

## Research Article

# Long monitoring of Birds of Elssuki Area. Sinnar State, Sudan

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## Abstract

This study aims to make a database of the birds in the area of Elssuki, Sinnar state - Sudan. The period of study spanning from 2008 to 2023 with a mix of methods used to identify bird species in many sites in the locality, these methods include road count, line transects, and direct count besides registering every strange, rare, or unusual single species seen in the area. All these methods are used by different researchers and applied in such studies in Sudan.

The study revealed that the area is one of the important areas enriched of birds in Sinnar state of 19 orders 53 families. The total number of species is 129 species. It included all birds; water birds, tree birds, diving birds, dabbling birds, swimming birds, small waders, and passerines which the most.

The study concluded that there is a need for comprehensive and regular studies and short and long-term monitoring to identify, classify, and establish a database for Sudan Birds Atlas.

## Introduction

Birds are considered as one of the important ecosystem components and also as an environmental indicator. Blair RB [1]. Due to their sensitivity to pollution in both terrestrial and aquatic ecosystems, bird populations are used as indicators of pollution [2,3]. Monitoring birds and their population diversity can ensure long-term survival through a better understanding of applying methods of conservation measures Caughley. G [4].

The Avifauna of Sudan is not exactly determined but varies between authors. The most reliable study which is a reference base for Sudan is of Nikolous 1987 [5], who stated bird's species 750 species.

Sudan is located on the main routes used by migratory birds from three continents (Europe, Asia, and Africa). The importance of Sudan for migratory birds using these routes is in; food providing, water, and resting sites during their journey [6].

In Sudan, there are no comprehensive national studies of birds covering the country with the exception of two old ones; Cave and Macdonald [7] recorded 971 species of birds, and Nikolaus [5] listed more than 750 species. The rest updated studies are fragmented and fewer studies are focused on the diversity of birds while some authors tend to study single species.

Sinnar state is considered one of the most important states in bird's richness. During his study about reptiles, Eldigair [8] found that the number of bird species in the Elssuki locality during the wet season has a strong correlation with the number of trees that increased southwards, and there is relationship between the birds' richness and some other factors such as birds' migration, number of small mammals that birds used to feed on beside herbs availability.

Hussien MEAE in 2018 [9], studied the diversity of water birds in some wetlands of Sinnar state He mentioned some important sites in Elssuki locality and their richness of birds. In 2021, he mentioned the area of Essuki is the wintering ground for the Demesell crane [9].

Studying bird diversity can provide a database for researchers and academic institutions to collect data to make an updated list of birds of Sudan. Data availability enabled decision-makers in strategic planning, and set up priority and future conservation measures.

Essuki area is a suitable site for studying birds of its diverse habitat comprising wetlands along the Blue Nile, forest, Agricultural land with a web of canal irrigation, and bare lands. The most important features are the Dindir National Park in the Southwest and the Sinnar Dam reservoir in the North.

### More Information

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Submitted: January 25, 2024

Approved: April 15, 2024

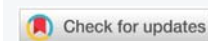
Published: April 16, 2024

How to cite this article: Hussien MEA. Long monitoring of Birds of Elssuki Area. Sinnar State, Sudan. Insights Vet Sci. 2024; 8: 001-011.

DOI: 10.29328/journal.ivs.1001040

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Keywords: Essuki; Richness; Monitoring; Endemic; Migratory; Habitat





## Objectives

1. To make a database of bird species for the area of Essuki state.
2. To build up information and data to be used further in the future for the whole Sinnar state.
3. To support and aid academic institutions and research centers and students for a better understanding of classification.
4. Data will be available for governmental agencies and corporations to make strategic plans for wetland management, and exploring Important Bird Area (IBA) in the region and Sudan.

## Study area

Elssuki area is located at the Eastern bank of the Blue Nile, Southeast of Sinnar state, N 13 31 67 E 33 8833, its elevation is 399 meters above sea level and its population amounts to 33,524. It is located in the poor Savannah zone (Figure 1). It is dominated by a tropical climate, the mean annual rainfall is 400 mm - 500 mm, and the temperature is 37 °C - 40 °C.

Elsuki locality (Manucibility) includes three management units; Elssuki, Karkoog, and Allakandi. The capital of the area is Essuki town about 339 km from Kahrtoon and 43 km from Sinnar Dam.

The area is famous for its soil fertility which includes Wifag Agricultural Company with an area of 7560 hectares (2500 feddan) about 7500 are horticultural areas on the Blue Nile. The irrigation system is gravity-fed using pumped water from the Blue Nile. The irrigation system consists of main and major, the main canal length is 21.09 km and 12 m width. The number of majors is 15 canals the length of all these canals is 55 km and 6 m wide, along the sub-length Fath elrahman Mahamoud 2019 [10].

## Materials and methods

### The methods used in this study

**Line transect:** This method is commonly used in Sudan by many scientists, from certain points four lines are determined, and two lines are chosen randomly, each line is one kilometer long, and the birds are counted using a telescope and binoculars on each side. The line transect method is used in an open and huge area that is unable to cover, where a sample is taken to represent the whole area.

**Direct count:** A famous method that is used in Sudan where specific and open areas are suitable in wetlands. They can cover as a whole or take percentages according to the number of team members, distance, time, and equipment.

Daily checklist registering for each new bird around.

Each method was used where necessary according to the site.

Materials used in this study are Telescope, Biangular, and GPS.

Site locations are given below in Table 1.

## Results and discussion

The diversity of birds of Sudan is mainly attributed to the habitat diversity and Sinnar state is not out of this rule. The availability of food, water, and cover comprise major factors in bird distribution and diversity. Overall species representing 19 orders belong to 53 families that include 128 species (Tables 1,2). The higher number of species is in the order Passeriformes, Charadriiformes, and Ciconiiformes respectively (Table 3, Figure 2).

Compared with the past studies of Nicklaus 1987 and Macleay 1969 the migration pattern and the range distribution of each species are questionable for many species and no doubt some of them may extend their range southwards from where more water sources and abundance of food (Table 4).

Key:

Accidental A species that rarely or accidentally occurs in Sudan.

Endemic A species endemic to Sudan.

Introduced A species introduced to Sudan as a consequence, direct or indirect, of human actions.

Reg: A species that is a regular or seasonal migrant

The order Passeriformes has the highest number of species recorded 37 distributing to 18 families, while the order Charadriiformes has 28 species consisting of 8 families, Ciconiiformes possesses a high species number of most important birds in the area stork's families are 3 and species

**Table 1:** Location of the studied sites.

No	Name	Coordination
1	Gladeema	N:13.341833 E:33.742517
2	Ronga	N:13.288818 E:33.89012
3	Allah maana	N:13.259289 E:33.0926969
4	Homrani	N:13.304017 E:33.8746
5	Elssuki irrigation pump	(E:03352351 N:1319302
6	Khor elfeel	N:13.418435 E: 33.833313
7	Faculty of natural resources and environmental studies	N:13.329812 E:33896299
8	Abbasia forest	N:13.407000 E:33.92919
9	Karkoog	N:12944618 E:34013057
Roads		
10	Elssuki - Wad elaiies road	N:13112518 E:33989951 N:13.112518 E: 33989951
11	Essuki Monhaza	N:13.331384 E: 33.881039 N:13.23323 E:33:49293
12	Elssuki -Monhaza Hamadna Allah road	N:13.331384 E: 33.881039 N:13. 23383 E:33.49160 N:1343655 E:33776410
13	Elssuki - Terara road	N:13324446 E: 33.8727 N:13. 313 222 E: 3383783



**Table 2:** Birds species at Elssuki area 2008 - 2023.

No	Order	Family	Species	Scientific name
<b>Grebes</b>				
1	Podicipediformes	Podicipedidae	Little grebe	<i>Tachybaptus ruficollis</i>
<b>Cormorants</b>				
2	Pelicaniformes	Phalacrocoracidae	Long tailed cormorant	<i>Phalacrocorax africanus</i>
<b>Darters</b>				
3	Pelicaniformes	Anhingidae	African darter	<i>Anhinga melanogaster</i>
<b>Hérons, Egrets</b>				
4	Ciconiiformes	Ardeidae	Black-headed Heron	<i>Ardea menocephala</i>
5	Ciconiiformes	Ardeidae	Grey heron	<i>Ardea cinerea</i>
6	Ciconiiformes	Ardeidae	Squacco heron	<i>Ardeola ralloides</i>
7	Ciconiiformes	Ardeidae	Purple heron	<i>Ardea purpurea</i>
8	Ciconiiformes	Ardeidae	Black crown night heron	<i>Nycticorax Nycticorax</i>
9	Ciconiiformes	Ardeidae	Goliath Heron	<i>Ardea goliath</i>
10	Ciconiiformes	Ardeidae	Striated Green-backed heron	<i>Butorides striatus</i>
11	Ciconiiformes	Ardeidae	Great white egret	<i>Aegretta alba</i>
12	Ciconiiformes	Ardeidae	Little egret	<i>Egretta grazetta</i>
13	Ciconiiformes	Ardeidae	Cattle egret	<i>Bubulcus ibis</i>
14	Ciconiiformes	Ardeidae	Yellow billed egret	<i>Mesophoyx intermedia</i>
<b>Ibis, Spoons bill</b>				
15	Ciconiiformes	Threskiornitidae	Sacred ibis	<i>Threskiornis aethiopicus</i>
16	Ciconiiformes	Threskiornitidae	Glossy ibis	<i>Plegadis falcinellus</i>
17	Ciconiiformes	Threskiornitidae	African spoon bill	<i>Platela alba</i>
18	Ciconiiformes	Threskiornitidae	Eurasian spoon bill	<i>Platela leucorodia</i>
<b>Storks</b>				
19	Ciconiiformes	Ciconiidae	Abdim's Stork	<i>Ciconia abdimii</i>
20	Ciconiiformes	Ciconiidae	Yellow billed Stork	<i>Mysteria ibis</i>
21	Ciconiiformes	Ciconiidae	African Open billed stork	<i>Anastomus lamilligrus</i>
22	Ciconiiformes	Ciconiidae	Marabou stork	<i>Leptoptilus crumeniferus</i>
23	Ciconiiformes	Ciconiidae	White stork	<i>Ciconia ciconia</i>
<b>Ducks , geese</b>				
24	Anseriformes	Anatadae	Fulvous whistling duck	<i>Dendrocygna bicolor</i>
25	Anseriformes	Anatadae	Garganey	<i>Anas querquedula</i>
26	Anseriformes	Anatadae	Northern shoveller	<i>Anas cyepeata</i>
27	Anseriformes	Anatadae	Comb (Knobbed) billed duck	<i>Sarkidiornis melanotos</i>
28	Anseriformes	Anatadae	Spur winged Goose	<i>Plectropterus gambensis</i>
29	Anseriformes	Anatadae	Eurasian Widgeon	<i>Anas Penelope</i>
30	Anseriformes	Anatadae	Northern Pintail	<i>Anas acuta</i>
<b>Cranes</b>				
31	Gruiformes	Gruidae	Demosell Crane	<i>Anthropoides vigo</i>
<b>Waders</b>				
32	Charadriiformes	Scolopacidae	Common sandpiper	<i>Tringa hypoleucos</i>
33	Charadriiformes	Scolopacidae	Green sand piper	<i>Tringa ochropus</i>
34	Charadriiformes	Scolopacidae	Wood sandpiper	<i>Tringa glareola</i>
35	Charadriiformes	Scolopacidae	Marsh sand piper	<i>Circus aeruginosus</i>
36	Charadriiformes	Scolopacidae	Temminck's Stint	<i>Calidris temminckii</i>
37	Charadriiformes	Scolopacidae	Little Stint	<i>Clidris minuta</i>
38	Charadriiformes	Scolopacidae	Ruff	<i>Philomachus pugnax</i>
39	Charadriiformes	Scolopacidae	Black tailed Godwit	<i>Limosa limosa</i>
40	Charadriiformes	Scolopacidae	Common red Shank	<i>Tringa totanus</i>
41	Charadriiformes	Scolopacidae	Spotted red Shank	<i>Tringa erythropus</i>
42	Charadriiformes	Scolopacidae	Common snipe	<i>Gallinago gallinago</i>
43	Charadriiformes	Scolopacidae	Greater Snipe	<i>Gallinago media</i>
<b>Plovers, Courses, Pratincols</b>				
44	Charadriiformes	Charadriidae	Spur winged plover	<i>Vannellus spinosus</i>
45	Charadriiformes	Charadriidae	Common ringed plover	<i>Charadris hiaticola</i>
46	Charadriiformes	Charadriidae	Little ringed plover	<i>Charadrius dubius</i>
47	Charadriiformes	Charadriidae	Kitlittiz's Plover	<i>Charadrius pecuarius</i>
48	Charadriiformes	Charadriidae	Black-headed lapwing	<i>Vannellus tectus</i>
49	Charadriiformes	Charadriidae	Kentish Plover	<i>Charadrius alexandrinus</i>
50	Charadriiformes	Glareolidae	Egyption plover	<i>Pluvianus Aegyptus</i>



51	Charadriiformes	Glareolidae	Cream coloured courses	<i>Cusorius curser</i>
52	Charadriiformes	Glareolidae	Black winged pratincole	<i>Glareola nordmanni</i>
<b>Painted snipes</b>				
53	Charadriiformes	Rostratulidae	Painted snipe	<i>Rostratula benghalensis</i>
<b>Jacanas, Stilts</b>				
54	Charadriiformes	Jacanidae	African jacana	<i>Actophilornis Africana</i>
55	Charadriiformes	Recuvirostiridae	Black-winged Stilt	<i>Himantopus himantopus</i>
<b>Thicknees</b>				
56	Charadriiformes	Burhinidae	Senegal Thicknee	<i>Burhinus senegalensis</i>
<b>Terns</b>				
57	Charadriiformes	Sterninae	White winged tern	<i>Chlidonias leucoptera</i>
58	Charadriiformes	Sterninae	whiskered Tern	<i>Chlidonias hybridus</i>
59	Charadriiformes	Sterninae	Gull bill Tern	<i>Gelochelidon Nilotic</i>
<b>Doves</b>				
60	Columbiformes	Columbidae	African moorning dove	<i>Streptopelia decipience</i>
61	Columbiformes	Columbidae	Laughing dove	<i>Streptopelia senegalensis</i>
62	Columbiformes	Columbidae	Speckled pigeon	<i>Columba guinea</i>
63	Columbiformes	Columbidae	Namaqua dove	<i>Oena capensis</i>
<b>Birds of prey</b>				
64	Falconiformes	Acciptiridae	Black Kite	<i>Milvans migrans</i>
65	Falconiformes	Acciptiridae	African marsh harrier	<i>Circus ranivorus</i>
66	Falconiformes	Acciptiridae	Pallid Harrier	<i>Circus macrourus</i>
67	Falconiformes	Acciptiridae	Lizzard buzzard	<i>Kaupifalco monogramicus</i>
68	Falconiformes	Acciptiridae	Dark chanting goshawk	<i>Melierax metabates</i>
69	Falconiformes	Falconidae	Common kestrel	<i>Falco tinnunculus</i>
70	Falconiformes	Falconidae	Lesser kestrel	<i>Falco naumanni</i>
<b>Owls</b>				
71	Strigiformes	Strigidae	Little owl	<i>Athene noctua</i>
<b>Sand grouse</b>				
72	Pterocliiformes	Pterocliidae	Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i>
<b>Horn bills</b>				
73	Coraciiformes	Bucerotidae	African grey horn bill	<i>Tockus fasciatus</i>
74	Coraciiformes	Upupidae	Eurasian Hoopoe	<i>Upupa epops</i>
<b>Rollers, Scimitar bills</b>				
75	Coraciiformes	Coraciidae	Abyssinain roller	<i>Coracias abyssinica</i>
76	Coraciiformes	Phoeniculidae	Black scimitar bill	<i>Rhinopomastus aterrimus</i>
<b>Kingfishers</b>				
77	Coraciiformes	Alcedinidae	Pied kingfisher	<i>Ceryle rudis</i>
78	Coraciiformes	Alcedinidae	Malakite king fisher	<i>Alcedo cristata</i>
79	Coraciiformes	Alcedinidae	Gaint kingfisher	<i>Megaceryle maxima</i>
80	Coraciiformes	Alcedinidae	Wood land kingfisher	<i>Halcyon senegalensis</i>
<b>Bee eaters</b>				
81	Coraciiformes	Meropidae	Little bee-eater	<i>Merops pussilus</i>
82	Coraciiformes	Meropidae	Northern carmine bee-eater	<i>Merops nubicoides</i>
<b>Woodpeckers, Barbets</b>				
83	Piciformes	Picidae	Nubian wood pecker	<i>Comphathera nubica</i>
84	Piciformes	Capitonidae	Yellow-breasted barbet	<i>Trachyphonus margaritatus</i>
<b>Quails</b>				
85	Phasianiformes	Phasianidae	Common Quail	<i>Coturnix coturnix</i>
<b>Coucal</b>				
86	Cuculiformes	Cuculidae	Senegal Coucal	<i>Centropus senegalensis</i>
<b>Parkeets</b>				
87	Psittaciformes	Psittacidae	Rose-ringed Parkeet	<i>Psittacula krameri</i>
<b>Mouse birds</b>				
88	Colliiformes	Colliidae	Blue napped mouse Bird	<i>Urocolius macrourus</i>
<b>Nightjars</b>				
89	Caprimulgiformes	Caprimulgidae	Long-tailed night jar	<i>Caprimulgus climacurus</i>
<b>Swift</b>				
90	Apodiformes	Apodidae	Little Swift	<i>Apus affinis</i>
91	Apodiformes	Apodidae	Pallid swift	<i>Apus pallidus</i>
<b>Passerines: Shrikes</b>				
92	Passeriformes	Laniidae	Lesser grey Shrike	<i>Lanius minor</i>



93	Passeriformes	Laniidae	Southern grey shrike	<i>Lanius meridionalis</i>
94	Passeriformes	Laniidae	Wood chat shrike	<i>Lanius senator</i>
95	Passeriformes	Laniidae	Soa' tome (newton) fiscal	<i>Lanius newtoni</i>
<b>Swallows</b>				
96	Passeriformes	Hirundinidae	Barn Swallow	<i>Hirundo rustica</i>
97	Passeriformes	Hirundinidae	Ethiopian Swallow	<i>Hirundo aethiopica</i>
<b>Bulbuls</b>				
98	Passeriformes	Pycnonotidae	Black Bulbul	<i>Picnonotus barbatus</i>
<b>Oriols</b>				
99	Passeriformes	Oriolidae	African Golden Oriole	<i>Oriolus auratus</i>
<b>Drongos</b>				
100	Passeriformes	Dicruridae	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>
<b>Firefinchs</b>				
101	Passeriformes	Estrilididae	African Silver bill	<i>Lonchura cantans</i>
102	Passeriformes	Estrilididae	Cut-throated Finch	<i>Amandina fasciata</i>
103	Passeriformes	Estrilididae	Red-checked cordon Bleu	<i>Uraeginthus bengatus</i>
104	Passeriformes	Estrilididae	Red-billed Firefinch	<i>Lagonosticta senegala</i>
<b>Starlings</b>				
105	Passeriformes	Sturnidae	Long-tailed Starling	<i>Lamprotornis caudatus</i>
106	Passeriformes	Sturnidae	Ruppel's starling	<i>Lamprotornis purpuropterus</i>
107	Passeriformes	Sturnidae	Wattled Starling	<i>Creatophora cinerea</i>
108	Passeriformes	Sturnidae	Lesser Blue-eared Glossy-Starling	<i>Lamprotornis chloropterus</i>
<b>Gonoleks</b>				
109	Passeriformes	Malaconotidae	Black-headed Gonolek	<i>Laniarius erythrogaster</i>
<b>Larks</b>				
110	Passeriformes	Alaudidae	Crested lark	<i>Galerida cristata</i>
111	Passeriformes	Alaudidae	Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>
<b>Wheatear</b>				
112	Passeriformes	Muscicapidae	Iseblin wheatear	<i>Oenanthe isabellina</i>
113	Passeriformes	Muscicapidae	Pied wheatear	<i>Oenanthe pleschanka</i>
114	Passeriformes	Muscicapidae	Winchat	<i>Saxicola ruberta</i>
115	Passeriformes	Muscicapidae	Black Scrub-Robin	<i>Cercotrichas podobe</i>
<b>Warblers</b>				
116	Passeriformes	Sylviidae	Black cap	<i>Sylvia atricapilla</i>
117	Passeriformes	Sylviidae	Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>
<b>Sunbirds</b>				
118	Passeriformes	Nectariniidae	Beautiful sun bird	<i>Cinnyris pulchellus</i>
<b>Weavers</b>				
119	Passeriformes	Plocidae	Northern masked weaver	<i>Ploceus taeniopterus</i>
120	Passeriformes	Plocidae	Village weaver	<i>Ploceus cucullatus</i>
121	Passeriformes	Plocidae	Northern masked weaver	<i>Ploceus taeniopterus</i>
122	Passeriformes	Ploceidae	Red Bishop	<i>Euplectes orix</i>
<b>Indigo birds, Whydahs</b>				
123	Passeriformes	Viduidae	Village indigobird	<i>Vidua calybeata</i>
124	Passeriformes	Viduidae	Sahel Paradise-Whydah	<i>Vidua orientalis</i>
<b>Sparrows</b>				
125	Passeriformes	Passeridae	House sparrow	<i>Passer domesticus</i>
<b>Wagtails</b>				
126	Passeriformes	Motacilidae	African pied wagtail	<i>Motacilla alba</i>
127	Passeriformes	Motacilidae	Yellow wagtail	<i>Motacilla flava</i>
<b>Robin, Babblers, Camaropteras</b>				
128	Passeriformes	Timaliidae	White-rumped Babbler	<i>Turdoides leucopygius</i>
129	Passeriformes	Cisticolidae	Green-backed Camaroptera	<i>Camaroptera brachyuran</i>



**Table 3:** Orders and families representative.

No	Orders	Number of Families	Number of species
1	Podicipediformes	1	1
2	Pelecaniformes	2	2
3	Ciconiiformes	3	20
4	Anseriformes	1	7
5	Gruiformes	1	1
6	Charadriiformes	8	28
7	Falconiformes	2	7
8	Columbiformes	1	4
9	Strigiformes	1	1
10	Ptercoliformes	1	1
11	Coraciiformes	6	10
12	Piciformes	2	2
13	Psittaciformes	1	1
14	Phasianiformes	1	1
15	Cuculiformes	1	1
16	Colliiformes	1	1
17	Caprimulgiformes	1	1
18	Apodiformes	1	2
19	Passeriformes	18	37
Total	19	53	128

**Table 4:** Migration pattern and Conservation status.

No	Species	Scientific name	Notes
1	Little grebe	<i>Tachybaptus ruficollis</i>	Endemic.Reg.
2	Long tailed cormorant	<i>Phalacrocorax africanus</i>	Endemic.Reg.
3	African darter	<i>Anhinga melanogaster</i>	Un known
4	Black headed Heron	<i>Ardea menocephala</i>	Endemic.Reg.
5	Grey heron	<i>Ardea cinerea</i>	Endemic.Reg.
6	Squacco heron	<i>Ardeola ralloides</i>	Endemic.Reg.
7	Purple heron	<i>Ardea purporea</i>	Endemic.Reg.
8	Black crown night heron	<i>Nycticorax Nycticorax</i>	Endemic.Reg.
9	Goliath Heron	<i>Ardea goliath</i>	Endemic. Unknown.
10	Striated Green backed heron	<i>Butorides striatus</i>	Endemic. Unknown
11	Great white egret	<i>Aegretta alba</i>	Endemic.Reg.
12	Little egret	<i>Egretta gazetta</i>	Endemic.Reg.
13	Cattle egret	<i>Bubulcus ibis</i>	Endemic.Reg.
14	Yellow billed egret	<i>Mesophoyx intermedia</i>	Endemic.Reg.
15	Sacred ibis	<i>Threskiornis aethiopicus</i>	Endemic.Reg.
16	Glossy ibis	<i>Plegadis falcinellus</i>	Endemic.Reg.
17	African spoon bill	<i>Platela alba</i>	Endemic.Reg.
18	Eurasian spoon bill	<i>Platela leucorodia</i>	Endemic.Reg.
19	Abdim's Stork	<i>Ciconia abdimii</i>	Endemic.Reg.
20	Yellow billed Stork	<i>Mysteria ibis</i>	Endemic.Reg.
21	African open billed stork	<i>Anastomus lamilligrus</i>	Endemic.Reg.
22	Marabou stork	<i>Leptoptilus crumeniferus</i>	Endemic.Reg.
23	White stork	<i>Ciconia ciconia</i>	Endemic.Unreg.
24	Fulvous whistling duck	<i>Dendrocygna bicolor</i>	Endemic.Reg.
25	Garganey	<i>Anas querquedula</i>	Endemic.Reg.
26	Northern shoveller	<i>Anas cyepeata</i>	Endemic.Reg.
27	Comb (Knobbed) billed duck	<i>Sarkidiornis melanotos</i>	Endemic.Reg.
28	Spur winged Goose	<i>Plectropterus gambensis</i>	Endemic.Reg.
29	Eurasian Widgeon	<i>Anas Penelope</i>	Endemic.Reg.
30	Northern Pintail	<i>Anas acuta</i>	Endemic.Reg.
31	Demosell Crane	<i>Anthropoides vigro</i>	Endemic.Reg.
32	Common sandpiper	<i>Tringa hypoleucos</i>	Endemic.Reg.
33	Green sand piper	<i>Tringa ochropus</i>	Endemic.Reg.
34	Wood sandpiper	<i>Tringa glareola</i>	Endemic.Reg.
35	Marsh sand piper	<i>Circus aeruginosus</i>	Endemic.Reg.
36	Temminck's Stint	<i>Calidris temminckii</i>	Endemic.Reg.
37	Little Stint	<i>Clidris minuta</i>	Endemic.Reg.



38	Ruff	<i>Philomachus pugnax</i>	Endemic.Reg.
39	Black tailed Godwit	<i>Limosa limosa</i>	Endemic.Reg.
40	Common red Shank	<i>Tringa tetanus</i>	Endemic.Reg.
41	Spotted red Shank	<i>Tringa erythropus</i>	Endemic.Reg.
42	Common snipe	<i>Gallinago gallinago</i>	Endemic.Reg.
43	Greater Snipe	<i>Gallinago media</i>	Endemic.Reg.
44	Spur winged plover	<i>Vannellus spinosus</i>	Endemic.Reg.
45	Common ringed plover	<i>Charadris hiaticola</i>	Endemic.Reg.
46	Little ringed plover	<i>Charadrius dubius</i>	Endemic.Reg.
47	Kitlittiz's Plover	<i>Charadrius pecuarius</i>	Endemic.Reg.
48	Black headed lapwing	<i>Vanelus tectus</i>	Endemic.Reg.
49	Kentish Plover	<i>Charadrius alexandrines</i>	Endemic.Reg.
50	Egyptian plover	<i>Pluvianus Aegyptus</i>	Endemic.Reg.
51	Cream coloured courses	<i>Cusorius curser</i>	Unknown.
52	Black winged pratincole	<i>Glareola nordmanni</i>	Endemic.Reg.
53	Painted snipe	<i>Rostratula benghalensis</i>	Accidental
54	African jacana	<i>Actophilornis Africana</i>	Endemic.Reg.
55	Black winged Stilt	<i>Himantopus himantopus</i>	Endemic.Reg.
56	Senegal Thicknee	<i>Burhinus senegalensis</i>	Endemic.Reg.
57	White winged tern	<i>Chlidonias leucoptera</i>	Endemic.Reg.
58	whiskered Tern	<i>Chlidonias hybridus</i>	Endemic.Reg.
59	Gull bill Tern	<i>Gelochelidon Nilotic</i>	Endemic.Reg.
60	African moorning dove	<i>Streptopelia decipience</i>	Endemic.Reg.
61	Laughing dove	<i>Streptopelia senegalensis</i>	Endemic.Reg.
62	Speckled pigeon	<i>Columba guinea</i>	Endemic.Reg.
63	Namaqua dove	<i>Oena capensis</i>	Endemic.Reg.
64	Black Kite	<i>Milvans migrans</i>	Endemic.Reg.
65	African marsh harrier	<i>Circus ranivorus</i>	Endemic.Reg.
66	Pallid Harrier	<i>Circus macrourus</i>	Endemic.Reg.
67	Lizzard buzzard	<i>Kaupifalco monogramicus</i>	Endemic.Reg.
68	Dark chanting goshawk	<i>Melierax metabates</i>	Endemic.Reg.
69	Common kestrel	<i>Falco tinnunculus</i>	Endemic.Reg.
70	Lesser kestrel	<i>Falco naumanni</i>	Endemic.Reg.
71	Little owl	<i>Athene noctua</i>	Unknown.
72	Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i>	Unknown
73	African grey horn bill	<i>Tockus fasciatus</i>	Endemic.Reg.
74	Eurasian Hoopoe	<i>Upupa epops</i>	Endemic.Reg.
75	Abyssinian roller	<i>Coracias abyssinica</i>	Endemic.Reg.
76	Black scimitar bill	<i>Rhinopomastus aterrimus</i>	Unknown
77	Pied kingfisher	<i>Ceryle rudis</i>	Endemic.Reg.
78	Malakite king fisher	<i>Alcedo cristata</i>	Endemic.Reg.
79	Gaint kingfisher	<i>Megaceryle maxima</i>	Endemic.Reg.
80	Wood land kingfisher	<i>Halcyon senegalensis</i>	Endemic.Reg.
81	Little bee-eater	<i>Merops pusillus</i>	Endemic.Reg.
82	Northern carmine bee-eater	<i>Merops nubicoides</i>	Endemic.Reg.
83	Nubian wood pecker	<i>Compathera nubica</i>	Endemic.Reg.
84	Yellow breasted barbet	<i>Trachyphonus margaritatus</i>	Endemic.Reg.
85	Common Quail	<i>Coturnix coturnix</i>	Endemic.Reg.
86	Senegal Coucal	<i>Centropus senegalensis</i>	Endemic.Reg.
87	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Endemic.Reg.
88	Blue napped mouse Bird	<i>Urocolius macrourus</i>	Endemic.Reg.
89	Long-tailed night jar	<i>Caprimulgus climacurus</i>	Endemic.Reg.
90	Little Swift	<i>Apus affinis</i>	Endemic.Reg.
91	Pallid swift	<i>Apus pallidus</i>	Endemic.Reg.
92	Lesser grey Shrike	<i>Lanius minor</i>	Endemic.Reg.
93	Southern grey shrike	<i>Lanius meridionalis</i>	Endemic.Reg.
94	Wood chat shrike	<i>Lanius senator</i>	Unknown
95	Soa' tome (newton) fical	<i>Lanius newtoni</i>	Unknown.
96	Barn Swallow	<i>Hirundo rustica</i>	Endemic.Reg.
97	Ethiopian Swallow	<i>Hirundo aethiopica</i>	Endemic.Reg.
98	Black Bulbul	<i>Picnonotus barbatus</i>	Endemic.Reg.
99	African Golden Oriole	<i>Oriolus auratus</i>	Accidental

100	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>	Unknown
101	African Silver bill	<i>Lonchura cantans</i>	Endemic.Reg.
102	Cut-throated Finch	<i>Amandina fasciata</i>	Endemic.Reg.
103	Red-checked cordon Bleu	<i>Uraeginthus bengatus</i>	Endemic.Reg.
104	Red-billed Firefinch	<i>Lagonosticta senegala</i>	Endemic.Reg.
105	Long-tailed Starling	<i>Lamprotornis caudatus</i>	Endemic.Reg.
106	Rupple's starling	<i>Lamprotornis purpuropterus</i>	Endemic.Reg.
107	Wattled Starling	<i>Creatophora cinerea</i>	Endemic.Reg.
108	Lesser Blue-eared Glossy-Starling	<i>Lamprotornis chloropterus</i>	Endemic.Reg.
109	Black headed Gonolek	<i>Laniarius erythrogaster</i>	Endemic.Reg.
110	Crested lark	<i>Galerida cristata</i>	Endemic.Reg.
111	Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>	Unknown
112	Iseblin wheatear	<i>Oenanthe isabellina</i>	Endemic.Reg.
113	Pied wheatear	<i>Oenanthe pleschanka</i>	Endemic.Reg.
114	Winchat	<i>Saxicola ruberta</i>	Endemic.Reg.
115	Black Scrub-Robin	<i>Cercotrichas podobe</i>	Endemic.Reg.
116	Black cap	<i>Sylvia atricapilla</i>	Accidental
117	Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>	Unknown
118	Beautiful sun bird	<i>Cinnyris pulchellus</i>	Endemic.Reg.
119	Northern masked weaver	<i>Ploceus taeniopterus</i>	Endemic.Reg.
120	Village weaver	<i>Ploceus cucullatus</i>	Endemic.Reg.
121	Red Bishop	<i>Euplectes orix</i>	Endemic.Reg.
122	Village indigobird	<i>Vidua calybeata</i>	Endemic.Reg.
123	Sahel Paradise-Whydah	<i>Viaua orientalis</i>	Endemic.Reg.
124	House sparrow	<i>Passer domesticus</i>	Endemic.Reg.
125	African pied wagtail	<i>Motacilla alba</i>	Endemic.Reg.
126	Yellow wagtail	<i>Motacilla flava</i>	Endemic.Reg.
127	White-rumped Babbler	<i>Turdoides leucopygius</i>	Endemic.Reg.
128	Green-backed Camaroptera	<i>Camaroptera brachyuran</i>	Endemic.Reg.

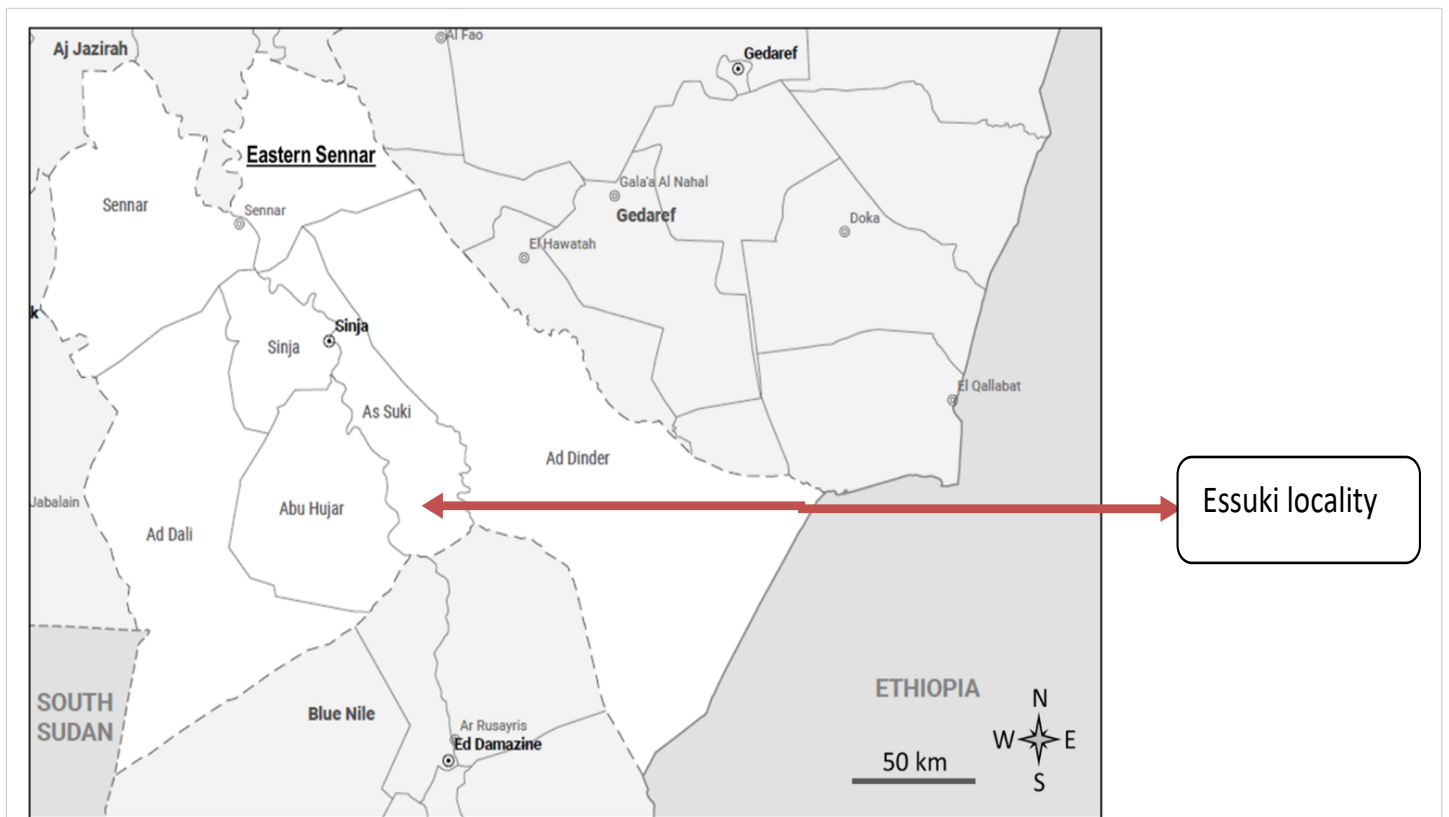


Figure 1: Sennar state administrative map [21].



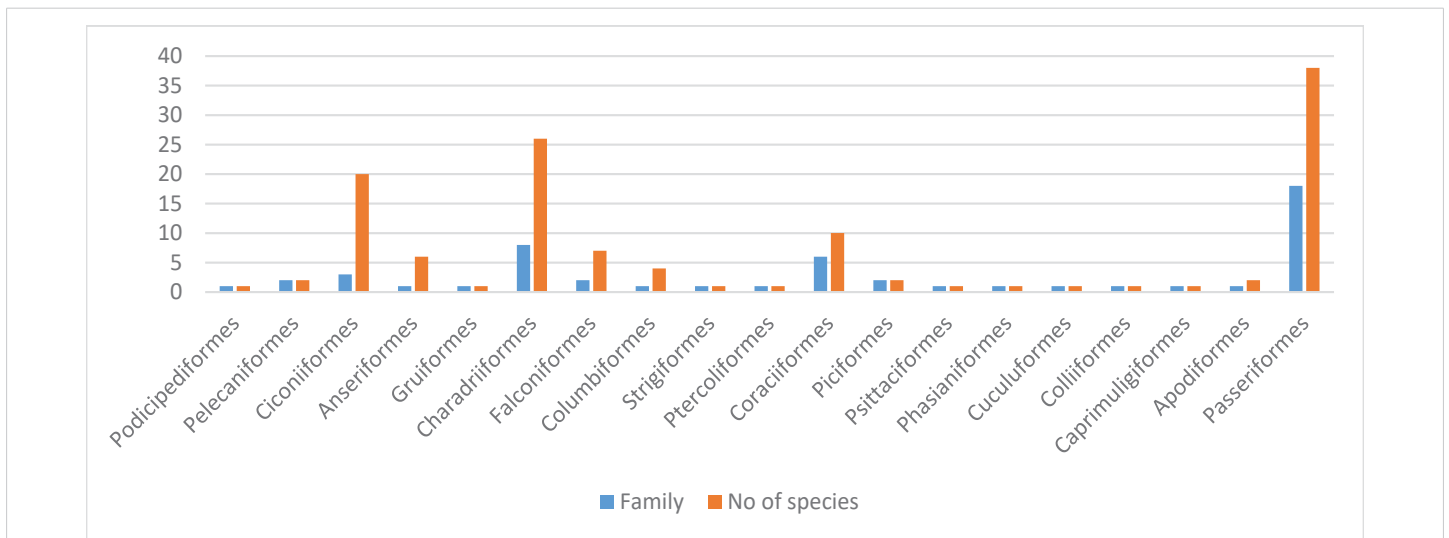


Figure 2: Number of families and species within the orders.

are 20, and Coraciiformes has 10 species with 6 families (Table 3).

It is not easy work to search deeper for reasons behind the huge richness of birds in the Elssuki area but the most justification is ascribable to the birds themselves for use of the diverse habitat and the adaptability of birds to occupy new habitat, nevertheless the big diversion habitat the big diversity of bird's species will consist. In Essuki, many habitats were available for birds to use: tall trees, shrubs, tall weeds, short weeds, agricultural lands, canals, wetlands, and bare land. The wetlands are found in most areas of the Sinnar state where they are scattered along the river Nile on both two banks, while there are some seasonal streams, ponds, canals, and excavation wholes and barrows found by humans. The habitat used by these birds provides them with the most basic needs for living, survival, nesting, and roosting site. The most important things and needs for birds are food for all types of categories Carnivores, herbivores grainivores, fruitivores, and nectarivores, food also includes water which is easy to attain from many different sources.

A study [11] accepted who studied sewage in Khartoum. They stated that many species seem as if they have significant range expansions, or changed their status inside Sudan. A number of species have recently been recorded for the first time in Egypt, including the three-banded Plover and Village Weaver. While a number of species were recorded in the Egyptian List, there is a strong suggestion they would have come from Sudan, and also probably many species could be extending their ranges along the River Nile in both directions, utilising man-made habitats. This gives justification for the appearance of some species like the Painted snipe (*Rostratula benghalensis*) in the locality.

The important finding of the study is that nearly half of the bird species are considered water birds and this is for

the reason that the locality is confounded of small seasonal wetlands scattered along the Blue Nile and seasonal streams or excavation barrows or the irrigation canals which all are seasonally flooded, indicating that temporary wetlands in Sudan can potentially be as important as permanent ones in terms of abundance. Waterbird diversity, however, seems maximized in permanent wetlands and lowest in most temporary water bodies. This pattern would fit, for instance, with the one described in the Okavango basin and in South Africa where the hydrological regime was found to primarily affect the composition of the water bird community, with higher, hence more permanent, water levels permitting the accumulation of various water bird guilds seeking foraging opportunities or escaping drying wetlands Marie Suet, et al. 2020 [12].

Sudan is strategically located on a very important water bird migration route and holds important water bird areas. Sudan encompasses huge areas of wetlands represented by the main streams of the Blue and White Nile valleys, floodplains, inland lakes, and marshes, in addition to long coastal and shoreline habitats along the Red Sea. These wetland habitats support numerous varieties of fauna and flora species, including birds [13].

There is no big variation between species that are found in Khartoum state except in a few species, most orders and families may be in both states. Mutasim EA, et al. in 2019 and Mutasim Essa Abdallah, et al. [14,15] in 2023, studied the diversity of Tutti Island and Omdum Island in the Khatoum state respectively, their results revealed great similarity of orders, families, and species. Hussien M.E.A.E in 2021 [16] revealed that Demosell Crane is wintering in other localities like Dindir.

Although the intensive human activities in the area which vary from cultivation, grazing, cutting trees for energy and

housing, fishing, and hunting wild birds are considered serious threats to birds, the species richness is quite good with unknown status numbers for all birds of Sudan. Most species are regular migrants or common and endemic to Sudan except two species that are seen once at a period, namely, the Black cap (*Sylvia atricapilla*) 2011, and the Painted snipe (*Rostratula benghalensis*) 2015, which are very difficult to know their migration pattern or nearly to be classified as an (Accidentals). Hussien MEAE in 2020 [17], studied the relationship between the species richness of birds and vegetation heights in some wetlands of Sinnar state, he found that wetlands of Sinnar State are rich with biodiversity and the distribution of bird species in wetlands along the riverine ecosystem and the importance of overstory cover surrounding these wetlands increase birds' richness which considered as a good site for roosting, nesting, perching and hunting.

The species richness in other localities is not varied due to the same factor that affects the distribution and abundance.

Osman Salah and Eihab Idris in 2013 [18], described the variation in the community's structure in the Suot forest and the temporal variation in bird community structure could be attributed to two different factors. First, bird migrational patterns; during the period of observation, some migrating birds (local and Palaearctic migrants) arrive at the study sites, using them as breeding grounds or as stopover sites for food supply. The seasonal movements of migrational birds to and from the study sites are likely to exert a deep influence on the avifauna composition. The second factor that underlies the temporal variation is the cyclic changes in plant cover and insect density that are induced by the seasonal cycle of water availability.

International studies proved the same Sudanese studies of the high diversity and species richness of birds. Some scientists demonstrated that the flooding temporality covariate did not show any effect on waterbird abundance distribution, indicating that temporary wetlands in Sudan can potentially be as important as permanent ones in terms of abundance, this is accepted with national studies showing the high abundance of birds and richness in small wetlands in central Sudan. Waterbird diversity, however, seems maximized in permanent wetlands and lowest in most temporary water bodies. This pattern would fit, for instance, with the one described in the Okavango basin by Cumming, et al. [19] and in South Africa by Harebottle [20], where the hydrological regime was found to primarily affect the composition of the water bird community, with higher, hence more permanent, water levels permitting the accumulation of various water bird guilds seeking foraging opportunities or escaping drying wetlands.

Since there are no long or short monitoring studies in Sudan- which is one of the acute problems facing researchers and ornithologists – The bird's evaluation, range distribution,

and comparison of species existence is very hard and depends only on old studies and few scientific papers.

Monitoring can help researchers to a better understanding of migration patterns, the season arrival, and the return back of each species to make suitable measures and procedures for the conservation of critically threatened species through collaboration between national and international agencies.

## Conclusion

The most important conclusion is that the gaps still appear, it's the head for very crucial information about many species that need to clarify their status or even existence. There is a gap in information about the avifauna of Sinnar state and needs updating through regular studies. There are many important bird areas that are neglected and not studied yet. The wetlands of Sinnar State are rich in biodiversity, and the locality is still hosting very important species like the Deemosell crane and other species for which they need special single programs.

## Recommendations

According to the study and its findings, the recommendations are as follows:

1. There is an urgent need for comprehensive projects for Sudan Birds Atlas.
2. The need for collecting all studies of birds to establish a basic unit for the database to analyse, and sort data by state, to know the gap and priorities sites that should be studied.
3. Increase and strengthen the training of bird watchers in academic research centres, non-governmental societies, and even volunteers.
4. More collaboration between the national institutions.
5. Raising awareness among the community and between associated governmental sectors such as agriculture, Electricity, and Animal resources.
6. The priority of conducting studies by political or administrative sites for the huge area of Sudan and states and establishing ornithological centres in each state or University.

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