

Balearica pavonina, espèce en danger critique au Niger : situation dans la partie Nigérienne du Bassin du Lac Tchad

***Balearica pavonina*, a critically endangered species in Niger: situation in the Nigerien part of the Lake Chad Basin**

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Résumé

L'étude sur la grue couronnée (*Balearica pavonina*) dans la partie nigérienne du bassin du lac Tchad a été menée pendant trois mois de février à Avril 2022. Elle a pour objectif de contribuer à une meilleure connaissance de l'avifaune en générale et de la grue couronnée en particulier. La méthode utilisée combine des points d'observations de 20 minutes sur des transects itinérants. 122 personnes ont été questionnées. 22 espèces dont la grue couronnée, appartenant à 12 familles et 8 ordres ont été identifiées avec un effectif cumulé de 941 individus et un IPA de 205. Le peuplement d'oiseaux est dominé par des individus appartenant aux espèces comme *Himantopus himantopus*, *Ardea goliath*, *Egretta garzetta*, *Actophilornis africana* et *Egretta intermedia*. Une espèce migratrice intra-africaine, dix espèces résidentes, deux espèces migratrices du paléarctique occidental, sept espèces résidentes migratrices intra-africaines, une espèce résidente migratrice du paléarctique occidental et une espèce résidente, migratrice intra-africaine et du paléarctique ont été recensées. Pour ce qui est de l'habitat, on note 19 espèces inféodées à l'eau, deux à l'habitat mixtes et une espèce à l'habitat ouvert. L'habitat de la Grue couronnée se caractérise par des espèces comme *Parkinsonia aculeata*, *piliostigma reculatum* et *Bauhinia rufescens*. La Grue couronnée est l'espèce la moins abondante $1,5 \pm 1,22b$ (CC-AG) et $0,33 \pm 0,8b$ (EB-AG). Elle est observée surtout en saison de pluies (59,02%) contre (13,11%) en saison sèche froide. Cette étude contribue permettra un meilleur suivi des populations de la grue couronnée, espèce qui se rarifie au nigérien.

Mots clés : Oiseaux, Points d'observation, Bassin du Lac Tchad, *Balearica pavonina*, Niger.

Abstract:

The study on the crowned crane (*Balearica pavonina*) in the Nigerien part of the Lake Chad basin was carried out for three months from February to April 2022. Its objective is to contribute to a better knowledge of the avifauna in general and to the crowned crane in particular. The method used combines 20-minute observation points on traveling transects. 122 people were questioned. 22 species including the crowned crane, belonging to 12 families and 8 orders have been identified with a cumulative number of 941 individuals and an IPA of 205. The bird population is dominated by individuals belonging to species such as *Himantopus himantopus*, *Ardea goliath*, *Egretta garzetta*, *Actophilornis africana* and *Egretta intermedia*. One intra-African migratory species, ten resident species, two western Palearctic migratory species, seven intra-African resident migratory species, one Western Palearctic resident migratory species and one resident, intra-African and Palearctic migratory species have been recorded. In terms of habitat, there are 19 water-dependent species, two with mixed habitat and one species with open habitat. The habitat of the Crowned Crane is characterized by species such as *Parkinsonia aculeata*, *pilostigma reticulatum* and *Bauhinia rufescens*. The Crowned Crane is the least abundant species $1.5 \pm 1.22b$ (CC-AG) and $0.33 \pm 0.8b$ (EB-AG). It is observed especially in the rainy season (59.02%) against (13.11%) in the cold dry season. This study contributes to better monitoring of crowned crane populations, a species that is becoming rare in Niger.

Keywords: Birds, Observation points, Lake Chad Basin, *Balearica pavonina*, Niger.

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I. Introduction

According to [1], global biodiversity is facing unprecedented extinction with species losses reaching levels, three times higher than estimated averages over geological time. Also, specific studies on the phenomena that influence the distribution of species become necessary, especially for the conservation of biodiversity and the sustainable ecosystem management [2]. However, there is a significant deficit in investments for the conservation, worldwide [3]. Moreover, in West Africa for instance, biodiversity conservation measures and the allocated financial resources are mostly concentrated in forest ecosystems ([4]; [5]; [6]; [7] and [8]). However, the alteration of these ecosystems and the disappearance of aquatic avifauna increase considerably under unsustainable logging, drying of wetlands, forest degradation, forest fragmentation and the increase of cultivated areas ([9], [7]).

That is the case of the Niger part of the Lac Tchad and the Komadougou river which could be considered as important bird areas with conservation potential. The Nigerien part of Lake Chad is also classified as a Ramsar site, because it offers immense possibilities for sustainable development [10]. This importance is measured in relation to its functions, values and their determining attributes both for the balance of the environment and for agricultural production ([11], [12]). These ecosystems constitute an excellent habitat of bird, which represent true biological indicators that can provide information on the state and proper functioning of their environments [13]. Indeed, birds constitute a zoological group that can easily be used in terms of ecological diagnosis, capable of leading to conservation strategies favorable to other species of flora and fauna [14].

Despite their importance, wetlands and waterbirds continue to face threats around the world. In Niger, drought combined with the abusive exploitation of wetlands' natural resources by man, are at the root of the deterioration of wetland ecosystems. The latter makes nearly 90% of the population of Niger vulnerable, as they depend directly on natural resources for their subsistence. The deterioration of Niger's wetlands has also contributed considerably to the loss of their biodiversity, especially the avifauna. This is the case of the Crowned Crane (*Balearica pavonina*), a species of the Gruidae family, vulnerable according to the IUCN red list. The population of this species is decreasing following the degradation of its habitat ([15]; [16] and [17]). The Crowned Crane mainly prevails in wet and grassy areas, large marshes, and it is also seen at the edge of lakes or rivers in shallow waters. Its preservation and the protection of its ecosystems require the implementation of judicious conservation measures, based on well-established scientific bases [18]; Also, since the Nigerien part of Lake Chad has been classified, according to the criteria of the Ramsar convention, as a wetland of international importance [19], it must, therefore benefit from the protection and conservation measures for birds as recommended by the said convention [20].

It is in this context that this study was initiated in order to contribute to a better knowledge on the avifauna in general and that of the Crowned Crane (*Balearica pavonina*) in particular along the Komadougou river with implications on the sustainable ecological management of the species and its habitat. Specifically, it aimed at: i) identifying the different bird species present in the area, ii) characterising their habitats, iii) analysing their abundance and spatio-temporal distribution, and iii) appreciate the presence of the Crowned Crane in the area.

II. Methodology

Study site presentation

This study was carried out in the Komadou Yobé valley (Figure 1). The Komadougou river originates in a region between 1000 and 1500 m above sea level in Nigeria, and flows into Lake Chad at the spillway of Mamouri (Rural Commune of Bosso). In normal year, the volume of the flowing water can reach 500 million m³. For more than a decade, significant changes have occurred on this watercourse. Readings carried out regularly by the IRD at the Bagara station show a downward trend in the quantities of water flowing. This is attributable to several factors including climate change which has disrupted the rainfall regime in the drainage basins of the river, and the construction of dams in the upstream part of its basin.

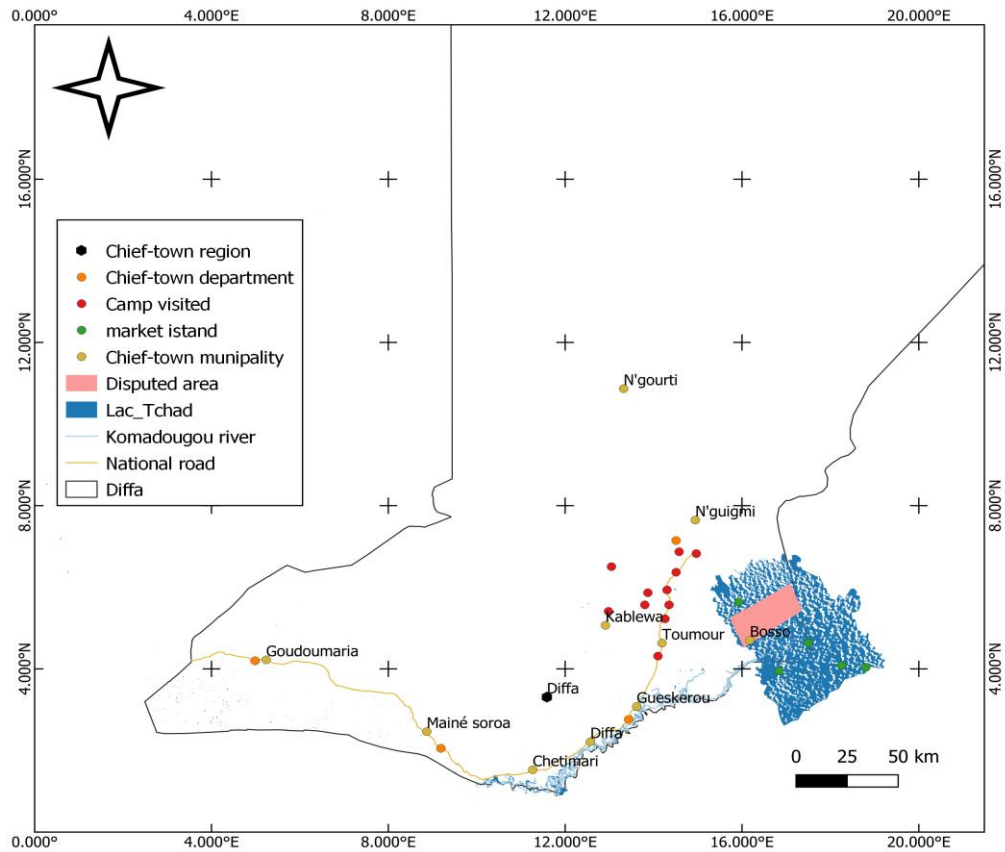


Fig 1.Study sites
Biophysical Aspects
Rainfall

Figure 2 shows that the annual rainfall in the region is high in July, August and September compared to the accumulations recorded in the month of June.

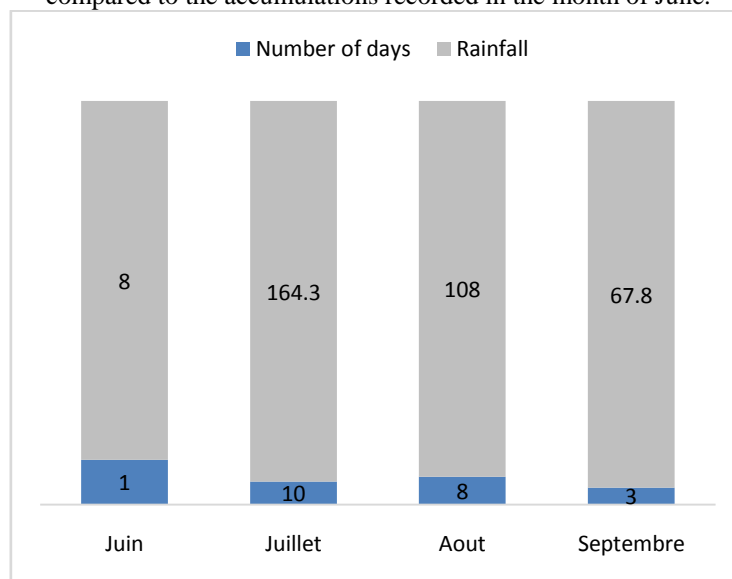


Figure 2 : Annual rainfall in the study area[21]

○ **Hydraulical Regime of the Komadougou**

The annual flow of the Komadougou in an average year is 467 million m³ of water at the hydrometric station of Bagara/Urban Commune of Diffa. In exceptional years, the total volume drained by the Komadougou can reach

575 million m³ and can be 319 million m³ in a dry year. The average duration of flow observed at the Bagara station is about 6 months in recent years while it was 10 months in previous years PDC Diffa (2020).

Flora and vegetation

The valley contains forests, doumeraies, natural gum groves, rupicolous formations, stands of *Acacia spp*, *Salvadora persica*, *Boscia senegalensis*, *Balanites aegyptiaca*, *Maerua crassifolia* in the form of shrub to tree steppes. It also contains very dense stands of *Prosopis chilensis*, *Prosopis juliflora*, located in certain villages in the southern strip of Gueskérou and mainly in the Komadouyou bed.

Persistent climatic hazards in recent years, and anthropogenic actions have greatly contributed to the degradation of these species. It should be noted that in the absence of natural regeneration, the disappearance of some of them (*Ziziphus mauritiana*, *Diospyros mespilliformis*, *Tamarindus indica*, etc.) is to be feared.

Wildlife resources

The fauna was very rich and abundant many years ago. Species of jackals, warthogs, hippopotamus, crocodiles, elephants were present. Alongside these species lived a range of birds such as wild ducks, wild guinea fowls, bustards etc. The limicole avifauna is also very important on the banks of the valley. For example, approximately thirty six (36) species were counted in the Tam pond in 2006 [22].

Despite difficult environmental conditions and the very strong threat of man, some of these species such as the Crowned Crane (*Balearica pavonina*) managed to survive over time. However, climatic hazards such as drought, the loss of breeding grounds due to the drainage of wetlands for agriculture, hunting, illegal trade and the use of pesticides in the fields, threaten the existence of the species. It is now listed as “endangered” on the IUCN Red List. The West African subspecies *Balearica pavonina pavonina* is distributed from Senegal to Chad, while the Sudanian subspecies *Balearica pavonina ceciliae* is found in East Africa with a greater concentration in Sudan ([23]; [24]; [25])

DATA COLLECTION

o Inventories

The ornithological inventory were made using pairs of binoculars and bird identification guides [28]. They were focused strictly on waterbirds.

The transect point count was used for this study [29]. This method consists in choosing on each transect, six (6) points which are 200 m apart from each other. At each point, during a period of 20 minutes, all the species observed or heard, whether landed or in flight, were noted taking into account the number of individuals. These points were arranged in such a way that the sampled surfaces do not overlap and allow the most exhaustive coverage of each transect [30]. For each point, the species seen or heard within a radius of 100 meters were taken into account in determining the Point Abundance Index (PAI).

The sites were visited in the mornings from 8 a.m. to 10 a.m. with a repetition two (2) times per month [9] during February, March et April .

Population level survey

Ethno-biological and ethno-ecological surveys were carried out among populations that are likely to provide additional information on the Crowned Crane. A total of 122 people were questioned orally through individual interviews. The people surveyed were identified by random choices, taking into account the criteria below:

- The age of the respondent makes it possible to take into account the different age categories for a good grouping of knowledge related to the species.
- The gender of the respondent to effectively take into account women and men in the sample because the information varies according to gender and
- The ethnicity of the respondent because knowledge varies according to ethnicity.

DATA ANALYSIS

Groupings:

✓ The biogeographical origins of the species (**resident, intra-African migrant, Palearctic migrant**) were determined according to the method of [31].

✓ The classification of bird species according to the habitat frequented is that of ([32] and [33] as follows: **F**: very dependent on forests; **M**: mixed environments; **O**: open environments; **E**: linked to water.

✓ Species conservation status were identified according to [34], [35] and [36]. The relative frequency (Fr) of observation is used to characterize the populations of each bird species according to the standards of [37].

Indices

Several indices were used to analyse data related to the biodiversity communities.

Diversity of bird communities

To assess the avifaunal diversity of the study area, the alpha diversity indices of the identified bird communities were calculated: these included:

Specific richness :

Two types of specific richness are calculated: Total specific richness (total number of bird species inventoried per site) and average specific richness per bird community at each site.

Shannon - Weaner (1949) diversity index:

$$H' = - \sum_{i=1}^s p_i * \log_2 p_i \quad \text{Equation (1)}$$

With $p_i = n_i/n$ where n_i is the number of individuals of bird species i at each census site and n is the total number of individual birds inventoried at the site. A Shannon diversity index is high when the site has suitable conditions for the installation of many bird species, but the number of individuals per species is low. This is a sign of great stability in the environment.

Pielou's equitability index:

It is often calculated to reflect the degree of diversity reached in relation to the maximum possible. It varies from 0 to 1. Its expression is:

$$E = \frac{H'}{H_{\max}} \quad \text{avec } H_{\max} = \log_2 S \quad \text{Equation (2)}$$

The Pielou evenness index tends towards 0 if almost all the numbers of birds on the site correspond to a single species and tends towards 1 when each of the species is almost represented by the same number of individuals in the site. The high Pielou's equitability index can then be the sign of a balanced population and a stable environment while a low value corresponds to very selective sites with dominant species.

Density:

It is calculated with the following formula

$$D = \frac{n}{S} \quad \text{Equation (3)}$$

D = density (n. of individuals/km²)

n = number of individuals of the considered species

S = area in km² or ha

□

Statistical analyses

Multivariate analysis was used to analyse the data.

A matrix of 12 observation points was subjected to a CHA (Ascending Hierarchical Classification) using the CANOCO (Canonical Community Ordination) software on the basis of the presence-absence criteria of species by observation point.

The comparison of means test (ANOVA) was used to compare the density of bird species within groups of birds.

III. Results

Avian species composition and abundance

The bird population for all 12 observation points consists of 22 species divided into 12 families and 8 orders with a cumulative number of 941 individuals and a PAI of 205 bird individuals. Pelecaniformes (8 species) 393 individuals divided into 3 families with an PAI of 87 followed by Ciconiiformes (6 species) 161 individuals divided into 3 families Ansériformes (3 species) 163 individuals and Charadriiformes, Suliformes, Coraciiformes, Gruiformes and Struthioniformes were presented by a single species each.

The dominant family is that of Ardeidae (5 species, 293 individuals, Fr = 22.72%) followed by the family Threskiornithidae (4 species), Anatidae and Ciconiidae (3 species each) and seven (7) other families represented by one species each.

Tableau 1 :Composition of the observed avifauna

Ordres	Species	Individuals	Families	PIA
Pélécaniformes	8	393	3	87
Ciconiiformes	6	161	3	34
Anseriformes	03	163	1	24
Charadriiformes	1	22	1	11
Coraciiformes	1	98	1	34
Gruiformes	1	5	1	0
Struthioniformes	1	25	1	8
Suliformes	1	74	1	7
Total	22	941	12	205

PIA :Ponctual indice of abundance

Global typology of species according to their biogeographical sources and Habitat

Data analysis shows that the 22 species listed come from six (6) biogeographical sources, including one intra-African migratory species (M, 4.55%), 10 resident species (R, 45.45%), two migratory species from Palearctic (P, 9.09%), 7 intra-African resident migratory species (R/M, 31.82%), one Palearctic resident migratory species (R/P, 4.45%) and one resident migratory species intra-African and Palearctic (R/M/P, 4.55%).

Analysis shows that the 22 species frequent three (3) habitats including 19 species dependent on water, two (2) in mixed habitat and one species in open habitat.

Tableau 2 : number of species and their frequency according to biogeographical sources

Sources Bio	Number of species	Fr(%)
M	1	4,55
P	2	9,09
R	10	45,45
R/M	7	31,82
R/M/P	1	4,55
R/P	1	4,55
Total	22	100

Habitat	Number of species	Fr(%)
E	19	86,36
E/F	2	9,09
F	1	4,55
Total	22	100

Bio: Biogeographic status; Hab: Preferred habitat; A: Resident; P: Palearctic migrant; M: Intra-African migrant; O: Occasional; E: Waterbird; f. : Open spaces; F: Secondary forest; FF: Primary Forest;; IPA: point index of abundance;;

Characterization of the ligneous flora of the studied sites

The ligneous flora is composed of 15 species divided into 8 families, the most dominant of which are those of Mimosaceae (5 species), Cesalpiniaceae (3 species) and Rhamnaceae (2 species). The species recorded in the habitat of the Crowned Crane are *Parkinsonia aculeata*, *Pilostigma reticulatum* and *Bauhinia rufescens*.

The analysis of the biological forms shows an abundance of Microphanerophytes followed by Mesophanerophytes. On the other hand, the weighted spectrum is characterized by a dominance of Microphanerophytes. The analysis of phytogeographical types shows that the flora of the study area consists only of Guinean Congolese (GC), Sudano Zambesian (SZ), Saharo-Sindian (Sah.S) and Introduced (I) species. The average coverage by family shows that the Mimosaceae family is the most dominant (66.19%), as for the biological forms, the highest average coverage is observed in the Microphanerophytes and for the

phytogeographical types the highest average coverage is obtained in species with Sudano Zambezian Saharo-indian affinity.

Tableau 3 :Analysis of the woody flora of the study site

Families	Nombre of species	Fr(%)	RM (%)
Mimosaceae	5	33,3	66,19
Cesalpiniaceae	3	20,0	32,96
Rhamnaceae	2	13,3	20,19
Autres	5	33,3	47,31
Total	15	100	166,65
TB	Nombre of species	Fr(%)	RM(%)
mp	12	80	114,5
mP	3	20	52,15
Total	15	100	166,65
TP	Nombre of species	Fr(%)	RM(%)
SZ-Sah.S	10	66,67	97,38
SZ	2	13,33	27,96
GC-SZ	1	6,67	15,46
GC-SZ-Sah.S	1	6,67	15,81
I	1	6,67	10,04
Total	15	100	166,65

Mp: Microphanerophytes, CH: mP: Mesophanerophytes, np: Nanophanerophytes; GC-SZ: Guinean-Congolese-Sudano-Zambésiennes, GC-SZ-Sah.S: Guinean-Congolese-Sudano-Zambésiennes-Saharo-Sindians, SZ-Sah.S: Sudano-Zambésiennes-Saharo-Sindians and SZ: Soudano- Zambesians. TB: Biological types, TP: Phytogeographic types and I: Introduced.

The frequencies and densities of bird species are given in Table 3

Identification of Bird Groupings

The dendrogram from the CHA C makes it possible to discriminate between two (2) groups of birds (G1, and G2).The factor map from DCA further illustrates the distribution of bird aggregations (Figure 3). The figure shows the arrangement of the 12 observation points in the factorial plane of axes 1 and 2 with a contribution of 65.6% for axis 1 and 35.2% for axis 2. The figure shows that the Crowned crane was observed at points (P1) and (P9). Species that share the same Ecological niche as the Crowned Crane are: *Ephippiorhynchus senegalensis*, *Mycteria ibis*, *Egretta alba*, *Platalea alba*, *Leptoptilos crumenifer*, *Phalacrocorax africanus* and *Plegadis falcinellus*. This habitat is characterized by three (3) plant species, *Parkinsonia aculeata*, *pilostigma reticulatum* and *Bauhinia rufescens*.

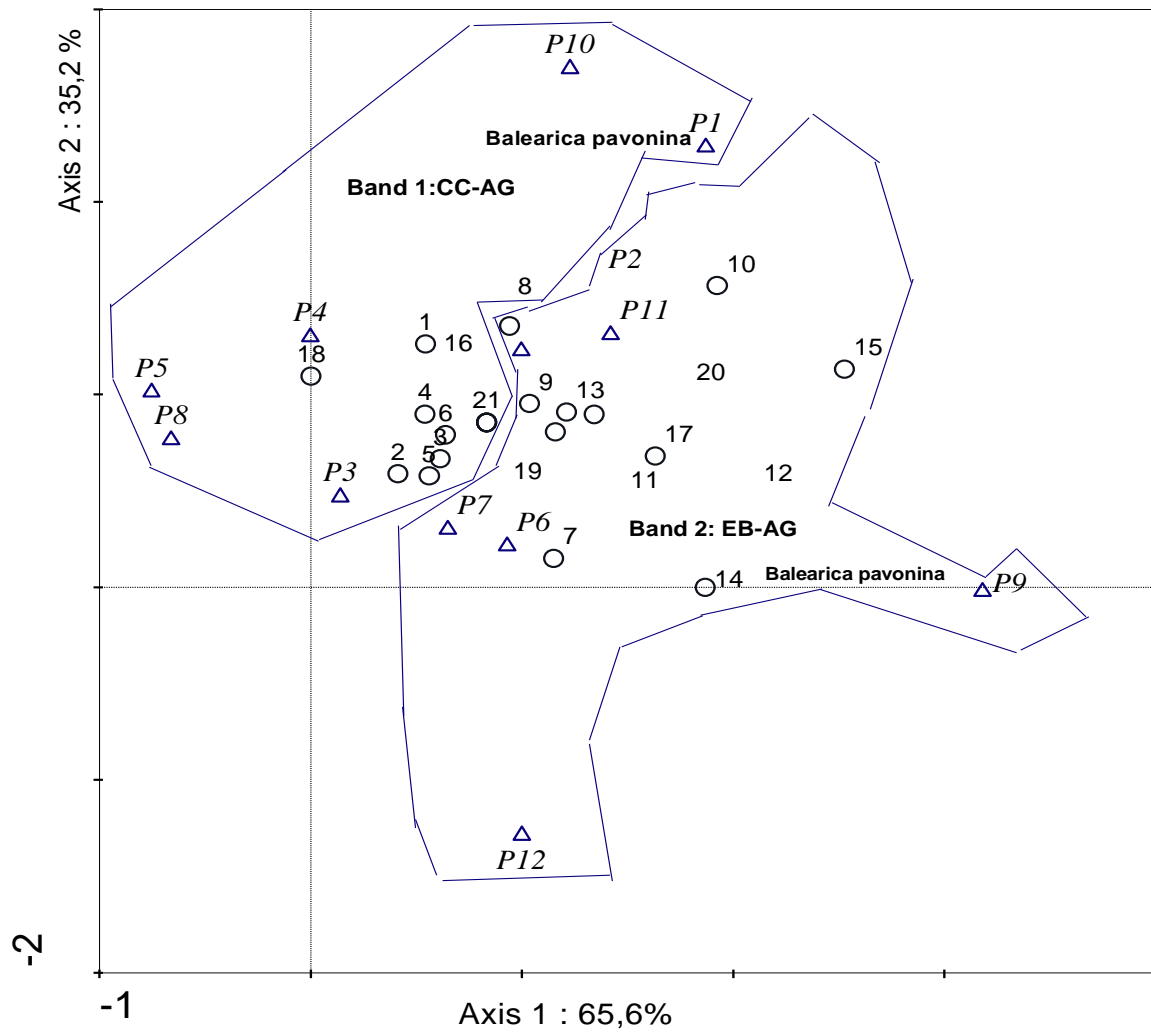


Figure 3 : Birds clusters

Tableau 3 : Frequencies and species densities

species	Frequencies		Nbre of individuals		Densities (Individuals/m ²)		Probabilities
	Nbre of individuals	Fr(%)	Nbre of individuals	Fr(%)	CC-AG	EB-AG	
Aigrarz	45	10,09	27	5,45	7,5(5,95)b	5,5(4,85)c	0,001
Bec ouve	55	12,33	17	3,43	8,16(6,01)b	6,83(2,01)c	
Canaarmé			25	5,05		6,16(4,36)	
Canacasq	51	11,43	30	6,06	8,5(5,85) b	5(4,89) b	0,12
Cigoblac	23	5,16			5,30(3,83)		
Cormafri	39	8,74	35	7,07	7,5(7,20) b	6,83(5,04)b	0,513
Dendveuf	19	4,26	25	5,05	5,16(4,16)b	5,16(4,91)b	0,345
Echablan	40	8,97	58	11,72	6,66(4,08)b	9,6(4,58)b	0,134
Granaigr	3	0,67	66	13,33	0,9(0,83)b	11(4,9)c	0,005
Gruecour	3	0,67	2	0,40	1,5(1,22)b	0,33(0,2)b	0,42
Herocrab	29	6,50	18	3,64	6,83(5,45)b	5(3,13)b	0,342

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Hérogoli	46	10,31	24	4,85	7,66(5,88)b	4(3,6)b	0,08
Herostri			20	4,04		5,33(3,92)	
Ibisfalc			25	5,05		6,16(4,14)	
Ibissacr	19	4,26	8	1,62	3,5(2,34)b	2,33(1,16)c	0,003
Jabirou	13	2,91	14	2,83	1,5(0,54)b	1,83(0,75)b	0,176
Marabou	23	5,16	16	3,23	2,16(0,98)b	1,83(0,98)b	0,342
Martpech			39	7,88		7,5(6,14)	
Ombrette			23	4,65		5,83(3,63)	
Spatd' Af			4	0,81		1,66(1,21)	
Tantibis	11	2,47	11	2,22	1,83(0,75)b	1,83(0,98)b	0,156
Vannéper	27	6,05	8	1,62	5,33(4,27)b	2,33(1,63)c	0,0001
Total	446	100,00	495	100,00			

Aigr garz : Aigrette garzette, **Herogoli** : Héron goliath, **Canacasq** : Canard casqué, **Vanneper** : Vanneau éperonné, **Cormafri** : Cormoran africain, **Herostri** : Héron strie, **Bec ouver** : Bec ouvert, **Canaarme** : Canard armé, **Ibisfalc** : Ibis falcinelle, **Ombrette**, **Herocrab** : Héron crabier, **Granaigr** : Grande aigrette, **Martpech** : Martin pecheur pie, **Gruecour** : Grue couronnée, **Echablan** : Echasse blanche, **Spatafri** : Spatule d'Afrique, **Ibissacr** : Ibis sacre, **Tantibis** : Tantale ibis, **Jabirou Marabou**, **Cignblan** : Cigogne blanche et **Dendveuf** : Dendrocygne veuf, **CC-AG** : Canard casqué et Aigrette garzette, **EB-AG** : Echasse blanche et Aigrette garzette

For the density the values accompanied by the different letters are significantly different at the 5% probability threshold

Crowned Crane Habitat

The Crowned Crane was observed in two (2) sites in the rural town of Gueskérou 100 m from the village of TEGUESA. Three (3) individuals were observed in site 1 (P1) with geographic coordinates 13°35'68.89"N and 12°74'25.68"E and two (2) individuals in site 2 (P9) with geographic coordinates 13°35'71.16"N and 12°74'12.81"E.

In this zone, the annual average minimum and maximum temperatures are $20 \pm 24.61^{\circ}\text{C}$ and $38 \pm 41^{\circ}\text{C}$ respectively. The average annual rainfall is 131.3 ± 271.6 mm (DMN, 2016). In terms of forestry, it has significant potential consisting of doumeraies, natural gum groves, rupicolous formations along the komadougou and stands of *Acacia spp*, *Salvadora persica*, *Boscia senegalensis*, *Balanites aegyptiaca* and *Maerua crassifolia* in the form of steppes. shrubs to trees in association and very dense stands of *Prosopis juliflora*, mainly located in the bed of the Komadougou. The plant cover is characterized by a tree stratum dominated in the northern part by thorny trees such as *Acacia raddiana*, *Balanites aegyptiaca* and in the southern part, along the Komadougou by species such as *Tamarindus indica*, *Diospyros mespilliformis*, *Acacia nilotica*, *Adansonia digitata* and *Hyphaene thebaica*. The shrub layer is dominated by *Ziziphus mauritiana*, and *leptadenia pyrotechnica*.

The soil is mainly sandy to sandy-loamy and clayey from north to south of the Commune, agriculture, livestock and fishing are the main socio-economic activities. This commune has a population of 42,261 inhabitants.

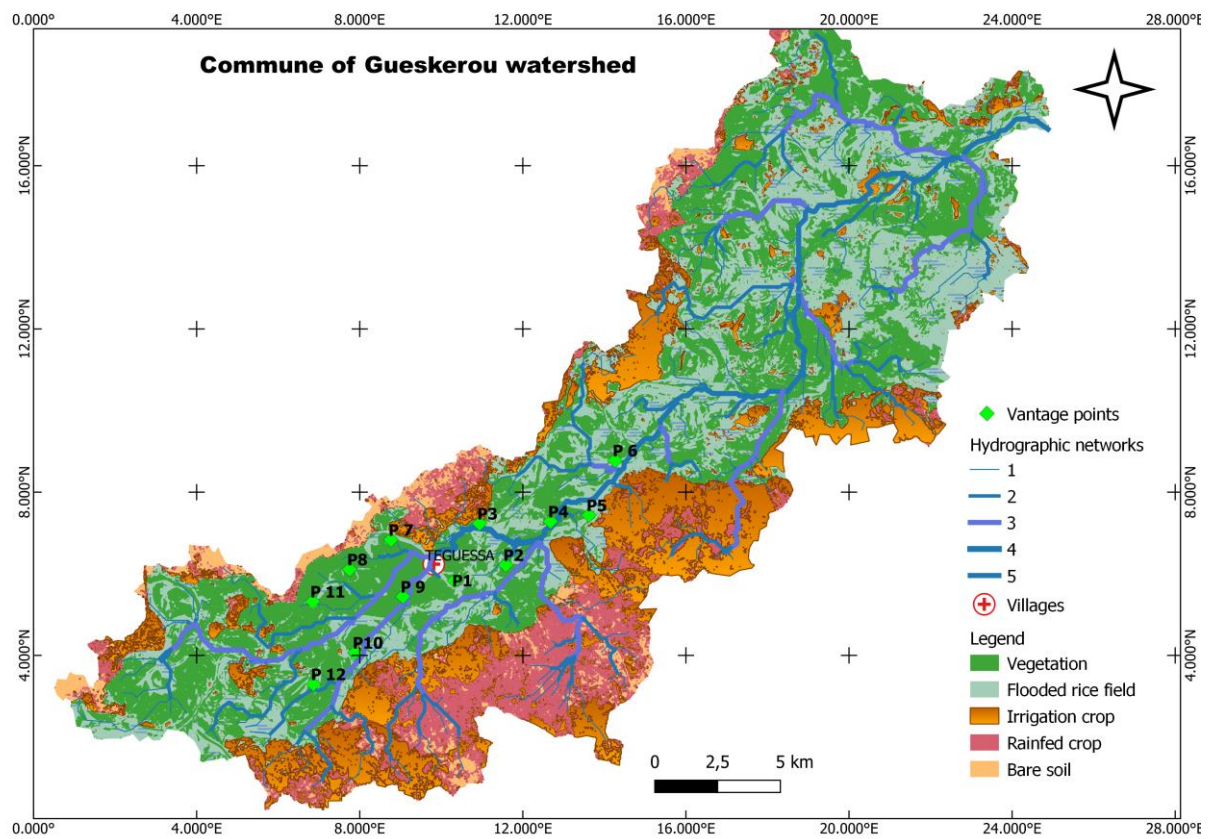


Figure 3: Location of presence habitat

Diversities

The study area has an overall Shannon-Weaver diversity index of 4.12 bits for a theoretical diversity index of 4.46 bits and a Pielou Equitability index of 0.92, the specific richness is 22 species and Finally, the beta diversity shows that the level of similarity between two communities is perfect (0.9).

Table 5: Avian Diversity Overall and by cluster

Indice	CC-AG	EB-AG	Global
H'	3,79	4,09	4,12
Hmax	4,00	4,39	4,46
E	0,95	0,93	0,92
S	16	22	22
P-Value		0,952	

CC-AG.Canard casqué et Aigrette garzette, EB-AG : Échasse blanche etAigrette garzette ;H' : Indice de diversité ; Hmax : Indice theorique maximale ; E : Equitabilite ; S : Richesse spécifique.

Spatial distribution of the ten most encountered species

The observation of the distribution maps reveals that the avian fauna of the study area is heterogeneous according to the toposequence. Indeed, they highlight the scattered nature of the birds and the topographic level offering the avian fauna the conditions favorable to its development. A denser distribution observed at points p8, p9 and p1 followed by points p10, p11 and p12, while at points p3, p4, p5 and p6 the bird individuals are much less dense.

The spatial structure of the avian fauna observed on the spatial distribution map can be explained by the analysis of the L(r) function curves at the watershed scale (Figure 5).

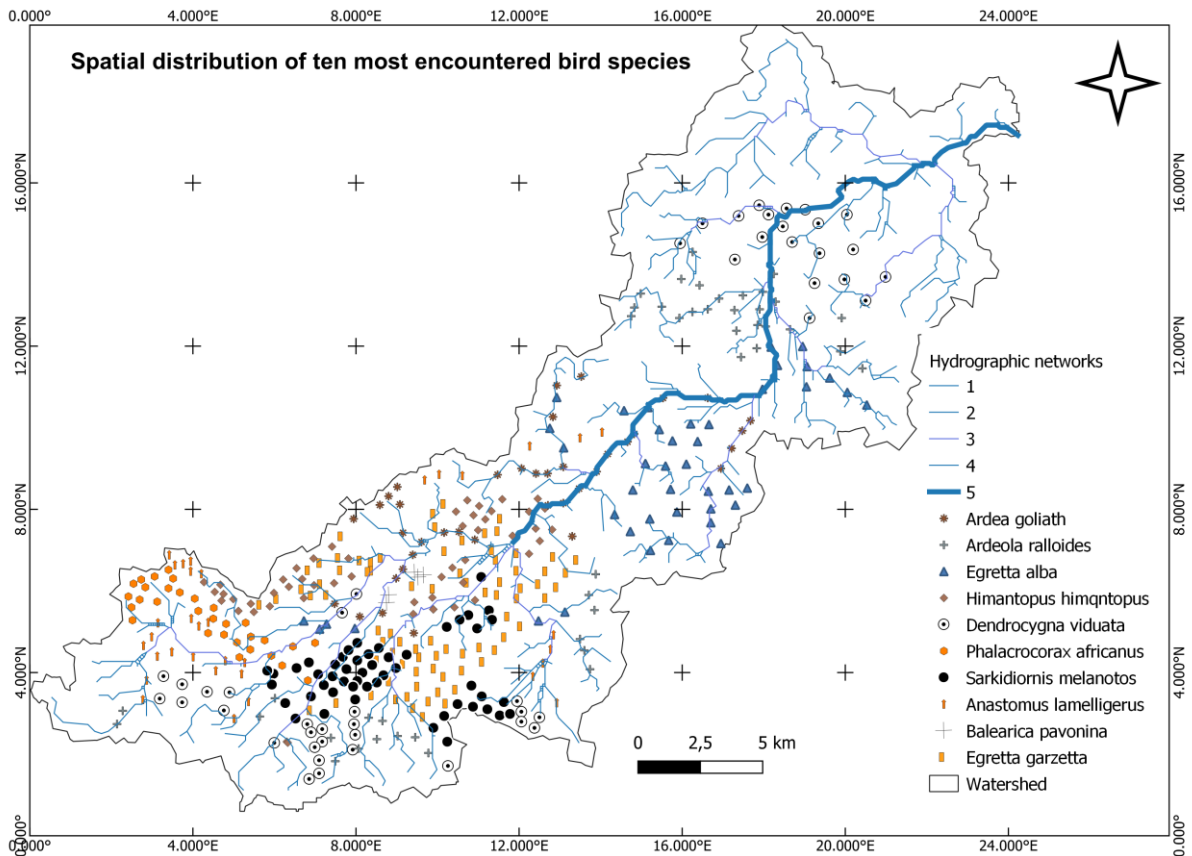


Figure 5 : Spatial distribution of 10 most encountered species

Information provided by surveys

Surveys revealed that 44.26% of people had encountered the crowned crane just a week ago before the survey. 31.15% claim to have seen it more than a month ago before the survey. According to 75.41% of the people surveyed, the Crane is more frequently observed in the morning than in the evening or at noon (Table 7).

Table 7: Frequency of encounter of the population with the species by period

	Last encounter			Time of encounter		
	01 day	01 week	01 month	Morning	Afternoon	Night
Nombre of persons	30	54	38	92	10	20
Pourcentage	24,59	44,26	31,15	75,41	8,20	16,39

It is particularly in the rainy season (59.02%) that the Crane is the most observed compared to the cold dry season (13.11%). 72.13% of people encountered a crowned crane colony one to five times and only 18.85% people encountered it 5 to 10 times (Table 8).

Table 8: Percentage of Crowned Crane contact by season

Saisons	Seasons			Numbersof encounter		
	Raining	Dry	Cold	1 à 5	5 à 10	Plus
Nombre de personnes	72	16	34	88	23	11
Pourcentage	59,02	13,11	27,87	72,13	18,85	9,02

IV. Discussion

The total of the 22 species recorded from February to March 2022 on the two sites in the municipality of Gueskerou is very low compared to the results of the inventory in the municipalities of Gueskerou and Diffa carried out by [38] from July to October 2021,

Gruiforme species are the least represented with 5 individuals from the Gruedae family. An alteration of their habitat could justify this situation. Regarding the biogeographical types, the resident and intra-African resident migratory species are the most dominant because they adapt more to the climatic conditions of the area, while the Palaearctic migratory species are moderately present in the area. is explained by the fact that the Komadougou River acts as an ecological corridor [39]. The ligneous flora is composed of 15 species divided into 8 families, the most dominant of which are those of Mimosaceae (5 species), Césalpiniaceae (3 species) and Rhamnaceae (2 species). The plant species that characterize the habitat of the Crowned Crane are *Parkinsonia aculeata*, *pilostigma retreatatum*. and *Bauhinia rufescens*.

The analysis of biological types shows a predominance of Microphanerophytes followed by Mesophanerophytes, the highest average recovery is observed in Microphanerophytes. This predominance of Microphanerophytes shows that species of these types adapt better to environmental conditions. The appreciation of the portion of Microphanerophytes denotes the importance of shrubby formations in the study area ([40]; [41]; [42]). The two (2) groups of birds observed have a strong correlation of 0.740 respectively, which means that the level of similarity is very high [43]. The density of the Little Egret 7.5(5.95), Open Beak 8.16(6.01), Helmeted Duck 8.5(5.85) species for the G1 (CC-AG) groups is significantly higher compared to a the density of the same species in the group G2 (EB-AG), the latter are characteristic species of group G1 (CC-AG) and in the end the density of the species *Balearica pavonina* (Crown Crane) is low in both groups with respectively 1.5 (1.22) of G1 (CC-AG) and 0.33 (0.2) for G2 (EB-AG), this low density is due to several threats including hunting and the destruction of its habitat [43].

V. Conclusion

The Crowned Crane is listed as an endangered species. It is a gregarious and resident bird. It gathers in more or less large groups depending on the possibilities of feeding. It is a sedentary animal that only makes a few daily or seasonal movements and seeks its food by walking. The study of the avifauna population of the komadougou sites indicates that the study area is rich and diversified. Gruiformes is the least presented order 5 individuals in a family with zero IPA. The dominant family is that of the Ardeidae followed by the family Threskiornithidae, the 22 species listed come from six (6) biogeographical sources, the plant species characteristic of the habitat of the Crowned Crane are *Parkinsonia aculeata*, *pilostigma retreatatum*. and *Bauhinia rufescens*. Two(2) groups of G1 and G2 birds of 6 observation points each have been identified, the density for the Crowned Crane is low in the two groups with respectively $1.5 \pm 1.22b$ (CC-AG) and $0.33 \pm 0.8b$ (EB-AG). A denser distribution observed at points p8, p9 and p1 followed by points p10, p11 and p12, while at points p3, p4, p5 and p6 the bird individuals is much less dense.

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