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Diversity of Avifauna in the Campus of Navsari Agricultural University, Navsari, Gujarat, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Educational institutions are important green spaces which reside diverse species of organisms. In this study, a checklist of bird species was compiled using data collected over seven years (2014-2020) from the campus of Navsari Agricultural University (NAU), Navsari, Gujarat. The study area comprises various habitats including agriculture lands, horticultural orchards, agroforestry plantations, monoculture plantations, biodiversity park, arboretum, grasslands, barren lands and water bodies. A total of 169 bird species belonging to 19 orders, 63 families, and 126 genera were documented throughout the study period. Among the recorded species two (Asian woolly necked stork *Ciconia episcopus and Alexandrine Parakeet Psittacula eupatria*) are near threatened and

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three (Greater Spotted Eagle *Clanga clanga,* Sarus Crane *Antigone Antigone and* River Tern *Sterna aurantia*) are vulnerable. Family Muscicapidae was most diverse within study area comprising 12 species. Species feeding on invertebrates were predominant. The substantial species diversity and presence of nesting activity emphasize the importance of university campuses as significant habitat for avian conservation. Present study provides crucial baseline data for further scientific studies on Avifauna of NAU campus.

Keywords: Avian diversity; urban green space; agroecosystems; educational institutes; Agricultural University.

1. INTRODUCTION

India is one of the most biodiverse countries and has a forest cover of 25.17% of its geographical area (ISFR 2023). The forest cover of the country includes 3.41% of tree cover, which falls outside the forest area. A considerable part of this tree cover is contributed by the educational institutes, public parks, roadside plantations, farm forests etc. Whilst urbanization is posing an increasing threat to biodiversity (Li et al., 2022). These premises act as important habitats amidst oases of concrete forests. These green spaces act as a source of food, water, and shelter for biodiversity. Several studies have highlighted the role of institutional campuses as home of various species (Colding & Barthel, 2017, Liu et al. 2021, Guthula et al. 2022). Educational institutions traditionally established in natural areas away from urban settlements are known to reside diverse flora and fauna. Many educational campuses in India have carried out study on the diversity of birds (Adhurya et al., 2023; Chandrakar & Dhuria, 2019; Jain et al., 2005; Kiran et al., 2022; Kumar et al., 2024; Patel et al., 2021; Rathod & Bhaduri, 2022; Shivhare et al., 2022; Singh, 2018; Singh et al., 2024).

Navsari Agriculture University lies in South Gujarat is spread over 333.42 hectares. It encompasses different land use types including agriculture lands, horticultural orchards, agroforestry plantations, monoculture plantations, biodiversity park (~140 plant species), arboretum (~162 tree species), grasslands, barren lands and water bodies. The rich plant diversity and various habitats provide ample space for different organisms. 89 species of butterflies are recorded from the campus (Malek et al., 2024). Agroecosystems are identified as important habitats and prominent nesting grounds for birds (Borad et al., 2000, 2001). With increasing urbanisation pressure identifying the role of institution campuses for biodiversity conservation is important. Given this background our study aims to provide a checklist of bird species found in the campus of Navsari Agricultural University (NAU).

2. MATERIALS AND METHODS

Navsari Agricultural University (NAU) is situated in district Navsari of Gujarat. NAU was established in 1965 and situated at 20.9248° N latitude, and 72.9079° E longitude at 10 meters above sea level (MSL). The campus is located 12 km away from the east of the Arabian seashore. The region experiences a warm and humid climate, with an average rainfall of approximately 1500 mm (June to September). Winters (November to February) are moderately cold, whereas summers (March to May) are characterized by hot and humid conditions.

This study is a compilation of 7 years of birding surveys. During the study, different trails of the campus were regularly visited in the seasons of winter, summer and monsoon. At least two visits in each month were ensured throughout the study period. The various habitats include agriculture lands, horticultural orchards, agroforestry plantations, monoculture plantations, biodiversity park (~140 plant species), arboretum (~162 tree species), grasslands, barren lands and water bodies. Since the NAU campus region lacks extensive homogenous areas of a single habitat, systematic transects could not be laid. As a result, pre-existing trails were followed for the bird survey. The survey was carried out in the morning and evening mostly 6.45-9.30 hrs and 16.00-18.00 hrs during peak activity time of birds. Apart from a systematic survey, we have included the opportunistic sightings of birds observed on campus. We observed birds with the aid of 12 X 50 binoculars and identified them using field guides of Ali (2002); Rasmussen & Anderton (2012) and Grimmett et al. (2011). Unidentified birds during field visits were identified from the photographs taken using a DSLR camera. The taxonomy of the given checklist is followed using Praveen et al. (2016);

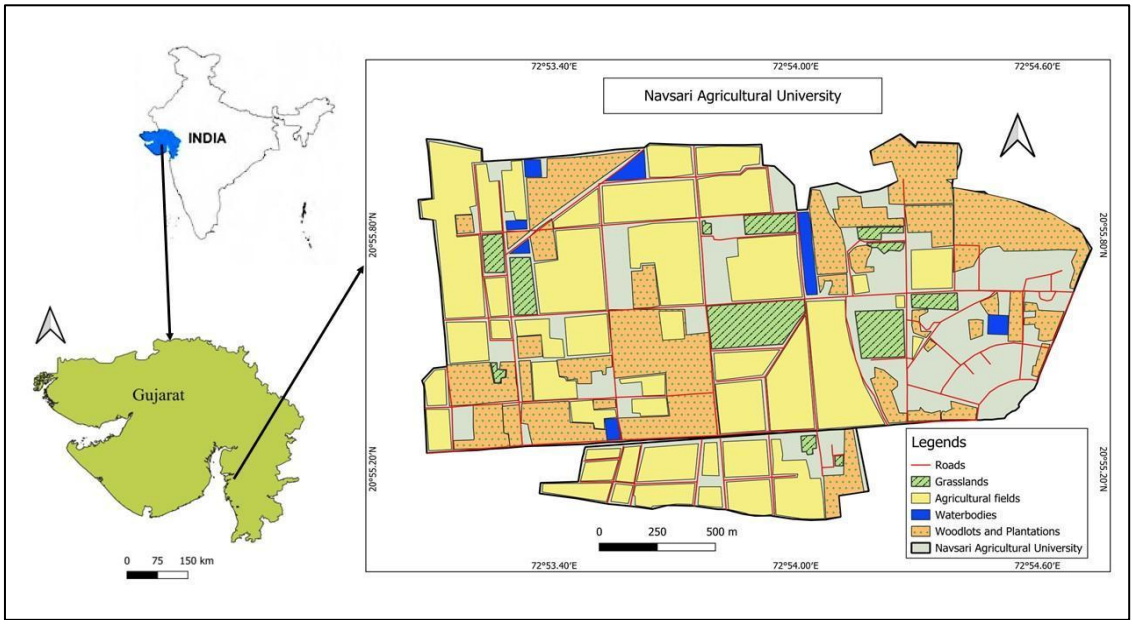

Fig. 1. Study map of the Navsari Agricultural University, Navsari

Praveen et al. (2020); Praveen and Jaypal (2023) and Praveen and Jaypal (2024). We determined whether a species was resident or migratory in the study area following Ganpule (2020) and feeding guilds following (Wilman et al., 2014). We also evaluated the threat level to species using the Red List prepared by the International Union for Conservation of Nature (IUCN 2024).

3. RESULTS AND DISCUSSION

We recorded a total of 169 bird species belonging to 19 orders, 63 families, and 126 genera throughout the study period (Table 1). We recorded the highest number of species in order of Passeriformes (89), followed by Pelecaniformes (13) and Charadriiformes (10). In present study area, the family Muscicapidae (12) was most prevalent, followed by Ardeidae (9) and Accipitridae (8) (Fig. 2). Of the recorded species, 112 bird species are residents followed by 44 winter migrants, 5 bird species residents as well as winter migrants and 3 bird species monsoon breeding. As per the IUCN category, Asian woolly necked stork *Ciconia episcopus and Alexandrine Parakeet Psittacula eupatria* are near threatened, and Greater Spotted Eagle *Clanga clanga,* Sarus Crane *Antigone Antigone and* River Tern *Sterna aurantia* are vulnerable. Among the feeding guild, 48% (81) of documented bird species consume invertebrates, while 17% (29) of species feed on plant parts and seeds. Additionally, 13% (22) of species each feed on terrestrial vertebrates, fish, and carrion/carcasses, and omnivores, and 9% (15) of bird species feed on fruits and nectar. (Fig. 3).

This study highlights the role of institutional campuses as important places that retain significant biodiversity. Navsari is an important region under the Central Asian flyway with rich avian diversity (Patel et al 2022). The cover of agricultural fields, orchards and plantations which give food and spatial resources attracts diverse species of birds. Some noteworthy migratory species in campus are Indian Pitta *Pitta brachyura*, Pied Cuckoo *Clamator jacobinus*, Eurasian Cuckoo *Cuculus canorus*, Yellow Bittern *Ixobrychus sinensis*, Asian Openbill *Anastomus oscitans*, Painted Stork *Mycteria leucocephala*, Taiga Flycatcher *Ficedula albicilla*, Malabar Starling *Sturnia blythii*, Isabelline Wheatear *Oenanthe isabellina*, Grey-headed Canary-Flycatcher *Culicicapa ceylonensis* and Eurasian Sparrowhawk *Accipiter nisus* among others. Many of these species are not easily encountered in surrounding areas. Sanllorente et al. (2023) have observed more species richness and varying species composition between campus areas and surrounding urban areas. Further study in NAU and its surroundings would help to identify such a pattern which could determine the important role of campus for retaining more functional and phylogenetic diversity of birds.

Table 1. Checklist of the avifauna of Navsari Agricultural University (Patel et al, 2022)

	Species	IUCN Status (2024)	Status	Feeding guild
Order: Galliformes				
Family: Phasianidae				
1.	Grey Francolin *Ortygornis pondicerianus(J.F. Gmelin, 1789)*	LC	R	PS
2.	Indian Peafowl *Pavo cristatus* Linnaeus, 1758	LC	R	PS
Order: Anseriformes				
Family: Anatidae				
3.	Indian Spot-Billed Duck *Anas poecilorhyncha J.R. Forster, 1781*	LC	W	PS
Order: Podicipediformes				
Family: Podicipedidae				
4.	Little Grebe *Tachybaptus ruficollis* (Pallas, 1764)	LC	R	I
Order: Ciconiiformes				
Family: Ciconiidae				
5.	Asian woolly necked stork *Ciconia episcopus* (Boddaert, 1783)	NT	R	VFC
6.	Painted Stork *Mycteria leucocephala* (Pennant, 1769)	LC	MM	VFC
7.	Asian Openbill *Anastomus oscitans* (Boddaert, 1783)	LC	MM	I
Order: Pelecaniformes				
Family: Threskiornithidae				
8.	Black-Headed Ibis *Threskiornis melanocephalus* (Latham, 1790)	LC	R	VFC
9.	Indian Black Ibis/ Red-Naped Ibis *Pseudibis papillosa* (Temminck, 1824)	LC	R	OM
10.	Glossy Ibis *Plegadis falcinellus* (Linnaeus, 1766)	LC	R, W	I
11.	Eurasian Spoonbill *Platalea leucorodia* Linnaeus, 1758	LC	R	I
Family: Ardeidae				
12.	Yellow Bittern *Ixobrychus sinensis* (J.F. Gmelin, 1789)	LC	MM	I
13.	Black Crowned Night Heron *Nycticorax nycticorax* (Linnaeus, 1758)	LC	R	VFC
14.	Indian Pond Heron *Ardeola grayii* (Sykes, 1832)	LC	R	OM
15.	Grey Heron *Ardea cinerea* Linnaeus, 1758	LC	R	VFC
16.	Purple Heron *Ardea purpurea* Linnaeus, 1766	LC	R	VFC
17.	Cattle Egret *Bubulcus ibis* (Linnaeus, 1758)	LC	R	I
18.	Great Egret *Ardea alba* Linnaeus, 1758	LC	R	VFC
19.	Intermediate Egret *Ardea intermedia* Wagler, 1829	LC	R	VFC
20.	Little Egret *Egretta garzetta* (Linnaeus, 1766)	LC	R	I
Order: Suliformes				
Family: Phalacrocoracidae				
21.	Little Cormorant *Microcarbo niger* (Vieillot, 1817)	LC	R	VFC
Order: Falconiformes				
Family: Falconidae				
22.	Common Kestrel *Falco tinnunculus* Linnaeus, 1758	LC	W	VFC
Order: Accipitriformes				
Family: Accipitridae				
23.	Black Winged Kite *Elanus caeruleus* (Desfontaines, 1789)	LC	W	VFC

	Species	IUCN Status (2024)	Status	Feeding guild
24a.	Black Kite *Milvus migrans* (Boddaert, 1783)	LC	R	VFC
24b.	Black-Eared Kite *Milvus migrans lineatus* (Boddaert, 1783)	LC	W	VFC
25	Oriental Honey Buzzard *Pernis ptilorhynchus* (Temminck, 1821)	LC	W	I
26.	Western Marsh Harrier *Circus aeruginosus* (Linnaeus, 1758)	LC	W	VFC
27.	Shikra *Accipiter badius* (J.F. Gmelin, 1788)	LC	R	VFC
28.	Eurasian Sparrowhawk *Accipiter nisus* (Linnaeus, 1758)	LC	W	VFC
29.	White-Eyed Buzzard *Butastur teesa* (Franklin, 1831)	LC	W	VFC
30.	Greater Spotted Eagle *Clanga clanga* (Pallas, 1811)	VU	W	VFC
Order: Gruiformes				
Family: Gruidae				
31.	Common Crane *Grus grus* (Linnaeus, 1758)	LC	W	PS
32.	Demoiselle Crane *Grus virgo* (Linnaeus, 1758)	LC	W	PS
33.	Sarus Crane *Antigone antigone* (Linnaeus, 1758)	VU	R	PS
Family: Rallidae				
34.	Common Moorhen *Gallinula chloropus* (Linnaeus, 1758)	LC	R	OM
35.	White Breasted Waterhen *Amaurornis phoenicurus* (Pennant, 1769)	LC	R	I
36.	Common Coot *Fulica atra* Linnaeus, 1758	LC	R, W	PS
37.	Purple Swamphen *Porphyrio porphyrio* (Linnaeus, 1758)	LC	R	PS
38.	Ruddy breasted crake *Zapornia fusca* (Linnaeus, 1766)	LC	R	PS
Order: Charadriiformes				
Family: Turnicidae				
39.	Barred Buttonquail *Turnix suscitator* (J.F. Gmelin, 1789)	LC	MM	PS
Family: Jacanidae				
40.	Pheasant-tailed Jacana *Hydrophasianus chirurgus* (Scopoli, 1786)	LC	R	I
41.	Bronze Winged Jacana *Metopidius indicus* (Latham, 1790)	LC	R	PS
Family: Recurvirostridae				
42.	Black Winged Stilt *Himantopus himantopus* (Linnaeus, 1758)	LC	W	I
Family: Charadriidae				
43.	Red Wattled Lapwing *Vanellus indicus* (Boddaert, 1783)	LC	R	I
Family: Scolopacidae				
44.	Wood Sandpiper *Tringa glareola* Linnaeus, 1758	LC	W	I
45.	Common Sandpiper *Actitis hypoleucos* (Linnaeus, 1758)	LC	W	OM
46.	Common Snipe *Gallinago gallinago* (Linnaeus, 1758)	LC	W	I
Family: Laridae				
47.	River Tern *Sterna aurantia* J.E. Gray, 1831	VU	R	OM
48.	Whiskered Tern *Chlidonias hybrid* (Pallas, 1811)	LC	W	VFC

	Species	IUCN Status (2024)	Status	Feeding guild
Order: Columbiformes				
Family: Columbidae				
49.	Rock Pigeon *Columba livia* J.F. Gmelin, 1789	LC	R	PS
50.	Eurasian Collared Dove *Streptopelia decaocto* (Frivaldszky, 1838)	LC	R	PS
51.	Red Collared Dove *Streptopelia tranquebarica* (Hermann, 1804)	LC	R	PS
52.	Spotted Dove *Spilopelia chinensis (Scopoli, 1786)*	LC	R	PS
53.	Laughing Dove *Spilopelia senegalensis (Linnaeus, 1766)*	LC	R	PS
54.	Yellow Legged Green Pigeon/ Yellow Footed Green Region *Treron phoenicopterus* (Latham, 1790)	LC	R	FN
Order: Psittaciformes				
Family: Psittaculidae				
55.	Alexandrine Parakeet *Psittacula eupatria* (Linnaeus, 1766)	NT	R	FN
56.	Rose Ringed Parakeet *Psittacula krameri* (Scopoli, 1769)	LC	R	FN
57.	Plum headed parakeet *Psittacula cyanocephala* (Linnaeus, 1766)	LC	R	FN
Order: Cuculiformes				
Family: Cuculidae				
58	Pied Cuckoo/ Jacobin Cuckoo *Clamator jacobinus* (Boddaert, 1783)	LC	MB	I
59.	Common Hawk Cuckoo *Hierococcyx varius* (Vahl, 1797)	LC	R	I
60.	Common Cuckoo/ Eursaian Cuckoo *Cuculus canorus* Linnaeus, 1758	LC	MB	I
61.	Grey Bellied Cuckoo *Cacomantis passerinus* (Vahl, 1797)	LC	R	I
62.	Asian Koel *Eudynamys scolopaceus* (Linnaeus, 1758)	LC	R	FN
63.	Greater Coucal/ Southern Coucal/ Crow Pheasant *Centropus sinensis parroti* (Stephens, 1815)	LC	R	OM
Order: Strigiformes				
Family: Tytonidae				
64.	Common Barn Owl/ Barn Owl *Tyto alba* (Scopoli, 1769)	LC	R	VFC
Family: Strigidae				
65.	Spotted Owlet *Athene brama* (Temminck, 1821)	LC	R	I
Order: Caprimulgiformes				
Family: Apodidae				
66.	Asian Palm Swift *Cypsiurus balasiensis* (J.E. Gray, 1829)	LC	R	I
67.	Indian House Swift/Little Swift *Apus affinis* (J.E. Gray, 1830)	LC	R	I
Order: Bucerotiformes				
Family: Upupidae				
68.	Common Hoopoe *Upupa epops* Linnaeus, 1758	LC	R, W	I
Family: Bucerotidae				
69.	Indian Grey Hornbill *Ocyceros birostris* (Scopoli, 1786)	LC	R	FN

	Species	IUCN Status (2024)	Status	Feeding guild
Order: Coraciiformes				
Family: Coraciidae				
70.	Indian Roller *Coracias benghalensis* (Linnaeus, 1758)	LC	R	OM
71.	European Roller *Coracias garrulus* Linnaeus, 1758	LC	PM	I
Family: Alcedinidae				
72.	White Throated Kingfisher *Halcyon smyrnensis* (Linnaeus, 1758)	LC	R	I
73.	Pied Kingfisher *Ceryle rudis* (Linnaeus, 1758)	LC	R	VFC
74.	Common Kingfisher *Alcedo atthis* (Linnaeus, 1758)	LC	R	VFC
Family: Meropidae				
75.	Green Bee Eater *Merops orientalis* Latham, 1801	LC	R	I
76.	Blue Tailed Bee Eater *Merops philippinus* Linnaeus, 1767	LC	R	I
Order: Piciformes				
Family: Megalaimidae				
77.	Coppersmith Barbet *Psilopogon haemacephalus* (Statius Muller, 1776)	LC	R	FN
Family: Picidae				
78.	Eurasian Wryneck *Jynx torquilla* Linnaeus, 1758	LC	W	I
79.	Lesser Golden-Backed Woodpecker *Dinopium benghalense* (Linnaeus, 1758)	LC	R	I
80.	Yellow crowned woodpecker/ Yellow-fronted Pied Woodpecker *Dendrocopos mahrattensis* (Latham, 1801)	LC	R	I
Order: Passeriformes				
Family: Acrocephalidae				
81.	Booted Warbler *Iduna caligata* (M.H.C. Lichtenstein, 1823)	LC	W	I
82.	Clamorous Reed Warbler *Acrocephalus stentoreus* (Hemprich & Ehrenberg, 1833)	LC	R	I
83.	Sykes's Warbler *Iduna rama* (Sykes, 1832)	LC	W	I
Family: Aegithinidae				
84.	Common Iora *Aegithina tiphia* (Linnaeus, 1758)	LC	R	I
Family: Alaudidae				
85.	Ashy Crowned Sparrow Lark *Eremopterix griseus* (Scopoli, 1786)	LC	R	PS
86.	Crested Lark *Galerida cristata* (Linnaeus, 1758)	LC	R	PS
87.	Rufous Tailed Lark *Ammomanes phoenicura* (Franklin, 1831)	LC	R	OM
88.	Sykes's Lark *Galerida deva* (Sykes, 1832)	LC	R	PS
Family: Campephagidae				
89.	Small minivet *Pericrocotus cinnamomeus* (Linnaeus, 1766)	LC	R	I
Family: Chloropseidae				
90.	Golden Fronted Leafbird *Chloropsis aurifrons* (Temminck, 1829)	LC	R	FN
91.	Jerdon`s Leafbird *Chloropsis jerdoni* (Blyth, 1844)	LC	R	FN
Family: Cisticolidae				
92.	Ashy Prinia *Prinia socialis* Sykes, 1832	LC	R	I
93.	Common Tailorbird *Orthotomus sutorius* (Pennant, 1769)	LC	R	I
94.	Grey Breasted Prinia *Prinia hodgsonii* Blyth, 1844	LC	R	I

	Species	IUCN Status (2024)	Status	Feeding guild
95.	Jungle Prinia *Prinia sylvatica* Jerdon, 1840	LC	R	I
96.	Plain Prinia *Prinia inornata* Sykes, 1832	LC	R	I
97.	Zitting Cisticola *Cisticola juncidis* (Rafinesque, 1810)	LC	R	I
Family: Corvidae				
98.	House Crow *Corvus splendens* Vieillot, 1817	LC	R	VFC
99.	Jungle Crow /Large -Billed Crow *Corvus macrorhynchos* Wagler, 1827	LC	R	FN
Family: Dicaeidae				
100.	Pale Billed Flowerpecker *Dicaeum erythrorhynchos* (Latham, 1790)	LC	R	FN
101.	Thick Billed Flowerpecker *Dicaeum agile* (Tickell, 1833)	LC	R	FN
Family: Dicrurus				
102.	Ashy Drongo *Dicrurus leucophaeus* Vieillot, 1817	LC	W	I
103.	Black Drongo *Dicrurus macrocercus* Vieillot, 1817	LC	R	OM
104.	White Bellied Drongo *Dicrurus caerulescens* (Linnaeus, 1758)	LC	R, W	I
Family: Emberizidae				
105.	Black Headed Bunting *Emberiza melanocephala* (Scopoli, 1769)	LC	W	PS
106.	Crested Bunting *Emberiza lathami* (J.E. Gray, 1831)	LC	R	PS
107.	Red Headed Bunting *Emberiza bruniceps* (von Brandt, 1841)	LC	W	PS
Family: Estrildidae				
108.	Indian Silverbill *Euodice malabarica* (Linnaeus, 1758)	LC	R	PS
109.	Red Munia *Amandava amandava* (Linnaeus, 1758)	LC	R	PS
110.	Scaly Breasted Munia *Lonchura punctulata* (Linnaeus, 1758)	LC	R	PS
111.	Tricoloured Munia *Lonchura malacca* (Linnaeus, 1766)	LC	R	PS
Family: Fringillidae				
112.	Common Rosefinch *Carpodacus erythrinus* (Pallas, 1770)	LC	W	PS
Family: Hirundinidae				
113.	Red-rumped Swallow *Cecropis daurica* (Laxmann, 1769)	LC	R	I
114.	Wire Tailed Swallow *Hirundo smithii* Leach, 1818	LC	R	I
Family: Laniidae				
115.	Bay Backed Shrike *Lanius vittatus* Valenciennes, 1826	LC	R	I
116.	Isabelline Shrike *Lanius isabellinus* Hemprich & Ehrenberg, 1833	LC	W	I
117.	Long Tailed Shrike *Lanius schach* Linnaeus, 1758	LC	R	I
Family: Leiothrichidae				
118.	Common Babbler *Argya caudata* (Dumont, 1823)	LC	R	OM
119.	Jungle Babbler *Turdoides striata* (Dumont, 1823)	LC	R	OM
Family: Monarchidae				
120.	Indian Paradise Flycatcher *Terpsiphone paradisi* (Linnaeus, 1758)	LC	R	I
121.	Black-naped Monarch *Hypothymis azurea*	LC	R	I

	Species	IUCN Status (2024)	Status	Feeding guild
	(Boddaert, 1783)			
Family: Motacillidae				
122.	Citrine Wagtail *Motacilla citreola* Pallas, 1776	LC	W	I
123.	Long Billed Pipit *Anthus similis* (Jerdon, 1840)	LC	W, R?	I
124.	Paddy field Pipit *Anthus rufulus* Vieillot, 1818	LC	R	I
125.	Tawny Pipit *Anthus campestris* (Linnaeus, 1758)	LC	W	I
126.	Tree Pipit *Anthus trivialis* (Linnaeus, 1758)	LC	W	I
127.	Western Yellow Wagtail *Motacilla flava* Linnaeus, 1758	LC	W	I
128.	White Wagtail *Motacilla alba* Linnaeus, 1758	LC	W	I
Family: Muscicapidae				
129	Asian Brown Flycatcher *Muscicapa dauurica* Pallas, 1811	LC	R, W	I
130.	Black Redstart *Phoenicurus ochruros* (S.G. Gmelin, 1774)	LC	W	I
131.	Bluethroat *Luscinia svecica* (Linnaeus, 1758)	LC	W	I
132.	Brown Rock Chat *Oenanthe fusca* (Blyth, 1851)	LC	R	I
133.	Indian Robin *Saxicoloides fulicatus* (Linnaeus, 1766)	LC	R	I
134.	Isabelline Wheatear *Oenanthe isabellina* (Temminck, 1829)	LC	W	I
135.	Oriental Magpie Robin *Copsychus saularis* (Linnaeus, 1758)	LC	R	I
136.	Pied Bush chat *Saxicola caprata* (Linnaeus, 1766)	LC	R	I
137.	Red Breasted Flycatcher *Ficedula parva* (Bechstein, 1792)	LC	W	I
138.	Siberian Stonechat *Saxicola torquatus* (Pallas, 1773)	LC	W	I
139.	Taiga Flycatcher *Ficedula albicilla* (Pallas, 1811)	LC	W	I
140.	Tickell's Blue Flycatcher *Cyornis tickelliae* Blyth, 1843	LC	R	I
Family: Nectariniidae				
141.	Purple Rumped Sunbird *Leptocoma zeylonica* (Linnaeus, 1766)	LC	R	FN
142.	Purple Sunbird *Cinnyris asiaticus* (Linnaeus, 1766)	LC	R	FN
Family: Oriolodae				
143.	Indian Golden Oriole *Oriolus kundoo* Sykes, 1832	LC	R	OM
Family: Paridae				
144.	Great Tit / Cinereous Tit *Parus cinereus* Vieillot, 1818	LC	W	I
Family: Passeridae				
145.	House Sparrow *Passer domesticus* (Linnaeus, 1758)	LC	R	PS
146.	Yellow-Throated Sparrow *Gymnoris xanthocollis* (E. Burton, 1838)	LC	R	OM
Family: Phylloscopidae				
147.	Common Chiffchaff *Phylloscopus collybita* (Vieillot, 1817)	LC	W	I
148.	Greenish Leaf Warbler *Phylloscopus trochiloides* (Sundevall, 1837)	LC	W	I
149.	Sulphur Bellied Warbler *Phylloscopus griseolus* Blyth, 1847	LC	W	I
Family: Pittidae				

	Species	IUCN Status (2024)	Status	Feeding guild
150.	Indian pitta *Pitta brachyura* (Linnaeus, 1766)	LC	MB	I
Family: Ploceidae				
151.	Baya Weaver *Ploceus philippinus* (Linnaeus, 1766)	LC	R	PS
Family: Pycnonotidae				
152.	Red Vented Bulbul *Pycnonotus cafer* (Linnaeus, 1766)	LC	R	OM
153.	Red Whiskered Bulbul *Pycnonotus jocosus* (Linnaeus, 1758)	LC	R	OM
154.	White Browed Bulbul *Pycnonotus luteolus* (Lesson, 1841)	LC	R	FN
Family: Rhipiduridae				
155.	White Browed Fantail *Rhipidura aureola* Lesson, 1831	LC	R	I
156.	White Spotted Fantail *Rhipidura albogularis* (Vieillot, 1818)	LC	R	I
Family: Stenostiridae				
157.	Grey headed canary flycatcher *Culicicapa ceylonensis* (Swainson, 1820)	LC	W	I
Family: Sturnidae				
158.	Bank Myna *Acridotheres ginginianus* (Latham, 1790)	LC	R	OM
159.	Brahminy Starling *Sturnia pagodarum* (J.F. Gmelin, 1789)	LC	R	OM
160.	Chestnut-Tailed Starling *Sturnia malabarica* (J.F. Gmelin, 1789)	LC	R	OM
161.	Common Myna *Acridotheres tristis* (Linnaeus, 1766)	LC	R	OM
162.	Jungle Myna *Acridotheres fuscus* (Wagler, 1827)	LC	R	OM
163.	Malabar Starling *Sturnia malabarica* (Jerdon, 1845)	LC	W	OM
164.	Rosy Starling *Pastor roseus* (Linnaeus, 1758)	LC	W	I
Family: Sylviidae				
165.	Lesser Whitethroat *Sylvia curruca* (Linnaeus, 1758)	LC	W	I
166.	Yellow Eyed Babbler *Chrysomma sinense* (J.F. Gmelin, 1789)	LC	R	I
Family: Timaliidae				
167.	Tawny Bellied Babbler *Dumetia hyperythra* (Franklin, 1831)	LC	R	I
Family: Vangidae				
168.	Common Wood shrike *Tephrodornis pondicerianus* (J.F. Gmelin, 1789)	LC	R	I
Family: Zosteropidae				
169.	Oriental White Eye *Zosterops palpebrosus* (Temminck, 1824)	LC	W	OM

(IUCN Red List categories: EN: Endangered, LC: Least concern, NT: Near Threatened, VU: Vulnerable, DD: Data Deficient; Residential Status: R: Resident/ Resident Breeding, MB: Monsoon Breeding , MM: Monsoon Migrant, W: Winter Migrant, PM: Passage Migrant, V: Vagrant and Feeding guilds: FN: Fruitnect, I: Invertebrate, OM: Omnivore, PS: PlantSeed and VFC: VertFishScav)

Well-wooded areas like biodiversity park, arboretum and uncultivated areas on campus are hotspots for bird diversity. Forest specialist birds like Indian Paradise-Flycatcher *Terpsiphone paradisi*, Indian Grey Hornbill *Ocyceros birostris* and Common Woodshrike *Tephrodornis pondicerianus* were observed in these areas. Several species are found to breed on the campus some peculiar to them are Indian Paradise-Flycatcher, Indian Grey Hornbill, Yellow Bittern, Pheasant-tailed Jacana *Hydrophasianus chirurgus*, Black Drongo *Dicrurus macrocercus*,

Common Woodshrike and Spotted Owlet *Athene brama*. A Comprehensive study on the biodiversity of ~300 international campuses shows an average of 66 bird species present on the premises of one particular campus (Liu et al., 2021). The study by Guthula et al. (2022) on 335 campuses in India shows an average of 88 species per campus. Our study documented 170 bird species which is considerably more than campus averages. Low averages in given studies might be attributed to the wide geographic area considered in the study. The reason for more richness in NAU could be the longer study period. The study carried out by Adhurya et al. (2023) in West Bengal recorded 106 species in a small area of a 12-hectare campus during the same 7-year period. The other reason could be the vicinity of NAU near the sea which provides year-round moderate climatic conditions for various species to thrive. Moreover, as the universities introduce and raise many diverse species of plants and actively conserve them, (In NAU, biodiversity park and Arboretum) it provides foraging and nesting places for bird species.

Change in land use patterns due to urbanisation severely impacts the birds in the tropics (Jetz et al., 2007). Urbanisation around the campus has been accelerating for a few years, which could pose a serious threat in the future. In addition, land use change on campus for developmental purposes can pose a risk to various habitats of birds. Therefore, mindful developmental works should be planned for the campus area. As the pressure on overall biodiversity rises, identifying secure refugia for different species in urban environments and taking proactive steps to conserve them could significantly aid in global conservation initiatives (Knapp et al., 2020).

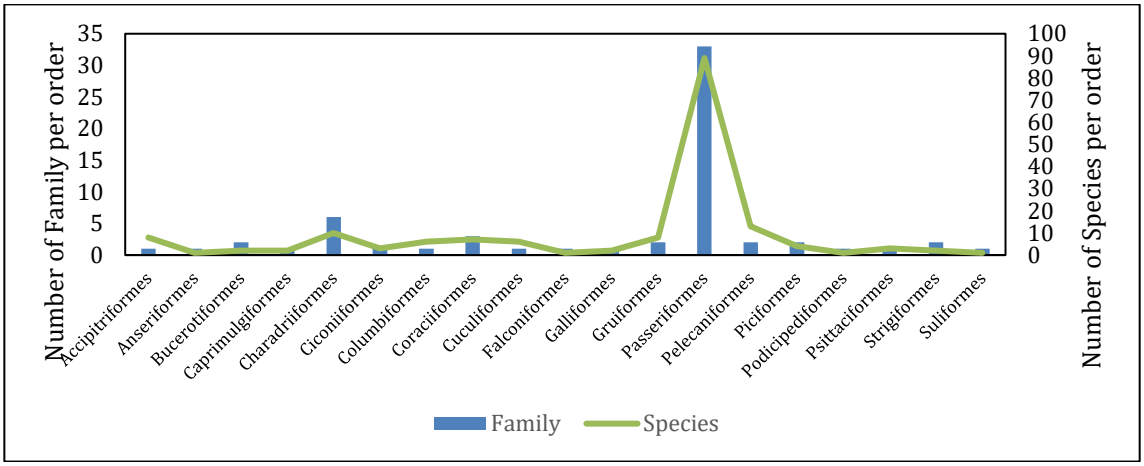

Fig. 2. Family and order-wise representation of Avifauna of Navsari Agricultural University, Navsari

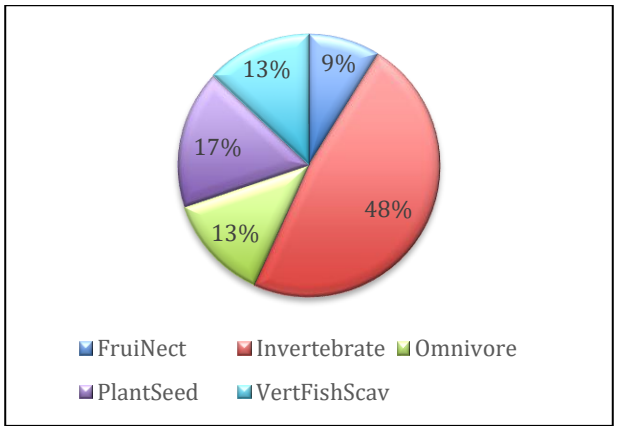

Fig. 3. Feeding guild representation of avifauna of Navsari Agricultural University, Navsari
(FruitNect - feeding on fruits and nectar, Invertebrate - feeding on aquatic and terrestrial invertebrates, PlantSeed - feeding on plant parts and seeds, VertFishScav - feeding on vertebrates, fishes and scavenging on carrion).

The present checklist on avifaunal diversity of NAU campus contributes to such conservation efforts.

4. CONCLUSION

The NAU campus harbours 169 species of birds and many other organisms. The rich diversity in the campus is attributed to presence of diverse habitats. The presence of rich biodiversity influences positively to students as it can be a valuable natural resource to observe and learn. The present findings on avian diversity can be used as a baseline for further research on studying avian species abundance and composition. Long-term scientific study on avian species in the study area can be continued, with a focus on habitat use, seasonal abundance, and nesting and breeding ecology. This would highlight the significance of the institutional campus of NAU in supporting and conserving biodiversity.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

ETHICAL APPROVAL

Animal Ethic committee approval has been collected and preserved by the author(s)

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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