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STUDY OF SEASONAL VARIATION OF BIRD DIVERSITY INDICES IN FOREST COMMUNITY IN JASHPUR DISTRICT (C.G.)

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ABSTRACT :- Seasonal variation plays an important role in the survival of birds in an ecosystem which is less explored in India. The study was carried out in Forest Community in Jashpur District (C.G.) between January to December 2021 with the objectives to explore the bird diversity and seasonal variation along with the factors affecting bird diversity in the study area. Mackinnon's Listing Method and Point Count Method were used for bird survey during winter and summer seasons. In the present study, attempt has been made to collect the relevant information regarding the avian fauna of around the study site Jashpur (C.G.). The periodic survey of the study area, showed great deal of avian biodiversity. During the study period, a total of 102 bird species during the two year periods belonging to 15 orders and 39 families were reported were recorded. Shannon diversity index (H) is highest in the winter (During the year 2019-20& 2020-21 H= 3.661 & 3.569) followed by summer (During the year 2019-20& 2020-21 H= 3.521 & 3.501) and it is least in Monsoon (During the year 2019-20& 2020-21 H= 3.441 & 3.525). The Evenness index is highest in the summer (During the year 2019-20& 2020-21 E= 0.583 & 0.530), followed by winter (During the year 2019-20& 2020-21 E= 0.546 & 0.564) and least in the monsoon (During the year 2019-20& 2020-21 E= 0.533 & 0.516). Bird diversity was affected by habitat type, distance to nearest settlement, fodder collection, livestock and number of human trails as shown by Canonical Correspondence Analysis (CCA). Gaining knowledge on bird diversity in any specific habitat will further helps to understand the ecology of bird species.

KEYWORDS:- Community forest, Diversity Indices, Factors, Seasonal variation Birds.

INTRODUCTION:-

Ornithology is a science which deals with the study of birds along with their environment where they reside. Birds can be called as conquest of land. Because they have the wider distribution on the earth. Birds are one of the most extensively studied organisms on the planet and shows an important indicator group to know the effects of climate change, particularly it relates to the effects of climate change in all ecosystems. Birds are most fascinating and varied group of modern vertebrates. In last twenty years the new fossil discoveries and evolutionary analysis transfigured our understanding about how birds are evolved. The birds are evolved from tetrapod dinosaurs during Jurassic era. On the basis of various evidences of evolution it is believed that birds have evolved from the reptilian ancestors in bygone era.

Birds can live in different habitat conditions and these have been blessed with the plumage and flying capacity. The specific aerial adaptations made these birds as the most successful species of the earth. Perhaps, due this reason, the birds are comparatively less affected when compared to other species of wildlife even under the continuous habitat loss.

Seasonality plays a major role in determining the abundance and distribution of birds. It affects food and cover availability of bird population, which in turn affects breeding success and ultimately survival of the bird species. The distinct seasonality of rainfall and seasonal variation in the availability of food resources, presence of migratory species, reproductive activities, and seasonal changes in the composition and abundance of birds, who are dependent from particular seasonal resources, are the factors that cause seasonal differences in the bird assemblage.

Diversity mostly used as an indicator of stable and sustainable ecological system. Avian diversity plays an important role in the linking of food chain in ecological unit of nature. A Niche consists an organism's total role

and interaction with its ecosystem and environment. The abiotic physical environment we also part of niche. Birds may give clues about overall natural health of an ecosystem. The community of birds is affected by changes in vegetation type due to natural or human induced disturbances that impact ecological recovery of a system.

RATIONALE OF THE STUDY:-

There was no any systematic studies have been carried on avian diversity of Jashpur district, which is rich in flora and fauna. Jashpur was once very rich in the avian population several birds' species like pin tell, parrot woodpecker. Whose population was once in abundance are now a days declining. There might be several biotic and abiotic factors which are affecting severally the population of birds of this area. This study aims at identifying birds species, diversity and seasonal variation of avian population of Jashpur district of C.G., because Avian fauna is an important constituent as well as an important link in the food chain of any Ecosystem.

OBJECTIVES:-

1. Identification of Species
2. Description of Niche
3. Seasonal variation of avian diversity

STUDY SITE-

The present investigations will be carried out in forest niche of Jashpur (C.G.). The district Jashpur lies North Eastern Part of C.G. and is rich with dense forest and Green Flora. Northern region of district hasa long series of hills and mountains. It has an average altitude from 2500 to 3500 meters above sea level, the district is geographically situated between 17^0 41 N to 24^0 5N latitude and 80^0 15 E to 84^0 26E longitude. The natural vegetation of this region in accordance with the climate of this area is of tropical deciduous forest type. The study in carried out in different forest area.

The bird's diversity will be investigated for two year regularly. This information will be collected from 3 sites in Jashpur.

Site A:-

Forest area near Sarudih tea garden area- It is an area with dense vegetation , where human interference is quite low. Various types of birds visit of this place.

Site B:-

This seated site is nearly village Gamharia – Which is moderate in habituated rural area, villagers regular visit the forest, because forest is very to the village.

Site C-:

The forest area selected is near Neemgoan dam – Where aquatic birds are abundantly present. The forest is even though not very dense.

MATERIALS AND METHODS:-

Surveys were carried out within the months of January, (winter) and August, (summer) to assess seasonal variation. Birds were observed through Mackinnon's Listing Method (Mackinnon et. al., 1993) and Point Count Method as described by (Sutherland W.J., 2006). Location of each point was determined using Garmin Etrex. Altogether, 13 points count stations was established within study site representing forest, shrub land and open habitat according to birding route, keeping each point at the difference of 200 meters. Different disturbance variables which include the distance to nearest settlement, number of trails, livestock and fodder collection were also measured at each station. Bird observation was done early in the morning from 07:00 hrs to 11:00 hrs. With the help of binoculars for about 20 minutes at each point (Olympus 8X40). Ten days was spent in the field during each season. A bird was recorded by direct observation and calls aided by photographs (Canon 800 D, 75 mm-300 mm telelens) and Field guidebook "Birds of India". However, study of flying raptors and nocturnal birds was not done in the current research.

Data Analysis

After the collection of data, the avian diversity of each habitat was analyzed using Shannon-Wiener Diversity Index (H) (Shannon C.E., 1949) which was calculated from the software PAST version 3.25 (Hammer et.al., 2001). Paired T-test was performed to compare bird diversity in different habitats and seasons.

RESULTS:-

In the present study, attempt has been made to collect the relevant information regarding the avian fauna of

around the study site Jashpur (C.G.). The periodic survey of the study area, showed great deal of avian biodiversity. During the study period, a total of 102 bird species during the two year periods belonging to 15 orders and 39 families were reported.

Comparative mean seasonal variation of avifaunal species during the study period (2019-20 & 2020-21)

Seasonal variations of avifaunal species during different seasons have been given in table 1 comparative seasonal occurrence of reported avifaunal species has been shown in Graph 1 respectively. Maximum avian species were observed during the summer season (72 species during 2019-2020 and 94 species during 2020-2021) followed by winter season (51 species during 2019-2020 and 72 species during 2020-2021) and minimum avian species were observed monsoon season (41 species during the year 2019-20 and 56 species during the year 2020-21) in both years.

DIVERSITY INDEX:-

A diversity index is a quantitative measurement which determines number of species in a community and also considers how evenly individual species are distributed. While studying diversity indices for ecology, our interest mainly in species composition but diversity indices includes genera, families, functional diversity.

Comparison of Avian Diversity Index in different seasons:-

Among the season, winter had maximum richness of species, this may be due to the addition of the winter migratory species. The incidence of the migratory waterfowls is also highest in the winter season. Therefore the total abundance of birds is also highest in winter. Shannon diversity index (H) is highest in the winter (During the year 2019-20& 2020-21 H= 3.661 & 3.569) followed by summer (During the year 2019-20& 2020-21 H= 3.521 & 3.501) and it is least in Monsoon ((During the year 2019-20& 2020-21 H= 3.441 & 3.525)). The Evenness index is highest in the summer (During the year 2019-20& 2020-21 E= 0.583 & 0.530), followed by winter (During the year 2019-20& 2020-21 E= 0.546 & 0.564) and least in the monsoon (During the year 2019-20& 2020-21 E= 0.533 & 0.516) (Table & Graph 2).

Abundance Status

On the basis of the frequency of sighting, various bird species was categorized as Abundant (A), Common (C), Uncommon (UC) and Rare (RA). Analysis of data showed that out of total, 33 species (42.3%) were Abundant, 28 species (35.89%) were Common, 17 (21.79%) species were Uncommon (Graph 3 & 4).

Residential Status

In order to assess the residential status of avian fauna, the recorded bird species were categorized as Resident (R), Migratory (M) and Resident Migratory (RM). Analysis of data revealed that of the total 102 avian species encountered, 80 species were residential, 15 species were migratory and 6 species were resident migratory (Graph. 5).

Factors affecting the avian fauna at the study sites

Degradation and destruction of habitats due to anthropogenic actions are major causes of global biodiversity declines. During the periodic survey of the study sites, a number of factors observed which might have affected the prevalence of avian fauna in the study area. These stress factors were (i) infestation of the lake with Water Hyacinth, *Eichhornia crassipes* and blue green algae, indicating the enriched nutrient loading in the lake. (ii) encroachment of livestock due to lack of fencing (iii) noise generated by plying vehicles on the roads at the periphery of the study sites (iv) dumping of domestic garbage in and around the wetland area (v) complete dryness of lake during summer season (vi) deforestation around the forest area (vii) washing of cloths at the bank of the near Neemgoan dam Jashpur (C.G.).

Table No. 1.
Comparative mean seasonal variation of avifaunal species during the study period (2019-20 & 2020-21)

Sr. No.	Season	Year	No. of Avian Species	%
1	Summer	2019-20	51	63.75
		2020-21	72	70.58
2	Winter	2019-20	72	90.00
		2020-21	94	92.15
3	Rainy	2019-20	41	51.25
		2020-21	56	54.90

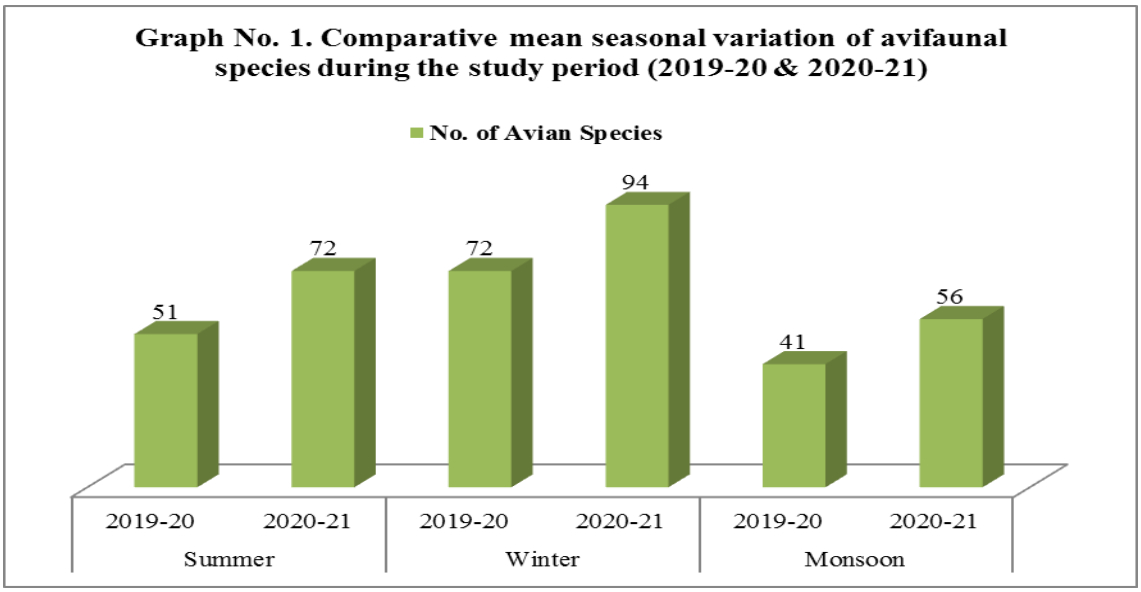
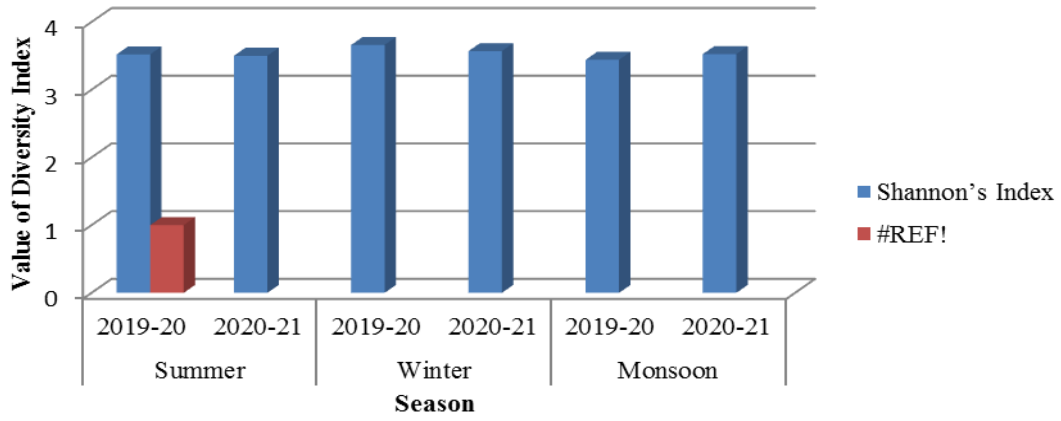


Table 2-

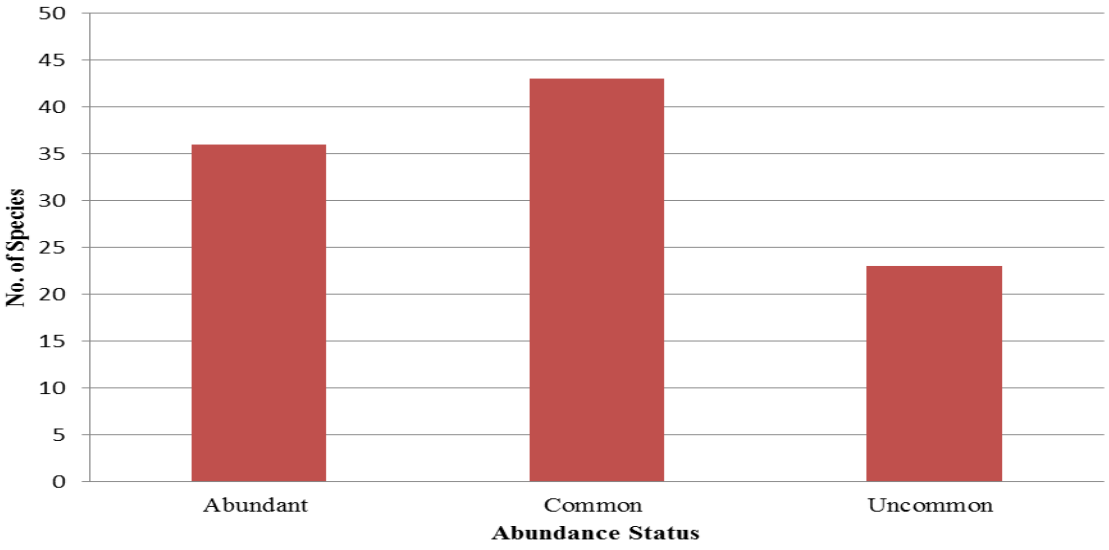
Comparative Mean Seasonal variation in diversity indices of avian diversity at Jashpur (C.G.) During the Year 2019-20 & 2020-21.

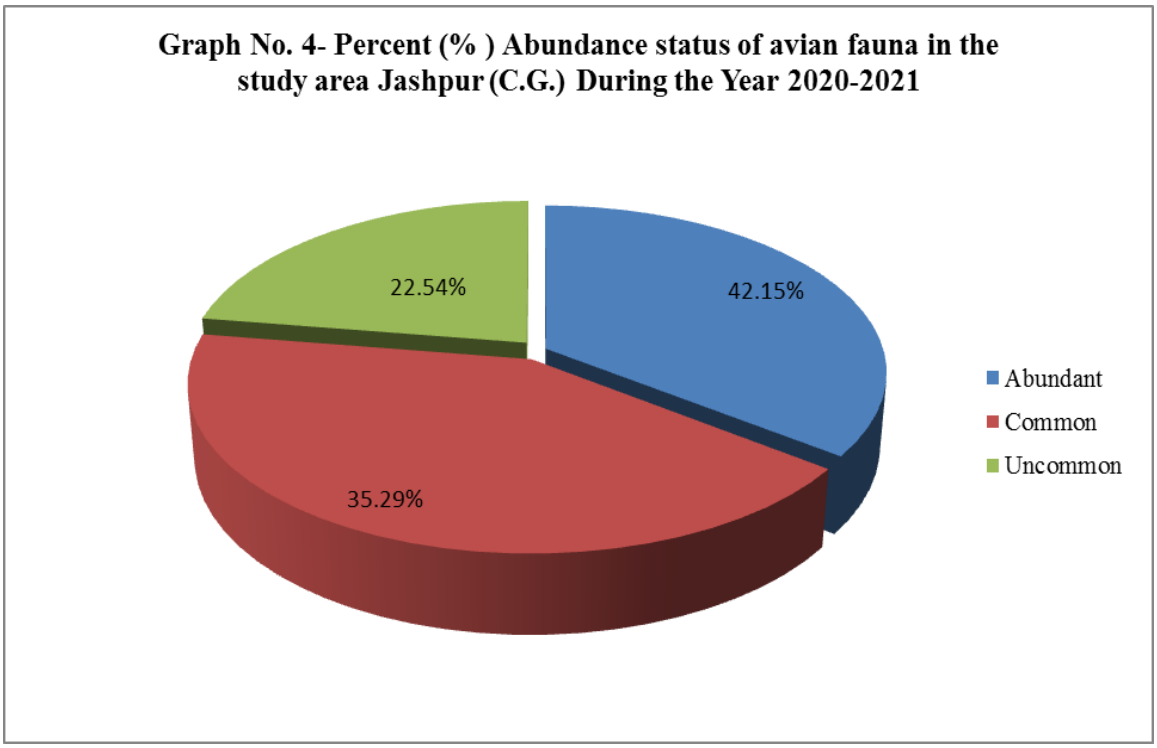
Season	Year	Shannon's Index	Evenness
Summer	2019-20	3.521	0.583
	2020-21	3.501	0.53
Winter	2019-20	3.661	0.546
	2020-21	3.569	0.564
Monsoon	2019-20	3.441	0.533
	2020-21	3.525	0.516

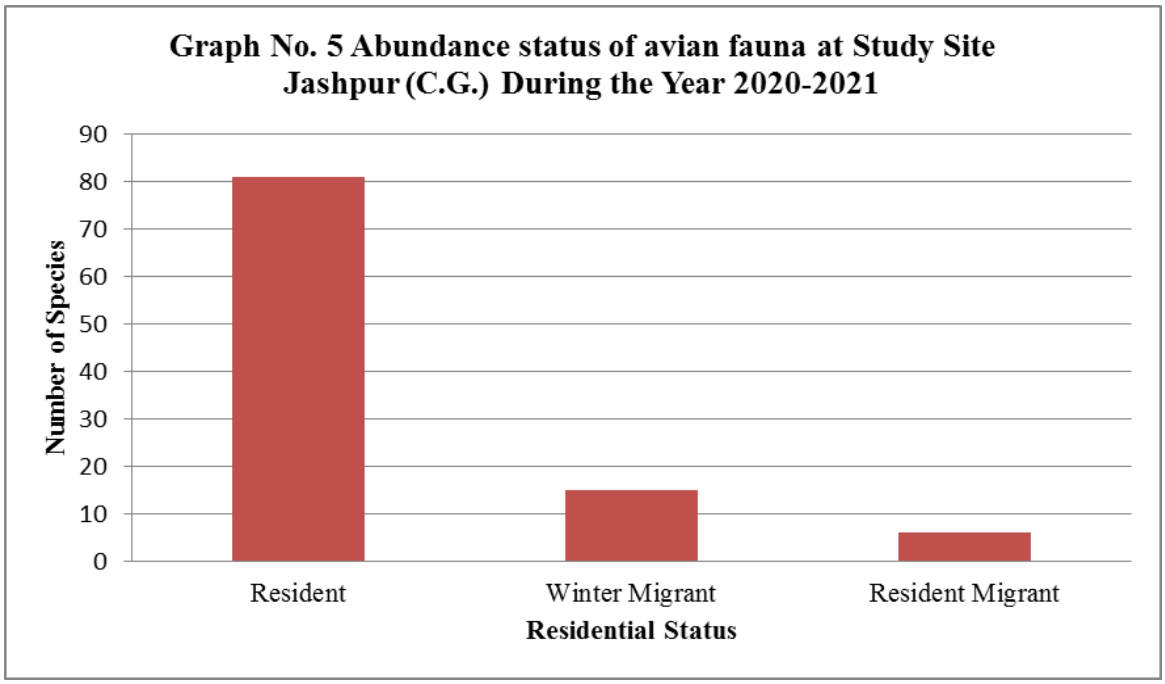
Graph No. 2 Comparative mean seasonal variation of Diversity Index avian faunal species during the study period (2019-20 and 2020-21)



Graph No. 3 Abundance status of reported avian fauna in the study area Jashpur (C.G.)







DISCUSSION:-

The fundamental problems of bird life and functioning of ecosystem resolve themselves, upon analysis, into simple questions of avian diversity, richness and evenness. The proportions of birds of any species to its competitors, and of the population as a whole to the food resources at its disposal, have a vital bearing on the economy and social organization prevailing over a given area.

The study conducted for the first time in the study area revealed that bird diversity and evenness was higher during winter season than summer season. Our study revealed that the high species of avian fauna in the study area attributed to different habitat types which provided different array of foraging opportunities and nesting sites (Girma Z et. al; 2016). Order Passeriformes was the dominant order (Chaudhari U.K. et.al.; 2009) which is similar with our study. Similarly, the present study found that the highest number of species was from Muscicapidae family followed by Corvidae and Cuculidae (Chaudhari UK et. al, 2009 & Thakuri J.J. et. al, 2018). The present study showed that the higher bird diversity was seen in winter season than in summer season. This might be due to increment in local movement of birds for searching food resources and defoliation of plants that helps them for easy detection of birds (Tirkey et al. 2022) . Our research agreed with the study conducted by (Katuwal et . al., 2018 & Tzortzakaki et. al., 2018). Where the higher number of species was recorded in winter season than in summer season where there is defoliation of plants, some raptors and other species moved spatially to optimize their resources (Almazan et. al., 2015). Open habitats were favorable for foraging activity (Otieno NE et. al., 2011). Hailu stated that open areas were favorable for avian fauna to sight easily for identifying and classifying as well as counting (Hailu S.,2008). Birds were unable to tolerate the high temperature in summer season which might lead to recording low species in summer (Pokherel U., 2015) which is similar with our study.

Local occurrence, migratory and threatened status-

Although the diversity of bird was higher in winter season, the higher abundance of the birds in summer season than winter season which might be due to the availability of enough food resources and breeding behavior of birds. Breeding activities lead to the increase in the number of the species which is similar with the finding of (Abie K, et.al., 2019). The reason behind this was the higher species abundance in summer season as wet season which created favorable environmental condition for food, cover, and another habitat requirement.

Factors affecting bird diversity-

The maximum abundance of species was associated with shrub land followed by forest and open habitat. Similar pattern was observed by (Kiros S, et.al. 2018) which might be due to the vegetation composition. It created variations in food sources, nesting and protection opportunities based up on the bird's habitat preference and feeding habits. Likewise, the variation in species dominance among different habitats were attributed by the presence food availability, suitable cover and nesting sites, adaptation or tolerance level and the degree of the threats Girma et. al.; 2017). There is variation in tolerance of bird to different disturbance variables resulting in different bird assemblage as depicted in the current study (Nsor. et. al., 2014).

Human settlement was another factor that limited avian productivity by decreasing resources, increasing nest predation, competition for resources, and brood parasitism (Marzluff J.M. et.al. 2001). However, informal settlements that are surrounded by a mosaic of vegetation types offer many opportunities for bird foraging and nesting (Jokimaki J, et. al., 2012). The study conducted by Gillespie et al. in Central America asserted that cattle reduced the capacity of seeds to germinate and intensive grazing could generate spiny and unpalatable forests (Gillespie TW et. al. 2000). Stern et al. (2000) found that the diversity and structure of the forests have been significantly influenced by cattle grazing in two protected areas in Costa Rica. Allowing large and repetitive livestock population in to unprotected area will also lead to loss of grassland specialist bird species (Asefa A, et.al 2015).

CONCLUSION:-

The first study in Jashpur Community forest, despite its small size, observed high bird diversity. Bird diversity and evenness was higher during winter season than during summer season suggesting that the area is preferred by winter migrants for their breeding grounds. We conclude that the bird assemblage with seasonality is determined by the strong influence of habitat type and disturbance variables including distance to nearest settlements, livestock, fodder collection and number of human trails. The presence of globally vulnerable species revealed the importance of the area to conserve these species. Further research on their habitat utilization

and their ecology will be crucial in the conservation of globally threatened species. Minimizing the disturbance in the community forest can enhance the habitat qualities which will ultimately supports diversity of avian fauna.

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