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A Preliminary Study on the Avifauna of Aranya Udhyan, Gandhinagar, Gujarat, India

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Abstract: The major focus of the current research was to identify and prepare the checklist of the diverse avifauna population present in the Aranya Udhyan in Gandhinagar, Gujarat, India during the time period of April 2021 to April 2022. Aranya Udhyan is a densely forested area governed by the government body, Gujarat Ecological Education and Research Foundation (GEER). The most avifaunal-friendly habitats can be found here, where there are many trees, less human activity, and dense forests. In this study, a total of 197 species of avifauna belonging to 64 families and 20 orders have been recorded from Aranya Udhyan. A total of 186 species were classified as least concern, 8 as nearly threatened, and 2 as vulnerable. This research provides the Aranya Udhyan with checklist data of avifauna diversity.

Keywords: Aves, Aranya Udhyan, Gandhinagar, Conservation, Forest, Diversity, Avifauna population

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Introduction

Birds are the widely-ranging, diversified creatures that have dominated the different types of habitats in the ecosystem (Sekercioglu, 2012). India has more than 1335 bird species, which accounts for roughly 12.5% of the global avifauna diversity, compared to the entire world (Praveen *et al.*, 2020). There are more than 574 species of birds known to exist in Gujarat state (Ganpule, 2016).

The diversity, abundance, and richness of the avifauna are directly related to habitat and

vegetation quality. Therefore, the number of avifauna is strongly impacted by changes in the habitat's vegetation (Bhattacharjee and Adhikari, 2022).

Birds are the key component in the sustainable and comprehensive development of the respective ecosystem. Their presence has a direct impact on the ecosystem by influencing human health conditions, eliminating pests from agricultural lands, and acting as environmental scavengers.

Birds, in general, act as bio-indicators and can be used as early conservation systems to understand the early effects of climate change (Biswas *et al.*, 2021).

The avifauna population is drawn to forests and wetland areas where anthropogenic activities are relatively low. This ecosystem provides suitable habitat and an appropriate niche for the bird community. Birds prefer this natural ecosystem as it is linked with both vegetation and water resources (Koli, 2014; Raval, 2022). The habitat preference of birds always depends upon the accessibility of survival resources (Veech *et al.*, 2011).

Birds are highly sensitive to air quality and habitat quality. So, the degradation of the habitat directly reduces the bird population of that kind. Due to several causes, including uncontrolled developmental projects, climate change, and urbanization, avian populations in forest regions are fast declining. Therefore, accurate documenting of bird species is crucial for the conservation and management of avian populations and their habitats. This includes identifying avian species' habitats and breeding areas (Khan *et al.*, 2019).

The current study is focused on the preparation of a checklist of the avifauna found in Aranya Udhyan located in Gandhinagar city, Gujarat, India.

Materials and Methods

Site Description:

The management and operations of Aranya Udhyan are handled by the Gujarat Ecological Education and Research Foundation (GEER) (Fig. 1). The influence of humans is seldom ever felt in this location. Humans are permitted to enter this area for the limited time purposes of tourism. Aranya Udhyan is located near the Sabarmati riverine system. The other side of the river is covered by the Indroda Park, which is a part of GEER. A substantial portion of the land is forested, and the trees and other plants are incredibly diverse. Along with it, it houses a tiny aquatic

body. This is the habitat of many herbivorous animals, including birds.

This study of the avifauna observation was carried out during April 2021 to April 2022, covering all the seasons. The presence of avifauna monitoring is directed during the morning time (06:00 to 11:00 h) and once a week as per their most active time for the different activities. The bird's data was carried out using point transect, random observation, and sound/call analysis. Birds were sighted and observed using a Nikon Aculon Binocular, 10 x 42 mm, and possible photographs were taken by a zoom camera, Nikon P900. The observed birds were identified using the field guides (Arlott, 2015; Grimmett *et al.*, 2015; Kalsi *et al.*, 2019; Grimmett and Inskipp, 2019) and verified with the avian database (IUCN, 2022).

Results and Discussion

The present study showed that the region of Aranya Udhyan is extremely rich in bird diversity having a total of 197 species of avifauna belonging to 64 families and 20 orders.

The lowest avifaunal diversity was observed in the order Podicipediformes, with a single family and species, followed by the order Psittaciformes by having a single family and three species. The order Passeriformes has the highest diversity of birds by having 91 species belonging to 31 families, followed by the order Charadriiformes with 15 species from 6 families. The orders Accipitriformes, Anseriformes, Apodiformes, Caprimulgiformes, Ciconiiformes, Columbiformes, Cuculiformes, Falconiformes, and Galliformes showed the appearance of only one family with a few species (Table 1) (Fig. 2).

All the families except Upupidae, Bucerotidae, Burhinidae, Jacanidae, Laridae, Gruidae, Pittidae, Vangidae, Oriolidae, Monarchidae, Acrocephalidae, Timaliidae, Paradoxornithidae, Zosteropidae, Stenostiridae, Dicaeidae, Emberizidae, Pelecanidae, Megalaimidae, Podicipedidae, Tytonidae and Anhingidae have more than one

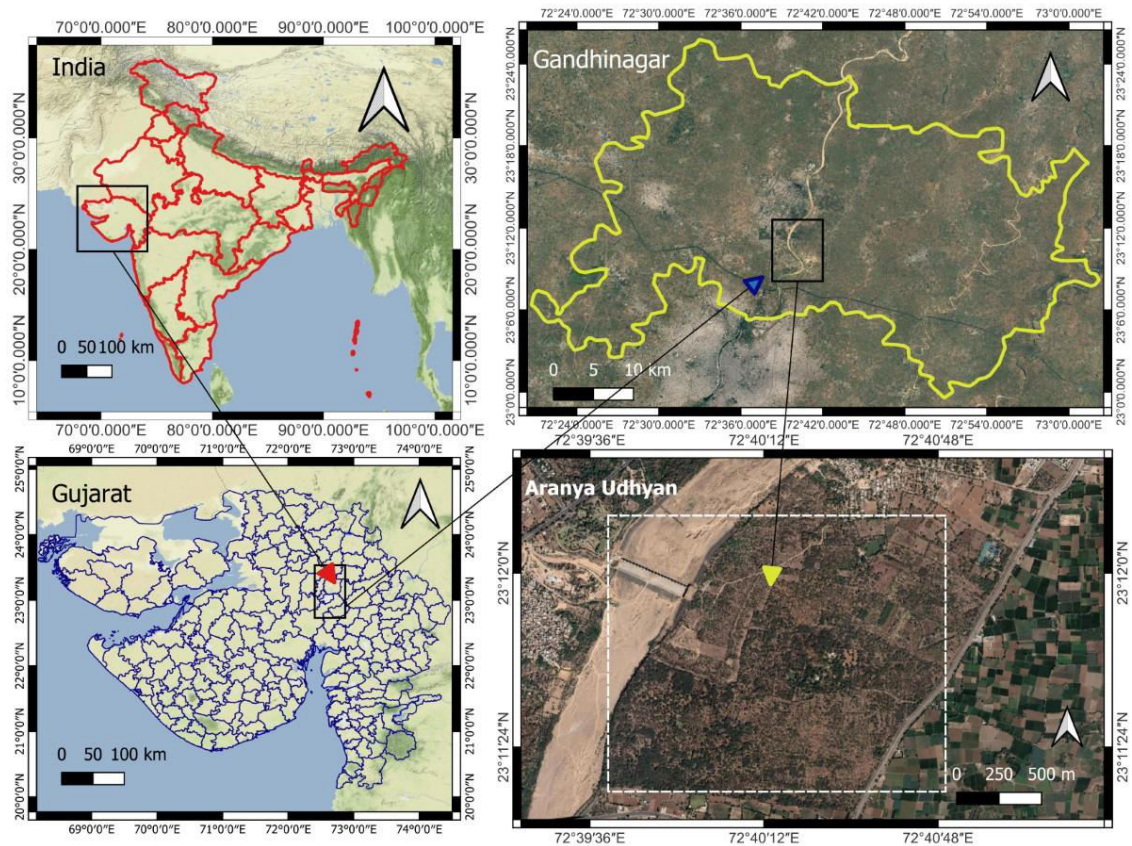


Fig. 1: Location of study area and sampling site for the observation of avifauna.

Table 1: Checklist of birds of the Aranya Udhyan, Gandhinagar, Gujarat. (LC - Least Concern; NT - Nearly Threatened; VU - vulnerable)

Order: Accipitriformes		
Family: Accipitridae		
1	Black winged kite	<i>Elanus caeruleus</i> LC
2	Black kite	<i>Milvus migrans</i> LC
3	Oriental honey buzzard	<i>Pernis ptilorhynchus</i> LC
4	Short toed snake eagle	<i>Circaetus gallicus</i> LC
5	Crested serpent eagle	<i>Spilornis cheela</i> LC
6	Eurasian marsh harrier	<i>Circus aeruginosus</i> LC
7	Pallid harrier	<i>Circus macrourus</i> NT
8	Shikra	<i>Accipiter badius</i> LC
9	Eurasian sparrowhawk	<i>Accipiter nisus</i> LC
10	White eyed buzzard	<i>Butastur teesa</i> LC
Order: Anseriformes		
Family: Anatidae		
11	Lesser whistling duck	<i>Dendrocygna javanica</i> LC
12	Knob billed duck	<i>Sarkidiornis melanotos</i> LC

13	Ruddy shelduck	<i>Tadorna ferruginea</i>	LC
14	Indian spot billed duck	<i>Anas poecilorhyncha</i>	LC
15	Northern shoveler	<i>Spatula clypeata</i>	LC
16	Northern pintail	<i>Anas acuta</i>	LC
17	Common teal	<i>Anas crecca</i>	LC
18	Common pochard	<i>Aythya ferina</i>	VU
Order: Apodiformes			
Family: Apodidae			
19	Asian palm swift	<i>Cypsiurus balasiensis</i>	LC
20	Little swift	<i>Apus affinis</i>	LC
Order: Bucerotiformes			
Family: Upupidae			
21	Eurasian Hoopoe	<i>Upupa epops</i>	LC
Family: Bucerotidae			
22	Indian grey hornbill	<i>Ocyrceros birostris</i>	LC
Order: Caprimulgiformes			
Family: Caprimulgidae			
23	Indian nightjar	<i>Caprimulgus asiaticus</i>	LC
24	Savanna nightjar	<i>Caprimulgus affinis</i>	LC
25	Jungle nightjar	<i>Caprimulgus indicus</i>	LC
Order: Charadriiformes			
Family: Burhinidae			
26	Indian thick knee	<i>Burhinus indicus</i>	LC
Family: Jacanidae			
27	Pheasant tailed jacana	<i>Hydrophasianus chirurgus</i>	LC
Family: Recurvirostridae			
28	Black winged stilt	<i>Himantopus himantopus</i>	LC
29	Pied avocet	<i>Recurvirostra avosetta</i>	LC
Family: Charadriidae			
30	Yellow wattled lapwing	<i>Vanellus malabaricus</i>	LC
31	Red wattled lapwing	<i>Vanellus indicus</i>	LC
32	Little ringed plover	<i>Charadrius dubius</i>	LC
Family: Scolopacidae			
33	Common snipe	<i>Gallinago gallinago</i>	LC

34	Eurasian curlew	<i>Numenius arquata</i>	NT
35	Common redshank	<i>Tringa totanus</i>	LC
36	Common greenshank	<i>Tringa nebularia</i>	LC
37	Green sandpiper	<i>Tringa ochropus</i>	LC
38	Wood sandpiper	<i>Tringa glareola</i>	LC
39	Common sandpiper	<i>Actitis hypoleucos</i>	LC
Family: Laridae			
40	River tern	<i>Sterna aurantia</i>	VU
Order: Ciconiiformes			
Family: Ciconiidae			
41	Painted stork	<i>Mycteria leucocephala</i>	NT
42	Woolly necked stork	<i>Ciconia episcopus</i>	NT
43	Asian openbill	<i>Anastomus oscitans</i>	LC
44	White stork	<i>Ciconia ciconia</i>	LC
Order: Columbiformes			
Family: Columbidae			
45	Eurasian collared dove	<i>Streptopelia decaocto</i>	LC
46	Red turtle dove	<i>Streptopelia tranquebarica</i>	LC
47	Spotted dove	<i>Streptopelia chinensis</i>	LC
48	Laughing dove	<i>Streptopelia senegalensis</i>	LC
49	Yellow footed green pigeon	<i>Treron phoenicopterus</i>	LC
50	Common pigeon	<i>Columba livia</i>	LC
Order: Coraciiformes			
Family: Coraciidae			
51	Indian roller	<i>Coracias benghalensis</i>	LC
52	European roller	<i>Coracias garrulus</i>	LC
Family: Alcedinidae			
53	White throated kingfisher	<i>Halcyon smyrnensis</i>	LC
54	Common kingfisher	<i>Alcedo atthis</i>	LC
55	Pied kingfisher	<i>Ceryle rudis</i>	LC
Family: Meropidae			
56	Green bee eater	<i>Merops orientalis</i>	LC
57	Blue cheeked bee eater	<i>Merops persicus</i>	LC
58	Blue tailed bee eater	<i>Merops philippinus</i>	LC
Order: Cuculiformes			
Family: Cuculidae			

59	Jacobin cuckoo	<i>Clamator jacobinus</i>	LC
60	Common hawk cuckoo	<i>Hierococcyx varius</i>	LC
61	Indian cuckoo	<i>Cuculus micropterus</i>	LC
62	Asian koel	<i>Eudynamys scolopaceus</i>	LC
63	Sirkeer malkoha	<i>Taccocua leschenaultii</i>	LC
64	Southern coucal	<i>Centropus sinensis</i>	LC
Order: Falconiformes			
Family: Falconidae			
65	Common kestrel	<i>Falco tinnunculus</i>	LC
66	Red necked falcon	<i>Falco chicquera</i>	NT
67	Peregrine falcon	<i>Falco peregrinus</i>	LC
Order: Galliformes			
Family: Phasianidae			
68	Grey Francolin	<i>Ortygornis pondicerianus</i>	
69	Jungle bush quail	<i>Perdica asiatica</i>	LC
70	Common quail	<i>Coturnix coturnix</i>	LC
71	Indian peafowl	<i>Pavo cristatus</i>	LC
Order: Gruiformes			
Family: Rallidae			
72	White breasted waterhen	<i>Amaurornis phoenicurus</i>	LC
73	Grey-headed swampphen	<i>Porphyrio poliocephalus</i>	
74	Eurasian Moorhen	<i>Gallinula chloropus</i>	LC
75	Eurasian coot	<i>Fulica atra</i>	LC
Family: Gruidae			
76	Common crane	<i>Grus grus</i>	LC
Order: Passeriformes			
Family: Pittidae			
77	Indian pitta	<i>Pitta brachyura</i>	LC
Family: Vangidae			
78	Common woodshrike	<i>Tephrodornis pondicerianus</i>	LC
Family: Campephagidae			
79	White bellied minivet	<i>Pericrocotus erythropygius</i>	LC
80	Small minivet	<i>Pericrocotus cinnamomeus</i>	LC
81	Large cuckooshrike	<i>Coracina macei</i>	LC
82	Black headed cuckooshrike	<i>Lalage melanopectera</i>	LC

Family: Aegithinidae			
83	Common iora	<i>Aegithina tiphia</i>	LC
84	Marshall's iora	<i>Aegithina nigrolutea</i>	LC
Family: Laniidae			
85	Isabelline shrike	<i>Lanius isabellinus</i>	LC
86	Bay backed shrike	<i>Lanius vittatus</i>	LC
87	Long tailed shrike	<i>Lanius schach</i>	LC
88	Great Grey Shrike	<i>Lanius excubitor</i>	LC
Family: Dicruridae			
89	Spangled drongo	<i>Dicrurus hottentottus</i>	LC
90	Black drongo	<i>Dicrurus macrocercus</i>	LC
91	Ashy drongo	<i>Dicrurus leucophaeus</i>	LC
92	White bellied drongo	<i>Dicrurus caerulescens</i>	LC
Family: Oriolidae			
93	Indian golden oriole	<i>Oriolus kundoo</i>	LC
Family: Rhipiduridae			
94	White spotted fantail	<i>Rhipidura albogularis</i>	LC
95	White browed fantail	<i>Rhipidura aureola</i>	LC
Family: Monarchidae			
96	Asian paradise flycatcher	<i>Terpsiphone paradisi</i>	LC
Family: Corvidae			
97	Rufous treepie	<i>Dendrocitta vagabunda</i>	LC
98	Large-billed Crow	<i>Corvus macrorhynchos</i>	LC
99	House crow	<i>Corvus splendens</i>	LC
Family: Hirundinidae			
100	Dusky crag martin	<i>Ptyonoprogne concolor</i>	LC
101	Barn swallow	<i>Hirundo rustica</i>	LC
102	Red rumped swallow	<i>Cecropis daurica</i>	LC
Family: Alaudidae			
103	Singing bushlark	<i>Mirafraga cantillans</i>	LC
104	Indian bushlark	<i>Mirafraga erythroptera</i>	LC
105	Rufous tailed lark	<i>Ammomanes phoenicura</i>	LC
106	Greater short toed lark	<i>Calandrella brachydactyla</i>	LC
107	Ashy crowned sparrow lark	<i>Eremopterix griseus</i>	LC
108	Crested lark	<i>Galerida cristata</i>	LC

109	Sykes's lark	<i>Galerida deva</i>	LC
Family: Pycnonotidae			
110	White eared bulbul	<i>Pycnonotus leucotis</i>	LC
111	Red vented bulbul	<i>Pycnonotus cafer</i>	LC
112	White browed bulbul	<i>Pycnonotus luteolus</i>	LC
Family: Cisticolidae			
113	Grey breasted prinia	<i>Prinia hodgsonii</i>	LC
114	Jungle prinia	<i>Prinia sylvatica</i>	LC
115	Ashy prinia	<i>Prinia socialis</i>	LC
116	Plain prinia	<i>Prinia inornata</i>	LC
117	Rufous fronted prinia	<i>Prinia buchanani</i>	LC
118	Zitting cisticola	<i>Cisticola juncidis</i>	LC
119	Common tailorbird	<i>Orthotomus sutorius</i>	LC
Family: Acrocephalidae			
120	Booted warbler	<i>Iduna caligata</i>	LC
Family: Phylloscopidae			
121	Common chiffchaff	<i>Phylloscopus collybita</i>	LC
122	Sulphur bellied warbler	<i>Phylloscopus griseolus</i>	LC
123	Greenish warbler	<i>Phylloscopus trochiloides</i>	LC
Family: Sylviidae			
124	Lesser whitethroat	<i>Curruca curruca</i>	LC
125	Orphean warbler	<i>Curruca crassirostris</i>	LC
Family: Timaliidae			
126	Tawny bellied babbler	<i>Dumetia hyperythra</i>	LC
Family: Leiothrichidae			
127	Common babbler	<i>Argya caudata</i>	LC
128	Large grey babbler	<i>Argya malcolmi</i>	LC
129	Jungle babbler	<i>Argya striata</i>	LC
Family: Paradoxornithidae			
130	Yellow eyed babbler	<i>Chrysomma sinense</i>	LC
Family: Zosteropidae			
131	Oriental white eye	<i>Zosterops palpebrosus</i>	LC
Family: Sturnidae			

132	Black myna	<i>Acridotheres ginginianus</i>	LC
133	Common myna	<i>Acridotheres tristis</i>	LC
134	Brahminy starling	<i>Sturnia pagodarum</i>	LC
135	Rosy starling	<i>Pastor roseus</i>	LC
Family: Muscicapidae			
136	Bluethroat	<i>Luscinia svecica</i>	LC
137	Oriental magpie robin	<i>Copsychus saularis</i>	LC
138	Indian robin	<i>Copsychus fulicatus</i>	LC
139	Black redstart	<i>Phoenicurus ochruros</i>	LC
140	Common stonechat	<i>Saxicola maurus</i>	LC
141	Pied bush chat	<i>Saxicola caprata</i>	LC
142	Desert wheatear	<i>Oenanthe deserti</i>	LC
143	Variable wheatear	<i>Oenanthe picata</i>	LC
144	Blue rock thrush	<i>Monticola solitarius</i>	LC
145	Spotted flycatcher	<i>Muscicapa striata</i>	LC
146	Red breasted flycatcher	<i>Ficedula parva</i>	LC
147	Ultramarine flycatcher	<i>Ficedula superciliaris</i>	LC
148	Verditer flycatcher	<i>Eumyias thalassinus</i>	LC
149	Tickell's blue flycatcher	<i>Cyornis tickelliae</i>	LC
Family: Stenostiridae			
150	Grey headed canary flycatcher	<i>Culicicapa ceylonensis</i>	LC
Family: Dicaeidae			
151	Thick billed flowerpecker	<i>Dicaeum agile</i>	LC
Family: Nectariniidae			
152	Purple rumped sunbird	<i>Leptocoma zeylonica</i>	LC
153	Purple sunbird	<i>Cinnyris asiaticus</i>	LC
Family: Passeridae			
154	House sparrow	<i>Passer domesticus</i>	LC
155	Chestnut shouldered petronia	<i>Gymnoris xanthocollis</i>	LC
Family: Ploceidae			
156	Baya weaver	<i>Ploceus philippinus</i>	LC
157	Black breasted weaver	<i>Ploceus benghalensis</i>	LC
Family: Estrildidae			
158	Indian silverbill	<i>Euodice malabarica</i>	LC
159	Scaly breasted munia	<i>Lonchura punctulata</i>	LC

Family: Motacillidae			
160	Western yellow wagtail	<i>Motacilla flava</i>	LC
161	Citrine wagtail	<i>Motacilla citreola</i>	LC
162	Forest wagtail	<i>Dendronanthus indicus</i>	LC
163	Grey wagtail	<i>Motacilla cinerea</i>	LC
164	White wagtail	<i>Motacilla alba</i>	LC
165	Tree pipit	<i>Anthus trivialis</i>	LC
166	Long billed pipit	<i>Anthus similis</i>	LC
Family: Emberizidae			
167	Grey necked bunting	<i>Emberiza buchanani</i>	LC
Order: Pelecaniformes			
Family: Threskiornithidae			
168	Black headed ibis	<i>Threskiornis melanocephalus</i>	NT
169	Glossy ibis	<i>Plegadis falcinellus</i>	LC
170	Red naped ibis	<i>Pseudibis papillosa</i>	LC
171	Eurasian spoonbill	<i>Platalea leucorodia</i>	LC
Family: Ardeidae			
172	Black crowned night heron	<i>Nycticorax nycticorax</i>	LC
173	Indian pond heron	<i>Ardeola grayii</i>	LC
174	Grey heron	<i>Ardea cinerea</i>	LC
175	Purple heron	<i>Ardea purpurea</i>	LC
176	Cattle egret	<i>Bubulcus ibis</i>	LC
177	Great egret	<i>Ardea alba</i>	LC
178	Intermediate egret	<i>Ardea intermedia</i>	LC
179	Little egret	<i>Egretta garzetta</i>	LC
Family: Pelecanidae			
180	Great White Pelican	<i>Pelecanus onocrotalus</i>	LC
Order: Piciformes			
Family: Megalaimidae			
181	Coppersmith barbet	<i>Psilopogon haemacephalus</i>	LC
Family: Picidae			
182	Eurasian wryneck	<i>Jynx torquilla</i>	LC
183	Yellow crowned woodpecker	<i>Leiopicus mahrattensis</i>	LC
184	Lesser goldenback	<i>Dinopium benghalense</i>	LC
Order: Podicipediformes			
Family: Podicipedidae			

185	Little grebe	<i>Tachybaptus ruficollis</i>	LC
Order: Psittaciformes			
Family: Psittaculidae			
186	Alexandrine parakeet	<i>Psittacula eupatria</i>	NT
187	Rose ringed parakeet	<i>Psittacula krameri</i>	LC
188	Plum headed parakeet	<i>Psittacula cyanocephala</i>	LC
Order: Strigiformes			
Family: Tytonidae			
189	Barn owl	<i>Tyto alba</i>	LC
Family: Strigidae			
190	Indian scops owl	<i>Otus bakkamoena</i>	LC
191	Jungle owlet	<i>Glaucidium radiatum</i>	LC
192	Spotted owlet	<i>Athene brama</i>	LC
193	Indian eagle owl	<i>Bubo bengalensis</i>	LC
194	Mottled wood owl	<i>Strix ocellata</i>	LC
Order: Suliformes			
Family: Anhingidae			
195	Oriental Darter	<i>Anhinga melanogaster</i>	NT
Family: Phalacrocoracidae			
196	Little cormorant	<i>Microcarbo niger</i>	LC
197	Great cormorant	<i>Phalacrocorax carbo</i>	LC

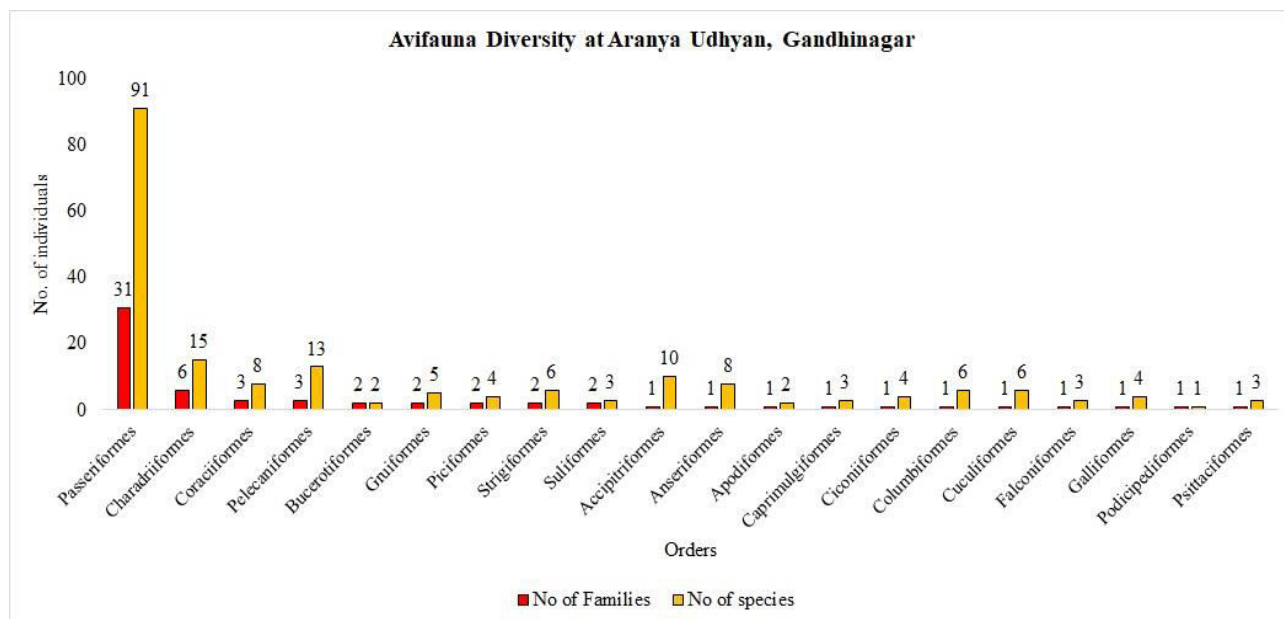


Fig. 2: Distribution of avifauna observed at Aranya Udhyan, Gandhinagar, Gujarat.

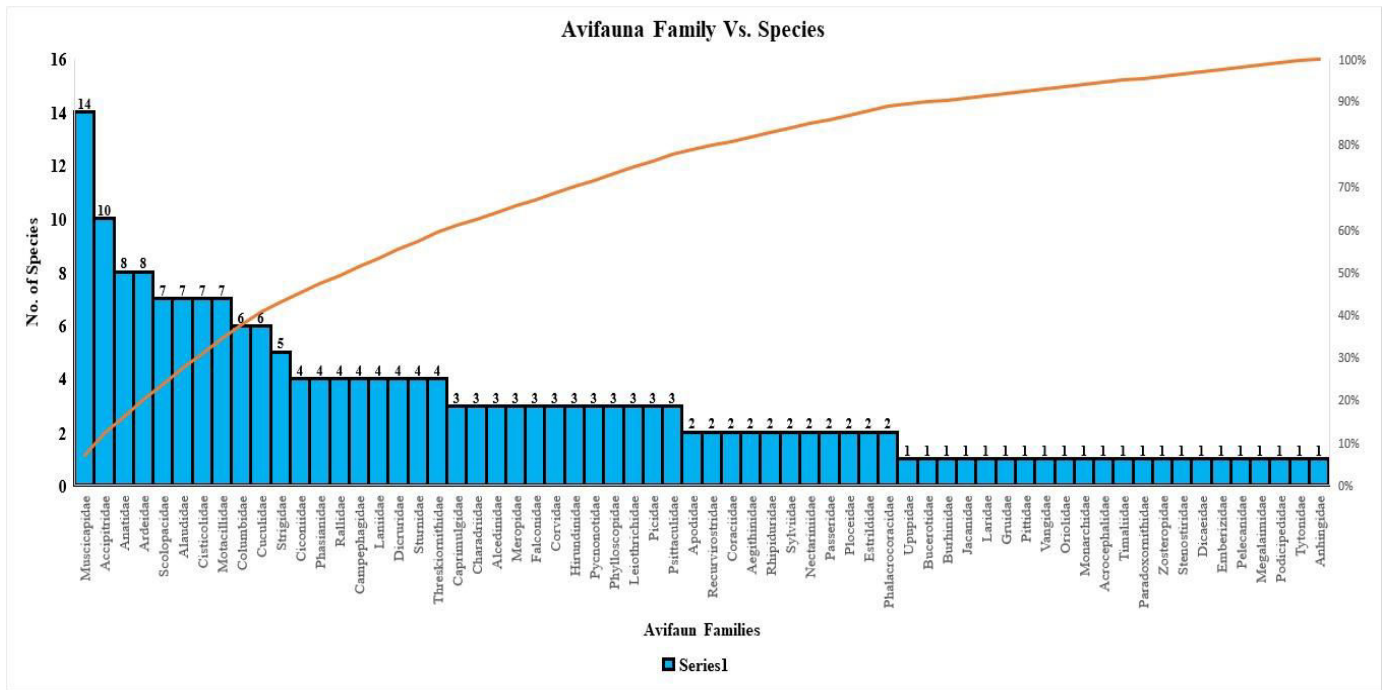


Fig. 3: Status of Avifauna Family and Species at Aranya Udhyan.

IUCN Status of birds in present checklist

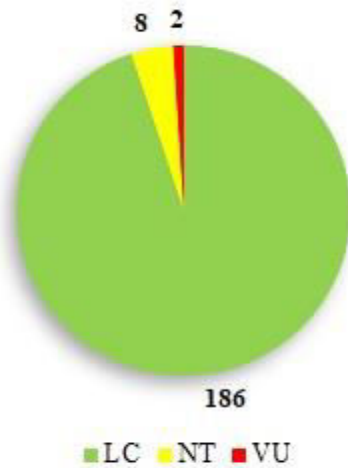


Fig. 4: IUCN status of birds at Aranya Udhyan.

species at Aranya Udhyan. The highest number of species (14) was observed in the family Muscicapidae. Following that are the families Accipitridae, Anatidae, and Ardeidae, with species numbers of 10, 8, and 8, respectively (Table 1) (Fig. 3).

Based on the IUCN status list, all of the observed bird species, a total of 186 species, came under the least concern category, 8 species into

nearly threatened and 2 species into vulnerable (Table 1) (Fig. 4).

There have been various distinctive avifauna diversity studies conducted in India regarding the various ecosystems. Das and Tripathy (2020) have worked on the avifauna inventory in the Jojari River, located in the Rajasthan state. They reported 11 orders of birds with 17 families and 40 species from the wastewater wetland area.

There is a study regarding the preliminary checklist of avifauna from Berhampur University, Odisha, in which researchers reported 108 species of avifauna from 48 families and 19 orders (Lenka and Singh, 2020). Chaudhary *et al.* (2022) reported a total of 84 bird species that belong to 41 families from M.N. College in Visnagar, Gujarat. A study was carried out at Satajaan Wetland, Assam by Bhaduri *et al.* (2022). They recorded a total of 87 species of birds. Siva and Neelananarayanan (2022) also reported a checklist of 120 species of avifauna belonging to 48 families and 19 orders from Nehru Memorial College Campus, Tamil Nadu, India.

Conclusion

This study revealed the status of the avifauna community in the densely forested area of Aranya Udhyan, Gandhinagar, India. This region is preferred by a high number of bird species (197 species) due to the ecological condition of this area. The current report will work as the final data for the bird checklist of Aranya Udhyan. The collection of information on the bird population is essential for the preparation and analysis of the conservation process. The area's long-term avifauna diversity monitoring will be a useful tool for assessing the impact of human pressures and putting Aranya Udhyan conservation plans into action.

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