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Avian biodiversity in the Guessabo wetland, Centre - West of Côte d'Ivoire

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Abstract

Wetlands are among the most remarkable ecosystems that can shelter a great diversity of animal and plant species. In order to determine the avifaunal diversity of the Guessabo wetland, ornithological censuses were carried out in this site using the slow walking method on transects punctuated by stops of about 15 minutes. A total of 168 species of birds, divided into 48 families of 18 orders, were recorded. Non-passeriformes are the most important with 29 families. With 14 species, the Ardeidae family is the most diversified. The majority of these species on this site are resident. Two Near Threatened species, 40 from the Guinean-Congolese forest biome, two from the Sudano-Guinean savannah and seven West African endemics breed here. Knowledge of the site's avifaunal diversity could contribute to the sustainable management of the site and will make it possible to envisage bird conservation programmes in this natural ecosystem.

Keywords: Birds, diversity, guessabo, wetland, Côte d'Ivoire

1. Introduction

The Earth Summit held in June 1992 in Rio de Janeiro, which brought together almost all the countries of our planet, made it possible to alert world public opinion to the risks of ecological degradation and to adopt a number of guidelines, including the Rio Declaration on the Environment and Agenda 21 (Ahon, 2010) ^[1]. Since then, the conservation of biodiversity has become a major concern, indeed an international issue for most governments and international organisations with a view to halting this massive erosion of biodiversity and preventing a major biological crisis (Ahon, 2010) ^[1]. Among the ecosystems that can host a wide variety of animal and plant species, wetlands appear to be one of the most remarkable (Costanza *et al.*, 1997) ^[2]. Wetlands, which are intermediate habitats between terrestrial and aquatic environments (Egnankou 2015, Abrou *et al.*, 2019) ^[3, 4], are characterised by a water table close to the surface and high biological productivity (Barnaud and Fustec, 2007) ^[5]. These ecosystems cover 9% of the world's land area (Zedler and Kercher, 2005) ^[6] and provide various ecological services such as improving water quality, regulating river flows, carbon sequestration and are a support for biodiversity (Levison, 2014) ^[7]. They provide valuable goods and services such as water purification, flood mitigation and support for low water levels. They are areas for recharging and protecting groundwater tables, maintaining the stocks and quality of domestic, agricultural and industrial water, trapping sediment and pollutants and biological production (Egnankou, 2015) ^[3]. These ecosystems play an essential role in the livelihoods of rural communities and the protection of soil and water (Hussain *et al.*, 2007) ^[8]. Despite this crucial importance, wetlands are among the most threatened ecosystems, mainly due to the recent and continuous growth of human populations and the joint development of irrigated agriculture, urbanization, transport infrastructure, tourism and intensive fishing activities (Kra, 2016) ^[9]. In Côte d'Ivoire, coastal and continental wetlands represent 2% of the national territory (Egnankou, 2015) ^[3]. As a result, Côte d'Ivoire has ratified the Ramsar Convention and has included six sites on the list of wetlands of international importance, namely the Azagny National Park, the Sassandra - Dagbégo complex, Fresco, the Grand-Bassam wetland, the Ehotilés - Essouman Islands and the N'Ganda-N'Ganda Classified Forest. Other sites that can be qualified as Ramsar sites exist in the interior of the country. However, the scientific data relating to the diversity and abundance of natural animal and plant resources remain very little known in the majority of these sites. This is the case of the avifauna of the Guessabo Wetland (GW) where no published scientific data is available until the present study.

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However, it is known that birds are an important component of wetland landscapes. Indeed, their tendency to congregate, often in spectacular concentrations, has made these birds objects of research and monitoring. They are thus excellent indicators of the value and health of wetlands (Gottschalk *et al.*, 2007, Fonderflick, 2009) [10, 11]. Thus, monitoring birds is a simple and effective tool not only for determining the relative importance of wetlands for bird fauna and trends in bird population numbers, but also for setting conservation priorities (Thirgood and Heath, 1994, Stattersfield *et al.*, 1998) [12, 13]. Birds are also an excellent vehicle for raising awareness and mobilising civil society for their conservation and, beyond that, for the ecosystems on which they depend. By improving the skills and awareness of private site managers, civil society and administrations responsible for site management, it is possible to achieve better management

and conservation of these key sites for biodiversity. The objective of this study is to determine the avifaunal diversity of the GW with a view to contributing to the sustainable management of this site and to consider any other conservation programme (monitoring of rare or bio-indicator species, population dynamics, reproduction of threatened species, etc.) on birds.

2. Material and methods

2.1 Study site

The GW is located between longitudes 6°58' and 6°46' West and latitudes 6°30' and 6°33' North and belongs to the region of Haut-Sassandra; in the centre-west of Côte d'Ivoire. Administratively, the sub-prefecture of Guessabo is part of the department of Zoukougbeu (Figure 1).

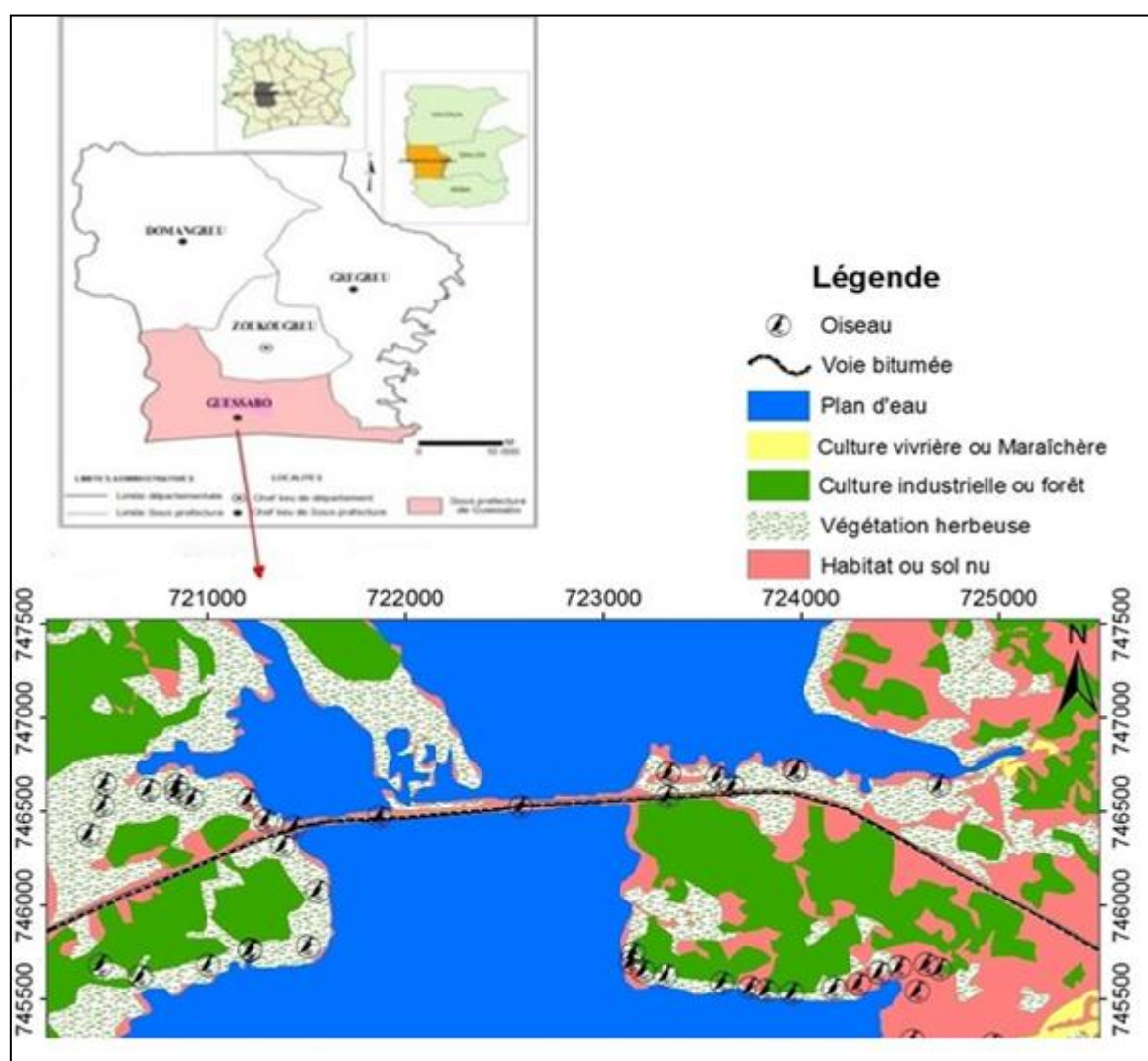


Fig 1: Map of the GW with indication of transects and birding points

It is limited as follows: to the north, the sub-prefectures of Domangbeu and Zoukougbeu, to the south, the sub-prefecture of Ibohué, to the east, the sub-prefecture of Gregbeu and to the west, the sub-prefecture of Guézon (Kra, 2016) [9]. This sub-prefecture benefits from numerous assets for the practice of continental fishing. In fact, the river Sassandra borders it to the west and with its tributaries the Lobo and Davo rivers form a dense hydrographic network. The Upper Sassandra region is marked by a sub-equatorial climate with two seasons: a rainy season (March to October) and a dry season

(November to February). The average annual temperature is 25,6°C (Adjiri *et al.*, 2018) [14]. The dry and wet seasons alternate with temperatures ranging from 24.65 °C to 27.75 °C on average. Annual rainfall has decreased from 1868,5 mm in 1968 to 1120,4 mm in 2005, a decrease of 40% (Ligban *et al.*, 2009) [15]. This climate gave the departments a homogeneous vegetation consisting of dense and humid forest in the south and wooded savannah in the north. However, the degradation of this forest is accelerated by the intensification of cash crops (cocoa, coffee, oil palm and rubber). Extensive

and shifting cultivation practices as well as uncontrolled exploitation of forest species have pushed back the limits of this forest. This situation seriously disrupts the climate of this locality and has an impact on the water resources that can be mobilised (Die, 2006) [16]. The relief of the area consists of a low-altitude peneplain with crystalline domes (260-400 m) and low plateaus (190-250 m) in the northern part. Therefore, the region presents alluvial valleys that are not very deep and offer wide alluvial lowlands favourable to irrigated crops (Adjiri *et al.*, 2020) [17]. As for the soils, they are of the reworked and hydromorphic type (Ligban *et al.*, 2009) [15].

2.2 Technical equipment

Observations were made through pairs of binoculars (Bushnell, 10 x 50 mm). The recording equipment consisted of a digital camera (Panasonic Lumix DMC-TZ61) for taking pictures and a GPS (Global Positioning System) (Garmin 60 CSx) to record geographical coordinates, altitude, route layout and to mark the various observation points. The West African Bird Guide (Borrow and Demey, 2001) [18] was used for the identification of these birds.

2.3 Data collection

Ornithological inventories in the GW were carried out in the periods from 12 to 18 January of the years 2018 to 2020 in order to take into account the majority of migratory bird species likely to visit the GW. The main method used during this work was bird watching by walking slowly along the edge of the GW and on the bridge crossing the site. Stops of about 15 minutes (Pomeroy, 1992, Yaokokoré-Béibro, 2001, Odoukpé *et al.*, 2014, Yaokokoré-Béibro *et al.*, 2015a and

Yaokokoré-Béibro *et al.*, 2015b) [19, 20, 21, 22, 23] were observed during these slow walks and all bird species seen or heard were recorded. Data collection was carried out from 06:30 to 11:30 and 14:00 to 18:00.

2.4 Data analysis

The nomenclature, taxonomy and order of species used in this article are taken from the Handbook of the Birds of the World and BirdLife International as published by (Fishpool, 2001) [24]. The conservation status (IUCN, 2020) [25] and biogeographical origins (Resident, Intra-african migratory or Palearctic migratory) (Borrow and Demey, 2001) [18] have been indicated for each of the species listed. Species endemic to West Africa (AO) were identified. Indications concerning the biomes (Sudano-Guinean savannah and Guinean-Congolese forest) are (Stattersfield *et al.*, 1998, Fishpool and Evans, 2001) [13, 26].

3. Results

3.1 Qualitative composition of the avifauna

A total of 168 bird species belonging to 48 families of 18 orders were recorded (Table 1). Non-passeriformes are the most represented with 109 species (64,88%) from 29 families (60,42%). The passeriformes represent the most important order in terms of species numbers with 35,12% of the species richness and 39,58% of the number of families in this wetland. In terms of families, the most diversified is that of the Ardeidae with a species richness of 08,33%. This is followed by the families Accipitridae and Nectariniidae with respectively 06,55% and 05,95% of the species richness.

Table 1: List of bird species recorded in the GW

NE	Orders / Families/ Species	Commons names	SC	SB	Biome	END
	Anseriformes					
	Anatidae					
1	<i>Dendrocygna viduata</i> (Linnaeus, 1766)	White-faced Whistling Duck	LC	R/M		
2	<i>Nettapus auritus</i> (Boddaert, 1783)	African Pygmy Goose	LC	R		
	Podicipediformes					
	Podicipedidae					
3	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	Little Grebe	LC	R		
	Columbiformes					
	Columbidae					
4	<i>Treron calvus</i> (Temminck, 1811)	African Green Pigeon	LC	R		
5	<i>Turtur brehmeri</i> (Hartlaub, 1865)	Blue-headed Wood Dove	LC	R	GC	
6	<i>Turtur tympanistria</i> (Temminck, 1809)	Tambourine Dove	LC	R		
7	<i>Turtur afer</i> (Linnaeus, 1766)	Blue-spotted Wood Dove	LC	R		
8	<i>Columba iriditorques</i> (Cassin, 1856)	Western Bronze-naped Pigeon	LC	R	GC	
9	<i>Streptopelia semitorquata</i> (Rüppell, 1837)	Red-eyed Dove	LC	R		
10	<i>Spilopelia senegalensis</i> (Linné, 1766)	laughing Dove	LC	R		
	Caprimulgiformes					
	Apodidae					
11	<i>Telacanthura melanopygia</i> (Chapin, 1915)	Black Spinetail	LC	R	GC	
12	<i>Cypsiurus parvus</i> (Lichtenstein, 1823)	African Palm Swift	LC	R		
13	<i>Apus pallidus</i> (Shelley, 1870)	Pallid Swift	LC	P		
14	<i>Apus apus</i> (Linnaeus, 1758)	European Swift	LC	P		
15	<i>Apus affinis</i> (Gray, 1830)	Little Swift	LC	R		
	Cuculiformes					
	Cuculidae					
16	<i>Clamator leuallantii</i> (Swainson, 1829)	Leuallant's Cuckoo	LC	M		
17	<i>Cuculus gularis</i> (Stephens, 1815)	African Cuckoo	LC	M		
18	<i>Chrysococcyx cupreus</i> (Shaw, 1792)	African Emerald Cuckoo	LC	R		
19	<i>Chrysococcyx klaas</i> (Stephens, 1815)	Klaas's Cuckoo	LC	R/M		
20	<i>Chrysococcyx caprius</i> (Boddaert, 1783)	Didric Cuckoo	LC	R/M		
21	<i>Ceuthochares aureus</i> (Vieillot, 1817)	Yellowbill	LC	R		
22	<i>Centropus leucogaster</i> (Leach, 1814)	Black-throated Coucal	LC	R	GC	

23	<i>Centropus senegalensis</i> (Linnaeus, 1766)	Senegal Coucal	LC	R		
Gruiformes						
Heliornithidae						
24	<i>Podica senegalensis</i> (Vieillot, 1817)	African Finfoot	LC	R		
Rallidae						
25	<i>Himantornis haematopus</i> Hartlaub, 1855	Nkulengu Rail	LC	R	GC	
26	<i>Sarothrura pulchra</i> (Gray, 1829)	White-spotted Flufftail	LC	R	GC	
27	<i>Porzana porzana</i> (Linnaeus, 1766)	Spotted Crake	LC	P		
28	<i>Zapornia flavirostra</i> (Swainson, 1837)	Black Crake	LC	R		
29	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	Purple Swampphen	LC	R/M		
30	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Common Moorhen	LC	R		
Musophagiformes						
Tableau 1 (Continued 1)						
MUSOPHAGIDAE						
31	<i>Corythaëola cristata</i> (Vieillot, 1816)	Great Blue Turaco	LC	R		
32	<i>Tauraco persa</i> (Linnaeus, 1758)	Green Turaco	LC	R	GC	
33	<i>Tauraco macrorhynchus</i> (Fraser, 1839)	Yellow-billed Turaco	LC	R	GC	
34	<i>Musophaga violacea</i> (Isert, 1788)	Violet Turaco	LC	R	SG	AO
35	<i>Crinifer piscator</i> (Boddaert, 1783)	Western Grey Plantain-eater	LC	R		
Ciconiiformes						
Ciconiidae						
36	<i>Ciconia abdimii</i> (Lichtenstein, 1823)	Abdim's Stork	LC	M		
37	<i>Ciconia episcopus</i> (Boddaert, 1783)	Woolly-necked Stork	LC	R		
Pelecaniformes						
Ardeidae						
38	<i>Ixobrychus minutus</i> (Linnaeus, 1766)	Little Bittern	LC	P		
39	<i>Ixobrychus sturmii</i> (Wagler, 1827)	Dwarf Bittern	LC	R		
40	<i>Tigriornis leucolopha</i> (Jardine, 1846)	White-crested Tiger Heron	LC	R	GC	
41	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	Black-crowned Night Heron	LC	R		
42	<i>Ardeola ralloides</i> (Scopoli, 1769)	Squacco Heron	LC	R/P		
43	<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle Egret	LC	R/M		
44	<i>Butorides striata</i> (Linnaeus, 1758)	Green-backed Heron	LC	R		
45	<i>Egretta ardesiaca</i> (Wagler, 1827)	Black Heron	LC	R		
46	<i>Egretta gularis</i> (Bosc, 1792)	Western Reef Egret	LC	R		
47	<i>Egretta garzetta</i> (Linnaeus, 1766)	Little Egret	LC	R		
48	<i>Egretta intermedia</i> (Wagler, 1829)	Intermediate Egret	LC	R		
49	<i>Egretta alba</i> Linnaeus, 1758)	Great Egret	LC	R		
50	<i>Ardea purpurea</i> (Linnaeus, 1766)	Purple Heron	LC	R/P		
51	<i>Ardea cinerea</i> (Linnaeus, 1758)	Grey Heron	LC	R/P		
Scopidae						
52	<i>Scopus umbretta</i> (Gmelin, 1789)	Hamerkop	LC	R		
Suliformes						
Phalacrocoracidae						
53	<i>Microcarbo africanus</i> (Gmelin, 1789)	Long-tailed Cormorant	LC	R		
Anhingidae						
54	<i>Anhinga rufa</i> (Daudin, 1802)	African Darter	LC	R		
Charadriiformes						
Burhinidae						
55	<i>Burhinus senegalensis</i> (Swainson, 1837)	Senegal Thick-knee	LC	R		
56	<i>Burhinus vermiculatus</i> (Cabanis, 1868)	Water Thick-knee	LC	R		
57	<i>Burhinus capensis</i> (Lichtenstein, 1823)	Spotted Thick-knee	LC	R		
Charadriidae						
58	<i>Charadrius dubius</i> (Scopoli, 1786)	Little Ringed Plover	LC	P		
59	<i>Charadrius hiaticula</i> (Linnaeus, 1758)	Common Ringed Plover	LC	P		
60	<i>Vanellus senegallus</i> (Linnaeus, 1766)	African Wattled Lapwing	LC	R		
61	<i>Vanellus albiceps</i> (Gould, 1834)	White-headed Lapwing	LC	R		
62	<i>Vanellus spinosus</i> (Linnaeus, 1758)	Spur-winged Lapwing	LC	M		
Rostratulidae						
Table 1 (Continued 2)						
63	<i>Rostratula benghalensis</i> (Linnaeus, 1758)	Greater Painted-snipe	LC	R		
Jacaniidae						
64	<i>Actophilornis africanus</i> (Gmelin, 1789)	African Jacana	LC	R		
65	<i>Microparra capensis</i> (Smith, 1839)	Lesser Jacana	LC	M		
Scolopacidae						
66	<i>Tringa stagnatilis</i> (Bechstein, 1803)	Marsh Sandpiper	LC	P		
67	<i>Tringa ochropus</i> (Linnaeus, 1758)	Green Sandpiper	LC	P		
68	<i>Tringa glareola</i> (Linnaeus, 1758)	Wood Sandpiper	LC	P		
69	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	Common Sandpiper	LC	P		

		Strigiformes				
		Tytonidae				
70	<i>Tyto alba</i> (Scopoli, 1769)	Barn Owl	LC	R		
		Strigidae				
71	<i>Strix woodfordii</i> (Smith, 1834)	African Wood Owl	LC	R		
		Accipitriformes				
		Pandionidae				
72	<i>Pandion haliaetus</i> (Linnaeus, 1758)	Osprey	LC	P		
		Accipitridae				
73	<i>Pernis apivorus</i> (Linnaeus, 1758)	European Honey Buzzard	LC	P		
74	<i>Elanus caeruleus</i> (Desfontaines, 1789)	Black-shouldered Kite	LC	R		
75	<i>Milvus migrans</i> (Boddaert, 1783)	Black Kite	LC	M		
76	<i>Haliaeetus vocifer</i> (Daudin, 1800)	African Fish Eagle	LC	R		
77	<i>Gypohierax angolensis</i> (Gmelin, 1788)	Palm-nut Vulture	LC	R		
78	<i>Polyboroides typus</i> (Smith, 1829)	African Harrier Hawk	LC	R		
79	<i>Circus macrourus</i> (Gmelin, 1770)	Pallid Harrier	NT	P		
80	<i>Circus aeruginosus</i> (Linnaeus, 1758)	Eurasian Marsh Harrier	LC	P		
81	<i>Accipiter tachiro</i> (Daudin, 1800)	African Goshawk	LC	R		
82	<i>Accipiter badius</i> (Gmelin, 1788)	Shikra	LC	R		
83	<i>Kaupifalco monogrammicus</i> (Temminck, 1824)	Lizard Buzzard	LC	R		
		Bucerotiformes				
		Bucerotidae				
84	<i>Horizoceros albocristatus</i> (Cassin, 1848)	White-crested Hornbill	LC	R	GC	
85	<i>Lophoceros semifasciatus</i> (Hartlaub, 1855)	African Pied Hornbill	LC	R	GC	
86	<i>Bycanistes fistulator</i> (Cassin, 1852)	Piping Hornbill	LC	R	GC	
		Coraciiformes				
		Meropidae				
87	<i>Merops gularis</i> (Shaw, 1798)	Black Bee-eater	LC	R	GC	
88	<i>Merops pusillus</i> (Müller, 1776)	Little Bee-eater	LC	R		
89	<i>Merops albicollis</i> (Vieillot, 1817)	White-throated Bee-eater	LC	M		
		Coraciidae				
90	<i>Coracias cyanogaster</i> (Cuvier, 1817)	Blue-bellied Roller	LC	R	SG	
91	<i>Eurystomus glaucurus</i> (Müller, 1776)	Broad-billed Roller	LC	R/M		
		Alcedinidae				
92	<i>Halcyon badia</i> (Verreaux & Verreaux, 1851)	Chocolate-backed Kingfisher	LC	R	GC	
93	<i>Halcyon leucocephala</i> (Müller, 1776)	Grey-headed Kingfisher	LC	M		
		Table 1 (Continued 3)				
94	<i>Halcyon senegalensis</i> (Linnaeus, 1766)	Woodland Kingfisher	LC	R		
95	<i>Ispidina lecontei</i> (Cassin, 1856)	African Dwarf Kingfisher	LC	R	GC	
96	<i>Ispidina pictus</i> (Boddaert, 1783)	African Pygmy Kingfisher	LC	R		
97	<i>Corythornis leucogaster</i> (Fraser, 1843)	White-bellied Kingfisher	LC	R	GC	
98	<i>Corythornis cristatus</i> (Pallas, 1764)	Malachite Kingfisher	LC	R		
99	<i>Ceryle rudis</i> (Linnaeus, 1758)	Pied Kingfisher	LC	R		
		Piciformes				
		Lybiidae				
100	<i>Gymnobucco calvus</i> (Lafresnaye, 1841)	Naked-faced Barbet	LC	R	GC	
101	<i>Pogoniulus scolopaceus</i> (Bonaparte, 1850)	Speckled Tinkerbird	LC	R	GC	
102	<i>Pogoniulus atroflavus</i> (Sparman, 1798)	Red-rumped Tinkerbird	LC	R	GC	
103	<i>Tricholaema hirsuta</i> (Swainson, 1821)	Hairy-breasted Barbet	LC	R	GC	
104	<i>Lybius vieilloti</i> (Leach, 1815)	Vieillot's Barbet	LC	R		
		Picidae				
105	<i>Dendropicos pyrrhogaster</i> (Malherbe, 1845)	Fire-bellied Woodpecker	LC	R	GC	
		Falconiformes				
		Falconidae				
106	<i>Falco tinnunculus</i> (Linnaeus, 1758)	Common Kestrel	LC	R/P		
107	<i>Falco ardosiaceus</i> (Vieillot, 1823)	Grey Kestrel	LC	R		
108	<i>Falco cuvierii</i> (Smith, 1830)	African Hobby	LC	R		
109	<i>Falco biarmicus</i> (Temminck, 1825)	Lanner Falcon	LC	R		
		Passeriformes				
		Platysteiridae				
110	<i>Platysteira cyanea</i> (Müller, 1776)	Common Wattle-eye	LC	R		
111	<i>Batis senegalensis</i> (Linnaeus, 1766)	Senegal Batis	LC	R	GC	AO
		Malaconotidae				
112	<i>Tchagra senegalus</i> (Linnaeus, 1766)	Black-crowned Tchagra	LC	R		
113	<i>Laniarius barbarus</i> (Linnaeus, 1766)	Yellow-crowned Gonolek	LC	R		AO
		Dicruridae				
114	<i>Dicrurus modestus</i> (Hartlaub, 1849)	Velvet-mantled Drongo	LC	R		
		Monarchidae				

115	<i>Terpsiphone rufiventer</i> (Swainson, 1837)	Red-bellied Paradise Flycatcher	LC	R	GC	
Laniidae						
116	<i>Lanius collaris</i> (Linnaeus, 1766)	Common Fiscal	LC	R		
Corvidae						
117	<i>Corvus albus</i> Müller, 1776)	Pied Crow	LC	R		
Cisticolidae						
118	<i>Apalis sharpii</i> (Shelley, 1884)	Sharpe's Apalis	LC	R	GC	AO
119	<i>Camaroptera brachyura</i> (Vieillot, 1820)	Grey-backed Camaroptera	LC	R		
120	<i>Camaroptera superciliaris</i> (Fraser, 1843)	Yellow-browed Camaroptera	LC	R	GC	
121	<i>Camaroptera chloronota</i> (Reichenow, 1895)	Olive-green Camaroptera	LC	R	GC	
122	<i>Cisticola erythropus</i> (Hartlaub, 1857)	Red-faced Cisticola	LC	R		
123	<i>Cisticola lateralis</i> (Fraser, 1843)	Whistling Cisticola	LC	R		
124	<i>Cisticola aberrans</i> (Smith, 1843)	Rock-loving Cisticola	LC	R		
125	<i>Cisticola galactotes</i> (Temminck, 1821)	Winding Cisticola	LC	R		
Table 1 (Continued 4)						
Hirundinidae						
126	<i>Cecropis abyssinica</i> (Guérin-Méneville, 1843)	Lesser Striped Swallow	LC	R		
127	<i>Hirundo rustica</i> (Linnaeus, 1758)	Barn Swallow	LC	P		
Pycnonotidae						
128	<i>Thescelocichla leucopleura</i> (Cassin, 1856)	Swamp Palm Bulbul	LC	R	GC	
129	<i>Chlorocichla simplex</i> (Hartlaub, 1855)	Simple Leaflove	LC	R	GC	
130	<i>Eurillas virens</i> (Cassin, 1858)	Little Greenbul	LC	R		
131	<i>Pycnonotus barbatus</i> (Desfontaine, 1789)	Common Bulbul	LC	R		
Scotocercidae						
132	<i>Hylia prasina</i> (Cassin, 1855)	Green Hylia	LC	R	GC	
Sturnidae						
133	<i>Lamprotornis splendidus</i> (Vieillot, 1822)	Splendid Glossy Starling	LC	R		
134	<i>Cinnyricinclus leucogaster</i> (Boddaert, 1783)	Violet-backed Starling	LC	M		
135	<i>Hypopsar cupreocauda</i> (Hartlaub, 1857)	Copper-tailed Glossy Starling	NT	R	GC	AO
Turdidae						
136	<i>Stizorhina finschi</i> (Sharpe, 1870)	Finsch's Flycatcher Thrush	LC	R	GC	AO
137	<i>Turdus pelios</i> (Bonaparte, 1850)	African Thrush	LC	R		
Muscicapidae						
138	<i>Alethe diademata</i> (Bonaparte, 1850)	Fire-crested Alethe	LC	R	GC	
139	<i>Muscicapa aquatica</i> (Heuglin, 1864)	Swamp Flycatcher	LC	R		
140	<i>Bradornis ussheri</i> (Sharpe, 1871)	Ussher's Flycatcher	LC	R	GC	
141	<i>Ficedula hypoleuca</i> (Pallas, 1764)	Pied Flycatcher	LC	P		
Nectariniidae						
142	<i>Deleornis fraseri</i> (Jardine & Selby, 1843)	Fraser's Sunbird	LC	R	GC	
143	<i>Anthreptes gabonicus</i> (Hartlaub, 1861)	Brown Sunbird	LC	R	GC	
144	<i>Anthreptes seimundi</i> (Ogilvie-Grant, 1908)	Little Green Sunbird	LC	R	GC	
145	<i>Hedydipna collaris</i> (Vieillot, 1819)	Collared Sunbird	LC	R		
146	<i>Cyanomitra olivacea</i> (Smith, 1840)	Olive Sunbird	LC	R		
147	<i>Chalcomitra adelberti</i> (Gervais, 1833)	Buff-throated Sunbird	LC	R	GC	AO
148	<i>Chalcomitra senegalensis</i> (Linnaeus, 1766)	Scarlet-chested Sunbird	LC	R		
149	<i>Cinnyris chloropygius</i> (Jardine, 1842)	Olive-bellied Sunbird	LC	R		
150	<i>Cinnyris venustus</i> (Shaw, 1799)	Variable Sunbird	LC	R		
151	<i>Cinnyris cupreus</i> (Shaw, 1811)	Copper Sunbird	LC	R		
Ploceidae						
152	<i>Euplectes hordeaceus</i> (Linnaeus, 1758)	Black-winged Red Bishop	LC	R		
153	<i>Euplectes macroura</i> (Gmelin, 1789)	Yellow-mantled Widowbird	LC	R		
154	<i>Ploceus aurantius</i> (Vieillot, 1805)	Orange Weaver	LC	R	GC	
155	<i>Ploceus cucullatus</i> (Müller, 1776)	Village Weaver	LC	R		
156	<i>Ploceus nigerrimus</i> (Vieillot, 1819)	Vieillot's Black Weaver	LC	R	GC	
Estrildidae						
157	<i>Lagonosticta senegala</i> (Linnaeus, 1766)	Red-billed Firefinch	LC	R		
158	<i>Nigrita bicolor</i> (Hartlaub, 1844)	Chestnut-breasted Negrofinch	LC	R	GC	
159	<i>Nigrita canicapillus</i> (Strickland, 1841)	Grey-crowned Negrofinch	LC	R		
160	<i>Spermestes cucullatus</i> (Swainson, 1837)	Bronze Mannikin	LC	R		
Viduidae						
Table 1 (Continued 5)						
161	<i>Vidua macroura</i> (Pallas, 1764)	Pin-tailed Whydah	LC	R		
Passeridae						
162	<i>Passer griseus</i> (Vieillot, 1817)	Northern Grey-headed Sparrow	LC	R		
Motacillidae						
163	<i>Anthus trivialis</i> (Linnaeus, 1758)	Tree Pipit	LC	R		
164	<i>Anthus leucophrys</i> (Vieillot, 1818)	Plain-backed Pipit	LC	R		
165	<i>Macronyx croceus</i> (Vieillot, 1816)	Yellow-throated Longclaw	LC	R		

166	Motacilla clara (Sharpe, 1908)	Mountain Wagtail	LC	R		
167	Motacilla flava (Linnaeus, 1758)	Yellow Wagtail	LC	R		
168	Motacilla aguimp (Dumont, 1821)	African Pied Wagtail	LC	R		

NE: Sequence number of species; **SC :** Conservation status; **LC:** Least Concern; **NT:** Near Threatened; **SB:** Biogeographic status; **M:** Intra-African migratory; **P:** Palearctic migratory; **R:** Resident; **O:** Occasional; **Biome:** **GC:** Species confined to the biome of Guinean-Congolese forest; **SG :** Species confined to the biome of the Sudano-Guinean savannah; **End:** **AO :** Endemic to West Africa.

Figure 2 shows photographs of some of the bird species observed in the GW.



Fig. 2 : Photographs of some bird species encountered in the GW (Photo: Ahon, 2018)

3.2 Species with special status

3.2.1 Vulnerability

Among the species inventoried, two in particular, the Pallid Harrier *Circus macrourus* (Gmelin, 1770) and the Copper-tailed Glossy Starling *Hylopsar cupreocauda* (Hartlaub, 1857), are protected as being of global conservation interest. These species belong to the Near Threatened category (NT). The other species are in the category Least Concern (LC).

3.2.2 Endemism

Seven (7) of the 168 bird species recorded in the GW are classified as West African endemic (AO). These are: the Violet Turaco *Musophaga violacea*; the Senegal Batis *Batis senegalensis*; the Yellow-crowned Gonolek *Laniarius barbarus*; the Sharpe's Apalis *Apalis sharpii*; the Copper-tailed Glossy Starling *Hylopsar cupreocauda*; the Finsch's Flycatcher Thrush *Stizorhina finschi* and the Buff-throated

Sunbird *Chalcomitra adelberti*.

3.2.3 Particular biomes

The presence of 40 species confined to the Guinean-Congolese forest (GC) biome and 2 species from the Sudano-Guinean savannah (SG) biome was noted in this study (Table 1).

3.2.4 Biogeographic status

These bird species in the GW fall into three bio-geographical categories. Bird species classified as *Resident* (R) are in the majority with 79,17% of the species richness. They are followed by the so-called *Total Migratory* species with 14,88% of the number of species. The latter are represented by species known as *Palearctic Migratory* (P) with a proportion of 09,52% and *Intra-African Migratory* (M) with a proportion of 05,36%. Species with mixed status are

represented by 02,38% *Palaearctic Resident and/or Migratory* (R/P) and 03,57% *Resident and/or Intra-African Migratory* (R/M).

4. Discussion

The study of the avifaunal diversity of the GW indicated that this site appears to be relatively rich and diverse with 168 bird species distributed among 55 families of 18 orders. In fact, this specific richness of birds in the GW represents 22,16% of the number of bird species observed on Ivorian territory, which is 758 according to (Ahon, 2016) [27]. Although relatively low, the species richness of birds in this wetland seems to be very interesting, given the numerous threats to which most wetlands, particularly those in Côte d'Ivoire, are exposed. Indeed, the work of (Egnankou, 2015) [31] has indicated that the majority of wetlands in Côte d'Ivoire are threatened with extinction (including the biological species they host) due to anthropogenic activities such as widespread deforestation, intensive fishing and the uncontrolled use of agricultural chemical inputs. Compared to avifaunal data obtained by other authors in certain wetlands in the interior of Côte d'Ivoire (notably the Koko urban dam in Korhogo, the Djibi swamp area in Abidjan and the urban lakes of Yamoussoukro) and even in the coastal zone (in this case the classified forest of N'Ganda-N'Ganda and the Grand-Bassam international wetland), the specific bird species richness of the GW appears to be higher. In fact, ornithological studies carried out in these different wetlands have reported the presence of 63 species (Niamien *et al.*, 2019) [28], 73 species (Yaokokoré-Béibro *et al.*, 2015a) [22], 111 species (Konan *et al.*, 2015) [29], 132 species (Kouadio *et al.*, 2014) [30] and 138 species (Yaokokoré-Béibro *et al.*, 2010) [31] respectively. On the other hand, it appears to be low compared to the specific richness of birds recorded in the wetland of the Iles Ehotilés National Park (190 species) (Yaokokoré-Béibro, 2010) [32] and in the biodiversity conservation area of the Soubré hydroelectric dam (190 species) (Ahon *et al.*, 2020) [33]. Nevertheless, this avifaunal richness in the GW seems to be close to that obtained by (Yaokokoré-Béibro *et al.*, 2015b) [23], which is 165 species in the urban area of the Grand-Bassam wetland. These similarities and dissimilarities could be explained on the one hand by the extent and geographical location of these different sites, the abundance and diversity of available food resources, the extent of threats in these sites, and the heterogeneity or diversity of feeding habitats and nesting and resting sites for birds in these ecosystems (Yaokokoré-Béibro *et al.*, 2015a, Yaokokoré-Béibro *et al.*, 2015b and Niamien *et al.*, 2019) [22, 23, 28]. On the other hand, they would be linked to the different study seasons and the duration of fieldwork, without forgetting, however, the skills and capacities of the different authors in the identification and recognition of birds, which would be a non-negligible factor. With regard to the season, the peak of bird migration on Ivorian territory being in January (Thiollay, 1985) [34], an ornithological study carried out during this period would have a better chance of obtaining the maximum number of species, especially migratory birds. In terms of the numerical importance of orders and families, the results of this study indicated that Passeriformes and Ardeidae are the best represented and diversified. Our results are similar to those of (Yaokokoré-Béibro *et al.*, 2015a, Yaokokoré-Béibro *et al.*, 2015b, Niamien *et al.*, 2019, Konan *et al.*, 2015, Kouadio *et al.*, 2014, Yaokokoré-Béibro, 2010 and Ahon *et al.*, 2020) [22, 23, 28, 29, 30, 32, 33]. As regards the number of species with special

status in the GW, although relatively small, particular attention should be paid to the results of this study, especially on the two species in the Near Threatened category, the seven species endemic to West Africa, the 25 total migratory species of the 151 observed in Côte d'Ivoire [27], the 40 (i.e. 21,62% species) of the GC biome and the two (i.e. 05,13% species) of the SG biome known in Côte d'Ivoire (Fishpool, 2001) [24]. Indeed, appropriate conservation measures should be taken in favour of these species in order to avoid the disappearance of these key species for the conservation of the avian biodiversity of this site. This study also indicated that Resident species are in the majority in the GW. This could be explained by the fact that these species find during the study year or period the ecological conditions favourable to their life (reproduction, feeding and preferred habitats) as indicated (Kouadio *et al.*, 2014) [30].

5. Conclusion

The study shows that the GW contains 168 bird species from 48 families of 18 orders. The order Passeriformes is the most important in terms of numbers of species (35,12% of the species richness) and families (39,58% of the number of families) in this site. Also, the Ardeidae family is the most diversified with 08,33% of the species richness of birds in this wetland. Resident species are predominantly represented in this GW with a proportion of 79,17%. As species with special status, two Near Threatened species (NT); seven West African endemic species (AO); 40 species from the Guinean-Congolese forest biome (GC); two from the Sudano-Guinean savannah (SG) and 25 total migratory species have been observed. This study therefore showed that the bird fauna of this site is relatively diverse despite the many threats facing the GW. It has contributed significantly to the knowledge of the avifauna of this wetland in western Côte d'Ivoire, which has been poorly known to date. Further studies are needed to give more arguments to the protection and conservation of the birds of this wetland for the long-term monitoring of the population dynamics and species of global interest for the conservation of the avian fauna of this site.

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