

Bird species richness trends in urban and semi-urban area in and around Pune City, India

Pune City located on the slopes of Western Ghats is one of the fastest growing cities in India along with rapid urbanization (Butsch et al. 2017). It is known to harbour a good biodiversity including 332 bird species (Ingalthalikar et al. 2000) but, has been negatively affected due to increased anthropogenic activities (Choudaj & Wankhede 2022).

To our knowledge, a specific comparative observational study on urban-semi urban areas isn't yet available for Pune City. Hence, the main objective of our study was to fill this gap, compare and contrast the species richness of birds observed in urban and semi-urban areas of Pune.

Two study sites were selected: a) Somwar Peth, Old Pune (18.5222° N & 73.8632° E) with very high degree of urbanization; and b) Pashan, Pune (18.5435° N & 73.7961° E) with relatively lower urbanization.

Data collection was done in early morning hours thrice a week from June 2021–January



(A) Tickell's Blue Flycatcher | (B) Indian Grey Hornbill | (C) Indian Spot-billed Duck | (D) Asian Green Bee-eater. © Christina Abraham.

2022 using a point count method. Identification of bird species was carried out using the Cornell Lab of Ornithology-Merlin's Bird Identification application (v. 2.0.1).

We calculated the Jaccard's similarity ($d_{jk} = M / (M+N)$; 'M for the number of matches and N for the total number of columns with presence in just one row' – PAST manual: <https://www.nhm.uio.no/english/research/resources/past/downloads/past4manual.pdf>) between the two locations with the species data for a) total species and b) only terrestrial species. We used

PAST (v 4.10) (Hammer et al. 2001) and Google Sheets for the analysis and visualisation.

Table 1 provide details of the species, families, and orders; abundance of families and species represented in both the sites. Similarity between the bird communities at both the sites based on the Jaccard's similarity was nearly 39% when all species were considered and 49% with only terrestrial species.

Our study documented nearly 50 species from just two locations within the Pune City limits with 23 species seen in



(A). Both the study sites situated 9 km away in Pune City | (B). Urban space in core Pune City (Somwar Peth): Study site 1 | (C). Semi-urban space in Pune City (Pashan): Study site 2.



A) Study site 1: Urban region © Eesha Chawan | (B) and (C) Study site 2: Semi-urban region © Christina Abraham.

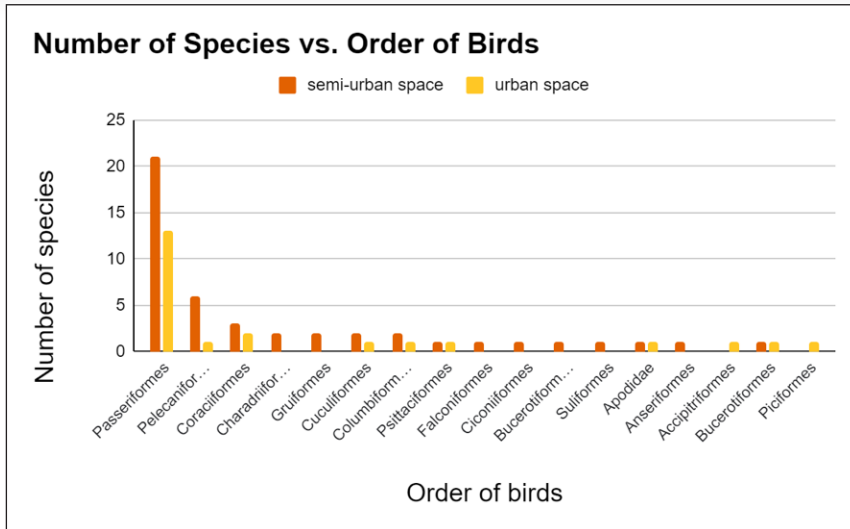
the heavily urbanised locality. This accounts for ~15% of the Pune bird fauna (Ingalhalikar et al. 2000). A very recent study showed the presence of 44 species of birds in two urban localities within the Pune metropolitan region (Choudaj & Wankhede 2022). Comparatively, our numbers were less for the urban site which could perhaps be due to sampling (regime, time period and/or method) difference. Bird richness was distinctly more at the semi urban site, though, four unique species to the urban site were also observed (Table 1).

An important factor in the unequal species richness could have been the presence of Pashan Lake close to our study site. Differences in vegetation could also have influenced the richness trends as variations in bird diversity are related to the vegetation changes in a region (Oduor 2013). Presence of exotic species of woody plants decreased the bird diversity in other urban locales in the Pune Metropolitan region (Choudaj & Wankhede 2022). We also observed invasive species like *Lantana camara* and *Parthenium hysterophorus* at the semi-urban site.

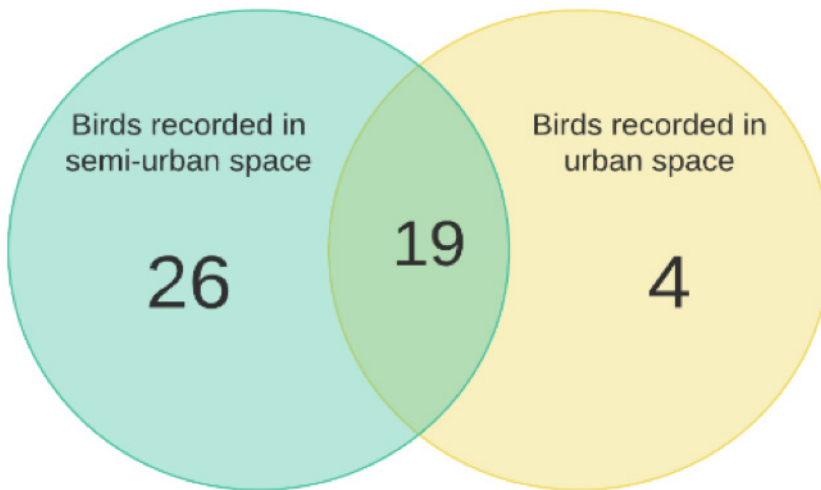
Table 1. Checklist of birds observed in urban and semi urban sites

Order	Family	Common name	Scientific name	Urban site	Semi-urban site	IUCN Red List status
Passeriformes	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	+	+	LC
		Red-whiskered Bulbul	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	+	+	LC
	Corvidae	House Crow	<i>Corvus splendens</i> Vieillot, 1817	+	+	LC
		Large-billed Crow	<i>Corvus macrorhynchos</i> Wagler, 1827	-	+	LC
		Rufous Treepie	<i>Dendrocitta vagabunda</i> (Latham, 1790)	-	+	LC
	Sturnidae	Common Myna	<i>Acridotheres tristis</i> (Linnaeus, 1766)	+	+	LC
		Jungle Myna	<i>Acridotheres fuscus</i> (Wagler, 1827)	-	+	LC
		Brahminy Starling	<i>Sturnia pagodarum</i> (Gmelin, 1789)	+	-	LC
	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i> Vieillot, 1817	+	+	LC
	Cisticolidae	Ashy Prinia	<i>Prinia socialis</i> Sykes, 1832	-	+	LC
Common Tailorbird		<i>Orthotomus sutorius</i> (Pennant, 1769)	+	-	LC	
Passeriformes	Campephagidae	White-bellied Minivet	<i>Pericrocotus erythropygius</i> (Jerdon, 1840)	-	+	LC
	Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i> (Latham, 1790)	+	+	LC
		Purple-rumped Sunbird	<i>Leptocoma zeylonica</i> (Linnaeus, 1766)	+	+	LC
	Ploceidae	Baya Weaver	<i>Ploceus philippinus</i> (Linnaeus, 1766)	-	+	LC
	Muscicapidae	Tickell's Blue- Flycatcher	<i>Cyornis tickelliae</i> Blyth, 1843	-	+	LC
		Oriental Magpie-Robin	<i>Copsychus saularis</i> (Linnaeus, 1758)	+	+	LC
	Paridae	Cinereous Tit	<i>Parus cinereus</i> Vieillot, 1818	+	+	LC
	Rhipiduridae	Spot-breasted Fantail	<i>Rhipidura albogularis</i> (Lesson, 1831)	+	+	LC
	Dicaeidae	Thick-billed Flowerpecker	<i>Dicaeum agile</i> (Tickell, 1833)	-	+	LC
		Blyth's Reed-Warbler	<i>Acrocephalus dumetorum</i> Blyth, 1849	-	+	LC
Aegithinidae	Common Iora	<i>Aegithina tiphia</i> (Linnaeus, 1758)	-	+	LC	
Estrildidae	Scaly-breasted Munia	<i>Lonchura punctulata</i> (Linnaeus, 1758)	+	+	LC	
Pelecaniformes	Ardeidae	Grey Heron	<i>Ardea cinerea</i> Linnaeus, 1758	-	+	LC

Order	Family	Common name	Scientific name	Urban site	Semi-urban site	IUCN Red List status
Pelecaniformes	Ardeidae	Intermediate Egret	<i>Ardea intermedia</i> Wagler, 1829	-	+	LC
		Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus, 1758)	+	+	LC
		Indian Pond-Heron	<i>Ardeola grayii</i> (Sykes, 1832)	-	+	LC
	Threskiornithidae	Black-headed Ibis	<i>Threskiornis melanocephalus</i> (Latham, 1790)	-	+	NT
		Eurasian Spoonbill	<i>Platalea leucorodia</i> Linnaeus, 1758	-	+	LC
Gruiformes	Rallidae	Grey-headed Swamphen	<i>Porphyrio poliocephalus</i> (Latham, 1802)	-	+	LC
		White-breasted Waterhen	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	-	+	LC
Coraciiformes	Meropidae	Asian Green Bee-eater	<i>Merops orientalis</i> Latham, 1802	+	+	LC
	Alcedinidae	White-throated Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	+	+	LC
		Common Kingfisher	<i>Alcedo atthis</i> (Linnaeus, 1758)	-	+	LC
Charadriiformes	Charadriidae	Red-wattled Lapwing	<i>Vanellus indicus</i> (Boddaert, 1783)	-	+	LC
	Laridae	River Tern	<i>Sterna aurantia</i> Gray, 1831	-	+	VU
Anseriformes	Anatidae	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i> Forster, 1781	-	+	LC
Bucerotiformes	Bucerotidae	Indian Grey Hornbill	<i>Ocyrceros birostris</i> (Scopoli, 1786)	+	+	LC
Suliformes	Phalacrocoracidae	Little Cormorant	<i>Microcarbo niger</i> (Vieillot, 1817)	-	+	LC
Cuculiformes	Cuculidae	Asian Koel	<i>Eudynamis scolopacea</i> (Linnaeus, 1758)	+	+	LC
		Greater Coucal	<i>Centropus sinensis</i> (Stephens, 1815)	-	+	LC
Ciconiiformes	Ciconiidae	Woolly-necked Stork	<i>Ciconia episcopus</i> (Boddaert, 1783)	-	+	NT
Falconiformes	Falconidae	Common Kestrel	<i>Falco tinnunculus</i> Linnaeus, 1758	-	+	LC
Columbiformes	Columbidae	Laughing Dove	<i>Spilopelia senegalensis</i> (Linnaeus, 1766)	-	+	LC
		Rock Pigeon	<i>Columba livia</i> Gmelin, 1789	+	+	LC
Psittaciformes	Psittaculidae	Rose-ringed Parakeet	<i>Psittacula krameri</i> (Scopoli, 1769)	+	+	LC
Piciformes	Megalaimidae	Coppersmith Barbet	<i>Psilopogon haemacephalus</i> (Müller, 1776)	+	-	LC
Apodiformes	Apodidae	Little Swift	<i>Apus affinis</i> (Gray, 1830)	+	+	LC
Accipitriformes	Accipitridae	Black Kite	<i>Milvus migrans</i> (Boddaert, 1783)	+	-	LC



Number of Species vs Order of Birds.



Venn diagram showing the Beta diversity relationship between the study sites.

Ours was a small survey-based study primarily carried out to explore the differences in avifauna between urban and semi-urban regions.

Still, we feel it is critical to provide such baseline faunal information from urban centres like Pune as unplanned urbanization is a pertinent issue in the Indian context.

References

Butsch, C., S. Kumar, P. Wagner, M. Kroll, L. Kantakumar, E. Bharucha, K. Schneider & F. Kraa (2017). Growing 'Smart'? Urbanization processes in the Pune urban agglomeration. *Sustainability* 9(12): 2335.

Choudaj, K. & V. Wankhade (2022). Study of the interrelationship between woody plants and birds in Pune urban area, insights on negative impacts of exotic plants. *Tropical Ecology*, 1-12. <https://doi.org/10.1007/s42965-022-00269-3>

Hammer, O., D.A.T. Harper & P.D. Ryan (2001). PAST: Paleontological Statistics Software Package for

education and data analysis. *Paleontología Electrónica* 4(1): 1–9.

Ingahlalikar, S., R. Purandare, S. Nalavade & S. Dhole (2000). Bird diversity changes of Pune urban area. *Journal of Ecological Society* 13(14): 59–70.

Oduor, A.M.O. (2013). Evolutionary responses of native plant species to invasive plants: a review. *New Phytologist* 200: 986–992.

Acknowledgements: We acknowledge Principal Dr. Rajendra S. Zunjarrao and Modern College of Arts, Science and Commerce, Shivajinagar, Pune, for their help and support. We also thank Dr. Rama Phadke, HOD, Department of Biotechnology, Modern College of Arts, Science and Commerce, Shivajinagar, Pune, for her support in this duration.

Eesha Chawan¹, Christina Abraham², Sameer M. Padhye³ & Divya Mistry⁴

^{1,2&4} Department of Biotechnology, Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune, Maharashtra 411005, India.

¹ School of Health Sciences, Savitribai Phule Pune University, Ganeshkhind Road, Pune, Maharashtra 411007, India.

² Symbiosis School of Biological Sciences, Symbiosis International (Deemed University), Lavale, Pune, Maharashtra 412115, India.

³ Biologia Life Science LLP, Ahmednagar, Maharashtra 414003, India.

Email: 4divyamistry1406@gmail.com (corresponding author)

Citation: Chawan, E., C. Abraham, S.M. Padhye & D. Mistry (2023). Bird species richness trends in urban and semi-urban area in and around Pune City, India. *Bird-o-soar* #192, In: *Zoo's Print* 38(3): 17–21.