



RESEARCH ARTICLE

DISTRIBUTION OF AVIFAUNA IN YUSMARG FOREST – JAMMU AND KASHMIR, INDIA

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ARTICLE INFO

Article History:

Received 25th February, 2012
Received in revised form
24th March, 2012
Accepted 26th April, 2012
Published online 30th May, 2012

Key words:

Distribution,
Avifauna,
Yusmarg forest.

ABSTRACT

Survey of avifauna of Yusmarg forest in Budgam (J&K), India was conducted using Line transect method from May 2010 to May 2011. A total of 43 species belonging to 6 orders, 18 families and 31 genera were recorded. The spatial distribution, diversity, and abundance of birds were worked out. The diversity varied with season and maximum number of species were found during summer season when most of the birds migrated for breeding. Among bird species, adopted to diverse habitats in the forest were *Corves macrorhynchos*, *Aridothres tristis tristis* and *Columba livia*. Human related impacts such as grazing by livestock, clearing of bushes for fuel purposes and rampant deforestation of the Yusmarg forest were also studied.

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INTRODUCTION

Aves are considered masters of air and are viewed as indicators of the quality of the environment, because the health of bird populations mirrors the health of the environment. The rapid decline in bird populations and the accelerating extinction rates of birds in the world forests, grasslands, wetlands, and islands are therefore reasons for great concern. Now-a-days, avifaunal diversity has been decreasing due to the destruction of natural habitats and human disturbances. Random destruction of natural habitats by cutting nesting trees and foraging plants for commercial use of woods and lands are the main factor responsible for narrowing down in avian foraging habitats and their nesting sites. Thus, many species of birds may be forced to inhabit the urban areas and constrain them to breed there. Birds are essential animal group of an ecosystem and maintain a trophic level. The Indian sub continent a part of the vast oriental biogeographic region is very rich in biodiversity. The Indian region harbors an incredibly rich avifauna. Over 1200 of the worlds 8,650 species of birds are found in this region (Grewal, 1995) Out of the more than 9000 birds of the world the Indian Sub Continent contains about 1300 species or over 13% of the world's birds (Grimmett *et al.*, 1998). According to Agarwal (2000), there are about 1228 species of birds in India. Zoo-geographically, the location of Jammu and Kashmir is of paramount importance because of central position in Asia and also a door way in between palearctic and oriental region in the northern India. The palearctic elements in the fauna of Kashmir mainly pertain to Manchurian region. Jammu and Kashmir lies in the Western Himalayas Endemic Bird Area (EBA 128) where 11 Restricted Range species have been listed by Stattersfield *et al.* (1998).

Avifauna of Jammu and Kashmir is rich in species diversity and unique in number of ways. The earliest studies on the birds of Kashmir were made by Theobald (1854). Brooks (1871 and 1872) was a pioneer in conducting detailed investigations on the birds of Kashmir. Earliest checklists of the bird species of Jammu and Kashmir with ecological notes, incorporating bird species were given by Ward (1906a, b and 1907a, b) later, Magrath (1912, 1921) added some more recorded bird species to the known avifauna of this region. The exhaustive and invaluable photography of birds and bird watching of this region during earlier years was successfully accomplished by Loke (1946, 1952). The first outstanding monograph on 167 species of breeding birds of Kashmir was presented by Bates and Lowther (1952).

Mountainous areas around the world and especially in Kashmir are one of the relatively less explored regions for their biodiversity and conservation wealth. The present study was conducted in the Yusmarg area of district Budgam of Kashmir valley, which stands within Pir-Panjal range. This and the surrounding mountain area in this region have been on low investigation records in the past and relatively no data is available on the species ecology especially avian ecology and its environment. The aim of the present survey was to study the distribution and status of avifauna of Yusmarg Forest and to find out major threats to the Avian fauna of Yusmarg Forest, Kashmir.

STUDY AREA

Kashmir valley lies between 33° 20' and 34° 54' N latitudes and 73° 55' and 75° 35' E longitudes and covers an area of 15,948 km². Topographically, it is a deep elliptical bowl-shaped valley bounded by the lofty mountains of the Pir-Panjal

Range in the South and South-West and the Greater Himalayan Range in the North and East, with 64% of the total area being mountainous. The Yusmarg is located in the Budgam district, 47 Kilometers away from the capital city Srinagar. It has temperate climate and precipitation is normally in the form of mild snowfall during the winters. Summers are mild and winters are very cold. The maximum temperature ranges around thirty degrees (30°C) during summer while winter months experience a minimum temperature of around minus two degrees (-2°C).

Ornithological observations were carried out at three different sites selected on the bases of vegetation and habitat type of avifauna. These sites (Fig. 1) were located around the water reservoir of Yusmarg within range of about 2 kms. These three sites were surveyed during the field work and the description of the different sites is as under:

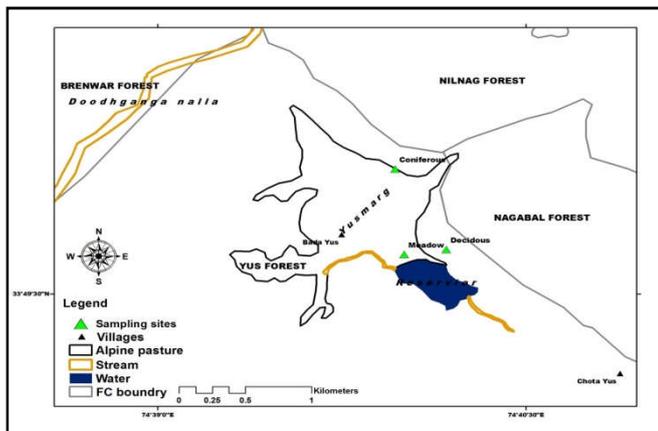


Fig. 1. Site map of study area

Site-1 Meadow Site

This site was located in front of Jammu and Kashmir Tourism Development Corporation restaurant round about 500 meters away from reservoir. It lies between the geographic coordinates of:

E 74° 39' 50.4" and
N 33° 49' 45.8"

Located at an elevation of 2336 meters above mean sea level.

Site-2 Deciduous forest site

This site was located behind the Yusmarg Market. This site has mixed type of vegetation mostly dominated by *populus* spp., *Rohinia psedacacia*, and dotted with *pinus* spp. trees also. It lies between the geographic coordinates of:

E 74° 40' 01.5" and
N 33° 49' 46.5"

Located at an elevation of 2417 meters above mean sea level.

Site-3 Coniferous forest site

This site was about one and half kilometer away from main Bus stand of Yusmarg dominated by coniferous vegetation. It lies between the geographic coordinates of:

E 74° 40' 01.5" and
N 33° 49' 46.5"

Located at an elevation of 2417 meters above mean sea level.

MATERIAL AND METHODS

The survey was conducted from May 2010 to May 2011. The data was collected by using direct as well as indirect methods in order to study the presence, population status, local threats, distribution and diversity of avian fauna. The study area was surveyed for recording avifauna by applying Line Transect method. Three transects were laid on each bird study day in three different sites. Each transect was walked slowly for one hour duration. In this method, a predetermined path (transect) was traversed at slow pace (0.2-0.5 Km/hr) and detections of birds were recorded along both sides of 30 m wide and 300 m long transect as silently as possible and identifying and recording the position of the all birds detected, by sight or sound, from both sides of the trail (Seber, 1973; Eberhardt, 1978; and Burnham *et al.*, 1980). The birds flying about 20-30 meter above from ground level were also recorded. A binocular [(12 x 50) Super Zenith field 5⁰] for visual detections and a 10 mega pixel Canon digital camera for photography were used. Audio/video clips were also taken for recording calls of unfamiliar voices.

Field identification of birds was carried out with the help of various field guides like Birds of Northern India by Grimmett *et al.*, Lowther and Bates (1952), Ali and Ripley (1987). A GPS receiver was used to record the coordinates of the study sites in the middle of transect. Specimens, like bird feathers, were also collected. This technique is widely used in faunal surveys. Transects were taken seasonally. These transects took from 3 to 4 hrs to complete in one bird watching day. The starting times of transects varied, but were interspersed among habitats, so that the results were not influenced by variation in starting time. The following information was collected for each bird encountered: Order, Family, species and Occurrence within the vertical strata of the forest. The data collected was analyzed by using the following

The Abundance Status of birds was assessed on an arbitrary frequency scale as follows:

Sighted greater than equal to 80%= Abundant
Sighted in the range of 50-79%= Common
Sighted in the range of 21-49%= Frequent
Sighted less than equal to 20%= Rare

Spatial occurrence

T = Top periphery of canopy
M= Sighted in middle canopy periphery
B = Sighted in bushes
G = Sighted on ground

Migratory status

Resident= Birds which were present in the area through out study period.
Migrant= Birds which were not present in the area through out study period.

- Species Richness Index (Gleason, 1922)

$$SRI = \frac{S - 1}{\ln N}$$

Where S is the number of species; and ln is the natural logarithm of the total number of birds.

- Shannon Wiener Index. (Mac Arthur, 1965)

$$H = -\sum \left(\frac{n_i}{N}\right) \times \ln \left(\frac{n_i}{N}\right)$$

Where n_i = number of individual bird species found at the site,

N= total number of all the species found at the site and

\ln = natural logarithm.

RESULTS AND DISCUSSION

Total of 43 species of birds were identified in fifteen Transects laid during various bird watching trips to Yusmarg from May 2010 to May 2011. These species belonged to 6 orders, 18 families 31 genera and exhibit a sort of vertical stratification (spatial distribution) in occurrence in Yusmarg area. The species richness index of Meadow site, Deciduous forest site and Coniferous forest site were highest 2.18, 4.26 and 5.53 on May 2010, June 2010, June 2010 and lowest 0.91, 1.53, 2.96 on December, 2010, December, 2010 and November 2010 respectively. The diversity index of meadow site (1.64), deciduous forest site (2.56) and coniferous forest site (3.13) was highest in May, 2010, June, 2010 and June, 2010 while as all the three sites had lowest (1.14), (1.69), (2.42) in December 2010 respectively. The diversity index of coniferous forest site was higher than other two sites. In the study area it was observed that bird species diversity is correlated with vegetation structure and plant species composition. Mac-Arthur and Mac-Arthur (1961) and Recher (1969) also discussed the factors that influence the vegetation diversity and assemblages of the birds. They also made the observation that bird species diversity is correlated with vegetation structure and plant species composition. Structural and floristic diversity tend to be positively associated with bird diversity during the non breeding season (Hobson and Bayne, 2000, Pagen *et al.*, 2000, Rodewald and Brittingham, 2002)

periphery of the canopy such as Citrine Wagtail (*Motacilla citreola*), White Wagtail (*Motacilla alba*). Jungle Crow (*Corvus macrorhynchos*), Russet Sparrow (*Passer rutilans*), European Hoopoe (*Upupa epops epops*) were sighted on ground. Long Tailed Minivet (*Percrocotus ethologus*), Eurasian Cuckoo (*Cuculus canorus*), Great tit (*Parus major*) were observed at the middle canopy periphery and Common starling (*Sturnus vulgaris*), Himalayan Rufous Turtle Dove (*Streptopelia orientalis*), Black Kite (*Milvus migrans*) were sighted at the tree tops. Wood peckers were mostly sighted in middle of the canopy. When the ranges of species overlap, those occupying the same fraction of a given resource dimension should differ along other dimensions due to either niche complementarity or resource partitioning (Schoener, 1974). In bird communities, this occurs through differences in feeding behavior (Cody, 1968), dietary specialization (Nudds and Bowlby, 1984) habitat use, and morphology (Miles and Ricklefs, 1984). Observations revealed that most of the migratory birds (summer migrants) arrived here during the second and third week of May. However, the arrival dates varied from year to year depending upon the weather and vegetation conditions. The birds were found throughout the study area. House Sparrow (*Passer domesticus*) Jungle Crows (*Corvus macrorhynchos*), Common Myna (*Acridotheres tristis tristis*) and bulbul were as residential and abundant as reported previously (Whistler, 1949).

The birds which were present in coniferous forests only are Woodpeckers, Spotted Nutcracker (*Nucifraga caryocatactes*), Black Bulbul (*Hypsipetus leucocephalus*) Common Starling (*Sturnus vulgaris*), and Yellow Billed Magpie (*Urocissa flavirostris*). Woodpeckers are adapted to forage on a variety of substrates and can access insect prey in the crevices of rough bark that are unavailable to other avian predators (Jackson, 1979a). All the trees of Coniferous forest site were with rough bark that may be the reason woodpeckers were sighted only on this site. In addition, because most woodpeckers are non-migratory, they are the primary avian insectivores during the winter months (Jackson, 1979b). During the whole study period one threatened species Kashmir Flycatcher *Ficedula subrubra* was also sighted in May 2010. Kashmir Flycatcher *Ficedula subrubra* which is one of the globally threatened

Table 1: Species Richness index of three different sites of Yusmarg forest

Season	Species Richness Index of Meadow site	Species Richness Index of Deciduous Forest site	Species Richness Index of Coniferous Forest Site
May 2010	2.1859	3.3064	3.6566
June 2010	1.6067	4.2654	5.5382
November 2010	1.1343	2.6727	2.9666
December 2010	0.9102	1.5346	3.2440
May 2011	1.3940	3.1623	4.0624

Table 2: Shannon Wiener Index

Season	Meadow site	Deciduous forest site	Coniferous forest site
May 2010	1.64	2.20	2.62
June 2010	1.53	2.56	3.13
November 2010	1.43	1.99	2.46
December 2010	1.14	1.69	2.42
May 2011	1.32	2.15	2.80

Different birds were found to occupy different niches. Out of 43 species 38.63% were sighted in middle of the tree canopy periphery, 34.09% were sighted on the ground, 13.63% were sighted in bushes and 11.36% were sighted on the top

species is found between an altitude of 1,800 m to 2,700 m in the Temperate Mixed Broadleaf Forest. (Stattersfield *et al.* 1998). Kingfishers were only observed in deciduous forest site as this site was close to the water reservoir and some feeding

Table 3: Spatial occurrence, Migratory and Abundance status of different bird species Sighted during various bird watching trips to Yusmarg, Kashmir

Common name	Scientific name	Order	Family	Spatial occurrence	Migratory status	Abundance Status
Common myna	<i>Acridotheres tristis tristis</i>	Passeriformes	Sturniidae	G	Resident	Abundant
Common kingfisher	<i>Alcedo atthis</i>	Coraciiformes	Alcedinidae	M	Resident	Rare
Grey sided bushwarbler	<i>Cettia brunnifrons</i>	Passeriformes	Muscicapidae	B	Migrant	Common
Brownish-flanked bush warbler	<i>Cettia fortipes</i>	Passeriformes	Muscicapidae	B	Resident	Frequent
White capped water redstart	<i>Chaimarrornis leucocephalus</i>	Passeriformes	Muscicapidae	G	Migrant	Rare
Rock pigeon	<i>Columba livia</i>	Columbiformes	Columbidae	G	Resident	Abundant
Jungle crow	<i>Corvus macrorhynchos</i>	Passeriformes	Corvidae	M	Resident	Abundant
Eurasian cuckoo	<i>Cuculus canorus</i>	Cuculiformes	Cuculidae	M	Migrant	Common
Brown fronted woodpecker	<i>Dendrocopos auriceps</i>	Piciformes	Picidae	M	Resident	Rare
Himalayan woodpecker	<i>Dendrocopos himalayensis</i>	Piciformes	Picidae	M	Resident	Frequent
Rufous-bellied woodpecker	<i>Dendrocopos huperythrus</i>	Piciformes	Picidae	M	Migrant	Common
Ashy Drongo	<i>Dicrurus longicaudatus</i>	Passeriformes	Dicruridae	M	Migrant	Rare
White capped bunting	<i>Emberiza stewarti</i>	Passeriformes	Emberizinae	G	Resident	Abundant
Asian koel	<i>Eudynamis scolopacea</i>	Cuculiformes	Cuculidae	B	Migrant	Frequent
Kashmir flycatcher*	<i>Ficedula subrubra</i>	Passeriformes	Muscicapidae	M	Migrant	Rare
Ultramarine flycatcher	<i>Ficedula superciliaris</i>	Passeriformes	Muscicapidae	B	Migrant	Frequent
White throated kingfisher	<i>Halcyon symrenensis</i>	Coraciiformes	Alcedinidae	M	Resident	Rare
Black bulbul	<i>Hypsipetes leucocephalus</i>	Passeriformes	Pycnonotidae	T	Migrant	Frequent
Black kite	<i>Milvus migrans</i>	Falconiformes	Accipitridae	T	Migrant	Rare
White wagtail	<i>Motacilla alba</i>	Passeriformes	Motacillidae	G	Migrant	Rare
Grey wagtail	<i>Motacilla cinerea</i>	Passeriformes	Motacillidae	G	Migrant	Rare
Citrine wagtail	<i>Motacilla citreola</i>	Passeriformes	Motacillidae	G	Migrant	Rare
Yellow wagtail	<i>Motacilla flava</i>	Passeriformes	Motacillidae	G	Migrant	Rare
Dark sided flycatcher	<i>Muciepa sibirica</i>	Passeriformes	Muscicapidae	B	Migrant	Common
Blue whistling thrush	<i>Myophonus caeruleus</i>	Passeriformes	Muscicapidae	G	Resident	Frequent
Spotted nutcracker	<i>Nucifraga caryocatactes</i>	Passeriformes	Corvidae corvidae	M	Resident	Frequent
Great tit	<i>Parus major</i>	Passeriformes	Paridae	M	Resident	Abundant
spot winged tit	<i>Parus melanolophus</i>	Passeriformes	Paridae	M	Resident	Abundant
Rofous naped tit	<i>Parus rufonuchalis</i>	Passeriformes	Paridae	M	Resident	Abundant
House sparrows	<i>Passer domesticus</i>	Passeriformes	Ploceidae	G	Resident	Abundant
Russet sparrow	<i>Passer rutilans</i>	Passeriformes	Ploceidae	G	Resident	Abundant
Long tailed minivet	<i>Perecrocotus ethologus</i>	Passeriformes	Pericrocotidae	M	Migrant	Common
Humes warbler	<i>Phylloscopus humei</i>	passeriformes	Muscicapidae	M	Migrant	Common
Mountain chif chaff	<i>Phylloscopus sindianus</i>	Passeriformes	Sylviidae	M	Migrant	Abundant
Scaly-bellied woodpecker	<i>Picus squamatus</i>	Piciformes	Picidae	M	Migrant	Common
Himalayan bulbul	<i>Pycnonotus leucogenys</i>	Passeriformes	Pycnonotidae	M	Resident	Abundant
Grey bushchat	<i>Saxicola ferrea</i>	Passeriformes	Muscicapidae	B	Migrant	Frequent
Himalayan rufous turtle dove	<i>Streptopelia orientalis</i>	Columbiformes	Columbidae	T	Migrant	Common
Common starling	<i>Sturnus vulgaris</i>	Passeriformes	Sturniidae	T	Migrant	Common
Winter wren	<i>Troglodytes troglodytes</i>	Passeriformes	Troglodytidae	G	Resident	Rare
Tickells thrush	<i>Turdus unicolor</i>	Passeriformes	Muscicapidae	M	Migrant	Common
European Hoopoe	<i>Upupa epops epops</i>	Coraciiformes	Upupidae	G	Migrant	Common
Yellow billed blue magpie	<i>Urocissa flavirostris</i>	Passeriformes	Corvidae	G	Resident	Rare

T = Top periphery of canopy; M= Sighted in middle canopy periphery; B = Sighted in bushes; G = Sighted on ground; * Threatened

channels of reservoir were passing through this site. The probable reason may be that feeding channels may have fishes or aquatic insects in it. Jungle Crows (*Corvus macrorhynchos*), Common Myna (*Acridotheres tristis tristis*), were mostly sighted in meadows feeding on the leftovers of tourists emptied in bins and worms, insects of the open meadows. Wagtails were sighted foraging specifically in small feeding channels passing via open meadows to the water reservoir of Yusmarg. Classification of observed species revealed, the dominant order was of Passeriformes followed by Piciformes, Coraciiformes, Columbiformes, Cuculiformes and then followed by Falconiformes. Out of the total 970 bird individuals sighted, 256 the most abundant were Jungle Crows (*Corvus macrorhynchos*) sighted during the whole period of study. The probable reason may be that they were feeding on the food leftovers emptied in bins by tourists in the meadows. Least sighted birds were Common Kingfisher, White Throated Kingfisher, White Wagtail and Winter Wrens. A number of studies have shown that food resources can be a limiting factor and that competition for food does occur and community patterns are affected. (Minot, 1981; Gant, 1986; Gustafson, 1987 and Martin, 1987).

Findings of the present study suggest that bird fauna of Yusmarg also exhibit variation in time and is a function of the food as reported by Sabo and Holmes, (1983); Mac Arthur, (1958); Holmes *et al*, (1986). During winter months low occurrence appeared due to shift of birds to low altitude. As the season changes, there is a change in both the quality and quantity of the food, thus fluctuation of these resources seem to influence the species composition and number of individual birds utilizing these sites and this results in seasonal migration of the birds. With the onset of spring and summer, growth of vegetation and insect population; many birds like Common Starling (*Sturnus vulgaris*), Grey Bushchat (*Saxicola ferrea*), Himalayan Rufous Turtle Dove (*Streptopelia orientalis*), Long Tailed Minivet (*Perecrocotus ethologus*), Eurasian Cuckoo (*Cuculus canorus*) and European Hoopoe (*Upupa epops epops*) visit the study area. Destruction of wildlife habitat by deforestation and bush clearing for fuel purposes by local people has threatened the habitat of warblers, bush chats and flycatchers. Pollution of water, air and noise due to military and traffic convoys are probably some other potential problems for birds in the future and their effect can be studied after few years. The rubbish and garbage heaps due to

booming tourism are such materials which have negative effect on human health as well as on the wildlife inhabiting that area. So, in addition to biological check, man itself is a major ecosystem destroyer.

ACKNOWLEDGEMENTS

We thank Department of Environmental Science, University of Kashmir J & K for providing various facilities to carry out study.

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