Avifauna Survey in Sudd Wetland of South Sudan

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DOI: https://doi.org/10.51244/IJRSI.2026.13020018

Received: 23 November 2025; Accepted: 30 November 2025; Published: 24 February 2026

ABSTRACT

This research aims to investigate the diversity, distribution, and abundance of avifauna within the Sudd Wetland, a critical ecological zone in South Sudan. The general objective is to provide a comprehensive assessment of bird species across various habitat types within this unique wetland ecosystem. Specific objectives include determining and comparing bird species diversity, distribution, and abundance; relating habitat features to bird abundance; and compiling a detailed checklist of avian species present in the study area. By employing systematic survey methods and statistical analyses, this study seeks to elucidate patterns of avian diversity in relation to environmental variables such as vegetation structure, water availability, and human impact. Understanding these dynamics is vital for conservation efforts and management strategies aimed at preserving the ecological integrity of the Sudd Wetland. This research not only contributes to the existing body of knowledge regarding wetland avifauna but also serves as a baseline for future studies focused on biodiversity conservation in rapidly changing environments.

Keywords: Avifauna, Biodiversity, Wetland Ecology, Habitat Assessment, Species Richness, Conservation Status, Migratory Patterns, Ecological Indicators, Anthropogenic Impact, Ornithological Survey

BACKGROUND

The Sudd wetland, located in South Sudan, is one of the largest freshwater ecosystems globally, covering an area that fluctuates between 42,000 km² during the dry season and up to 90,000 km² in the rainy season. This vast wetland is formed by the White Nile River and is characterized by its unique hydrology, biodiversity, and ecological significance. The Sudd supports a wide range of flora and fauna, including numerous avian species that are critical for maintaining ecological balance. It serves as a habitat for both resident and migratory bird populations, making it an essential site for avifaunal diversity in Africa (Ruuskanen C., & Darbyshire E. (2025).

Avifauna plays a crucial role in wetland ecosystems by contributing to seed dispersal, pest control, nutrient cycling, and ecosystem monitoring. The Sudd wetland's strategic location along migratory routes makes it a vital stopover point for Palearctic migratory birds traveling between Europe and Africa. Additionally, the wetland provides breeding grounds for several waterbird species and supports endangered avian populations such as the Shoebill (*Balaeniceps rex*) (UNEP-WCMC & Ramsar Secretariat, 2020). Despite its ecological importance, the Sudd faces significant threats from climate change-induced flooding variability, human activities such as overgrazing and agriculture expansion, oil exploration projects, and political instability (Clingendael Institute, 2020).

Given these challenges, understanding the composition and distribution of bird species within the Sudd wetland is critical for conservation planning. Avifaunal surveys can provide valuable insights into habitat health and biodiversity trends while identifying priority areas for protection. However, limited research has been conducted on avian diversity in this region due to logistical constraints and ongoing conflicts in South Sudan4. This study aims to address this gap by conducting a comprehensive survey of avifauna within the Sudd wetland.

Research Questions

1. What is the current composition of avian species within different habitats of the Sudd wetland?

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

2. How does seasonal variation (dry vs. rainy seasons) influence bird diversity and abundance in the Sudd?
3. What are the key environmental factors (e.g., vegetation type, water levels) affecting avian distribution patterns within the wetland?
4. Are there any threatened or endangered bird species present in the Sudd wetland? If so, what are their population statuses?
5. How do anthropogenic activities (e.g., grazing pressure or oil exploration) impact bird populations in specific areas of the wetland?

Hypothesis

1. **H1:** The diversity of avian species within the Sudd wetland varies significantly across different habitats (e.g., open water areas vs. seasonally flooded grasslands).
2. **H2:** Seasonal changes (dry vs. rainy seasons) have a measurable impact on both bird abundance and species richness due to fluctuations in water levels and food availability.
3. **H3:** Vegetation cover (measured through NDVI) positively correlates with higher bird diversity because it provides nesting sites and food resources.
4. **H4:** Threatened or endangered bird species are more likely to be found in less disturbed areas of the Sudd where human activity is minimal.
5. **H5:** Anthropogenic pressures such as overgrazing or oil exploration negatively affect local bird populations by reducing habitat quality.

METHODOLOGY

The Sudd Wetland, one of the largest freshwater wetlands in the world, is located in South Sudan and serves as a critical habitat for a diverse range of avian species. Conducting the avifauna survey in this unique ecosystem requires a systematic methodology that encompasses various stages, including site selection, data collection techniques, and analysis.

Site photo

An aerial view of the extreme east edge of Sudd wetland Bor South County site

Data Collection Techniques

During Data collection both visual and auditory methods were employed to ensure comprehensive species identification. Observers used binoculars and spotting scopes for visual identification while employing audio recorders to capture bird calls and songs (Bibby et al., 2000). It was crucial that researchers have prior knowledge of local bird species and utilized field guides of south of Sahara specific to East African avifauna to accurately identify birds during surveys.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Sampling Effort

The sampling effort for the avifauna survey in the Sudd Wetland from June 2023 to May 2024 typically involved a systematic approach to cover the diverse habitats within the wetland. This includes establishing a series of transects and point count stations across different vegetation types, such as open water, papyrus beds, floating grass mats, and riparian forests (*Ornithological Techniques*). The number and length of transects, or the number and duration of point counts, were determined by the size and heterogeneity of the study area, aiming for adequate spatial coverage to capture species diversity and abundance (*Wildlife Study Design*). Each sampling location was frequency visits throughout the survey period, to ensure that seasonal variations in bird presence and activity were accounted for (*Bird Census Techniques*).

Survey Duration per each Site

The survey duration per site refers to the amount of time spent actively observing and recording birds at each specific sampling location. For point counts, this involved a fixed duration of 5 to 10 minutes, during which all birds seen or heard within a defined radius were recorded (*Handbook of Field Ornithology*). For transects, the duration was determined by the speed of the observer and the length of transect (1-2 hours walk), with consistent effort applied across all transects (*Measuring and Monitoring Biological Diversity*). The timing of surveys within a day was also crucial, typically focusing on early morning hours when birds were most active and vocal, to maximize detection rates (*The Sibley Guide to Bird Life & Behavior*).

Possible Detection Biases

Several detection biases but a few to mention have influenced the results of an avifauna survey in the Sudd Wetland:

- **Observer Bias:** Differences in observer experience, hearing acuity, and visual skills lead to variations in species detection and identification (*Wildlife Study Design*). Some observers were better at detecting cryptic species or identifying birds by call.
- **Habitat Bias:** Certain habitats were more difficult to survey due to dense vegetation, making birds harder to see or hear (*Bird Census Techniques*). For example, birds in dense papyrus beds were underrepresented compared to those in open water.
- **Species-Specific Bias:** Some bird species were inherently more conspicuous than others. Large, brightly colored, or vocal species were more likely detected than small, cryptic, or silent ones (*Ornithological Techniques*).
- **Temporal Bias:** Bird activity and detectability vary throughout the day and across seasons. Surveys conducted during periods of low activity (e.g., midday heat) or outside of breeding seasons missed certain species or underestimate their abundance (*The S Sibley Guide to Bird Life & Behavior*).
- **Weather Conditions:** Adverse weather, such as heavy rain, strong winds, or dense fog, can reduce visibility and audibility, leading to lower detection rates (*Handbook of Field Ornithology*).
- **Accessibility Bias:** Some areas of the Sudd Wetland were inaccessible due to water levels, dense vegetation, security concerns, leading to an incomplete representation of the avifauna (*Measuring and Monitoring Biological Diversity*).

Data Analysis

After data collection was completed, statistical analyses were performed to assess species richness, abundance, and distribution patterns within the surveyed areas. The statistical used tools include Species Accumulation Curves to estimate total species richness and Diversity Indices such as Shannon-Wiener Index to evaluate community diversity (Magurran, 1988).

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

RESULTS AND DISCUSSION

The avifauna survey conducted in June 2023 to May 2024 in the Sudd Wetland of South Sudan yielded significant data, providing valuable insights into the biodiversity and ecological health of this globally important wetland. The metrics presented—Total Individuals (90,667), Total Species (418), Total Families (56), and Total Orders (23)—emphasizes the remarkable avian richness of the region. This discussion contextualized these findings within existing ornithological and ecological literature, spotlighting their implications for conservation and further research.

Individuals Species

The sheer number of individuals recorded (90,667) is a testament to the Sudd Wetland's capacity to support large avian populations. This figure is particularly significant when considering the dynamic nature of wetland ecosystems, which often experience fluctuations in water levels and resource availability. Large aggregations of birds, especially water birds, are characteristic features of productive wetlands globally (Lowe et al., 2016). The Sudd, as one of the world's largest freshwater wetlands, provides extensive foraging grounds, breeding sites, and refuge for a multitude of species. Such high individual counts often indicate a healthy ecosystem with abundant food resources, including fish, invertebrates, and aquatic vegetation, which are crucial for supporting large bird populations (del Hoyo et al., 2014).

Comparisons with other major African wetlands, such as the Okavango Delta or the Inner Niger Delta, would likely reveal similar patterns of high individual counts, particularly during peak migration periods or breeding seasons (Hockey et al., 2005). The Sudd's relatively undisturbed nature, compared to some other wetlands facing significant anthropogenic pressures, may contribute to its ability to sustain such large numbers of individuals. The presence of a large number of individuals across various species also suggests a robust food web, where different trophic levels are well-represented and interconnected.

Species

The identification of 418 avian species within the Sudd Wetland is a remarkable finding, placing it among the most bio diverse avian hotspots in Africa. This high species richness is characteristic of large, complex wetland systems that offer a diversity of habitats, including open water, emergent vegetation, floodplains, and riparian forests (Fry et al., 2016). The Sudd's geographical location, at the crossroads of several bio geographical zones, likely contributes to its high species diversity, attracting both resident and migratory species from various parts of Africa and Eurasia (Borrow & Demey, 2014).

Existing literature on African avifauna consistently highlights the importance of large wetlands as critical habitats for a significant proportion of the continent's bird species (Urban et al., 1986). The Sudd's species count of 418 line up with expectations for such a vast and ecologically diverse area. This figure likely includes a mix of resident species, intra-African migrants, and Palearctic migrants, all utilizing the wetland for different purposes throughout the year. The presence of a high number of species often correlates with a high degree of habitat heterogeneity, which provides a wider range of ecological niches for different bird species to exploit (Newton, 2003). Furthermore, the Sudd's relatively pristine condition, compared to many other wetlands globally, may allow for the persistence of species that are more sensitive to habitat degradation.

Families

The presence of 56 avian families emphasize the broad phylogenetic diversity of the Sudd's avifauna. This metric provides insight into the evolutionary breadth of the bird community, indicating that a wide array of avian lineages are represented in the wetland. A high number of families suggests a diverse range of ecological adaptations and life history strategies among the birds present (Sibley & Ahlquist, 1990). For instance, the presence of families like *Ardeidae* (herons and egrets), *Anatidae* (ducks, geese, and swans), *Ciconiidae* (storks), and *Threskiornithidae* (ibises and spoonbills) is expected in a major wetland, reflecting the dominance of water-associated birds. However, the inclusion of families typically associated with terrestrial or arboreal habitats, such as *Passeridae* (sparrows), *Sylviidae* (warblers), or Accipitridae (hawks and eagles), further

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

emphasizes the Sudd's diverse habitat mosaic, extending beyond just aquatic environments to include surrounding grasslands and woodlands (Fry et al., 2016).

The number of families observed is a strong indicator of the overall ecological complexity and stability of the ecosystem. A broad representation of families often implies a robust and resilient ecosystem capable of supporting a wide range of ecological functions and services (Gaston, 2000). This metric also provides a higher-level taxonomic perspective on biodiversity, complementing the species-level data by illustrating the evolutionary depth of the avian community.

Orders

The identification of 23 avian orders further highlights the profound evolutionary diversity present in the Sudd Wetland. Orders represent major evolutionary divergences within birds, and a high number of orders signifies the presence of a wide array of fundamental avian body plans, physiological adaptations, and ecological roles (Gill & Donsker, 2019). For example, the presence of orders such as *Anseriformes* (waterfowl), *Pelecaniformes* (pelicans, cormorants, etc.), *Ciconiiformes* (storks, herons, ibises), *Gruiformes* (cranes, rails), *Charadriiformes* (shorebirds, gulls, terns), and Passeriformes (perching birds) is expected in a diverse wetland and surrounding terrestrial habitats. The inclusion of less common orders in such a survey, depending on the specific species identified, would further underscore the unique ecological characteristics of the Sudd.

The number of orders is a powerful indicator of the overall biodiversity and evolutionary significance of a region. It suggests that the Sudd provides suitable conditions for a broad spectrum of avian life forms, each with distinct evolutionary histories and ecological requirements (Newton, 2003). This broad representation of orders reinforces the Sudd's status as a critical area for avian conservation, as it supports a significant portion of global avian evolutionary diversity. The presence of such a high number of orders also implies a complex and stable ecosystem that can accommodate a wide range of ecological niches, from filter-feeders to top predators, and from aquatic specialists to terrestrial generalists.

CONCLUSION

The results of the avifauna survey in the Sudd Wetland of South Sudan—Total Individuals (90,667), Total Species (418), Total Families (56), and Total Orders (23)—collectively paint a picture of an exceptionally rich and vital avian ecosystem. These metrics are consistent with existing literature on major African wetlands, which consistently highlight their importance as biodiversity hotspots (Lowe et al., 2016). The high numbers across all categories underscore the Sudd's capacity to support large populations, a wide array of species, and a deep evolutionary diversity of birds. These findings have significant implications for conservation, emphasizing the need for robust protection strategies to safeguard this globally important wetland and its remarkable avifauna. Further research focusing on population dynamics, migratory patterns, and the ecological roles of key species would provide even deeper insights into the functioning and conservation needs of the Sudd Wetland.

Table 1: Summary Statistics

A total of 90,667 individuals, representing 418 bird species, were observed during the survey period. These species belonged to 56 families and 23 orders.

Metric	**Value**
Total Individuals	90667
Total Species	418
Total Families	56
Total Orders	23

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Figure 3: below illustrates species richness across habitats:

Statistical Analyses

Attribute	Swamp	Open water	Flooded grassland	savanna	Shrubs
Shannon H′	3.55	3.57	3.86	3.94	3.84
lnS	3.47	3.53	3.98	3.47	3.37
Simpson, 1/D	0.67	0.45	1.42	0.89	0.86

Analysis of Species Richness across Habitats in the Sudd Wetland

Figure 3, provides a statistical analysis of avian species richness across five distinct habitats: Swamp, Open water, flooded grassland, Savanna, and Shrubs. This analysis utilizes three key ecological indices: Shannon H', lnS (natural logarithm of species richness), and Simpson's 1/D. These indices offer different perspectives on the diversity and evenness of species within each habitat, allowing for a comprehensive understanding of avian community structure (Magurran, 2004).

Shannon H' Index

The Shannon H' index (often denoted as H′) is a widely used measure of species diversity that accounts for both species richness (the number of different species) and species evenness (how close in numbers each species in an environment is). A higher Shannon H' value indicates greater diversity, meaning there are more species and/or the species are more evenly distributed in terms of abundance (Rosenzweig, 1995). The formula for the Shannon H' index is typically given as:

$$H' = -\sum_{i=1}^{S} (p_i \ln p_i)$$

Where S is the total number of species in the community, and pi is the proportion of individuals belonging to the i-th species.

In Figure 3, the Shannon H' values are: Swamp (3.55), Open water (3.57), flooded grassland (3.86), Savanna (3.94), and Shrubs (3.84). The highest Shannon H' value is observed in the Savanna (3.94), suggesting that this habitat possesses the greatest avian diversity, considering both the number of species and their relative abundances. The Flooded grassland (3.86) and Shrubs (3.84) also exhibit high diversity. In contrast, the Swamp (3.55) and Open water (3.57) habitats show slightly lower Shannon H' values, indicating comparatively less diverse avian communities, possibly due to fewer species or a more uneven distribution of individuals among the species present (Gotelli & Ellison, 2004). This pattern suggests that habitats with more complex vegetation structures, such as savanna and shrub lands, may offer a wider range of niches and resources, thereby supporting a greater variety of bird species and more equitable population sizes.

lnS (Natural Logarithm of Species Richness)

The lnS value represents the natural logarithm of the total number of species (S) found within a given habitat. This metric directly reflects species richness, with higher values indicating a greater number of distinct species present. While Shannon H' considers both richness and evenness, lnS focuses solely on the count of species (Krebs, 1999).

The lnS values presented in Figure 3 are: Swamp (3.47), Open water (3.53), flooded grassland (3.98), Savanna (3.47), and Shrubs (3.37). The Flooded grassland habitat exhibits the highest lnS value (3.98), suggesting that it harbors the greatest number of avian species among all the surveyed habitats. This contrasts with the Shannon H' results, where Savanna had the highest diversity. This discrepancy highlights the difference

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

between richness and evenness; while flooded grassland has the most species, their abundances might be less evenly distributed compared to the Savanna, which has a slightly lower species count but more balanced populations (Magurran, 2004). The lowest lnS value is found in the Shrubs (3.37), indicating it has the fewest distinct bird species. The Swamp and Savanna share the same lnS value (3.47), implying they have a similar number of species, even though their Shannon H' values differ, suggesting variations in species evenness.

Simpson's 1/D Index

Simpson's index of diversity (often denoted as 1/D) is another measure of species diversity that places more weight on common species. It represents the probability that two individuals randomly selected from a sample will belong to different species. A higher value of Simpson's 1/D indicates greater diversity, meaning there is a lower probability of selecting two individuals of the same species (Magurran, 2004). The formula for Simpson's index of diversity is:

$$1/D=1/\sum i=1S\ (pi2)$$

Where S is the total number of species and pi is the proportion of individuals belonging to the i-**th** species.

In Figure 3, the Simpson's 1/D values are: Swamp (0.67), Open water (0.45), flooded grassland (1.42), Savanna (0.89), and Shrubs (0.86). The Flooded grassland habitat shows the highest Simpson's 1/D value (1.42), reinforcing its status as a highly diverse habitat, particularly in terms of the probability of encountering different species. This aligns with its high **lnS** value, suggesting both a high number of species and a relatively good distribution of common species. The Open water habitat has the lowest Simpson's 1/D value (0.45), indicating the lowest diversity according to this index. This suggests that in open water, there is a higher probability of encountering individuals of the same species, implying a dominance by a few common species (Gotelli & Ellison, 2004). The Savanna (0.89) and Shrubs (0.86) show moderate diversity according to this index, while the Swamp (0.67) is somewhat lower.

Synthesis of Findings

The combined analysis of Shannon H', lnS, and Simpson's 1/D provides a shaded understanding of avian species richness and diversity across the Sudd Wetland habitats. The flooded grassland consistently emerges as a highly diverse habitat, exhibiting the highest lnS (most species) and Simpson's 1/D (high probability of encountering different species). It's high Shannon H' also supports this, indicating a good balance of richness and evenness. This suggests that the flooded grassland provides a rich array of resources and suitable conditions for a wide variety of bird species.

The savanna habitat also demonstrates high diversity, particularly with the highest Shannon H' value, implying a well-balanced community in terms of both species numbers and their relative abundances. While its lnS is lower than flooded grassland, its high Shannon H' suggests that the species present are more evenly distributed.

Reversely, the open water habitat consistently shows the lowest diversity across all three indices (lowest Shannon H', lowest Simpson's 1/D, and moderate lnS). This indicates that open water environments in the Sudd Wetland likely support fewer species, and these species may be dominated by a few highly abundant ones, leading to lower evenness.

The swamp and shrubs habitats present intermediate levels of diversity, with some variations across indices. The swamp has moderate Shannon H' and lnS but a relatively low Simpson's 1/D, suggesting a moderate number of species but perhaps some dominance by a few. The shrubs habitat has a high Shannon H' but the lowest lnS, indicating that while it has fewer species, those species are relatively evenly distributed.

In conclusion, the analysis in Figure 3 highlights the heterogeneous nature of avian diversity within the Sudd Wetland. The flooded grassland and savanna appear to be critical habitats for avian biodiversity, supporting a greater number of species and/or more evenly distributed communities. Understanding these patterns is crucial

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

for conservation efforts, as it allows for the identification of key habitats that require protection to maintain the overall avian diversity of the Sudd Wetland (Magurran, 2004).

Table 2: The table below summarizes the number of species observed per order:

Order	**Number of Families**	**Number of Species**	**(%) Total Species**
Passeriformes	23	209	50
Charadriiformes	7	37	8.9
Anseriformes	2	6	1.4
Pelecaniformes	6	25	6
Accipitriformes	3	17	4.1
Ciconiiformes	1	30	7.2
Columbiformes	1	10	2.4
Coraciiformes	1	9	2.2
Falconiformes	1	20	4.8
Galliformes	1	7	1.7
Gruiformes	1	1	0.2
Piciformes	1	4	1
Procellariiformes	1	5	1.2
Psittaciformes	1	6	1.4
Pterocliformes	1	5	1.2
Strigiformes	1	3	0.7
Trogoniformes	1	4	1
Coliiformes	1	2	0.5
Suliformes	2	3	0.7
Podicipediformes	1	1	0.2
Caprimuligiformes	1	5	1.2
Cuculiformes	1	6	1.4
Phoenicopteriformes	1	3	0.7
TOTAL	**60**	**418**	**100.1**

Table 3: Summary of Bird Orders and Families Observed

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Order	Family	No. of Species	Example	Species
Anseriformes	Anatidae	7000	Ducks, Geese	African Black Duck (Anas sparsa)
Apodiformes	Apodidae	400	Swifts	White-throated (Hirundapus caudacutus)
Charadriiformes	Scolopacidae	9000	Sandpipers	Common Sandpiper (Actitis hypoleucos)
Ciconiiformes	Ciconiidae	12780	Storks	African Openbill (Anastomus lamelligerus)
Columbiformes	Columbidae	757	Pigeons, Doves	Rock Pigeon (Columba livia)
Coraciiformes	Alcedinidae	5000	Kingfishers	Pied Kingfisher (Ceryle rudis)
Falconiformes	Falconidae	3000	Falcons	Lanner Falcon (Falco biarmicus)
Galliformes	Phasianidae	200	Pheasants, Partridges	Helmeted Guineafowl (Numida meleagris)
Gruiformes	Gruidae	700	Cranes	Grey Crowned Crane (Balearica regulorum)
Passeriformes	Muscicapidae	17000	Flycatchers	Phoenicurus phoenicurus)
Pelecaniformes	Ardeidae	23000	Herons, Egrets	Great Egret (Ardea alba)
Piciformes	Picidae	300	Woodpeckers	Nubian Woodpecker (Campethera nubica)
Procellariiformes	Procellariidae	1500	Manx Shearwater	Manx Shearwater (Puffinus puffinus)
Psittaciformes	Psittacidae	700	Parrots	African Grey Parrot (Psittacus erithacus)
Pterocliformes	Procellariidae	2000	Oriental Sandgrouse	Oriental Sandgrouse (Pterocles orientalis)
Strigiformes	Strigidae	30	Owls	African Wood Owl (Strix woodfordii)
Trogoniformes	Trogonidae	400	Trogons	(Apaloderma narina)
Coliiformes	Coliidae	200	All Mousebird	Speckled Mousebird (Colius striatus)
Suliformes	Anhingidae	600	African Darters	African Darter (Anhinga rufa)
Podicipediformes	Podicipedae	100	Little Grebe	Tachybaptus ruficollis
Cuculiformes	Cculidae	600	cuckoos	Senegal Coucal (Centropus senegalensis)
Phoenicopteriformes	Phoenicopteridae	700	All Flamingos	Lesser Flamingo (Phoeniconaias minor)

Figure 1: Showing Birds Families

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

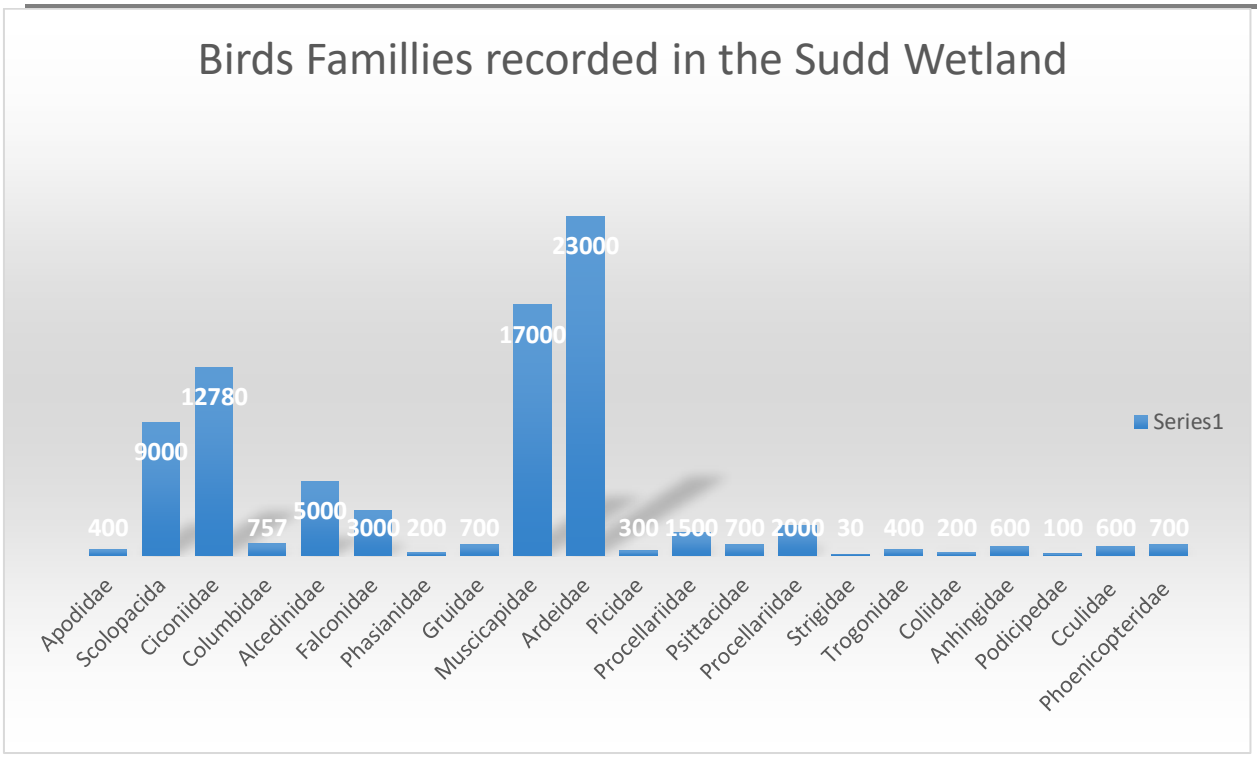
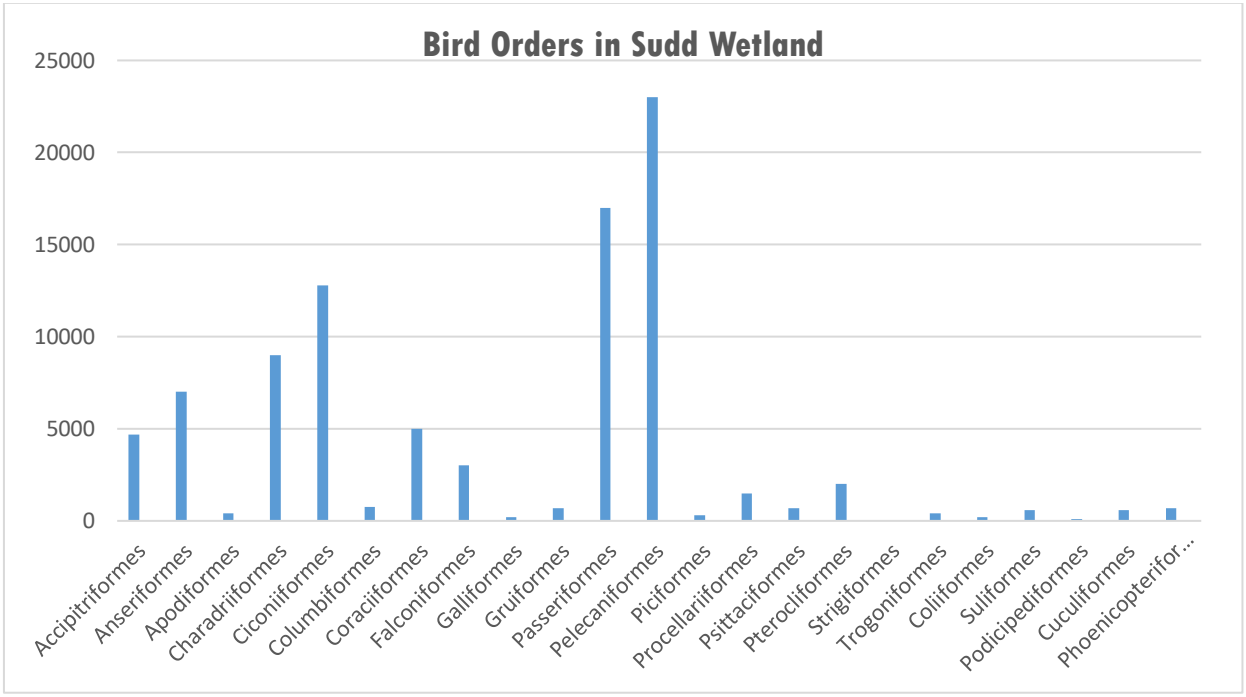


Figure 2: Distribution of Bird Orders in Sudd Wetland



Tables 4: List of Families recorded in the Sudd Wetland

Family	Examples	Species
Accipitridae	*Aquila rapax*	Hawks, Eagles, and Kites
Acrocephalidae	*Iduna pallida*	Eastern Olivaceous Warbler
Alaudidae	*Pinarocorys erythropygia*	Rufous-rumped Lark
Alcedinidae	*Corythornis cristatus*	Kingfishers

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Anatidae	Anas platyrhynchos	*Ducks, Geese, and Swans*
Anhingidae	*Anhinga rufa*	African Darter
Apodidae	*Apus apus*	Swifts
Ardeidae	*Ardea cinerea*	Herons, Egrets, and Bitterns
Balaeniciptidae	*Balaeniceps rex*	Shoebill
Burhinidae	*Burhinus capensis*	Spotted Thick-knee
Charadriidae (Plovers)	*Charadrius dubius*	Shores dawdlers
Cisticolidae	*Eremomela icteropygialis*	Yellow-bellied Eremomela
Coliidae	*Colius striatus*	Speckled Mousebird
Corvidae	*Ptilostomus afer*	Piapiac
Cuculidae	*Cuculus canorus*	Cuckoos
Estrildidae	*Estrilda astrild*	African Silverbill
Fringillidae	*Carduelis carduelis*	Finches
Gruidae	*Balearica pavonina*	Black Crowned-Crane
Haematopodidae	*Haematopus moguini*	African Oystercatcher
Hirundinidae	*Hirundo rustica*	Swallows and Martins
Hyliotidae	*Hyliota flavigaster*	Yellow-bellied Hyliota
Hylviidae	*Hylia prasina*	Green Hylia
Jacanidae	*Actophilornis africanus*	African Jacana
Laniidae	*Lanius collurio*	Red-backed Shrike
Laridae	*Larus ridibundus*	Black-headed Gull
Macrosphenidae	*Sylvietta virens*	Green Crombec
Meropidae	*Merops apiaster*	Bee-eaters
Monarchidae	*Terpsiphone viridis*	African Paradise-Flycatcher
Motacillidae	*Motacilla alba*	Wagtails and Pipits
Muscicapidae	*Muscicapa striata*	Spotted Flycatcher
Oriolidae	*Oriolus oriolus*	Eurasian Golden Oriole
Pandionidae	*Pandion haliaetus*	Osprey
Passeridae	*Passer domesticus*	Old World Sparrows

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Pelecanidae	*Pelecanus onocrotalus*	Great White Pelican
Phalacrocoracidae	*Phalacrocorax carbo*	Cormorants
Phasianidae	*Pavo cristatus*	Indian Peafowl
Phoenicopteridae	*Phoeniconaias minor*	Lesser Flamingo
Phylloscopidae	*Phylloscopus sibilatrix*	Wood Warbler
Picidae	*Dendrocopos major*	Woodpeckers
Plocidae	*Dinemellia dinemelli*	White-headed Buffalo-Weaver
Pluvianidae	*Pluvianus aegyptius*	Egyptian Plover
Podicipedae	*Tachybaptus ruficollis*	Little Grebe
Procellariidae	*Psittacus erithacus*	Manx Shearwater
Psittacidae	*Psittacus erithacus*	Parrots
Pteroclidae	*Pterocles orientalis*	Oriental Sandgrouse
Pycnonotiae	*Stelgidillas gracilirostris*	Slender-billed Greenbul
Rallidae	*Gallinula chloropus*	Rails, Gallinules, and Coots
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt
Scolopacidae	*Calidris alpina*	Sandpipers and Allies
Scopidae	*Scopus umbretta*	Hamerkop
Strigidae	*Bubo bubo*	Eurasian Eagle-Owl
Sturnidae	*Creatophora cinerea*	Wattled Starling
Sylviidae	*Sylvia atricapilla*	Eurasian Blackcap
Threskiornithidae	*Threskiornis aethiopicus*	Ibises
Vangidae	*Prionops plumatus*	White Helmetshrike
Viduidae	Vidua macroura	Pin-tailed Whydah

Table 5: Checklist of Birds Species recorded from eastern zone of Sudd wetland from May 2023-June 2024

				Local Language	**Habitat types**				
Order	**Family**	**Common Name**	**Scientific Name**	**Dinka**	**SW**	**OW**	**FL**	**SV**	**SH**
Anseriformes	Anatidae	African Pygmy Goose	*Nettapus auritus*	Tuoor	+	"	-	-	-
"	"	Tufted Duck	*Aythya fuligula*	Tuoor	+	+	-	-	-

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Egyptian Goose	*Alopochen aegyptiaca*		+	+	-	-	-
		Spur-Winged Goose	*Plectropterus gambenis*		+	+	-	-	-
		Comb Duck	*Sarkidiornis melanotas*		+	+	-	-	-
"	''	White-faced Duck	*Dendrocygna viduata*	Aleluiy	+	+	-	-	-
Charadriiformes	Laridae	African Skimmer	*Rynchops flavirostris*		+	+	-	-	-
"	"	White-winged Tern	*Chlidonias leucopterus*		+	+	-	-	-
Phoenicopteriformes	Phoenicopteridae	Lesser Flamingo	*Phoeniconaias minor*		+	+	-	-	-
"	"	Greater Flamingo	*Phoenicopterus roseus*		+	+	-	-	-
		Eurasian Marsh Harrier	*Circus aeruginosus*		+	+	-	-	+
Accipitriformes	Accipitridae	African Marsh Harrier	*Circus ranivorus*			+	-	-	-
		African Fish-Eagle	*Haliaeeful vocifer*	Kuei	+	-	-	-	+
		African Goshawk	*Accipiter tachiro*		-	-	-	-	-
		Brown Snake-Eagle	*Circaetus cinereus*		-	-	+	+	+
		African Goshawk	*Accipiter tachiro*		-	-	+	+	+
		Pillid Harrier	*Circus macrourus*		-	+	-	-	-
		Montagu;s Harrier	*Circus pygargus*		-	+	-	-	-
		Black Kite	*Milvus migrans*		-	-	+	+	+
		Yellow-Billed Kite	*Milvus aegyptiens*		+	-	+	+	+
		Tawny Eagle	*Aquila rapax*				+	+	+
		Lappet-faced Vulture	*Torgos tracheliotus*	Anyijong			+	+	+
		Hooded Vulture	*Necrosyrtes monachus*	Guon	+	+	+	+	-
		White-headed Vulture	*Trigonoceps occipitalis*		-	-	+	+	+
		White-Backed Vulture	*Gyps africanus*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Long-Crested Eagle	*Lophaetus occipitalis*	Tielweer	-	-	+	+	+
	Haematopodidae	African Oystercatcher	*Haematopus moguini*	Ajiith-Tooc	+		-	-	-
Coraciiformes	Alcedinidae	Shining-blue Kingfisher	*Alcedo quadribrachys*		+	+	-	-	-
		Malachite Kingfisher	*Corythornis cristatus*		-	-	+	+	+
		African Pygmy Kingfisher	*Ispidina picta*		-	+	-	-	-
		African Dwarf Kingfisher	*Ispidina lecontei*		-	+	-	-	-
		Gray-headed Kingfisher	*Halcyon leucocephala*		-	+	-	-	-
		Blue-breasted Kingfisher	*Halcyon malimbica*		-	+	-	-	-
		Striped Kingfisher	*Halcyon chelicuti*		-	+	-	-	-
		Giant Kingfisher	*Megaceryle maxima*		-	+	-	-	-
		Pied Kingfisher	*Ceryle rudis*	Agoprech	+	+	-	-	-
Falconiformes	Falconidae	Pygmy Falcon	*Polihierax semitorquatus*		-	+	+	+	+
		Lesser Kestrel	*Falco naumanni*		-	-	+	+	+
		Eurasian Kestrel	*Falco tinnunculus*		-	-	+	+	+
		Fox Kestrel	*Falco alopex*		-	-	+	+	+
		Gray Kestrel	*Falco ardosiaceus*		-	-	+	+	+
		Red-necked Falcon	*Falco chicquera*		-	-	+	+	+
		Lanner Falcon	*Falco biarmicus*		-	-	+	+	+
		Peregrine Falcon	*Falco peregrinus*		+	-	+	+	-
Charadriiformes:	Recurvirostridae	Black-winged Stilt	*Himantopus himantopus*		+	-	-	-	-
		Pied Avocet	*Recurvirostra avosetta*		+	-	-	+	-
Charadriiformes	Pluvianidae	Egyptian Plover	*Pluvianus aegyptius*		“	-	-	-	-
Charadriiformes:	Burhinidae	Spotted Thick-knee	*Burhinus capensis*		+	-	-	-	-
		Eurasian Thick-	*Burhinus*		+	-	-	-	-

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		knee	*oedicnemus*						
		Indian Thick-knee	*Burhinus indicus*		+	-	-	-	-
		Senegal Thick-knee	*Burhinus senegalensis*	Abingich	+	-	-	-	-
Charadriiformes:	Charadriiddae	Common Ringed Plover	*Charadrius hiaticula*	Abingich	+	-	-	-	-
		Forbes's Plover	*Charadrius forbesi*		+	-	-	-	-
		Little Ringed Plover	*Charadrius dubius*		+	-	-	-	-
		Long-toed Lapwing	*Vanellus crassirostris*		+	-	-	-	-
		Spur-winged Lapwing	*Vanellus spinosus*		+	-	-	-	-
		Black-headed Lapwing	*Vanellus tectus*		+	-	-	-	-
		White-crowned Lapwing	*Vanellus albiceps*		+	-	-	-	-
		Senegal Lapwing	*Vanellus lugubris*		+	-	-	-	-
		Crowned Lapwing	*Vanellus coronatus*		+	-	-	-	-
		Wattled Lapwing	*Vanellus senegallus*		+	-	-	-	-
		Caspian Plover	*Anarhynchus asiaticus*		+	-	-	-	-
Charadriiformes	Scolopacidae	Eurasian Curlew	*Numenius arquata*		+	-	-	-	-
		Black-tailed Godwit	*Limosa limosa*		+	-	-	-	-
		Jack Snipe	*Lymnocryptes minimus*		+	-	-	-	-
		Great Snipe	*Gallinago media*		+	-	-	-	-
		African Snipe	*Gallinago nigripennis*		+	-	-	-	-
		Common Snipe	*Gallinago gallinago*		+	-	-	-	-
		Common Sandpiper	*Actitis hypoleucos*		+	-	-	-	-
		Green Sandpiper	*Tringa ochropus*		+	-	-	-	-
		Marsh Sandpiper	*Tringa stagnatilis*		+	-	-	-	-

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Wood Sandpiper	*Tringa glareola*		+	-	-	-	-
		Common Redshank	*Tringa totanus*		+	-	-	-	-
		Spotted Redshank	*Tringa erythropus*		+	-	-	-	-
		Common Greenshank	*Tringa nebularia*		+	-	-	-	-
		Ruff	*Calidris pugnax*		+	-	-	-	-
		Temminck's Stint	*Calidris temminckii*		+	-	-	-	-
		Little Stint	*Calidris minuta*		+		-	-	
Charadriiformes	Jacanidae	African Jacana	*Actophilornis africanus*	Akeer	+	+	-	-	
“	‘”	Lesser Jacana	*Microparra capensis*	Akeer	+		-	-	
Columbiformes:	Columbidae	African Collared-Dove	*Streptopelia roseogrisea*	Kurek	-	-	+	+	+
“	“	Mourning Collared-Dove	*Streptopelia decipiens*	Kurek	-	-	+	+	+
		Red-eyed Dove	*Streptopelia semitorquata*	Kurek	-	-	+	+	+
		Ring-necked Dove	*Streptopelia capicola*	Kurek	-	-	+	+	+
		Vinaceous Dove	*Streptopelia vinacea*	Kurek	-	-	+	+	+
		Laughing Dove	*Spilopelia senegalensis*	Kurek	-	-	+	+	+
		Tambourine Dove	*Turtur tympanistria*	Kurek	-	-	+	+	+
		Namaqua Dove	*Oena capensis*	Kurek	-	-	+	+	+
		Bruce's Green-Pigeon	*Treron waalia*	Kurek	-	-	+	+	+
		African Green-Pigeon	*Treron calvus*	Kurek	-	-	+	+	+
Cuculiformes	Cuculidae	Senegal Coucal	*Centropus senegalensis*	Akeliet		+	-	+	+
		Great Spotted Cuckoo	*Clamator glandarius*		-	-	-	+	+
		Black Cuckoo	*Cuculus clamosus*		-	-	-	+	+
		Red-chested Cuckoo	*Cuculus solitarius*		-	-	-	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		African Cuckoo	*Cuculus gularis*		-	-	-	+	+
		Common Cuckoo	*Cuculus canorus*		-	-	-	+	+
Caprimulgiformes:	Apodidae	Alpine Swift	*Tachymarptis melba*		-	-	-	-	-
		Common Swift	*Apus apus*		-	+	-	-	-
		Little Swift	*Apus affinis*		-	+	-	-	-
		White-rumped Swift	*Apus caffer*		-	+	-	-	-
		African Palm Swift	*Cypsiurus parvus*		-	-	-	-	-
Gruiformes	Gruidae	Black Crowned-Crane	*Balearica pavonina*		+	-	+	+	-
Podicipediformes	Podicipedae	Little Grebe	*Tachybaptus ruficollis*		-	-	-	-	-
Ciconiiformes	Ciconiidae	African Openbill	*Anastomus lamelligerus*	Agal	+	-	+	-	-
		Black Stork	*Ciconia nigra*	Atok					
		Abdim's Stork	*Ciconia abdimii*						
		African Woolly-necked Stork	*Ciconia microscelis*	Atok	+	-	+	+	+
		White Stork	*Ciconia ciconia*	Atok					
		Saddle-billed Stork	*Ephippiorhynchus senegalensis*		+	-	+		
		Marabou Stork	*Leptoptilos crumenifer*	Dhel	+		+	+	+
		Yellow-billed Stork	*Mycteria ibis*				-	-	-
Suliformes:	Anhingidae	African Darter	*Anhinga rufa*	Liei	+	+	-	-	-
Suliformes:	Phalacrocoracidae	Long-tailed Cormorant	*Microcarbo africanus*				+	+	+
		Great Cormorant	*Phalacrocorax carbo*		+	+	-	-	-
Accipitriformes	Phalacrocoridae	Reed Cormorant	*Phalacrocorax africanus*		+		-	-	-
Pelecaniformes	Pelecanidae	Great White Pelican	*Pelecanus onocrotalus*		+	+	-	-	-
		Pink-backed Pelican	*Pelecanus rufescens*		+	+	-	-	-
Passeriformes	Corvidae	Piapiac	*Ptilostomus afer*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Cape Crow	*Corvus capensis*	Gak-Chol	-	-	+	+	+
		Pied Crow	*Corvus albus*	Gak-Aror	-	-	+	+	+
Pelecaniformes	Balaeniciptidae	Shoebill	*Balaeniceps rex*		+		-	-	-
Pelecaniformes	Scopidae	Hamerkop	*Scopus umbretta*	Adolchirik	+	+	-	-	-
Pelecaniformes	Ardeidae	Great Bittern	*Botaurus stellaris*		+	-	-	-	-
		Dwarf Bittern	*Ixobrychus sturmii*		+	-	-	-	-
		Little Bittern	*Ixobrychus minutus*		+	-	-	-	-
		Black Heron	*Egretta ardesiaca*	Guak	+	-	-	-	-
		Little Egret	*Egretta garzetta*	Kan	+	-	-	-	-
		Striated Heron	*Butorides striata*	Guak	+	-	-	-	-
		Squacco Heron	*Ardeola ralloides*	Guak	+	-	-	-	-
		Western Cattle Egret	*Bubulcus ibis*	Kan	+	-	-	-	-
		Great Egret	*Ardea alba*	Kan	+	-	-	-	-
		Yellow-billed Egret	*Ardea brachyrhyncha*	Kan	+		+	-	-
		Gray Heron	*Ardea cinerea*	Guak	+	-	-	-	-
		Purple Heron	*Ardea purpurea*	Guak	+	-	-	-	-
		Black-headed Heron	*Ardea melanocephala*	Guak	+	-	-	-	-
		Goliath Heron	*Ardea goliath*	Guak	+	-	-	-	-
Pelecaniformes	Threskiornithidae	Glossy Ibis	*Plegadis falcinellus*	Awau	+	-	-	-	-
		African Sacred Ibis	*Threskiornis aethiopicus*	Arumjo	+	-	-	-	-
		Hadada Ibis	*Bostrychia hagedash*	Awau	+	-	+	-	-
		Eurasian Spoonbill	*Platalea leucorodia*		+	-	-	-	-
	Pelecanidae	African Spoonbill	*Platalea alba*	Jakathopur	+	-	-	-	-
Accipitriformes	Pandionidae	Osprey	*Pandion haliaetus*		+	+	+	-	-
Coliiformes	Coliidae	Speckled Mousebird	*Colius striatus*		+	+	+	+	+
		Blue-naped Mousebird	*Urocolius macrourus*		+	+	+		

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Falconiformes	Falconidae	Pygmy Falcon	*Polihierax semitorquatus*		-	-	-	+	+
		Lesser Kestrel	*Falco naumanni*		-	-	-	+	+
		Eurasian Kestrel	*Falco tinnunculus*		-	-	-	+	+
		Fox Kestrel	*Falco alopex*		-	-	+	+	+
		Gray Kestrel	*Falco ardosiaceus*		-	-	+	+	+
		Red-necked Falcon	*Falco chicquera*		-	-	+	+	+
		Red-footed Falcon	*Falco vespertinus*		-	-	+	+	+
		Eleonora's Falcon	*Falco eleonorae*		-	-	+	+	+
		Eurasian Hobby	*Falco subbuteo*		-	-	+	+	+
		African Hobby	*Falco cuvierii*		-	-	+	+	+
		Lanner Falcon	*Falco biarmicus*		-	-	+	+	+
		Peregrine Falcon	*Falco peregrinus*		-	-	+	+	+
Passeriformes	Monarchidae	African Paradise-Flycatcher	*Terpsiphone viridis*			+	+	+	+
Passeriformes	Laniidae	Red-backed Shrike	*Lanius collurio*		-	-	+	+	+
		Red-tailed Shrike	*Lanius phoenicuroides*		-	-	+	+	+
		Isabelline Shrike	*Lanius isabellinus*		-	-	+	+	+
		Emin's Shrike	*Lanius gubernator*		-	-	+	+	+
		Great Gray Shrike	*Lanius excubitor*		-	-	+	+	+
		Gray-backed Fiscal	*Lanius excubitoroides*		-	-	+	+	+
		Yellow-billed Shrike	*Lanius corvinus*		-	-	+	+	+
		Taita Fiscal	*Lanius dorsalis*		-	-	+	+	+
		Northern Fiscal	*Lanius humeralis*		-	-	+	+	+
		Woodchat Shrike	*Lanius senator*		-	-	+	+	+
Passeriformes	Hyliotidae	Yellow-bellied Hyliota	*Hyliota flavigaster*		-	-	+	+	+
Passeriformes	Alaudidae	Rufous-rumped Lark	*Pinarocorys erythropygia*		-	-	+	+	+
		Red-winged Lark	*Mirafra hypermetra*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Flappet Lark	*Mirafra rufocinnamomea*		-	-	+	+	+
		Singing Bushlark	*Mirafra javanica*		-	-	+	+	+
		Sun Lark	*Galerida modesta*		-	-	+	+	+
		Sparrow-Lark	*Eremopterix leucotis*			+	+	+	+
Passeriformes	Macrosphenidae	Green Crombec	*Sylvietta virens*		-	-	+	+	+
		Northern Crombec	*Sylvietta brachyura*		-	-	+	+	+
		Red-faced Crombec	*Sylvietta whytii*		-	-	+	+	+
		Grass-Warbler	*Melocichla mentalis*		-	-	+	+	+
Passeriformes	Acrocephalidae	Olivaceous Warbler	*Iduna pallida*		-	-	+	+	+
		African Yellow-Warbler	*Iduna natalensis*		-	-	+	+	+
		Yellow-Warbler	*Iduna similis*		-	-	+	+	+
		Olive-tree Warbler	*Hippolais olivetorum*		-	-	+	+	+
		Icterine Warbler	*Hippolais icterina*		-	-	+	+	+
		Common Reed Warbler	*Acrocephalus scirpaceus*		-	-	+	+	+
		Basra Reed Warbler	*Acrocephalus griseldis*		-	-	+	+	+
		Lesser Swamp Warbler	*Acrocephalus gracilirostris*		-	-	+	+	+
		Greater Swamp Warbler	*Acrocephalus rufescens*		-	-	+	+	+
		Great Reed Warbler	*Acrocephalus arundinaceus*		-	-	+	+	+
Passeriformes	Hirundinidae	White-headed Sawwing	*Psalidoprocne albiceps*		-	-	+	+	+
		Black Sawwing	*Psalidoprocne pristoptera*		-	-	+	+	+
		Gray-rumped Swallow	*Pseudhirundo griseopyga*			+	+	+	+
		Banded Martin	*Neophedina cincta*		-	-	+	+	+
		Plain Martin	*Riparia paludicola*		-	-	+	+	+

		Bank Swallow	*Riparia riparia*		-	-	+	+	+
		Rock Martin	*Ptyonoprogne fuligula*		-	-	+	+	+
		Barn Swallow	*Hirundo rustica*		-	-	+	+	+
		Ethiopian Swallow	*Hirundo aethiopica*		-	-	+	+	+
		Wire-tailed Swallow	*Hirundo smithii*				+	+	+
		Western House-Martin	*Delichon urbicum*		-	-	+	+	+
		Red-rumped Swallow	*Cecropis daurica*		-	-	+	+	+
		Lesser Striped Swallow	*Cecropis abyssinica*		-	-	+	+	+
		Rufous-chested Swallow	*Cecropis semirufa*		-	-	+	+	+
		Mosque Swallow	*Cecropis senegalensis*		-	-	+	+	+
Passeriformes	Pycnonotiae	Slender-billed Greenbul	*Stelgidillas gracilirostris*		-	-	+	+	+
		Red-tailed Bristlebill	*Bleda syndactylus*		-	-	+	+	+
		Yellow-throated Greenbul	*Atimastillas flavicollis*		-	-	+	+	+
		Joyful Greenbul	*Chlorocichla laetissima*		-	-	+	+	+
		Honeyguide Greenbul	*Baeopogon indicator*		-	-	+	+	+
		Little Greenbul	*Eurillas virens*			+	+	+	+
		Yellow-whiskered Greenbul	*Eurillas latirostris*		-	-	+	+	+
		Plain Greenbul	*Eurillas curvirostris*		-	-	+	+	+
		White-throated Greenbul	*Phyllastrephus albigularis*		-	-	+	+	+
		Northern Brownbul	*Phyllastrephus strepitans*		-	-	+	+	+
		Leaf-love	*Phyllastrephus scandens*		-	-	+	+	+
		Toro Olive-Greenbul	*Phyllastrephus hypochloris*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Common Bulbul	*Pycnonotus barbatus*		-	-	+	+	+
Passeriformes	Phylloscopidae	Wood Warbler	*Phylloscopus sibilatrix*		-	-	+	+	+
		Willow Warbler	*Phylloscopus trochilus*		-	-	+	+	+
		Common Chiffchaff	*Phylloscopus collybita*		-	-	+	+	+
Passeriformes	Sturnidae	Wattled Starling	*Creatophora cinerea*		-	-	+	+	+
		Violet-backed Starling	*Cinnyricinclus leucogaster*		-	-	+	+	+
		Red-winged Starling	*Onychognathus morio*		-	-	+	+	+
		Waller's Starling	*Onychognathus walleri*		-	-	+	+	+
		Sharpe's Starling	*Pholia sharpii*		-	-	+	+	+
		Rüppell's Starling	*Lamprotornis purpuroptera*		-	-	+	+	+
		Long-tailed Glossy Starling	*Lamprotornis caudatus*			+	+	+	+
		Superb Starling	*Lamprotornis superbus*		-	-	+	+	+
		Lesser Blue-eared Starling	*Lamprotornis chloropterus*		-	-	+	+	+
		Greater Blue-eared Starling	*Lamprotornis chalybaeus*		-	-	+	+	+
		Purple Starling	*Lamprotornis purpureus*		-	-	+	+	+
		Bronze-tailed Starling	*Lamprotornis chalcurus*		-	-	+	+	+
Passeriformes	Plocidae	White-headed Weaver	*Dinemellia dinemelli*		-	-	+	+	+
		Speckle-fronted Weaver	*Sporopipes frontalis*		-	-	+	+	+
		Gray-headed Social-Weaver	*Pseudonigrita arnaudi*		-	-	+	+	+
		Red-headed Weaver	*Anaplectes rubriceps*		-	-	+	+	+
		Baglafecht Weaver	*Ploceus baglafecht*		-	-	+	+	+
		Little Weaver	*Ploceus luteolus*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Slender-billed Weaver	*Ploceus pelzelni*		-	-	+	+	+
		Spectacled Weaver	*Ploceus ocularis*		-	-	+	+	+
		Northern Masked-Weaver	*Ploceus taeniopterus*		-	-	+	+	+
		Lesser Masked-Weaver	*Ploceus intermedius*		-	-	+	+	+
		Vitelline Masked-Weaver	*Ploceus vitellinus*		-	-	+	+	+
		Heuglin's Masked-Weaver	*Ploceus heuglini*		-	-	+	+	+
		Village Weaver	*Ploceus cucullatus*			+	+	+	+
		Black-headed Weaver	*Ploceus melanocephalus*		-	-	+	+	+
		Golden-backed Weaver	*Ploceus jacksoni*		-	-	+	+	+
		Cinnamon Weaver	*Ploceus badius*		-	-	+	+	+
		Compact Weaver	*Pachyphantes superciliosus*		-	-	+	+	+
		Cardinal Quelea	*Quelea cardinalis*		-	-	+	+	+
		Red-headed Quelea	*Quelea erythrops*		-	-	+	+	+
		Red-billed Quelea	*Quelea quelea*				+	+	+
		Northern Red Bishop	*Euplectes franciscanus*				+	+	+
		Black-winged Bishop	*Euplectes hordeaceus*				+	+	+
		Black Bishop	*Euplectes gierowii*				+	+	+
		Yellow-crowned Bishop	*Euplectes afer*				+	+	+
		Yellow Bishop	*Euplectes capensis*		-	-	+	+	+
		Yellow-mantled Widowbird	*Euplectes macroura*		-	-	+	+	+
		Red-cowled Widowbird	*Euplectes laticauda*		-	-	+	+	+
		Fan-tailed Widowbird	*Euplectes axillaris*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Grosbeak Weaver	*Amblyospiza albifrons*		-	-	+	+	+
Passeriformes	Passeridae	House Sparrow	*Passer domesticus*		-	-	+	+	+
		Shelley's Rufous Sparrow	*Passer shelleyi*		-	-	+	+	+
		Gray-headed Sparrow	*Passer griseus*		-	-	+	+	+
		Chestnut Sparrow	*Passer eminibey*		-	-	+	+	+
Passeriformes	Motacillidae	Gray Wagtail	*Motacilla cinerea*		-	-	+	+	+
		Western Yellow Wagtail	*Motacilla flava*			+	+	+	+
		African Pied Wagtail	*Motacilla aguimp*		-	-	+	+	+
		White Wagtail	*Motacilla alba*		-	-	+	+	+
		African Pipit	*Anthus cinnamomeus*		-	-	+	+	+
		Plain-backed Pipit	*Anthus leucophrys*		-	-	+	+	+
		Tree Pipit	*Anthus trivialis*		-	-	+	+	+
		Red-throated Pipit	*Anthus cervinus*		-	-	+	+	+
		Golden Pipit	*Tmetothylacus tenellus*		-	-	+	+	+
		Yellow-throated Longclaw	*Macronyx croceus*		-	-	+	+	+
Passeriformes	Oriolidae	Eurasian Golden Oriole	*Oriolus oriolus*		-	-	+	+	+
		African Golden Oriole	*Oriolus auratus*		-	-	+	+	+
		Black-headed Oriole	*Oriolus larvatus*		-	-	+	+	+
		Black-winged Oriole	*Oriolus nigripennis*		-	-	+	+	+
Passeriformes:	Alaudidae	Rufous-rumped Lark	*Pinarocorys erythropygia*		-	-	+	+	+
		Chestnut-Sparrow-Lark	*Eremopterix leucotis*		-	-	+	+	+
		Red-winged Lark	*Mirafra hypermetra*		-	-	+	+	+
		Flappet Lark	*Mirafra rufocinnamomea*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Singing Bushlark	*Mirafra javanica*			+	+	+	+
		Sun Lark	*Galerida modesta*		-	-	+	+	+
Passeriformes	Vangidae	White Helmetshrike	*Prionops plumatus*		-	-	+	+	+
		African Shrike-flycatcher	*Megabyas flammulatus*		-	-	+	+	+
Passeriformes	Cisticolidae	Yellow-bellied Eremomela	*Eremomela icteropygialis*		-	-	+	+	+
		Green-backed Eremomela	*Eremomela canescens*		-	-	+	+	+
		Crowned Eremomela	*Eremomela badiceps*		-	-	+	+	+
		Red-winged Gray Warbler	*Drymocichla incana*		-	-	+	+	+
		White-chinned Prinia	*Schistolais leucopogon*		-	-	+	+	+
		Gray Wren-Warbler	*Calamonastes simplex*		-	-	+	+	+
		Green-backed Camaroptera	*Camaroptera brachyura*		-	-	+	+	+
		Buff-bellied Warbler	*Phyllolais pulchella*		-	-	+	+	+
		Yellow-breasted Apalis	*Apalis flavida*		-	-	+	+	+
		Buff-throated Apalis	*Apalis rufogularis*		-	-	+	+	+
		Tawny-flanked Prinia	*Prinia subflava*		-	-	+	+	+
		Pale Prinia	*Prinia somalica*		-	-		+	+
		Red-winged Prinia	*Prinia erythroptera*		-	-	+	+	+
		Rufous-Warbler	*Bathmocercus rufus*			+	+	+	+
		Gray-capped Warbler	*Eminia lepida*		-	-	+	+	
		Red-faced Cisticola	*Cisticola erythrops*		-	-	+	+	+
		Singing Cisticola	*Cisticola cantans*		-	-	+	+	+
		Whistling Cisticola	*Cisticola lateralis*		-	-	+	+	+
		Rock-loving	*Cisticola aberrans*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Cisticola							
		Rattling Cisticola	*Cisticola chiniana*		-	-	+	+	+
		Red-pate Cisticola	*Cisticola ruficeps*		-	-	+	+	+
		Winding Cisticola	*Cisticola marginatus*		-	-	+	+	+
		Croaking Cisticola	*Cisticola natalensis*		-	-	+	+	+
		Foxy Cisticola	*Cisticola troglodytes*		-	-	+	+	+
		Zitting Cisticola	*Cisticola juncidis*		-	-	+	+	+
		Wing-snapping Cisticola	*Cisticola ayresii*		-	-	+	+	+
Passeriformes	Hylviidae	Green Hylia	*Hylia prasina*		-	-	+	+	+
Passeriformes	Sylviidae	Eurasian Blackcap	*Sylvia atricapilla*		-	-	+	+	+
		Garden Warbler	*Sylvia borin*		-	-	+	+	+
		African Hill Babbler	*Sylvia abyssinica*		-	-	+	+	+
		Lesser Whitethroat	*Curruca curruca*			+	+	+	+
		Greater Whitethroat	*Curruca communis*		-	-	+	+	+
Passeriformes	Estrildidae	Gray-headed Silverbill	*Spermestes griseicapilla*		-	-	+	+	+
		Bronze Mannikin	*Spermestes cucullata*		-	-	+	+	+
		Black-and-white Mannikin	*Spermestes bicolor*		-	-	+	+	+
		African Silverbill	*Euodice cantans*		-	-	+	+	+
		Yellow-bellied Waxbill	*Coccopygia quartinia*		-	-	+	+	+
		Green-backed Twinspot	*Mandingoa nitidula*		-	-	+	+	+
		Gray-headed Oliveback	*Delacourella capistrata*		-	-	+	+	+
		Black-cheeked Waxbill	*Brunhilda charmosyna*		-	-	+	+	+
		Black-crowned Waxbill	*Estrilda nonnula*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Fawn-breasted Waxbill	*Estrilda paludicola*		-	-	+	+	+
		Common Waxbill	*Estrilda astrild*		-	-	+	+	+
		Black-rumped Waxbill	*Estrilda troglodytes*		-	-	+	+	+
		Crimson-rumped Waxbill	*Estrilda rhodopyga*		-	-	+	+	+
		Quailfinch	*Ortygospiza atricollis*		-	-	+	+	+
		Cut-throat	*Amadina fasciata*		-	-	+	+	+
		Red-cheeked Cordonbleu	*Uraeginthus bengalus*			+	+	+	+
		Blue-capped Cordonbleu	*Uraeginthus cyanocephalus*		-	-	+	+	+
		Black-bellied Seedcracker	*Pyrenestes ostrinus*		-	-	+	+	+
		Green-winged Pytilia	*Pytilia melba*		-	-	+	+	+
		Orange-winged Pytilia	*Pytilia afra*		-	-	+	+	+
		Red-winged Pytilia	*Pytilia phoenicoptera*		-	-	+	+	+
		Red-billed Pytilia	*Pytilia lineata*		-	-	+	+	+
		Brown Twinspot	*Clytospiza monteiri*		-	-	+	+	+
		Red-billed Firefinch	*Lagonosticta senegala*		-	-	+	+	+
		African Firefinch	*Lagonosticta rubricata*		-	-	+	+	+
		Black-bellied Firefinch	*Lagonosticta rara*		-	-	+	+	+
		Bar-breasted Firefinch	*Lagonosticta rufopicta*		-	-	+	+	+
		Black-faced Firefinch	*Lagonosticta larvata*		-	-	+	+	+
Passeriformes	Viduidae	Pin-tailed Whydah	*Vidua macroura*		-	-	+	+	+
		Sahel Paradise-Whydah	*Vidua orientalis*		-	-	+	+	+
		Eastern Paradise-Whydah	*Vidua paradisaea*		-	-	+	+	+

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

		Straw-tailed Whydah	*Vidua fischeri*			+	+	+	+
		Village Indigobird	*Vidua chalybeata*		-	-	+	+	+
		Wilson's Indigobird	*Vidua wilsoni*		-	-	+	+	+
		Quailfinch Indigobird	*Vidua nigeriae*		-	-	+	+	+
		Jambandu Indigobird	*Vidua raricola*		-	-	+	+	+
		Cameroon Indigobird	*Vidua camerunensis*		-	-	+	+	+
		Parasitic Weaver	*Anomalospiza imberbis*		-	-	+	+	+
Passeriformes	Fringillidae	Oriole Finch	*Linurgus olivaceus*		-	-	+	+	+
		White-rumped Seedeater	*Crithagra leucopygia*		-	-	+	+	+
		Yellow-fronted Canary	*Crithagra mozambica*		-	-	+	+	+
		West African Seedeater	*Crithagra canicapilla*		-	-	+	+	+
		Reichard's Seedeater	*Crithagra reichardi*		-	-	+	+	+

Keys SW=Swamp OW=Open Water, FL=Farmland, SV=Savanna, SH=Shrubs

(+) = bird observed/recorded (-) = non record/observed

Actionable Recommendations

Based on the provided metrics and the ecological significance of the Sudd wetland, the following actionable recommendations are crucial for the long-term conservation and sustainable management of its avifauna.

1. Establish and Strengthen Protected Area Networks

The high species richness and individual counts emphasize the Sudd's critical importance as an avian habitat. Formal protection through the establishment of national parks, wildlife reserves, or Ramsar sites is paramount "*Protected Areas: A Global Guide to Their Status and Management*". This provides legal frameworks for conservation and helps mitigate threats such as habitat degradation and unsustainable resource extraction.

Actionable Steps:

- **Designate new protected areas or expand existing ones:** Focus on areas identified as critical bird habitats, particularly those supporting high concentrations of threatened or endemic species.
- **Develop and implement effective management plans:** These plans should include zoning regulations, enforcement mechanisms, and provisions for community involvement.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

- **Seek international recognition:** Pursue designation as a Ramsar Site (Wetland of International Importance) to leverage international support and expertise for conservation efforts "*The Ramsar Convention on Wetlands: Its History and Development*".

2. Implement Comprehensive Habitat Monitoring and Restoration Programs

While the current metrics are positive, ongoing monitoring is essential to detect changes in avian populations and habitat quality. Wetland ecosystems are dynamic and susceptible to hydrological alterations, climate change, and human activities (*Wetland Ecology: Principles and Conservation*).

Actionable Steps:

- **Establish a long-term avian monitoring program:** This should involve regular surveys using standardized methodologies (e.g., point counts, transect surveys) to track population trends of key indicator species and overall species richness.
- **Monitor hydrological regimes:** Track water levels, flow rates, and inundation patterns, as these are critical drivers of wetland productivity and avian habitat availability.
- **Identify and restore degraded habitats:** Focus on areas affected by invasive species, pollution, or unsustainable land use practices. This may involve re-vegetation, removal of invasive plants, or restoration of natural water flow.
- **Assess the impact of climate change:** Monitor changes in rainfall patterns, temperature, and extreme weather events, and develop adaptive management strategies to mitigate their effects on avifauna.

3. Promote Sustainable Resource Management and Community Engagement

Explanation: Local communities often depend on wetland resources for their livelihoods. Sustainable management practices that integrate local needs with conservation goals are crucial for long-term success "*Conservation and Sustainable Use of Wetlands*".

Actionable Steps:

- **Develop and implement community-based conservation initiatives:** Engage local communities in decision-making processes, provide training on sustainable resource use (e.g., sustainable fishing, papyrus harvesting), and explore alternative livelihood options.
- **Raise awareness about the ecological importance of the Sudd:** Educate local communities, policymakers, and the general public about the value of the wetland and its avifauna through workshops, educational materials, and outreach programs.
- **Support sustainable tourism initiatives:** Develop eco-tourism opportunities that provide economic benefits to local communities while promoting conservation and minimizing environmental impact.
- **Address human-wildlife conflict:** Develop strategies to mitigate conflicts between humans and birds, particularly those involving crop depredation or disease transmission.

4. Conduct Targeted Research on Key Species and Ecological Processes

While the overall diversity is high, specific research is needed to understand the ecology of individual species, particularly those that are threatened, endemic, or play critical ecological roles "*Fundamentals of Conservation Biology*".

Actionable Steps:

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

- **Identify and prioritize research on threatened and endemic species:** Investigate their population dynamics, breeding biology, habitat requirements, and threats to inform targeted conservation actions.
- **Study migratory patterns and connectivity:** Use banding, satellite tagging, and genetic analysis to understand the migratory routes, stopover sites, and wintering grounds of migratory birds using the Sudd. This information is vital for international conservation efforts.
- **Investigate food web dynamics and trophic interactions:** Understand how different bird species interact with their prey and other components of the ecosystem to ensure the long-term health of the food web.
- **Assess the impact of emerging threats:** Research the effects of pollution (e.g., plastics, agricultural runoff), disease outbreaks, and infrastructure development on avian populations.

5. Strengthen Policy and Governance Frameworks

Effective conservation requires robust legal and institutional frameworks at national and regional levels. This includes clear policies, adequate funding, and strong enforcement mechanisms "*Environmental Policy and Law*".

Actionable Steps:

- **Review and update national environmental legislation:** Ensure that laws adequately protect wetlands and their biodiversity, aligning with international conventions and best practices.
- **Allocate sufficient financial resources:** Secure dedicated funding for conservation programs, research, and protected area management from national budgets and international donors.
- **Enhance institutional capacity:** Strengthen the capacity of government agencies, research institutions, and local organizations involved in conservation through training, equipment, and technical support.
- **Foster regional and international cooperation:** Collaborate with neighboring countries and international organizations on trans-boundary conservation initiatives, particularly for migratory species.

CONCLUSION

The avifauna survey in the Sudd wetland discloses an ecosystem of immense ecological value, characterized by high species richness and abundant individual birds. The metrics—90,667 individuals, 418 species, 56 families, and 23 orders—paint a picture of a vibrant and diverse avian community. However, this richness is not immutable. Proactive and integrated conservation efforts, encompassing protected area establishment, habitat monitoring, community engagement, targeted research, and robust governance, are essential to safeguard this invaluable natural heritage for future generations. The Sudd's avifauna represents a critical component of global biodiversity, and its preservation demands sustained commitment and collaborative action.

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Plate 1: (Bor Highway, 2023) by Investigator (UNMISS Site Bor, 2023)

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Plate 2: African Sacred Ibis (*Threskiornis aethiopicus*) and Glossy Ibis (*Plegadis falcinellus*) in Lesik Bor study site 2023 – *by the investigator.*

Plate 3: Sudd Site Bor Sudd Site (2023) by Investigator

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026

Plate 4: at Leudiet docking site in Bor Town (2023) by Investigator

Plate 4: at Maluachat site Bor by Investigator

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue II February 2026