 6 | 10 | R |
| 3 | Aves | 17 | 41 | 86 | R(58),M(16),RM(10),V(2) |
| 4 | Mammals | 6 | 9 | 10 | R |

**(R= Residential, M= Migratory, RM= Regional Migratory, V= Vagrants)**

**Diversity indices for different habitats**

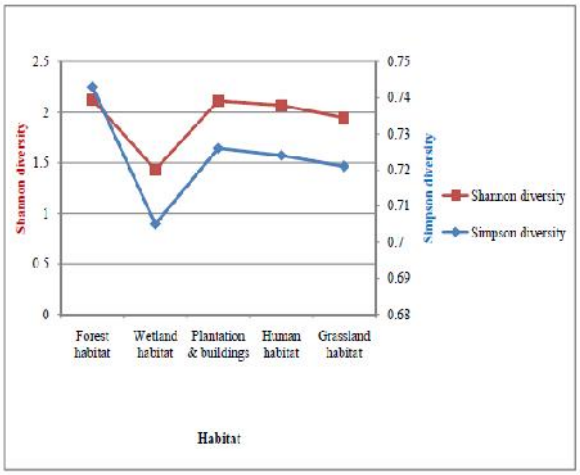


**Fig.1** Simpson/Shannon diversity in different habitats.

Vertebrate diversity indices for different habitat highest Simpson/Shannon in forest habitat (0.743/2.126) due to preference of special habitat features and less human disturbances while moderate in plantation and buildings (0.726/2.112) due to anthropogenic activity in that habitats, followed by human habitat (0.724/2.069) and grassland habitat (0.721/1.946) and lowest in wetland habitat (0.705/1.432) due to seasonal migration of avifauna species. The Simpson indices show the abundance as well as species richness in any particular habitat. The maximum Abundance and species richness found in forest habitat which reflects the preference of vertebrate community towards less human interference as well as the heterogeneity of land and vegetation features. The Shannon indices reflects habitat evenness in the three areas of study site -Plantation and buildings, Human habitat and grassland habitat because of vegetation patches and less seasonal changes in that habitat. While in forest habitat the vertebrate species distributed unevenly due to seasonal changes of vegetation cover, availability of food and other mining activity at rocky area of the forest which disturbed the vertebrate fauna. In wetland also the uneven distribution shows the migratory patterns of avifaunal species and other vertebrate's movement due to change in water body.

**Vertebrate species richness according to class**

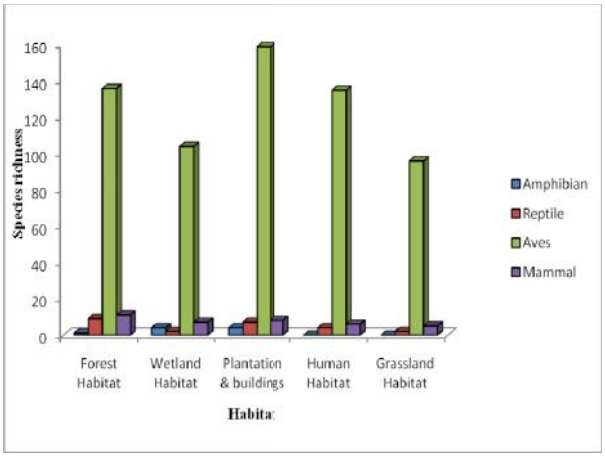


**Fig.2** Habitat wise species richness of vertebrate fauna.

The vertebrate community especially the reptiles and mammals preferred the forest habitat as it provided feeding, breeding and hiding ground. Wheras the avifauna prefers the semi urban type habitat so found more in plantation and building area. Here, the distribution preferances of different vertebrate community are found variable. So forest can support most of forest bird communities, reptile and mammal species. The amphibians found more in wetland habitat due to adaptable climate.

***Distribution of vertebrate faunal species according to vegetation cover***

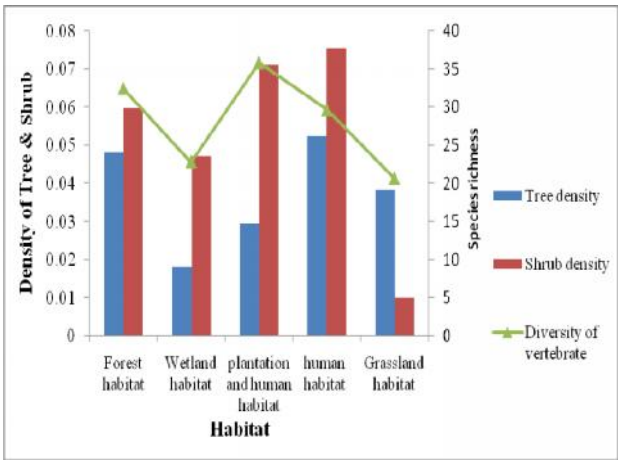


**Fig.4** Comparison between vertebrate diversity and density of flora

Species richness and species diversity were the highest in plantation and human habitat and lowest in grassland habitat due to urbanization. Birds, or any other highly mobile organisms, may fail to be reliable indicators of the local resource conditions being monitored because populations could be affected by habitat conditions on other parts of the year-round range of migratory species (Temple and Wiens 1989). The more number of different vertebrate species found in plantation and human habitat while lower in grassland habitat due to anthropogenic pressure and homogenizing of habitat with grasses cover.

So, the grassland vertebrate communities especially the avifauna of grassland found to prefer only the grassland habitat in which shrub density is very less. Most of vertebrate community found to prefer the plantation and human habitat due to heteroginity of landscape features and higher shrub density.

***T -Test performed between biodiversity and traffic for working as well as***

**Non-working days**

By performing t-test for unequal variance at 5% significance level in all different five habitat in Saurashtra University Campus the traffic not affected on vertebrate diversity . In nonworking days the traffic minimally affects to the vertebrate diversity in all five different habitats in Saurashtra University Campus-Rajkot.

By performing the t-test for unequal variance at 5% significance level in all five habitats in Saurashtra University Campus it was found that in wetland habitat and plantation and human habitat traffic adversely affects on vertebrate diversity.

During working days traffic as well as mining activity of rocky area negatively affects the vertebrate diversity in forest habitat. While in Wetland habitat and Plantation and near buildings traffic not much affects to the vertebrate diversity. In Human habitat traffic as well as urbanization adversely impacts on vertebrate diversity. In grassland habitat the traffic and human interferences affects negatively on vertebrate fauna distribution.

**Table2** Two tailed t-test performed between biodiversity and traffic in nonworking days.

| Name of habitat | Calculated t value | Tabulated (critical) t value | Comparison of Tc & Tt | Null Hypothesis | Significance level |
|---|---|---|---|---|---|
| Forest habitat | 0.0002 | 2.14 | Tc < Tt | Accepted | Non significant |
| Wetland habitat | 0.07 | 2.78 | Tc < Tt | Accepted | Non significant |
| Plantation and buildings | 0.003 | 2.26 | Tc < Tt | Accepted | Non significant |
| Human habitat | 0.092 | 2.26 | Tc < Tt | Accepted | Non significant |
| Grassland habitat | 1.37 | 2.26 | Tc < Tt | Accepted | Non significant |

**Table 3** Two tailed t-test performed between biodiversity and traffic in working days.

| Name of habitat | Calculated t value | Tabulated (critical) t value | Comparison of Tc & Tt | Null Hypothesis | Significance level |
|---|---|---|---|---|---|
| Forest habitat | 2.33 | 2.14 | Tc > Tt | Rejected | Significant |
| Wetland habitat | 0.17 | 2.78 | Tc < Tt | Accepted | Non significant |
| Plantation and building | 0.008 | 2.31 | Tc < Tt | Accepted | Non significant |
| Human habitat | 4.18 | 2.26 | Tc > Tt | Rejected | Significant |
| Grassland habitat | 6.02 | 2.26 | Tc > Tt | Rejected | Significant |

## CONCLUSION

The forest habitat with diverse features of land as well as vegetation supports forest bird communities and maximum number of mammal species. Whereas the mixed type of habitat (plantation and buildings) supports maximum species richness of diverse vertebrate communities. The seasonal wetlands provide reliable place for migratory avifauna during their migration period only.

The less vertebrate diversity observed in human habitat due to human interferences While more number of individuals of few bird communities found due to their human tolerance adaptation. Whereas the mammal species are case sensitive towards human presence so, they preferred forest habitat with minimum human interference. In other hand due to mining

activity in rocky area of forest some Passeriformes communities are forced to settle in other area.

The traffic also negatively affects on the diverse vertebrate communities. So, due to these anthropogenic activities of human some vertebrate community either adapted towards human tolerance or shifted to other area if not they are become extinct from that particular area in future. The polycuture practices of vegetation support more vertebrate community compare to monoculture land or habitat. So, it is concluded that different types of vegetation affect variously to different vertebrate communities.

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