DST funded Research Project

Causes Of Avian Diversity Gradients Along The Himalayas

Final Project Report

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भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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Summary

Studies on bird species diversity across the Himalayan mountain range in India have shown that the southeast parts of the Himalaya has threefold more number of breeding bird species in comparable areas than northwest Himalaya (Price et al., 2011; White, 2016). To understand the causes of this diversity gradient along the Himalayas the present study was undertaken. For this study two phylogenetically coherent groups of flycatchers comprising 9 and 10 species respectively from the *Ficedula*/*Muscicapella* and *Niltava*/*Cyornis* genera were taken up. Phylogenetic coherence of the two groups was confirmed through a recent analysis of Himalayan passerines (Price *et al*, 2014). The flycatchers show a sharp decline in species number from southeast to northwest Himalaya as well as a similar mid-elevation peak corresponding to the pattern of all Himalayan passerines. The group also provides examples of species restricted to southeast (9 species), restricted to northwest (3 species) and widely distributed across Himalaya (7 species). Since resource distributions are critical to explain patterns of bird diversity, and because many bird species show strong habitat associations (Price 1991; Ghosh-Harihar and Price 2014), sampling for flycatcher distribution and abundance, vocalization, phylogenetic and habitat differences in associated vegetation from southeast to northwest Himalaya was carried out in this study. And, the fieldwork for this study was primarily conducted along two elevational gradients both in the southeast in parts of north Bengal and Sikkim, and for northwest Himalaya in parts of Jammu & Kashmir.

The elevational distribution of the flycatchers showed a mid-elevational peak both in eastern and western Himalaya. In particular, the number of flycatcher species peaks at about 2000 m in the east, and plateaus from about 2000-3000 m in the west, albeit at lower levels than in the east. Previous studies had found evidence that insect food was highest at mid-elevations in the east and from east to west (Ghosh-Harihar & Price, 2014, Price *et al*., 2014), supporting the hypothesis that more food leads to more individuals leading to more species. The largest flycatcher species *Niltava grandis* and the smallest species *Muscicapella hodgsoni* are both confined to the middle elevations, as well as sallying species in the genera *Muscicapa* and *Eumyias* also occupied the mid-elevations, supporting the idea that a larger resource base allows for a finer partitioning of those resources.

To understand whether the resources themselves are more diverse a comparison of foliage density with the flycatcher diversity along elevational gradients showed a correlation value of 0.65 for southeast and 0.33 for northwest Himalaya. The number of flycatcher species correlates well with the foliage density, except for low elevation sites in the east Himalaya, which have more foliage density and few flycatcher species. Thus, foliage density alone did not appear to explain the flycatcher pattern. Comparison of tree diversity showed a low-elevation peak in southeast and declining species number in northwest along the elevational gradients. In case of shrubs however, the variation in species diversity with increasing elevation is very less with no continuous increasing or decreasing pattern. Thus, the species diversity of woody vegetation hypothesized did not show similar patterns to the flycatcher diversity, as well as the overall avifaunal diversity along the elevational gradient.

In this study, we found significant genetic differentiation between east and west populations of Slaty-blue Flycatcher *Ficedula tricolor* and Blue-throated Flycatcher *Cyornis rubeculoides*. The genetic divergence time in the populations of *F. tricolor* was estimated to be more than 4.6 Mya. In the case of *C. rubeculoides* apart from the population in the west two distinct populations occurring in the east with one found in the upper reaches above 900 m and the other to about 300 m were found. The divergence time between the west and eastern upper population was estimated to be more than 3 Mya, while the eastern populations was estimated to have diverged 4.7 Mya. These results suggest that the recolonisation of these species to the west is not a result of recent post glacial events, and qualify to be described as separate species.

To conclude, the flycatcher species richness along the elevational gradient correlated with arthropod abundance and as well with plant biomass (primary productivity), but not with the plant species richness. The reason for this may be attributed to the nature of dispersal and seasonality since unlike plants birds are highly mobile and majority of these species are summer migrants. The creation of new climatic regime after last glacial maxima has resulted in a climatic gradient which in turn is shaping the biological communities across the Himalaya. The disparity in species number from southeast to northwest is a combined result of prevalent climatic conditions coupled with community assembly processes like competition, productivity, resource availability, dispersal ability, and evolutionary dynamics.