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Study of Avian Species in Relation to Exotic Trees at Ludhiana, Punjab

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Abstract

Birds are exclusively sensitive to alterations both in terms of environmental and ecological. Birds have very close association with trees. There is a complicated connection that is present between birds and their living and non- living components. There are number of variables in a habitat such as vegetation cover, foliage height and these variables influence avian abundance and diversity. Exotics refer to the species carried from outside the country. Occurrence of non-native plants has been revealed to decline innate plant richness and communal range. Exotic species have been recently found as the most common agent of evolutionary traps, influencing species diversity. Invading species repress growth of native flora and this ultimately results in the reduction of nesting sites for birds. The present study on avian community structure in relation to exotic trees was conducted at Punjab Agricultural University, Ludhiana (Location I) and Gurpal Nagar, Ludhiana (Location II). Five different exotic trees were selected i.e. Safeda (*Eucalyptus tereticornis*), Poplar (*Populus deltoides*), Bottle brush (*Callistemon viminalis*), Monkey Puzzle (*Araucaria araucana*),The Silver Oak (*Grivillea robusta*). A total of 23 species belonging to 11 orders of birds were recorded. Highest species richness (14) was observed on Bottle Brush (*Callistemon viminalis*). Passeriformes was the dominant order of bird species observed. Common Myna (*Acridotheres tristis*), Rose-ringed Parakeet (*Psittacula krameri*), House Crow (*Corvus splendens*) and Blue Rock Pigeon (*Columba livia*) were dominant bird species recorded on selectedexotic trees.

Keywords: Avian diversity, exotic trees, community structure, percentage abundance

1. Introduction

India is home to more than 1260 bird species forming about 12% of total world bird species. There are more than 10,000 bird species in the world. Birds give rise to group of necessary ecosystem functions because of their taxonomic and niche range. Birds are significant suppliers of environment facilities and are exclusively sensitive to ecological alterations (Whelan et al., 2008).Plant incursions can modifygroups in a variety of means, resultant in modifications to the species richness/variety and capability of inhabitant flora and fauna, as well as widerecology-level practices and purposes (Ehrenfeld, 2010; Schirmel et al., 2016; Vila et al., 2011, Tanveer et al., 2002). The variety of non-native kinds is measured the second major warning to biodiversity worldwide (Wilcove et al., 1998). The biological effects of non-native plant arrivals are well recognized across varied biomes, taxa, spatial and progressive scales, and levels of naturaldensity

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(Vila et al., 2011; Pysek et al., 2012; Schirmel et al., 2016). Non-native plants can modify inherent species richness, communal alignment, and species abundance, as well as species relationships and communal structure through modifications in food web dynamics (Richardson et al., 2007; Hladyz et al., 2011; Hajzlerova and Reif, 2014). These modifications results in damaging concerns for biome functioning and human welfare (Pejchar and Mooney, 2009). Introduced plants may exchange high quality habitation to biologicaltraps, surroundingchosen by birds even though conditions that declineability (Battin, 2004; Robertson and Hutto, 2006). Plant incursions disturb animal populations through various ways and understanding the mechanisms underlying these alterations is serious for notifying management and controlling decisions.

Exotic species have been recently found as the most common agent of evolutionary traps, influencing species diversity and activating traps within a wide array of behavioural frameworks (Robertson et al*.,* 2013). The strategy of exchanging low value plantations into farms was meant at refiningproduction and to produceadministrativeincome. Some of the states initiated the raising of fast growing species by dissipating the deprivedtypes. The introduction of exotic tree species arises either because the innate tree flora is revealing or is primarily composed of species which are very slow growing and are not freelyobtainable for use. Exotics refer to the species carried from outside the country (Chauhan et al., 2008; Ikin et al., 2013). Eucalyptus, pines and poplars are 3 widely fast growing tree species in the world over. It is estimated that approximately 4.8 mha of *Eucalyptus* and 60,000 ha of *Populus deltoids* is growing in India alone (Chandra, 2001).

A study conducted in Australia onvisit of nectar feeding birds to native and exotic plants and also on nectar production was done and it showed that there was no connection among the extent of nectar and the number of flower visited by nectar feeding birds. However birds show high percentage of visiting native plants than exotic ones (French et al., 2005).

Due to incursion of exotic species in the residential regions, the innate species are gone important to natural homogenization which poses a risk to the biotic individuality of the indigenous environments (McKinney, 2005). Species disappearing by development also likely to be threatened by agriculture, recreation, roads and many other human influences, underlining the exclusively far reaching alterations that go with urban spread (Mc Kinney, 2005).

The purposeful and involuntary introduction of plant species into a communal can seriously modify the subtleties and organization of the prevailing plant and animal variety. Occurrence of non-native plants has been revealed to declineinnate plant richness and communalrange (Davies, 2011).

Grassland bird variety in Eastern Europe was adversely compressed by offensive goldenrod inhabitants, wherever goldenrod occurrence specified poorer food convenience and plant species abundance (Skorka et al., 2010). Grass hopper Pied Myna and savannah Pied Myna habituated to native plant structure were adversely compressed by the incursion of leafy spurge in the northern Great Plains (Scheiman et al., 2003). The significance of a varied, innate habitation has been broadly recognized with relative to the existence of grassland bird species (Scheiman et al*.,* 2003; Kuvlesky et al., 2006; Skorka et al*.,* 2010). For biodiversity most common and serious hazard are the invasive alien species (Butchart et al., 2010). Invading species repress growth of native flora and this ultimately results in the reduction of nesting sites for birds (Holland et al., 2011).

2. Materials and Methods

The study was carried out from May 2018 to April 2019 to find out the avian species richness relative to exotic trees in agronomic environment. The study was carried out at selectedlocations i.e. Location 1: Punjab Agricultural University, Ludhiana (75.79° E, 30.90° N, above mean sea level –189 m). Punjab Agricultural University site comprises of agronomic grounds, plantations, official campuses and housing areas. Location 2: Gurpal Nagar (30.8764° N, 75.8770° E) Ludhiana. This area consists of residential area comprising of modern housing structure, AnajMandi, Canal, Schools, Parks, Hospitals (SPS Hospital), Industries. Vegetation structure includes both indigenous trees and exotic trees. To study the bird abundance on five selected exotic tree species *i.e.*Safeda (*Eucalyptus tereticornis*), The Silver Oak (*Grevillea robusta*), Poplar (*Populus deltoides*), The Monkey Puzzle (*Araucaria araucana*) and Bottle Brush (*Callistemon viminalis*). These exotic tree species are indigenous to Australia. Three trees for each species were selected at different sites. Safeda is known to be one of the tallest tree in the world attaining height of 65 m. The Silver Oakis an evergreen large tree attaining a height of 30-35 m. Poplar is a fast growing tall tree attaining a height of 30m and girth of 2 m. The Monkey Puzzleis an evergreen tree growing to 1-1.5 m in diameter and 30-40 m in height. Bottle Brushis a small tree upto 8 m tall and, large specimens up to 18 m tall have also been recorded. During the study periodic surveys were carried out by adopting systematic field procedures plus techniques and point count methods was followed at selected sites (Javed and Kaul, 2002). Identification of birds were done with the help of key given by Ali (Ali, 2002). The nomenclature followed was given by Manakadan and Pittie, 2001.Digital camera (Nikon P 500), Bushnell Binocular (8×42) for observing birds and Haglof EC II Clinometer for measuring tree height were used.

3. Results and Discussion

A total 23 species of birds were recorded belonging to 11 orders (Table 1). Highest species richness (14) was recorded on Bottle Brush tree. Common Myna (*Acridotheres tristis*), Rose-ringed Parakeet (*Psittacula krameri*), House Crow (*Corvus splendens*), Blue Rock Pigeon (*Columba livia*) were the

Table 1: Avian species recorded in reference to exotic trees

Sl. No.	Common Name↓	Bottle Brush		The Silver Oak		Poplar		Safeda		Monkey Puzzle	
	Locations→	L I	L II	L I	L II	L I	L II	L I	L II	L I	L II
1.	Ashy *Prinia priniasocialis*	2.77	-	-	-	-	-	-	-	-	-
2.	Asian Koel *Eudynamys scolopacea*	-	-	-	-	4.05	-	3.57	-	-	-
3.	Asian Pied Starling *Sturnus contra*	-	-	1.25	-	-	-	-	-	-	-
4.	Baya weaver *Ploceus philippinus*	4.16	-	-	-	-	-	-	-	-	-
5.	Black Drongo (*Dicrurus macrocercus*)	-	-	3.12	-	2.70	-	-	-	-	-
6.	Black Ibis *Pseudibis papillosa*	-	-	-	-	-	-	2.67	-	-	-
7.	Black Kite *Milvus migrans*	-	-	1.87	-	-	-	8.03	6.45	-	-
8.	Blue Rock Pigeon *Columba livia*	2.77	-	14.37	-	5.40	18.18	3.57	-	-	-
9.	Common Golden-backed Woodpecker *Dinopium javanense*	-	-	3.12	-	-	-	-	-	-	-
10.	Common Hoopoe *Upupa epops*	2.77	-	-	-	-	-	-	-	-	-
11.	Common Myna *Acridotheres tristis*	4.16	-	13.12	16.66	14.86	40.90	12.5	22.58	30	75
12.	Common Tailorbird *Orthotomus sutorius*	4.16	-	-	-	-	-	-	-	-	-
13.	House Crow *Corvus splendens*	5.55	6.66	18.75	44.44	35.13	27.27	41.96	45.16	50	25
14.	Indian Grey Hornbill *Ocyceros birostris*	-	-	-	-	-	-	1.78	-	-	-
15.	Jungle Babbler *Turdoides striatus*	25	20	10.625	-	9.45	-	-	-	20	-
16.	Little Brown Dove *Streptopelia senegalensis*	4.16	-	11.875	-	4.05	-	5.35	-	-	-
17.	Purple Sunbird *Nectarinia asiatica*	19.44	33.33	-	-	-	-	-	-	-	-
18.	Red-vented Bulbul *Pycnonotus cafer*	5.55	-	1.875	5.55	4.05	4.54	-	-	-	-
19.	Rose-ringed Parakeet *Psittacula krameri*	9.72	40	17.5	33.33	17.56	9.09	20.53	25.80	-	-
20.	Small Bee-eater *Merops orientalis*	-	-	1.25	-	-	-	-	-	-	-
21.	Spotted Owlet *Athene brama*	8.33	-	1.25	-	-	-	-	-	-	-
22.	Verditer Flycatcher *Eumyias thalassinus*	1.38	-	-	-	-	-	-	-	-	-
23.	White-breasted Kingfisher *Halcyon smyrnensis*	-	-	-	-	2.70	-	-	-	-	-
	Species richness	14	4	13	4	10	5	9	4	3	2

abundant species observed during the study on exotic trees under study. The order Passeriformes was the dominant order of bird species observed. In overall study it was found that House Crow (*Corvus splendens*) was the dominating species. House Crow is adaptable to all type of vegetation. Lowest species richness (2) was found on Monkey puzzle (*Araucaria araucana*).In the Atlantic Forest of Argentina, Araucaria tree that is native to Atlantic Forest and exotic Pine and Eucalyptus are the most common trees used in commercial cultivated area. A local and regional survey was conducted to study bird community in *Pinus* sp. and Araucaria tree species. It was found that bird species richness was 50% less in plantations than in native forests. Pine and Araucaria have same composition and species richness. Comparison showed greater species richness in native forests than in conifer plantations. It is estimated that threatened species only found on Araucaria forests. In the local and regional surveys a total of 124 species was recorded,102 species was recorded in

native forests and 73 in commercial plantations including 54 in Araucaria and 58 in Pine plantations (Zuritaet al., 2006).

Native plants and native birds have mutualistic associations mean many woody plants are dependent on birds for seed dispersal and cross-pollination and to continue this the local maintenance of native bird numbers is important (Kelly et al., 2010) though some exotic plants can be important properties for native flora and fauna (Shapiro, 2002, French et al., 2005, Daniels and Kirkpatrick, 2006, Smith et al., 2006c) and exotic birds can contribute to dispersal and pollination (Kelly et al., 2010). For insectivorous birds contrasting two indigenous and two exotic trees species abundance and richness of arthropods was found higher on indigenous trees than exotic ones (Bhullar and Majer, 2000).

3.1. Bottle brush (Callistemon viminalis)

Location 1: Total 14 species of birds were observed during the study. Jungle Babbler (*Turdoides striatus*), Purple Sunbird (*Nectarinia asiatica*) were the most dominant species of birds found on this tree followed by Rose-ringed Parakeet (*Psittacula krameri*), Spotted owlet (*Athene brama*). Verditer Flycatcher (*Eumyias thalassina*) was least abundant (1.38) species found on this tree during the study. Species richness was found to be highest during the flowering season (March, April, May).

Location 2: Total 4 species of birds were observed on this tree during the study. More species diversity of birds was observed from February-May. Flowering season results in more diversity of species. Otherwise species diversity was less during winter months. Rose-ringed Parakeet (*Psittacula krameri*), Purple Sunbird (*Nectarinia asiatica*) were the most dominant species found on this tree whereas House Crow (*Corvus splendens*) and Jungle Babbler (*Turdoides striatus*) were the least abundant species observed on this tree.

3.2. The silver oak (Grivillea robusta)

Location 1: Total 13 species of birds were observed during study. Most dominant species found were House Crow (*Corvus splendens*), Rose-ringed Parakeet (*Psittacula krameri*), Blue Rock Pigeon (*Columba livia*) and Common Myna (*Acridothere stristis*) whereas Spotted owlet (*Athene brama*), Asian Pied Starling (*Sturnus contra*) , Small Bee-eater (*Merops orientalis*) were the least dominant species found on this tree. More species diversity (13) was found throughout the year on this tree.

Location 2: Total 4 species of birds were observed on this tree during the study. Annual abundance (44.44%) of House Crow (*Corvus splendens*) were maximum followed by 33.33% of Rose-ringed Parakeet (*Psittacula krameri*), 16.66% of Common Myna (*Acridotheres tristis*) and 5.55% was ofRed-vented Bulbul (*Pycnonotus cafer*).

3.3. Poplar (Populus deltoides)

Location 1: Total 10 species of birds were observed on this tree during study. Maximum species richness (10) was observed from April- August. As the leaves turned yellowish before they shed in October- November that's why number of birds during that period were very less. Most dominant species (35.13) found on this tree were of House Crow (*Corvus splendens*) followed by Rose-ringed Parakeet (*Psittacula krameri*) and Common Myna (*Acridotheres tristis*). Least dominant species on this tree were White-breasted Kingfisher (*Halcyon smyrnensis*) and Black Drongo (*Dicrurus macrocercus*).

Location 2: Maximum species richness was observed during months of April-August. Total 5 species of birds have been observed during study. Most dominant species were of common Myna followed by House Crow (*Corvus splendens*) and Blue Rock Pigeon (*Columba livia*). Least dominant species found on this tree were of Rose-ringed Parakeet (*Psittacula krameri*) and Red-vented Bulbul (*Pycnonotus cafer*).

3.4. Safeda (Eucalyptus tereticornis)

Location 1: Total 9 species of birds have been observed during study. Annual abundance of House Crow (*Corvus splendens*) was observed to be highest (41.96%). Second highest annual abundance (20.53%) was ofRose-ringed Parakeet (*Psittacula krameri*) followed by 12.5% annual abundance of common Myna (*Acridotheres tristis*). Maximum number of House Crow (*Corvus splendens*) were counted on this tree. Least dominant species found on this tree was of Black Ibis (*Pseudibis papillosa*) followed by Indian Grey Hornbill (*Ocyceros birostris*).

Location 2: Maximum species diversity were observed during spring season (March, April, May). Total 4 species of birds were observed during study. Annual abundance (45.16%) of House Crow (*Corvus splendens*) was observed to be highest. Second highest abundance (25.80%) was of Rose-ringed Parakeet (*Psittacula krameri*) and 22.58% of Common Myna (*Acridotheres tristis*). Black kite (*Milvus migrans*) was the leastdominant (6.45%) species found on this tree.

3.5. Monkey puzzle (Araucaria araucana)

Location 1: House crow (*Corvus splendens*) and Common Myna (*Acridotheres tristis*) and Jungle Babbler (*Turdoides striatus*) were the three main species found on this tree. Species richness was maximum during the month of March, April and May and lowest during months of winters. Species diversity (10) found on this tree was lowest. Annual abundance (50%) of House crow (*Corvus splendens*) was found to be abundant on this tree.

Location 2: Only 2 species of birds were found on Araucaria tree. The number of species was maximum in March, April and May, June and July. Annual abundance (75%)of Common Myna (*Acridotheres tristis*) was found to be maximum. House crow (*Corvus splendens*) and Common Myna (*Acridotheres tristis*)are the two main species found on this tree.

4. Conclusion

Trees offer a platform to birds for different daily activities. Introduction of exotic trees have affected the density of birds. Their density is less in new sites as compared to older sites because of the disturbed habitat. So to conserve bird species

there is need to cultivate more native tree species instead of exotic tree species. More services are provided by indigenous trees so there is need to promote plantation of indigenous trees over exotic trees.

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