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Avian diversity of Jangareddigudem town, Andhra Pradesh, India with reference to their threats

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Abstract

Birds are the ecosystem indicators. The richness of avian species indicates the quality of the ecosystem. Jangareddigudem is an upland town, located in the tropical region. The natural flora in and around the Jangareddigudem supports the birds for their survival. The aim of the present study is to get a consolidated account of the avifaunal composition of Jangareddigudem town and also to assess the changes in the habitat with reference to crop transformation and threats to the avian fauna. Among the 73 sighted bird species, Great Stone Plover (*Esacus magnirostris*) & Curlew Sandpiper (*Calidris testacea*) fall under near threatened species. Habitat transformation, hunting and inflow of domestic sewage to aquatic habitats are the observed threats to the survival of these local birds.

Birds are warm-blooded vertebrates. They deduced from flying reptilian ancestors[2]. Birds are well known to all and being studied more compared to other vertebrate taxa. Across the globe, many human cultures reflect their innate interest on birds. Identification, study, survey and monitoring of avian fauna are practically easy[9]. Hill and mountain habitats have relatively more avian diversity than that of other low altitudinal regions[8].

Sightings of birds in any ecological or geographical region are relevant to their ability to react with different environmental parameters. Studies about either absence of anyone or more of these parameters can reveal the influencing factors in that ecological region[6]. As birds are the bio-indicators of the quality of an environment, such studies are indeed needed to find out the factors that are effecting the survival of the birds in a particular ecological region. Birds astonish us by their long-distance migration towards favourable conditions in search of food and breeding. Since past, birds are continuously struggling against ecological factors for their perpetuation[6]. The remarkable advances in agricultural practices and shifting towards cash crops are some of the factors that resulted in the degradation of the natural habitat. Studies by Hakim *et al*.[10] revealed that there was a significant decline of some bird species and extinctions of some other local bird

species due to habitat loss[10]. As per the Hakim *et al*.[10], the clearance of land for commercial crops and decreased bamboo trees could be the cause for the decline of Cresent-chested Babbler (*Stachyris melanothorax*) in West Java of Indonesia. Water bodies support a wide range of biodiversity by acting as resources for food and also serving as breeding grounds[11]. Urbanization also resulted in a greater impact on the adjacent existing aquatic habitats. The domestic sewage inflow into the aquatic habitats causes changes in the properties of the water and results in threatening of the wetland species. Inputs of soaps, detergents, dish wash wastes into water bodies also causes eutrophication of the lakes. Elevated levels of heavy metals in lake waters leads to biomagnification which also causes the death of the dependent life forms on that water body[19].

Research findings revealed that the cultivation of Tobacco resulted in incurable widespread negative impacts on agro-biodiversity, biodiversity, quality of soil and water and as well on traditional agro-practices[12].

Primarily, the present study was conducted to prepare a checklist of local avian flora of Jangareddigudem with reference to their habit, habitat and ecology. Secondarily, efforts were made to prepare a note of impact of habitat destruction, cultivation, urbanization, industrialization, anthropogenic activities with reference to the wetland birds of the existing ponds.

Study Area :

Jangareddigudem (17.1223° N, 81.2923° E) is an upland area of West Godavari district of Andhra Pradesh state, India. Its altitude is 74 meters above median sea level, with 15.8 Km^2 area. Jangareddigudem is a semi-urban town with tropical climate consists more of open areas. The town is also devoid of bulk food resources like paddy and cereals for sparrows. The climate is dry, with an average rain fall of 1050 mm per annum. The topography of the town is characterized by the hills and a canal with a sloppy area. A hill is located at north end of the town, which slopes from north-west to south-east. The east side of the town is flat.

According to 2011 census, the population of the town is 48,994 with a growth rate of 25.56% in that decade; whereas the growth rate of the district is 8.13%. In early 1990's, Oil palm cultivation has been started and an industry for palm oil extraction has also been established[18].

Data collection & Ecological impact studies:

The entire Jangareddigudem town was divided into eight zones with respect to abundance of houses and vegetation. A survey was conducted in the study area in between April-May 2019 to January 2021, to find out the avian biodiversity. Line transect method was conducted for bird counting based on sighting and call of the birds. The flora was identified with the help of a botanical taxonomist by reviewing the literature of Pullaiah[15]; Pullaiah & Chennaiah[15] and Pullaiah & Moulali[16] and by comparing with herbarium[15,16,17]. The Amphibian and Reptilian fauna was identified with the help of a book, 'The Book of Indian Reptiles and Amphibians[7]. Avian fauna was

identified by the field guide of Sálim Ali's[2] Book of Indian Birds and Ali & Ripley's[3] Pictorial guide to the birds of Indian subcontinent[2,3]. Animals were identified and compared with the book of Indian Animals by Prater[13]. All the eight zones were monitored in the months of January, May and September to represent all the three seasons. In each season, all the zones were monitored four times. Night survey was also conducted on the same day to find out nocturnal birds. Along with the avian sightings, ecological and habitat parameters were also recorded.

Biota (Flora and Fauna) of Jangareddigudem:

Flora of Jangareddigudem

Flora of Jangareddigudem town consists of both wild and cultivated species. During our study, about 124 wild plant species were identified and among them, 40 were tree species. The canopy of the town was contributed by Banyan (*Ficus benghalensis* L.), Teak (*Tectona grandis* L.f.), Rosewood (*Dalbergia sissoo* Roxb.), Golden shower (*Cassia fistula* L.), Indian Ash Tree (*Lannea coromandelica* (Houtt.) Merr.), and Rain trees (*Samanea saman* (Jacq.) Merr.). Neem (*Azadirachta indica* A.Juss.) grows in open areas as symbolic to upland. Among the common herbs, 'Bush Mint' (*Hyptis suaveolens)* is very predominant. In several pockets, it was observed that the local herbaceous flora was dominated by the invasive species, *Parthenium hysterophorus*. Around 48 varieties of planted species were also recognized (including exotic species). All the species have their own role in ecological niche as producers in the town ecosystem. These plant resources were sources of essential requirement such as shelter and food. (Fig. 1) shows the distribution of natural flora in the Jangareddigudem town.

Fauna of Jangareddigudem :

As the town Jangareddigudem was a forest, a century ago, still some wild animal species spotted occasionally. Despite of several developmental activities in the town, King Cobra and Python could be seen often in the surrounding areas. It is common to hear the call of Fox (*Vulpus bengalensis)* during nights. The flying fox (*Pteropus gigantus)* is a specific predominant arborial mammal found at the core of the town. Rosy pastor (*Sturnus roseus*) appears in the months of November and February on its way of migration. During dusk, it is pleasurable to hear the call from Partridge. The largest butterfly Blue Mormon (*Papilio polymnestor)* used to appear in the winter seasons. (Fig. 2) show the distribution of vertebrates in the study area.

Avian fauna of Jangareddigudem :

Avian fauna constitute the major vertebrate group. They belong to 13 orders with 43 families. The majority of them were birds that belong to the order Passeriformes with 20 families. Passeriformes constitute 44% of entire avifauna of the town. Herons, Egrets and Ibis form the second largest order, Ciconiiformes with 4 families. Rosy pastor (*Sturnus roseus*) appears during the months of November and February on its way to and fro of migration. Rare sighting of Grey-bellied Cuckoo (*Cacomantis passerinus*) was also observed. Among all these, two species, Great

Stone Plover (*Esacus magnirostris*) & Curlew Sandpiper (*Calidris testacea*) were the near threatened. Table1 shows the list of avian flora of Jangareddigudem and Table 2 shows the abundance of avian species in the Jangareddigudem.

Table-1. List of avian flora of Jangareddigudem

S. No.	Order	Family	Common Name Status	Zoological Name	IUCN
1	Podicipediformes	*Phalacrocora-cidae*	Little Cormorant	*Phalacrocorax niger*	LC
2	Ciconiiformes	*Ardeidae*	Purple Heron	*Ardea purpurea*	LC
3		*Ardeidae*	Pond Heron	*Ardeola grayii*	LC
4		*Ardeidae*	Night Heron	*Nycticorax nycticorax*	LC
5		*Ardeidae*	Cattle Egret	*Bubulcus ibis*	LC
6		*Ardeidae*	Little Egret	*Egretta garzertta*	LC
7		*Ardeidae*	Chestnut Bittern	*Ixobrychus cinnamomeus*	LC
8		*Ardeidae*	Yellow Bittern	*Ixocrychus sinensis*	LC
9		*Ciconiidae*	Openbill Stork	*Anastomus oscitans*	LC
10		*Threskiornithidae*	White Ibis	*Threskiornis aethiopica*	LC
11		*Threskiornithidae*	Glossy Ibis	*Plegadis falcinellus*	LC
12	Anseriformes	*Anatidae*	True Duck	*Dendrocygna javanica*	LC
13	Falconiformes	*Accipitridae*	Common Pariah Kite	*Milvus migrans*	LC
14		*Accipitridae*	Shikra	*Accipiter badius*	LC
15	Galliformes	*Phasianidae*	Jungle Bush Quail	*Perdicula asiatica*	LC
16		*Phasianidae*	Grey Partridge	*Francolinus pondicerianus*	LC
17		*Rallidae*	White-breasted waterhen	*Amaurornis phoenicurus*	LC
18		*Rallidae*	Water Cock	*Gallicrex cinerea*	LC
19		*Rallidae*	Indian Moorhen	*Gallicrex chloropus*	LC
20		*Rallidae*	Purple Moorhen	*Porphyrio porphyrio*	LC
21	Charadriformes	*Jacanidae*	Bronze-winged Jacana	*Metopidius indicus*	LC
22		*Recurvirostridae*	Black-winged Stilt	*Himantopus himantopus*	LC
23		*Burhinidae*	Great-stone Plover	*Esacus magnirostris*	**NT**
24		*Charadriidae*	Red-wattled Lapwing	*Vanellus indicus*	LC
25		*Scolopacidae*	Redshank	*Tringa totanus*	LC
26		*Charadriidae*	Lesser Sand Plover	*Charadrius mongolus*	LC
27		*Scolopacidae*	Curlew-Sandpiper	*Calidris testacea*	**NT**
28	Columbiformes	*Columbidae*	Blue Rock Pigeon	*Columba livia*	LC
29		*Columbidae*	Spotted dove	*Streptopelia chinensis*	LC
30	Psittaceaeformes	*Psittaculidae*	Roseringed Parakeet	*Psittacula kramrai*	LC
31	Cuculiformes	*Cuculidae*	Grey Bellied Cuckoo	*Cacomantis passerinus*	LC
32		*Cuculidae*	Koel	*Eudynamys scolopacea*	LC
33		*Cuculidae*	Crow-Pheasant	*Centrous sinensis*	LC
34	Strigiformes	*Tytonidae*	Barn Owl	*Tyto alba*	LC

35	Strigiformes	*Strigidae*	Spotted Owlet	*Athene brama*	LC
36	Apodiformes	*Apodidae*	House Swift	*Apus affinis*	LC
37	Coraciiformes	*Alcedinidae*	White-throated Kingfisher	*Halcyon smyrnensis*	LC
38		*Meropidae*	Blue-tailed Bee-eater	*Merops philippinus*	LC
39		*Meropidae*	Small Green Bee-eater	*Merops orientalis*	LC
40	Piciformes	*Picidae*	Lesser Golden-backed Woodpecker	*Dinopium benghalense*	LC
41		*Megalaimidae*	Large Green Barbet	*Megalaima zeylanica*	LC
42	Passeriformes	*Pittidae*	Indian Pitta	*Pitta brachyura*	LC
43		*Hirundinidae*	Swallow	*Hirundo rustica*	LC
44		*Riolidae*	Black-naped Oriole	*Oriolus chinensis*	LC
45		*Laniidae*	Brown Shrike	*Lanius cristatus*	LC
46		*Dicruridae*	Black Drongo	*Dicrurus adsimilis*	LC
47		*Sturnidae*	Rosy Pastor	*Sturnus roseus*	LC
48		*Sturnidae*	Brahminy Myna	*Sturnus pagodarum*	LC
49		*Sturnidae*	Indian Myna	*Acridotheres tristis*	LC
50		*Sturnidae*	Pied Myna	*Sturnus contra*	LC
51		*Corvidae*	House Crow	*Corvus splendens*	LC
52		*Corvidae*	Large-billed Crow	*Corvus macrorhynchos*	LC
53		*Vangidae*	Common Woodshrike	*Tephrodornis pondicerianus*	LC
54		*Irenidae*	Iora	*Aegithina tiphia*	LC
55		*Pycnonotidae*	Red-vented Bulbul	*Pycnonotus cafer*	LC
56		*Pycnonotidae*	Red-wihskered Bulbul	*Pycnonotus jocosus*	LC
57		*Pycnonotidae*	White-browed Bulbul	*Pycnonotus luteolus*	LC
58		*Leiothrichidae*	Jungle Babbler	*Turdoidus striatus*	LC
59		*Cisticolidae*	Tailor Bird	*Orthotomus sutorius*	LC
60		*Cisticolidae*	Ashy wren-Warbler	*Prinia socialis*	LC
61		*Acrocephalidae*	Blyth's Reed Warbler	*Acrocephalus dumetorum*	LC
62		*Muscicapidae*	Magpie- Robin	*Copsychus malabaricus*	LC
63		*Muscicapidae*	Black Redstart	*Phoenicurus ochruros*	LC
64		*Muscicapidae*	Indian Robin	*Saxicoloides fulicata*	LC
65		*Dicaeidae*	Tickell's Flowerpecker	*Dicaeum erythrorhynchos*	LC
66		*Motacillidae*	Yellow headed Wagtail	*Motacilla citreola*	LC
67		*Motacillidae*	Large Pied Wagtail	*Motacilla maderaspatensis*	LC
68		*Nectariniidae*	Purple-rumped Sunbird	*Nectarinia zeylonica*	LC
69		*Nectariniidae*	Purple Sunbird	*Nectarinia asiatica*	LC
70		*Passeridae*	House sparrow	*Passer domesticus*	LC
71		*Ploceidae*	Baya weaver Bird	*Ploceus philippinus*	LC
72		*Estrildidae*	Spotted Munia	*Lonchura punctulata*	LC
73		*Estrildidae*	White-throated Munia	*Lonchura malabarica*	LC

Table-2. Abundance of avian species in Jangareddigudem

Sl. No.	Order	Family	Genus	Species
1	Podicipediformes	1	1	1
2	Ciconiiformes	4	9	10
3	Anseriformes	1	1	1
4	Falconiformes	1	2	2
5	Galliformes	1	2	6
6	Charadriformes	7	7	7
7	Columbiformes	1	1	2
8	Psittaceaeformes	1	1	1
9	Cuculiformes	1	3	3
10	Strigiformes	2	2	2
11	Apodiformes	1	1	1
12	Coraciiformes	2	2	3
13	Piciformes	2	2	2
14	Passeriformes	20	25	32
	Total	45	59	73

Threats to Avian Biodiversity at Jangareddigudem Town :

a) Habitat Transformation

During the last couple of decades, the natural vegetation in the town was gradually replaced by ornamental, cultivated plants and invasive species. Several bird species have been affected due to alteration in the native flora. In the year 2014, 250 years old Banyan trees that were planted along the road side were removed in the road widening process. Fruits of these banyan trees form a major food for Rosy Pastor, visible in the months of September and June in its path of migration. In course of 100 years, the forest habitat of the town was converted to mango orchards which were gradually replaced by coconut plantations in some areas and with tobacco croplands in some patches of town. For the past 25 years, several croplands in the upland region were converted to cultivate oil palm.

b) Hunting

The tribal people who inhabited the interior villages of the town habitually hunt several birds for food. They travel more than 40 km from their residence to hunt the birds. They kill birds like Myna, Koel, Babblers, Golden Oriole, House Sparrow, Pond Heron, *etc.*

c) Sewage Disposal

The town consists of only three water bodies. The major pond of the town, *Vuracheruvu* was disappeared due to occupancy. Among those existing ponds, two ponds on east side became the collective sites for domestic sewage. Bronze Winged Jacana, White Ibis, Herons were habituated to survive in those contaminated ponds. Deposition of all soluble wastes such as soaps, detergents, shampoos, hair dies, wall paints, automobile oils, anthropogenic by products, excretory substances etc., made the water unfit for the habitat. One small aquatic pond at new Municipal Office is also under threat due to dumping of the wastes from the market yard and wastes from fish market. (Fig-3) shows the schematic representation of pond water pollution by the disposal of various kinds of sewage and their affects. (Fig-4) shows the wetland avifauna at one of the sedimented and polluted pond at Jangareddigudem.

Anza *et al*.[4] conducted Limnological studies to study the effects of bacterial pathogens and eutrophication on wetland birds in urban wastewater treatment plants. The authors determined the physic-chemical properties of sediment water and found the

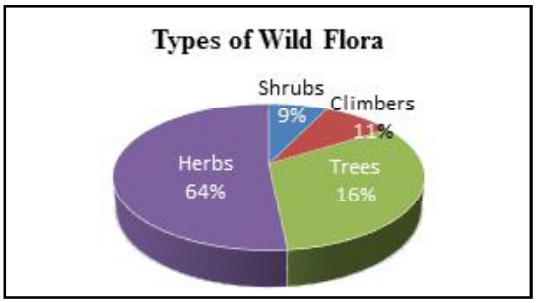

Fig. 1. Distribution of natural flora in Jangareddigudem town.

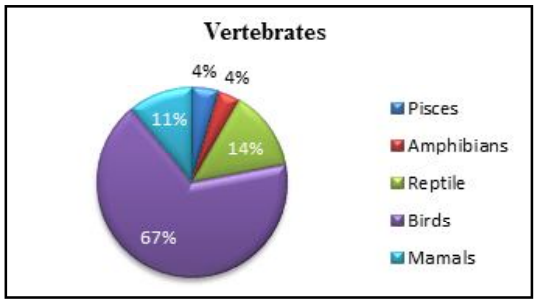

Fig. 2. The distribution of vertebrates at the study area

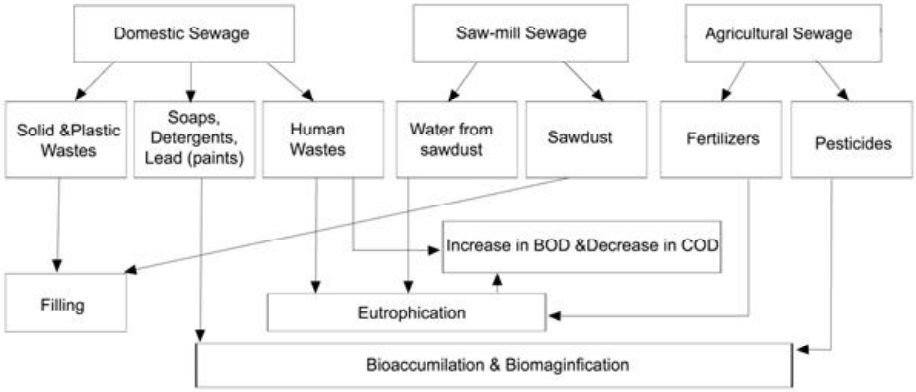

Fig. 3. Schematic representation of pond water pollution and their affects at Jangareddigudem

Fig. 4. Existance of wetland avifauna at sedimented and polluted pond of Jangareddigudem

presence of several bacteria such as *Clostrdium perfringens* Type-A, *Clostridium botulinum*, Avian Pathogenic. *Escherichia coli* (APEC). The presence of *C. botulinum* in the wetland bird faeces leads to outbreak of botulism due to production of boutulinum toxin by the bacteria[4]. In sedimentation point of view, small water bodies have high grade of pollutant loadings and were associated with low faunal diversity, when compared to large water bodies. Large water bodies in contrast are with more heterogeneous habitats and thus consists more of species diversity. They harbor less conta-mination due to dilution compared to smaller ponds[20]. Adhikari *et al*.[1] studied the changes in physic-chemical properties of water and decline of water quality by eutrophication and habitat degradation due to invasion of alien plant species such as Southern Cutgrass (*Leersia hemandra*) and Hyacinath (*Eichhornia crassipes*) that became threats for wetland birds at Beeshazari Lake system, Nepa[1]. The habitat degradation and destruction of wetlands in Nepal and other countries threatened several migratory wetland birds[14]. The recent studies showed that the eutrophication in lentic water system lead to emission of Methane gas. It is expected that by the next century eutrophication enhances the emissions of Methane from 30% to 90%[5].

In the present study, the abundance of avian fauna was observed in South-East regions and North-East regions of the town. The habitat conversion and shifting of cultivation towards cash crops were the major threats to the survival of birds. As per the data, the common Night Jar was not sighted in the adjacent open areas. Among various bird species, the house sparrow population was found to be abundant. About 2,000 sparrows were observed and their abundance was mainly due to the provision of Nest boxes for their breeding by the local non-governmental organization SPARO.

As per the available records, one century ago, Jangareddigudem was a forest. The opinions gathered from the senior citizens revealed that 50 years ago, their cattle and Spotted Deer (*Axis axis*) used to graze together on northern side of the town. Hunting could be the only reason for the disappearance of such wild animals. An occasional sighting of Grey Bellied Cuckoo (*Cacomantis passerinus*) was noticed during the noon of September, 2020.

As the town was located in the hilly region with adequate flora, supports the existence of avian fauna. Among the various threat factors observed, developmental activities such as expansion of national highway, agricultural area, poaching are found as the prime causes of reduction in local avian flora. The release of domestic sewage into the water bodies of the town is also causing remarkable damage to the aquatic flora and fauna. Proper measures have to be taken by the local governing bodies for the conservation of threatened avian taxa. The existing ponds in the town should be protected to avoid further degradation, which will in turn help to maintain the water birds. The *Chinna Cheruvu* is under encroachment from south and east margins. This wetland habitat is gradually decreasing in its size and is under threat. The local governments should take the policy actions about their encroachments.

Awareness programmes on the importance of local flora and wild life among local inhabitants and arrangement of forest

guards are some of the measures that should be followed by the local authorities. Much detailed study is required to assess the impact of local crop transformation on avian flora.

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