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Anthropogenic impact on the distribution of the birds in the tropical thorn forest, Punjab, Pakistan

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ABSTRACT

The present research was conducted to assess the anthropogenic impacts on avian diversity around the river Chenab, Pakistan. The avian diversity was recorded on different landscapes along the river Chenab, that is, forest, agricultural, rural, and urban habitats. The data on diversity and distribution of various avian species were collected through linear count along with direct count methods viz. personal observations and sound records and indirect count methods viz. presences of carcasses and meeting with local communities. The habitat preferences of birds varied significantly. A decline in avian diversity was observed from forest habitat to urban landscapes. One year of bird surveys compiled a total of 150 species from all habitats along the river Chenab. Computed statistical data show that Shannon's index provides a quantitative report of diversity which was highest at forest habitat (4.261) followed by rural forest habitat (3.746), agri-rural habitat (3.746), agriculture habitat (3.623), WLH (2.723), urban vegetative habitat (3.215), and very least at urban nonvegetative habitat (2.247). It can be concluded from the present study that many of the avian species have specific habitats and also noted that corridors and connections among different landscapes are important for the conservation of avian diversity.

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Introduction

Rapid increase in human population has adversely affected diversity around the globe (Blom et al 2004). The negative effects of this increase include pollution, climate change, deforestation, habitat loss, and invasion of exotic species (Bierwagen 2007; Mazumder 2014; Scanes 2018). The urbanized areas are very much different from the natural habitats of the species, and with the development of new residential areas and allied facilities, the bigger ecosystems have been fragmented (McKinney 2002), the natural vegetations have been removed (McNeill 2000; Aronson et al 2014), and many native species have been replaced either with exotic ornamental or with the plants having better yields (Holway and Suarez 2006; Aravind et al 2010). Therefore, the

natural ecosystems have been altered and changed in urbanized, peri-urban, and forested landscapes. To some extent, moderate urbanization enhances diversity of some of the species by providing nesting and foraging sites (Blair 1996; Paker et al 2014). However, in densely populated areas, the natural vegetations have been removed leading to decrease in diversity and density of the biodiversity (Blair 2001; Aronson et al 2014).

Urban ecosystem study has been ignored along with other ecosystems during ecosystem research (Roberts 1991,1992; Grimmitt et al 1998; Mirza and Wasiq 2007); while at the mid of the 20th century, from different researches, different studies about urban ecosystem and management and maintenance of urban ecosystem (McKinney 2002; Pickett et al 2011) emerged, and further level of urbanization was studied (Veech 2006). At the end of 20th century, urban ecosystem became challenge for conservation, maintenance, and restoration ecology due to urbanization (Miller and Hobbs 2002; Ahern 2013).

Asia was considered among most diversity-rich continents; however, increase in human population has adversely affected the

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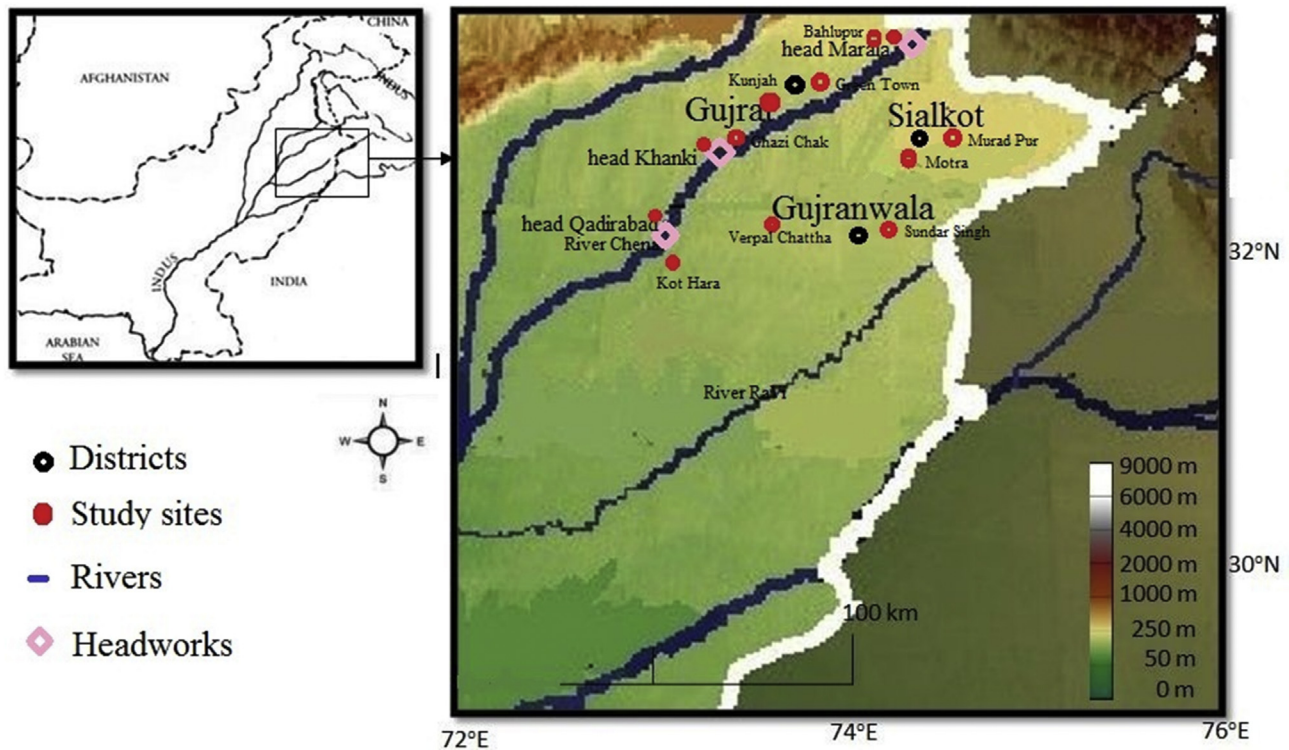


Figure 1. Map of study area with forest, wetland, rural, agriculture, urban and semi-urban habitats along the river Chenab.

diversity of the region (McDonald et al 2008), as the increasing populations demanded for food and shelter which resulted in agriculture intensification, urbanization, industrialization, and pollution (Altaf et al 2013; Altaf et al 2014; Ali et al 2016). During the last 10,000 years, natural vegetations have been converted to agricultural lands; the generalist species adopted new habitats while the habitat-specific species became extinct (Di Giulio et al 2009). At the end of the 20th century, intense farming brought changes in land use (Stoate et al 2009; Barretto et al 2013) and affected the diversity of the areas at massive scales. Population census of all the species in urbanized and peri-urban areas is a prerequisite for conservation planning.

The birds are good environment indicators and help to identify priority areas for conservation (Galgani et al 2010). Metrics such as species currently inhabiting any specific area, their historic distribution records, and the levels of threat to the species aid in

protection efforts (Myers 1990; Myers et al 2000). Major threats to birds of Pakistan include illegal hunting, urbanization, agriculture intensification, eutrophication, pollution, and livestock grazing. These threats are leading species toward extinction (Altaf 2016). So we have designed a project to know the diversity and distribution of birds in different habitats.

Materials and methods

River Chenab starts from Kangra districts of Himachal Pradesh, India, and then enters Diawara village, Sialkot District, Pakistan. The length of river is 960 km (Siddiqi and Tahir-Kheli 2004). Tropical thorn forest is situated along the river Chenab (Altaf 2016). Gujranwala District, that covers an area of 3,622 km², is the third most populated city of the country with human population of 4.48 million (Sheikh 2012a). Gujrat District covers an area of 3,192 km²

Table 1. Study areas of the river Chenab.

Study area	Type	Coordinate	Elevation (ft)
Head Marala (Sialkot)	Forest habitat (FH-1 & WLH-1)	32°39'59 N, 74°28'05 E	811
Motra agriculture	Agriculture habitat (AH-1)	32°24'40 N, 74°24'47 E	840
Bahloolpur	Rural forest habitat (RFH-1)	32°34'55 N, 74°25'41 E	840
Motra	Agri-rural habitat (ARH-1)	32°23'07 N, 74°25'18 E	777
Latifa bad	Urban nonvegetative habitat (UNVH-1)	32°29'42 N, 74°32'05 E	840
Murad Pur	Urban vegetative habitat (UVH-1)	32°31'09 N, 74°30'05 E	808
Head Khanki (Gujrat)	Forest habitat (FH-2 & WLH-2)	32°28'32 N, 73°03'39 E	712
Kunjah agriculture	Agriculture habitat (AH-2)	32°30'57 N, 73°57'22 E	734
Ghazi Chak	Rural forest habitat (RFH-2)	32°30'00 N, 73°05'39 E	739
Kunjah	Agri-rural habitat (ARH-2)	32°31'52 N, 73°58'29 E	735
Walled City	Urban nonvegetative habitat (UNVH-2)	32°34'26 N, 74°04'39 E	802
Green Town	Urban vegetative habitat (UVH-2)	32°33'27 N, 74°04'39 E	756
Head Qadirabad (Gujranwala)	Forest habitat (FH-3 & WLH-3)	32°19'06 N, 073°41'36 E	683
Verpal agriculture	Agriculture habitat (AH-3)	32°14'38 N, 073°53'04 E	701
Kot Hara	Rural forest habitat (RFH-3)	32°16'06 N, 073°42'22 E	695
Verpal Chattha	Agri-Rrural habitat (ARH-3)	32°13'02 N, 073°54'26 E	704
Noor Bawa	Urban nonvegetative habitat (UNVH-3)	32°09'44 N, 074°10'56 E	758
Sundar Singh	Urban vegetative habitat (UVH-3)	32°08'33 N, 074°10'00 E	731

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