

# An exploratory study on the mixed-grouping behavior of Birds in Sikkim

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## ABSTRACT

Mixed species bird flocks are moving groups of individuals from at least two species searching for food together and have been reported from across the world. Hardly any studies are found to exist from India and which is a major gap in literature because with its exceptional avian biodiversity India is an exceptional nurturing ground to understand this phenomenon. Sikkim, as a constituent of eastern Himalayas, is one of the ten foremost biodiversity hotspots of the world and hence is important. The study is essentially an observation of the mixed grouping behavior of the birds – occurrence across seasons, habitats, altitudes, bird size, feeding inclination of mixed group birds, size of groups. Results show interesting variations on the selected variables and the statistical significance of which has been measured to test the corresponding hypotheses. Implications of the study are that this behavior is extremely important from a conservation perspective and also as an indicator of ecological imbalances, habitat alterations and climate change.

*Key words* : Mixed-grouping, Birds, Sikkim

## Introduction

It is generally believed that “birds of same feather flock together.” Mostly we find that either the birds are solitary or are found in groups which is entirely made up of same species of birds. But there are notable exceptions. Quite a few birds are found to move around in assemblage comprising of number of bird species.

Mixed species bird flocks are moving groups of individuals from at least two species searching for food together. These have been recorded over terrestrial habitats all over the world. Mixed-species foraging groups are frequently observed in birds, primates, reef-dwelling fish and a variety of other taxa (Morse, 1977). Mixed-species flock have been defined as a group of two or more species sharing space within 25 m of one another and traveling together. These

exclude chance aggregations of species and rather are foraging assemblages of individuals of varying species that sustain group structure for a considerable time and space (Hutto, 1987).

Mixed-species flocks of foraging birds have been documented from terrestrial habitats across the world. Though not infrequent in temperate regions during the non-breeding season (Morse 1977), they acquire their utmost sizes and species diversities in tropical regions. The driving force behind these inter-species groups is believed to be either improved feeding efficiency or better protection from predators.

In Sikkim, mixed groups comprising of chloropsis, white syes, sibilas and spider hunters; tree pies, blue magpie and jays; minlas, sivas leaf warblers and fly catcher too fly around.

## Literature Review

Mixed-species bird flocks (flocks hereafter), roving groups of individuals from at least two species searching for food together, are found in terrestrial habitats all over the world. These flocks show large variation in size, permanence and strengths of association (Moynihan, 1962; Terborgh, 1990; Greenberg, 2000) and include many different species in different parts of the world such as tits (Paridae), woodpeckers (Picidae) and nuthatches (Sittidae) in temperate areas; antwrens (Thamnophilidae), antshrikes (Thamnophilidae) and tanagers (Thraupidae) in the Neotropics and babblers (Timaliidae), drongos (Dicruridae) and minivets (Campephagidae) in the Palaeotropics. Two main hypotheses have been proposed to explain why birds participate in such flocks: (1) improved feeding efficiency; (2) reduced risk of predation (Morse, 1977). Improved feeding could occur through feeding on insects flushed by other birds (Winterbottom 1943), copying foraging locations (Krebs 1973; Waite and Grubb, 1988) and avoiding previously exploited areas (Cody, 1971; Beauchamp, 2005). Reduced predation risk can arise through the selfish-herd effect (reduced risk in relation to the position of other group members; Hamilton, 1971), the dilution effect (reduced probability of being singled out by a predator; Foster and Treherne, 1981), the encounter effect (reduced probability of being encountered by a predator; Inman and Krebs, 1987), the confusion effect (reduced ability of a predator to single out and attack individual prey; Neill and Cullen, 1974), the 'many-eyes' effect (increased probability of a predator being detected; and physical disturbance of predators by many birds (Charnov and Krebs, 1975). These two types of advantage need not be mutually exclusive; participation in flocks might allow birds to exploit the vigilance of other species, reduce their own time spent in vigilance and correspondingly increase foraging efficiency (Greenberg, 2000). At the same time, it is not necessary that all participants in flocks accrue benefits; certain species that are joined by other species might in fact suffer costs from being in flocks (Zamora *et al.*, 1992; Cimprich and Grubb, 1994; Pomara *et al.*, 2003). What is the impact of anthropogenic disturbances on mixed-species bird flocks? Zhou, *et al.* (2019) explored this aspect southwest China. They report that Mixed-grouping flocks occur at only one-third frequency in agricultural areas compared to the one in the forests and also differ

considerably in composition and leadership. Zou *et al.* (2018) have explored the conservation implications of mixed species terrestrial birds. Recently a study (Williams and Lindell, 2019) investigated the influence a single species exert on the space used by a mixed-flock. In this study undertaken at Peru the conclusion drawn is vegetation density of the Dusky-throated Antshrike was the only driver of space use patterns of flocks have proposed a framework for explaining the composition and organization of mixed groupings. Williams and Lindell (2018) studying mixed flocks in Amazonian forests of Peru found that species find Dusky-throated Antshrikes beneficial because of their reliable alarm calling, whereas species flock to antwrens because they serve as a flock indicator

From the literature review it appears that hardly any studies has been made in the realm of India, an exceptionally biodiverse country and which harbours two bio-diversity hot spots – Eastern Himalayas and Western Ghats. This study has been undertaken at Sikkim, part of a biodiversity hotspot, namely Eastern Himalayas. Is a preliminary study in a new geographic region not contemporary? Apparently not so as we keep on coming across geography-specific studies in this respect (Wilson and Wilson, 2018). Geography specific-studies are still important to fill the literature gap, but more importantly to develop insight into the locally occurring phenomenon. Hence the aim of this study is to make an exploratory study on mixed groups of bird species at Sikkim.

## Methodology

This study is essentially an observation of the mixed grouping behavior of the birds of Sikkim. Objectives of the study is to determine the extent of mixed behavior in Sikkim across season, Habitat-type, species-size, species food-habits, and species migratory status and across group-size. As corresponding hypotheses are mentioned with result and discussion, these are not mentioned here to avoid duplication. Sikkim, the **study area**, is the second smallest state of India and is wholly a mountainous region, located in biogeographic region that is a confluence of Indian, Malayan and Tibetan flora and fauna. Though occupying merely about 7096 square kilometers of area, it nevertheless is critical for conservation efforts. It is a convergence of varying microclimates, ranging from tropical to subtropical, temperate, subalpine and arctic type and which is an outcome of consid-

erable altitudinal changes ranging from 300 msl to approximately 8000 msl. Mount Kahngchendzonga, the third highest mountain peak in the world is located here. These climatic possibilities give rise to biodiversity of unimagined magnitude. Sikkim harbours over 500 avian species (Ali, 1998); 156 mammalian species (Avasthe and Jha, 1999); 78 Reptilian species (Jha and Thapa, 2003); over 700 butterflies (Haribal *et al.*, 1988). It is a region that falls at the confluence of two biogeographic realms – Palearctic and Oriental. Fauna, therefore, also is representative of these two realms. Study is based on surveys undertaken from 2015 to 2020.

Basic methods utilized for this study includes: Literature review and Personal observation. Primary data has been collected using observation method. Mixed group of birds were observed from a distance of 40-50 metre using a binocular. The bird species were identified and counted. When the group flew away the species left were discarded from the list. In all, we observed 93 groups in different parts of Sikkim Himalayas. The bird species were confirmed with the help from available literature and also by consulting ethno-ornithologist of the region.

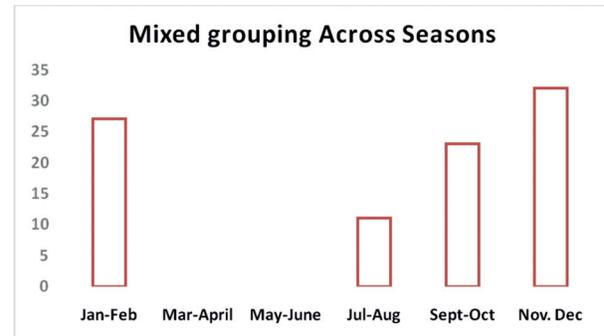
Once the bird species were identified, the relevant details such as size, altitude, residential/migratory, population were collected from a standard book of birds of Sikkim (Ali, 1998).

## Results and Discussion

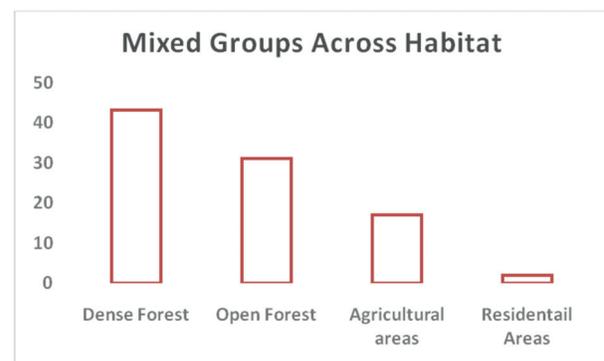
In all 93 mixed-groups have been studied for this work. Result and discussion has been discussed under following heading:

**a. Grouping behavior across seasons:** The details of 93 mixed groupings identified across seasons have been provided in Graph 1. From the graph it is evident that seasons play an important role in the mixed grouping behavior. Such grouping are common during winter and practically non-existent during spring and summer. Breeding season imply abundance of food and parental responsibility and which make long journeys for searching food, unessential and incompatible respectively. It is to be noted that during the last ten days of February, hardly any mixed grouping have been sighted. The same holds for the month of July. To test the hypothesis that *there is no variations in mixed grouping numbers across seasons*, a one sample chi square test was done on the data. As the p-value (0.016) obtained is below 0.05 the null hypothesis stands rejected and it

is concluded that there are strongly significant seasonal variations in mixed grouping numbers. Implications for conservationists is to support mixed grouping visits by conserving the sites of visitations.

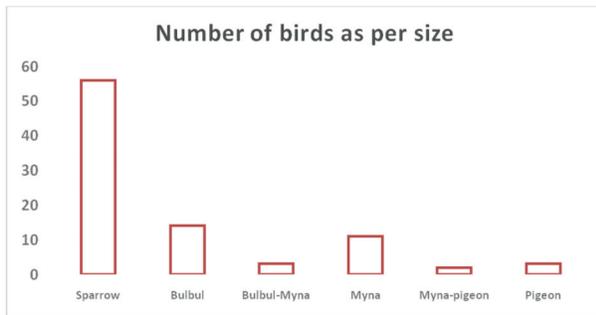


**b. Across Habitat :** Graph 2 provides the details of mixed groups across habitat. It may be observed from the graph that number of mixed groups vary across habitat. They occur heavily in dense forest and are practically nil in residential areas. This is understandable as most bird species indulging in mixed grouping behavior are wild birds and hence are sensitive to human presence. Alternately it may be said that food availability and safety is highest in forested areas and is less in agricultural areas and human habited regions. The null hypothesis in this respect is stated as *there is no significant variations in mixed group numbers across various habitats*. Again a one sample chi square was used to test this hypothesis and the resultant p-value is ( $<0.0010$ , implying that the null hypothesis is to be rejected and agree that there are substantially high variations in mixed grouping incidents across habitat type. The implications for the conservationists are that mixed group are sensitive to habitat destruction and habitat alterations. As the very survival of species is linked to mixed grouping behavior efforts must be taken to avoid habitat alterations.



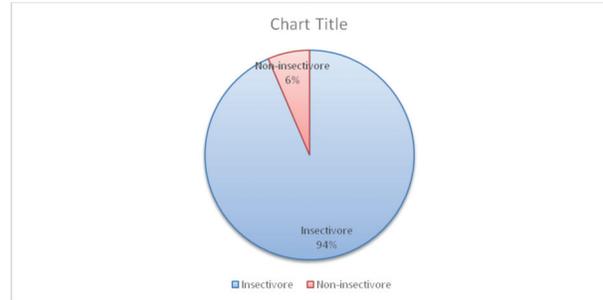
**c. Size of birds participating in mixed groups:**

From the Graph 3 we find, that sparrow sized birds have a greater inclination to be a part of mixed groupings. This is followed by Bulbul, Myna, Pigeon, Bulbul-Myna and Pigeon-Myna. It appears that size does influence the inclination for this behavior with the small sized birds being more inclined to have this behavioral trait. This may be an erroneous conclusion because most birds are small in size and therefore it is not surprising that they find, greater representation for this behavior also. Interesting point to be noted here is that none of the birds bigger than pigeon are found to be a part of mixed groups. Size, therefore does matter. This may be logical because, bigger birds require greater amount of food and hence, their catchment area is bigger and therefore they are more inclined to be territorial by nature, which means they will not tolerate other birds with the same food habits. Null hypothesis that there are no significant variations across size leads to a p-value ( $<0.0010$ ), confirming that strongly significant variations exist across size of mixed group species. Implications for the conservationists is to understand the pattern of assemblage that a certain bird species follow for an all-inclusive conservation strategies.



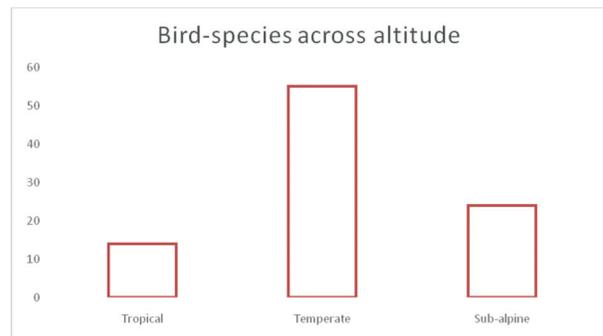
**d. Food Habits:** Figure 4 provides the details of mixed group avian species as per their preferred food. Hypothesis formulated in this respect has been that there is no significant variation in food habits of bird-species part of mixed groups. Birds mostly feeding on insects (94%) are found to be having an extremely high tendency to be part of mixed groups. A few birds (6%) are nectar or fruit eaters but are not averse to eating insects. One sample chi square test yields a p-value is ( $<0.0010$ ), suggesting that the null hypothesis is unsupported and conclude there are substantially high variations in mixed grouping incidents across food-type and therefore it may be concluded that food habits is the greatest driver of

this phenomenon. This could be an interesting field for future research. Implications for ecologists is to understand the food requirements that drive mixed groupings.

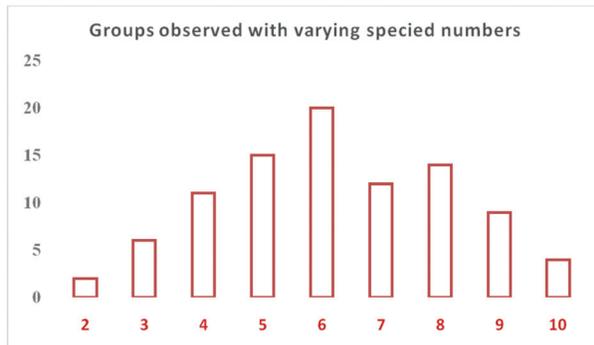


**e. Variations of bird-species across Altitude:** From the graph-5 we find, that most birds indulging in mixed grouping are found at temperate region. Once again this could be a misplaced logic because most birds in Sikkim perhaps reside in temperate region. Also, there is not much difference in the numbers of birds residing in tropical, temperate, and alpine regions and also displaying such a behavior. Before we started this study, our hypothesis was that more birds from tropical regions will display this behavior because birds generally are known to be more abundant in tropical regions. We cannot test this hypothesis with number alone. We need percentage of birds from respective region against total species number to make any conclusions. A p-value of 0.005 is obtained by conducting a non-parametric Chi square test for the null hypothesis that no significant variations exist in this respect. Null hypothesis is rejected and it is confirmed that variations across altitude, indeed are significant.

**f. Variations across group size:** The question, the answer of which is being provided here was that what is the number of bird-species forming mixed groups. We expect this to vary across groups. Graph-6 we find an interesting phenomenon. For



our study the number of species in a group ranged from 2 to 10. Groups having 6 species are most prevalent and being recorded with as many as 20 groups. This is followed by 5 numbers (15 instances) and 8 (14 instances) numbers respectively. The results indicate that this follows a normal distribution as frequency is high towards mean and lower towards the extremes. Hypothesis drawn for this part of the study is that there are no variation in number of bird species across groups. A P-value 0.001 obtained through one sample Chi-square test proposes that significant variations occur in mixed group species participants.



## Conclusion

We had undertaken this study to explore mixed grouping behavior of birds in Sikkim and our objective was to find if certain demographic factors such as size of the bird, its residential status, the altitude it is found in and their food habits have any bearing upon the mixed grouping behavior. From the result and discussion, we find that an approximate profile of birds having inclination for this behavior is that they are relatively small sized, are residential; even if they migrate locally, have relatively high population and are insectivores.

Altitude and habitat preferences do not appear to be important indicators. We also found that some birds have a greater tendency to be a part of one group.

These studies point out that mixed grouping behavior is ecologically significant. Implication for ecologists and conservationists are that such behavior should be explored in greater detail across different parts of the country. Forested habitats record more number of mixed group of birds compared to open forests, agricultural plots and urban dwellings. Implications are that forests are key to sustain mixed group species richness and this ought to be the fore-

most priority while making conservation decisions. Secondly habitat diversity in terms of floral species, tree-density and canopy characteristics such as richness and size need to be understood and conserved. Varying ecological behaviors of bird species must be explored to identify the vulnerable and marginalized ones. Some species, naturally will not survive even minor alterations. Lastly mixed-groups appear to be sensitive indicators of ecological imbalances, habitat alterations and climate change. They could also help to identify and restore the ecological integrity of habitats which have suffered ecological losses. The future researchers can focus on researching impact of degradation of a habitat on this behavior. Another area of study could be to identify reasons for some specific birds being more inclined to be together in mixed groups.

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