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Avian Fauna of proposed wind power project area at Chillavaripalli and Ellutla reserve forests

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Abstract

Birds are highly diverse and noticeable biota of the ecosystem. They are the potential bio-indicators of every ecosystem. Presently birds' population is decreasing rapidly due to several factors such as unplanned development activities, climate change, urbanization etc. The main objective of this study is to prepare a checklist of avifauna in the study region enabling us to understand the diversity of avifauna. Present study was conducted in Chillavaripalli and Ellutla Reserve forests located in Anantapur district of Andhra Pradesh. Complete avian survey has been conducted for one year from October 2015 to September 2016 in and around the study area, which extends to over 201538 Sq. Km. of mosaic habitat of agriculture scrub, grassland, and rice fields. We adopted standard methods for Survey in the study area and identified a total 119 avian species of 51 families. A comparative study of these populations in different habitats was also carried out studied of which agriculture land habitat has recorded high species richness followed by scrubland, and grassland. Conversely, species diversity observed to be more in scrubland habitat followed by agriculture lands, and grasslands areas. This study will serve as an excellent baseline assessment for future research. It will also help in decision making at micro level, towards sustainable management of bird habitats and ecosystem services providing by birds in the study region.

Keywords: Avian fauna, Windmills, Reserve forest, Southern euphorbia thorn forest and dry region

1. Introduction

Birds are very beautiful, highly diverse, and noticeable biota in an ecosystem. They exhibit tremendous ecological and morphological, diversity across its wide geographic range. Birds contribute towards all four types of ecosystem services viz. provisioning, regulating, cultural, and supporting services [1]. They also play multiple roles in ecosystem that includes pollinators, scavengers, predators, and they help in propagation of floral species by action as seed dispersing agents. Birds are one of the most studied groups of vertebrates in different habitats of the world. India harbors 10% of the world's flora and fauna on only 2.4% of the landmass of the world [2]. The Indian subcontinent has rich avian diversity and is home to 1,300 species [3]. Several ornithological studies have been conducted in Andhra Pradesh for instance by Ali's in 1933 & 34 [4], followed by Abdulali in 1945 [5] and Ripley *et al.* in 1987 & 1988 [6] etc. However, there aren't many studies (local habitat type, feeding habits etc.) at a micro level on bird communities. Avian fauna plays a major role in pre and post-environmental impact assessment, keeping this in view the study was taken up to assess potential impact of windmills on avian fauna. Forest advisor Committee of Ministry of Environment, Forests & Climate Change recommended that an impact assessment be carried out of their proposed projects. The user agency proposed to establish 13 windmills (Fig 1) to generate 19.50 MW power over diversion of 32.03 hectares. Accordingly, user agency has sponsored us a project to list out the available avian fauna for assessing the impact of windmills on post establishment. The main objective of the present study is to list out the available avian fauna in the study area and document the feeding type and habitat types. The present study will help us provide up to date documented information of avian fauna and their habitat utilization pattern in order to provide baseline information for future conservation programmes.

2. Materials and Methods

2.1 Study area: Chillavaripalli and Ellutla Reserve Forest is located in Narpala mandal of Anantapur district, Andhra Pradesh, India. It lies between latitude 14°35'10"N to 14°41'50"N and 77°49'00" E to 78°00'00" E at an elevation of 585 Mts above the sea level (Figure 2). The reserve forest has grasslands and shrubby flora lacking prominent deep-rooted vegetation. The area is a mid-stun broken chain of rugged hills.

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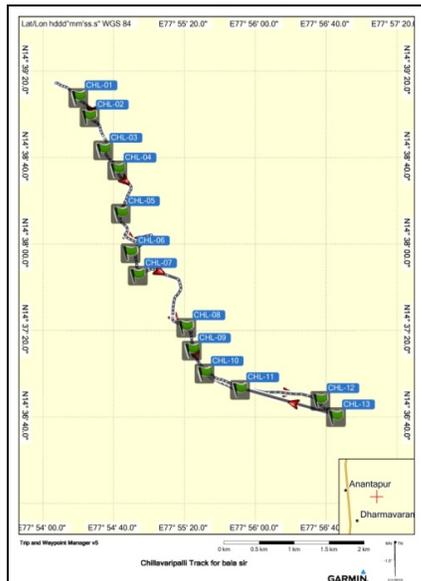


Fig 1: GPS Locations of proposed windmills

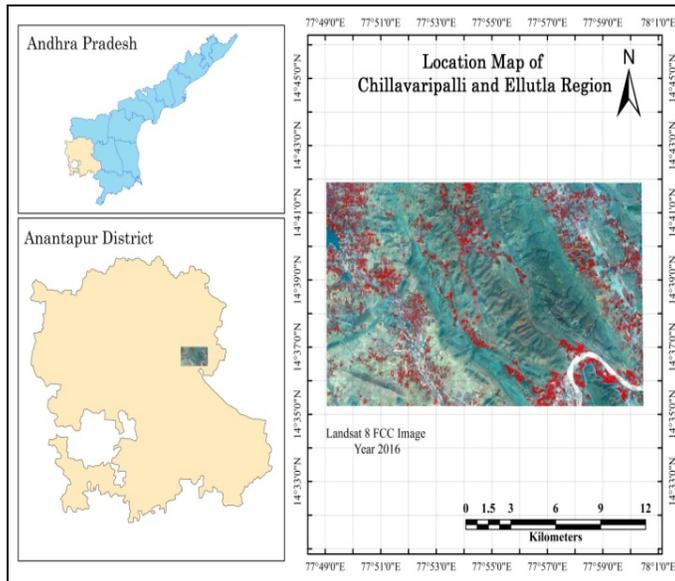


Fig 2: Location map of study area

2.2 Sampling/survey method

Complete avian surveys were conducted in the study area for one year from October 2015 to September 2016 by employing following standard methods i.e. 1) Line-transect method and 2) Point count method.

2.2.1 Line-transect method: In this method, a straight line of 1 km is drawn, and all birds heard or seen up to a range of 25 m on either side of transect are recorded.

2.2.2 Point count method: In this method, the observer will stand in a haphazardly chosen point and record bird species seen and heard in a 50 m radius for 5 minutes. This observation is recorded in another point at least 300 m from the first point. In addition to this, opportunistic bird sightings were made while traveling within the study region [7, 8]. Survey and observations were made twice a day when avifauna is usually most active (05:00 am to 10 am and evening 03:00 pm to 06:00 pm). Birds were observed with the

help of an Olympus Binocular (8X42) and photographs were taken using a Canon EOS 700D SL R camera. Sometimes birds were identified by listening to the bird calls. Identification of birds was done by using standard field guides [9-11].

3. Results

A total of 119 species of birds which belongs to 51 families (Figure 3) and Genera were recorded in various landscapes of study area (Table 1). Accipitridae is most dominant family which consists of 16 species in the study area followed by Muscipapidae (7 Species), Cisticolidae, Cuculidae & Motacillidae (5 Species), Columbidae & Alaudidae (4 species) (Fig 3). Detailed feeding guilds of birds were studied and documented from study area and details have been given in Table 1. Maximum number of bird species were found belonging to insectivorous (78 species) followed by carnivores (22 species) and granivore (21 bird species) (Table 2).

Table 1: Checklist of Avian fauna along with their feeding habit and Habitat types in the study area

S. No	Scientific name	Common Name	Family	Feeding Habit	Type of habitat	Conservation Status
1	<i>Spizaetus cirrhatius</i>	Crested Hawk Eagle	Accipitridae	C	Deciduous, secondary forest, gallery forest, savanna and forested	Least Concern
2	<i>Ictinaetus malayensis</i>	Black eagle	Accipitridae	C	Forested hills and mountains from sea-level to 3300 m elevation	Least Concern
3	<i>Circaetus gallicus</i>	Short-toed snake-eagle	Accipitridae	C	Varied habitats mainly in warm temperate and tropical zones; from open woodland	Least Concern
4	<i>Circus macrourus</i>	Pallid harrier	Accipitridae	C	During breeding, found mainly on natural grassy plains and dry steppes in flat or undulating.	Near Threatened
5	<i>Circus pygargus</i>	Montagu's harrier	Accipitridae	C	Open areas with grass or shrubs; generally flat or undulating ground, less often in steeper terrain	Least Concern
6	<i>Hieraetus fasciata</i>	Bonelli's eagle	Accipitridae	C	Mainly warm, sunny mountainous or broken terrain, normally with crags and cliffs. Vegetation cove	Least Concern
7	<i>Neophron percnopterus</i>	Egyptian vulture	Accipitridae	C	Extensive open areas mainly in dry or arid region	Endangered
8	<i>Pernis ptilorhynchus</i>	Oriental honey buzzard	Accipitridae	C	Wooded areas, preferring broad-leaved trees, in wide variety of bio climatic conditions	Least Concern
9	<i>Elanus caeruleus</i>	Black winged kite	Accipitridae	C	Open savanna grasslands with scattered bushes and small trees; extends into arid steppe and desert	Least Concern
10	<i>Milvus migrans</i>	Black kite	Accipitridae	C	Ubiquitous, occurring from semi desert, grassland and savanna to woodland, but avoids dense forest.	Least Concern
11	<i>Haliastur indus</i>	Brahminy kite	Accipitridae	C	Coasts, estuaries, rivers, lakes, swamps, marshes, reservoirs, rice fields and urban areas	Least Concern

12	<i>Accipiter badius</i>	Shikra	Accipitridae	C	Throughout is found in dry areas with trees. Deciduous woodland and savanna, from arid steppe	Least Concern
13	<i>Accipiter nisus</i>	Eurasian sparrow hawk	Accipitridae	C	Inhabits wide variety of forest types, including coniferous, deciduous.	Least Concern
14	<i>Aquila rapax</i>	Tawny eagle	Accipitridae	C	Open woodland, wooded savannah, semi-desert and arid steppe; only absent from forest	Least Concern
15	<i>Hieraetus pennatus</i>	Booted eagle	Accipitridae	C	Forests and woods mixed with open areas, often in open woodland	Least Concern
16	<i>Circus aeruginosus</i>	Eurasian marsh harrier	Accipitridae	C	Typically in extensive areas of dense marsh vegetation	Least Concern
17	<i>Acrocephalus stentoreus</i>	Clamorous red warbler	Acrocephalidae	C	ponds and along rivers	Least Concern
18	<i>Acrocephalus dumetorum</i>	Blyth's reed warbler	Acrocephalidae	C	Adapted to varied habitats, not necessarily close to water.	Least Concern
19	<i>Iduna rama</i>	Sykes's warbler	Acrocephalidae	C	Sand or clay deserts and semi-deserts with scattered vegetation at least 2 m tall,	Least Concern
20	<i>Aegithina tiphia</i>	Common iora	Aegithinidae	O	Mangroves are about the only natural closed-canopy evergreen forest inhabited permanently.	Least Concern
21	<i>Aegithina nigrolutea</i>	Marshall's iora	Aegithinidae	O	Exclusively at plains level in N of range, where favours thorny <i>Acacia</i> jungle	Least Concern
22	<i>Eremopterix griseus</i>	Ashy crowned sparrow lark	Alaudidae	I&G	Dry open habitats with scattered low vegetation	Least Concern
23	<i>Ammomanes phoenicura</i>	Rufous tailed lark	Alaudidae	I&G	Dry, open habitats with sparse vegetation; often found together with other species	Least Concern
24	<i>Mirafra erythroptera</i>	Indian bushlark	Alaudidae	I&G	Arid, preferably somewhat scrubby and often rocky areas	Least Concern
25	<i>Galerida deva</i>	Sykes's lark	Alaudidae	I&G	Dry, stony areas with sparse scrubby vegetation and dry cultivation	Least Concern
26	<i>Alcedo atthis</i>	Common kingfisher	Alcedinidae	C & I	Still or gently flowing water with plentiful small fish, and with reeds, rushes or shrubs	Least Concern
27	<i>Anas poecilorhyncha</i>	Indian spot-billed duck	Anatidae	feeds by dabbling for plant food	Various types of inland and coastal (both tidal and brackish) wetlands	Least Concern
28	<i>Cypsiurus balasiensis</i>	Asian palm swift	Apodidae	I	Primary dependence on fan palms (<i>Livistona</i> , <i>Borassus</i> , <i>Corypha</i>)	Least Concern
29	<i>Apus nipalensis</i>	House swift	Apodidae	I	In Asia familiar in towns and cities, though scarcer elsewhere.	Least Concern
30	<i>Ardeola grayii</i>	Indian pond heron	Ardeidae	C	Very varied, including rivers, streams, lakes, marshes, paddy fields, reservoirs, tidal and mudflats	Least Concern
31	<i>Egretta garzetta</i>	Little egret	Ardeidae	C	Wide variety, frequenting all kinds of open wetlands, both ephemeral and permanent, with shallow waters.	Least Concern
32	<i>Bubulcus ibis</i>	Cattle egret	Ardeidae	I	All kinds of wet lands	Least Concern
33	<i>Pericrocotus speciosus</i>	Scarlet minivet	Campephagidae	I	Broadleaf evergreen, semi-evergreen and deciduous forests, and peat swamp-forest.	Least Concern
34	<i>Pericrocotus cinnamomeus</i>	Small minivet	Campephagidae	I	Forest, woodland, mangrove forest, thorn-forest, strand woodland, casuarinas.	Least Concern
35	<i>Coracina melanoptera</i>	Black-headed cuckooshrike	Campephagidae	I&F	Open forest, secondary growth, scrub-jungle and bamboo; also in gardens, orchards and hedgerows.	Least Concern
36	<i>Caprimulgus asiaticus</i>	Indian night jar	Caprimulgidae	I & N	Highly variable throughout range, but typically scrubland or wooded country. Light scrub jungle.	Least Concern
37	<i>Caprimulgus atripennis</i>	Jerdon's nightjar	Caprimulgidae	I	Mainly forest, woods and forested country: evergreen forest, moist deciduous forest, and dry forest.	Least Concern
38	<i>Ceryle rudis</i>	Pied kingfisher	Cerylidae	C	Small and large lakes, large rivers, estuaries, coastal lagoons, mangroves and sandy and rocky.	Least Concern
39	<i>Vanellus indicus</i>	Red wattled lapwing	Charadriidae	I	Dry and open habitats, including cultivated and fallow fields and wasteland.	Least Concern
40	<i>Vanellus malabaricus</i>	Yellow wattled lapwing	Charadriidae	I	Dry and open habitats, including cultivated and fallow fields and wasteland.	Least Concern
41	<i>Ciconia nigra</i>	Black stork	Ciconiidae	C&I	undisturbed open woodland, foraging in streams, pools, marshes, and riverbanks	Least Concern
42	<i>Ciconia episcopus</i>	Woolly necked stork	Ciconiidae	C&I	Undisturbed open woodland, foraging in streams, pools, marshes, riverbanks.	Least Concern
43	<i>Orthotomus sutorius</i>	Common tailor bird	Cisticolidae	I	Favours bushy cover by villages, gardens, and parks, even shrubbery in city centers, and in forest area.	Least Concern
44	<i>Prinia buchanani</i>	Rufous fronted prinia	Cisticolidae	I	Semi-desert plains and foothills with scrub, including dry fields with scattered shrubs.	Least Concern
45	<i>Prinia hodgsonii</i>	Grey breasted prinia	Cisticolidae	I	Favours scrubby areas in open forest, forest edge, riverside thickets such as <i>Lantana</i>	Least Concern
46	<i>Prinia socialis</i>	Ashy prinia	Cisticolidae	I	Bushy places, from scrubby grassland to garden	Least Concern

					shrubby, including <i>Lantana</i> thickets	
47	<i>Prinia inornata</i>	Plain prinia	Cisticolidae	I	Scrubby grassland in variety of situations, from saltmarshes to reedbeds, bamboo thickets	Least Concern
48	<i>Spilopelia senegalensis</i>	Laughing dove	Columbidae	F&G	Bushy places, from scrubby grassland to garden shrubbery	Least Concern
49	<i>Streptopelia decaocto</i>	Eurasian collared dove	Columbidae	F&G	inhabits semi-desert and arid regions	Least Concern
50	<i>Streptopelia tranquebarica</i>	Red collared dove	Columbidae	G	Inhabits open country with trees, scrub, jungle and dry woodland	Least Concern
51	<i>Columba livia</i>	Blue rock pigeon	Columbidae	G	Rocky sandstone and limestone plateau and associated gullies, and escarpments	Least Concern
52	<i>Coracias benghalensis</i>	Indian roller	Coraciidae	I	Open farmland, pasture, stubble, plantations, palm groves, dry <i>Acacia</i> and <i>Prosopis</i> spp	Least Concern
53	<i>Dendrocitta vagabunda</i>	Rufoustreepie	Corvidae	O,C&I	Open deciduous woodland of all kinds, from dry forest to moist broadleaf woodland	Least Concern
54	<i>Corvus macrorhynchos</i>	Long-billed crow	Corvidae	O&F	Favors primary forest, in both lowlands and hills, and found more locally	Least Concern
55	<i>Phaenicophaeus viridirostris</i>	Blue faced malkoha	Cuculidae	I, C&F	Secondary woodland, thorn scrub and bush, especially with <i>Euphorbia antiquorum</i> .	Least Concern
56	<i>Centropus sinensis</i>	Greater coucal	Cuculidae	C&I	Secondary forest, tall grassland, thickets, bamboo, scrub near cultivation and paddy fields	Least Concern
57	<i>Taccocua leschenaultii</i>	Sirkeer Malkoha	Cuculidae	I, C & F	Dry deciduous secondary forest, scrub and bush, with undergrowth of lantana and thick grass, thorn.	Least Concern
58	<i>Clamator jacobinus</i>	Jacobin cuckoo	Cuculidae	I	Open woodland and scrub, dry thorn savanna, thorny jungle, plains.	Least Concern
59	<i>Eudynamis scolopaceus</i>	Asian koel	Cuculidae	I&F	Open forest, coastal swamp forest, edge and scrub, gallery forest, riverside scrub, plantations	Least Concern
60	<i>Dicrurus macrocercus</i>	Black drongo	Dicruridae	I	Mostly open country and farmland with scattered trees; very common also in villages and suburbs	Least Concern
61	<i>Emberiza buchanani</i>	Grey-necked bunting	Emberizidae	G	Dry, rocky mountainsides, ravines and upland plateau, with grassy clumps and weedy vegetation	Least Concern
62	<i>Lonchura malabarica</i>	Indian silverbill	Estrildidae	G&I	Open country, semi-desert and scrub, open dry woodland, cultivated areas, and towns and villages	Least Concern
63	<i>Lonchura punctulata</i>	Scaly breasted munia	Estrildidae	G	Grassland with bushes, trees and scrub, scrubby mangroves, coastal landfill, and rice fields	Least Concern
64	<i>Amandava amandava</i>	Red avadavat	Estrildidae	I	Grassland, low marshy plains, damp grass, reeds, rice fields, sugar-cane fields	Least Concern
65	<i>Falco tinnunculus</i>	Common kestrel	Falconidae	C	Adaptable to great variety of open or moderately wooded terrains, normally with herbaceous	Least Concern
66	<i>Halcyon smymensis</i>	White breasted kingfisher	Halcyonidae	I	Uses wide variety of habitats: dams, ponds, canals, creeks, swamps, mudflats	Least Concern
67	<i>Hirundo rustica</i>	Barn sparrow	Hirundinidae	I	cultivation, human habitations	Least Concern
68	<i>Cecropis daurica</i>	Red-rumped swallow	Hirundinidae	I	Open hilly country and mountains, river gorges, valleys, sea cliffs, cultivation, and human dwellings	Least Concern
69	<i>Ptyonoprogne concolor</i>	Dark crag martin	Hirundinidae	I	Mountains, crags and coastal cliffs; also around human habitations	Least Concern
70	<i>Lanius vittatus</i>	Bay-backed shrike	Laniidae	I	Variety of open, dry bushy areas with scattered trees, also cultivated areas	Least Concern
71	<i>Lanius schach</i>	Long tailed shrike	Laniidae	I	Open country with scrub, light woodland and bushes, mainly in cultivated areas, also steppe areas	Least Concern
72	<i>Lanius meridionalis</i>	Southern grey shrike	Laniidae	I	Fairly open country dotted with thorny bushes in dry and warm, sunny lands	Least Concern
73	<i>Turdoides caudata</i>	Common babbler	Leiotherichidae	I	Semi-desert, dry plains, stony lower hills, xerophytic thorn scrub-jungle, scrubland, sandy locations	Least Concern
74	<i>Turdoides affinis</i>	Yellow bellied babbler	Leiotherichidae	I	Scrub, secondary growth, thorn-jungle, tamarisks, brushwood, scrub-covered eroded ravines	Least Concern
75	<i>Merops orientalis</i>	Green bee eater	Meropidae	I	Arid woodland with scattered trees on mainly bare soil or sand, and <i>Acacia</i> , <i>Commiphora</i>	Least Concern
76	<i>Terpsiphone paradisi</i>	Asian paradise flycatcher	Monarchidae	I	Wide range inhabits, deciduous mountain forest, shady and well-watered groves, light forest	Least Concern
77	<i>Anthus campestris</i>	Twany pipit	Motacillidae	I	Open dry habitats, from sand dunes, sandy heaths, dry grassland and clear-felled areas	Least Concern
78	<i>Anthus rufulus</i>	Paddy field pipit	Motacillidae	I	Open country, short grassland, paddy fields, stubble fields and cultivations, also airfields,	Least Concern
79	<i>Motacilla cinerea</i>	Grey wagtail	Motacillidae	I	Fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals	Least Concern
80	<i>Motacilla maderaspatensis</i>	White browed wagtail	Motacillidae	I	Watercourses. Favours streams and rivers, especially smooth-flowing rivers with rocks and stony	Least Concern
81	<i>Anthus hodgsoni</i>	Olive-backed pipit	Motacillidae	I	Breeds on edge of taiga, on grassy and bracken-covered slopes, rocky ground	Least Concern
82	<i>Monticola solitarius</i>	Blue rock thrush	Muscicapidae	I	Breeds on precipitous cliffs, in steep rocky valleys and defiles, ravines and gorges, on crags	Least Concern

83	<i>Saxicola caprata</i>	Pied bush chat	Muscicapidae	I	Open terrain with some low to mid-height vegetation	Least Concern
84	<i>Copsychus saularis</i>	Oriental magpie robin	Muscicapidae	I	Dry deciduous forest but preferring presence of shady evergreen trees, disturbed peat swamp-forest	Least Concern
85	<i>Phoenicurus ochruros</i>	Black redstart	Muscicapidae	I	Sparsely vegetated rocky areas, including stony slopes with xerophytic vegetation	Least Concern
86	<i>Saxicola maurus</i>	Siberian stonechat	Muscicapidae	I	Open, usually rather barren landscapes.	Least Concern
87	<i>Muscicapa dauurica</i>	Asian brown flycatcher	Muscicapidae	I	Lowland open temperate and subtropical mature and secondary broadleaf forests, secondary.	Least Concern
88	<i>Ficedula parva</i>	Red breasted flycatcher	Muscicapidae	I	Woodland, mainly mixed deciduous forest	Least Concern
89	<i>Cinnyris asiaticus</i>	Purple sunbird	Nectariniidae	I&N	Usually around flowering shrubs and trees in dry and deciduous forests, thorn-scrub, cultivation.	Least Concern
90	<i>Leptocoma zeylonica</i>	Purple-rumped sunbird	Nectariniidae	I&N	Various types of forest and jungle, including secondary forest, at forest edge	Least Concern
91	<i>Passer domesticus</i>	House sparrow	Passeridae	G	Primarily associated with man, living around buildings from isolated farms to urban centers	Least Concern
92	<i>Phalacrocorax niger</i>	Little cormorant	Phalacrocoracidae	C	Chiefly occupies bodies of fresh water in lowlands, including ponds, rivers, lakes, swamps, canals	Least Concern
93	<i>Pavo cristatus</i>	Indian peafowl	Phasianidae	O	Open forest	Least Concern
94	<i>Francolinus pondicerianus</i>	Grey francolin	Phasianidae	G	Grassland and semi-thorny scrub; dry rolling plains and plateau, especially in areas near village.	Least Concern
95	<i>Dinopium benghalense</i>	Black-rumped flame back	Picidae	I	All types of moist to dry woodland, mostly deciduous; open woodland and light forest	Least Concern
96	<i>Ploceus philippinus</i>	Baya weaver	Ploceidae	G	Grassland, scrub with scattered trees, mangroves and cultivated areas	Least Concern
97	<i>Tachybaptus ruficollis</i>	Little grebe	Podicipedidae	I	Wide range of wetlands, normally small and shallow, including small lakes, ponds, canals;	Least Concern
98	<i>Psittacula krameri</i>	Rose-ringed parakeet	Psittaculidae	F	Chiefly deciduous habitats ranging from semi-desert to light secondary jungle, mainly in lowlands	Least Concern
99	<i>Pterocles Indicus</i>	Painted sand grouse	Pteroclididae	G	Bare foothills and plateau, sparsely covered with scrub or thorn bushes of <i>Acacia</i> spp	Least Concern
100	<i>Pterocles exustus</i>	Chestnut bellied sand grouse	Pteroclididae	G	Typically inhabits bare semi-desert, often with scattered thorny scrubs or trees, e.g. <i>Acacia</i> .	Least Concern
101	<i>Pycnonotus cafer</i>	Red vented bulbul	Pycnonotidae	G,F &N	Drier deciduous woodland, sparse secondary forest, scrub, orchards and gardens,	Least Concern
102	<i>Pycnonotus luteolus</i>	White-browed bulbul	Pycnonotidae	F&I	Open and largely cultivated habitats. Occurs in dry woodland edge, second growth, scrub land	Least Concern
103	<i>Himantopus himantopus</i>	Common stilt	Recurvirostridae	I	Near water and wet lands	Least Concern
104	<i>Saxicoloides fulicatus</i>	Indian robin	Saxicoloides	I	Palm groves, bare hillsides, open rocky places, newly burnt clearings, cultivated fields	Least Concern
105	<i>Tringa Ochropus</i>	Green sandpiper	Scolopacidae	I	Damp wooded areas	Least Concern
106	<i>Actitis hypoleucos</i>	Common sandpiper	Scolopacidae	I	Prefers margins of water bodies, mostly riverbanks, preferably with pebbles, sand or rocks	Least Concern
107	<i>Bubo bubo</i>	Eurasian eagle owl	Strigidae	C	Mostly inhabits areas of sparse human settlement or of topographically inaccessible terrain	Least Concern
108	<i>Athene brama</i>	Spotted owlet	Strigidae	I	Towns, agricultural fields, open forest, desert and semi-desert, and mango groves,	Least Concern
109	<i>Acridotheres tristis</i>	Common myna	Sturnidae	I	Open country, avoiding forest; dry open woodland, floodplains, grasslands, cultivated areas	Least Concern
110	<i>Sturnia pagodarum</i>	Brahminy starling	Sturnidae	I&F	Open deciduous forest, scrub, and cultivated areas near human habitation;	Least Concern
111	<i>Pastor roseus</i>	Rosy starling	Sturnidae	I	pen steppes where orthopterans (locusts and other grasshoppers) abundant	Least Concern
112	<i>Sylvia curruca</i>	Lesser white throat	Sylviidae	I	open country or near forests in wide range of habitats rich in dense	Least Concern
113	<i>Sylvia althaea</i>	Hume's white throat	Sylviidae	I	Broadleaf woodland	Least Concern
114	<i>Chrysomma sinense</i>	Yellow eyed babbler	Sylviidae	I	Scrub, secondary growth, thorn-jungle, tamarisks, brushwood, scrub-covered eroded ravines,	Least Concern
115	<i>Tephrodornis pondicerianus</i>	Common woodshrike	Tephrodornithidae	I	Open forest, dry deciduous forest, secondary growth, bamboo forest, woodland, scrub, orchards	Least Concern
116	<i>Threskiornis melanocephalus</i>	Black headed ibis	Threskiornithidae	C	Open country in marshes, swamps, flooded areas, margins of rivers and lakes, paddy fields and fallow.	Least Concern
117	<i>Dumetia hyperythra</i>	Tawny-bellied warbler	Timaliidae	G	Tall moist grasslands, rolling grassy hillsides, also roadside patches of grassland	Least Concern
118	<i>Turnix suscitator</i>	Barred button quail	Turnicidae	I	Grassland (mainly <i>Imperata</i> in peninsular Malaysia), crops (including sugarcane and maize	Least Concern
119	<i>Upupa epops</i>	Eurasian hoopoe	Upupidae	I	Open country such as pastures, parkland, orchards, sand-heath land, olive groves, vineyards	Least Concern

*C- Carnivores, F- Frugivore, G- Granivore, I-Insectivore, N- Nectarivore, O- Omnivore

Table 2: Guild wise number of the bird species found at the study area

Bird's Habit	Number
Carnivores	22
Omnivore	01
Insectivore	78
Frugivore	16
Granivore	21
Nectarivore	07

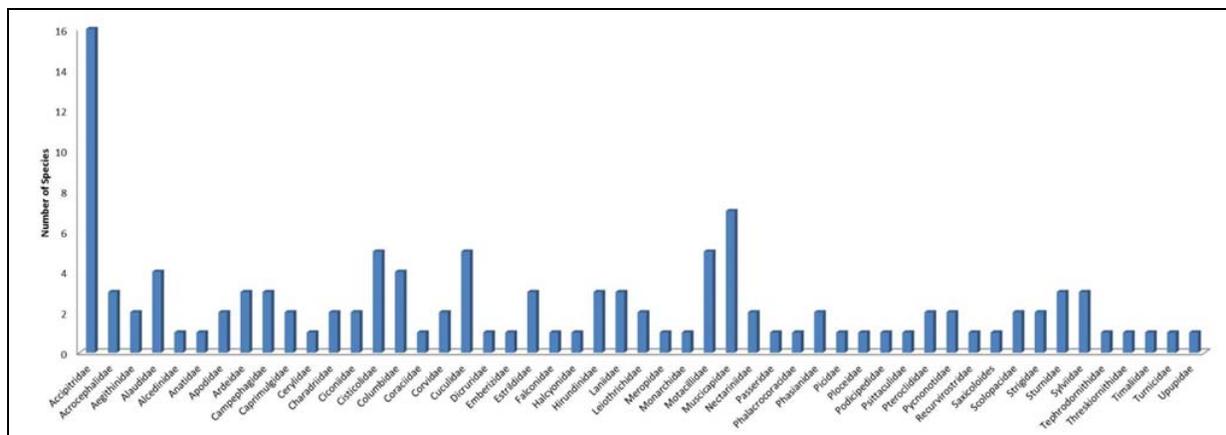


Fig 3: Avian faunal diversity among various families.

4. Discussion

Windmill establishment area of Chillavaripalli and Ellutla Reserve forest that has a total forest area of 12280 Ha, is 13.52% of total land usage. The remaining land has been

converted into agricultural land, which spreads over 9012 Ha of 35.93%. Human settlements has been occupied by 146 Ha of 0.58% (Table 3 & Fig 4).

Table 2: LULC changes from 1995 to 2016

LULC classes	1995		2016		Area change (ha)
	Area (ha)	Area (%)	Area (ha)	Area (%)	
Agriculture	6758	26.94	9012	35.93	2254
Open land	3959	15.78	3391	13.52	-568
Forest	14042	55.98	12280	48.95	-1762
Settlement	48	0.19	146	0.58	98
Water	63	0.25	59	0.24	-4
River	215	0.86	197	0.79	-18
Total	25085	100.00	25085	100.00	

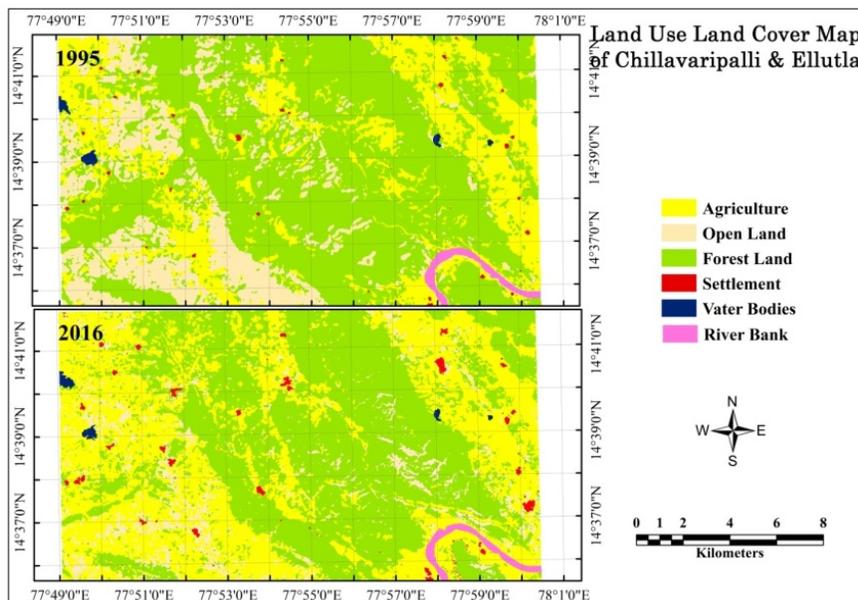


Fig 4: Land use and Land cover (1995 and 2016) change map of study area

Most of the forest vegetation type is southern tropical thorn forest comprising of stunted trees with no deep-rooted system and shrub species like *Randia dumetorum*, *Gymnosporia montana*, *Gmelina asiatica*, *Zizyphus nummularia*, *Ixora arborea* etc., *Acacia chundra*, *Cadaba fruticosa*, *Carissa carandas*, *Cassia auriculata*, *Dichrostachys cinerea*, *Euphorbia antiquorum*, *Dolichandrone sp*, *Dichrostachys cinerea*, *Acacia ferruginea*, *Acacia planifrons*, *Acacia torta*, *Acacia horrida*, *Zizyphus glabrata*. The study area habitat is not conducive for many species and hence only 44 families had been reported, that comprises of only a couple of species from each family. The highest diversity was of insectivorous bird with 78 species, followed by carnivores' with 22 bird species and 21 bird species of granivore were reported. 11 wet land bird species were observed, those are commonly observed during monsoon and post monsoon period. It was observed that these wetland birds rely on paddy fields and stagnated water bodies like check dams and trenches during post monsoon period. Majority of the bird species reported in the checklist are common and are usually seen in other similar areas of Indian subcontinent. Egyptian vulture is an endangered bird, which is a rare category of its frequency in the open areas of the windmill establishment. In the present study predominant number of insectivorous bird species have been reported from agricultural lands, which are considered as key stone species and play a significant role in pest control keeping a delicate balance of pests that affect crop production in the surrounding agricultural lands which occupies a major portion in the proposed landscape. Insects are major pests, which occur perennially and cause serious and persistent economic damage in an ecosystem in the absence of effective control measures. According to Ali (1990) [12], caterpillars, large insects, lizards, young mice and birds eggs and nestlings are the food of Crow pheasant. Ali and Ripley (1994), Shrestha (2001) [13-15], have studied the feeding behavior and its role in pest control. It was observed during field surveys that crabs, which are typically destructive to paddy, were eaten by House crow (*Corvus splendens*). Furthermore, many birds like Cattle egret (*Bubulcus ibis*), Crow pheasant (*Centropus sinensis*), Small green bee eater (*Merops orientalis*), Blue-tailed bee eater (*Merops philippinus*), Common myna (*Acridotheres tristis*), Bank myna (*Acridotheres ginginianus*), Indian tree pie (*Dendrocitta vagabunda*), House crow (*Corvus splendens*) and Red-vented bulbul (*Pycnonotus cafer*) feed on Grasshopper abating its swarming population in the study areas. Many species of insect moths were also controlled by Magpie robin (*Copsychus saularis*), Black drongo (*Dicrurus adsimilis*) and Jungle babbler (*Turdoides striatus*). Weevils were eaten by Indian treepie (*Dendrocitta vagabunda*). Large-pied wagtail (*Motacilla maderaspatensis*) was found to control the aphid. Owl, House crow (*Corvus splendens*) and Jungle crow (*Corvus macrorhynchos*) abate the more destructive pest like rats and mice in agriculture fields. Deforestation, hunting, forest fires, biotic stress due to feeding of grazing animals, indiscriminate use of pesticides in agricultural fields was also observed which may affect the feeding habit of insectivore birds that control pest population.

5. Conclusion

The outcomes of the present study emphasize the importance of dry region as a preferred habitat for birds. If the habitats of avian fauna and vegetation pattern are well maintained, the diversity of birds may increase in this study area. This study will also add to future efforts in understanding the mutualistic

interaction between birds and various vegetation types or plant species. The present investigation is a comprehensive study and further studies are appreciable for impact assessment and to continue to update this checklist on avian fauna from Chillavaripalli and Ellutla reserve forest.

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