

Wild birds diet of the Gouro people and their conservation status, Marahoué region, Côte d'Ivoire

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ABSTRACT

In West Africa, wildlife exploitation methods are frequently in conflict with natural resource management programs. This requires the establishment of conservation mechanisms that incorporate the needs and food preferences of local populations. However, until now, few works have highlighted the interests of populations in this area. Thus, an ethnozoological survey was undertaken, from 2010 to 2013, among Gouro populations in 19 villages of the Marahoué region of Côte d'Ivoire. The aim was to find out the food preferences of these people, in terms of wild birds, with a view to drawing up biodiversity conservation plans. It emerged that 223 species of birds are consumed by the Gouro people with 18 species (8%) highly prized, including the Brown-cheeked Hornbill, which is classified as Vulnerable. Three of these highly appreciated species are partially resident and another, the Garganey, is a Palearctic migratory bird. These results expose the close link between local people and animals and constitute one of the first databases on the usefulness of birds in the lives of populations to be taken into account in natural resource management programs.

KEY WORDS

Gouro people; Conservation programs; birds; food preferences; wildlife.

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INTRODUCTION

The usefulness of wildlife is an issue addressed in multiple ways throughout the world (Ripple et al., 2016; Bahuchet, 2000). Its consumption by populations is tangible proof of its usefulness, to the point where several studies have been dedicated to it (Bahuchet, 2000; Czudek, 2001; Forestry Economics and Policy Division, 2005; Baddianaah & Baaweh, 2021). This need for consumption has become increasingly significant with the rate of population growth (Lamarque & Mensah, 2007; Chabi-Boni et al., 2021). However, the need of these food cannot threaten biodiversity (Cowlshaw et al., 2005; Ripple et al., 2016; Fa et al., 2019; In-

gram et al., 2021). This threat is intensifying for wildlife, including birds (Ripple et al., 2016). Thus, human needs and uncontrolled harvesting of this wildlife very often clash with the interests of various natural resource management programs. This is the case with the continued harvesting despite public awareness campaigns prohibiting the consumption of this meat due to “new” diseases such as Ebola virus and other zoonoses (Fa et al., 2019). Therefore, it becomes more than necessary to put in place a mechanism that combines conservation interests with the food needs of populations such as the Gouro from Marahoué region whose culture and wealth are closely linked to nature (Tououi Bi, 2014). Indeed, the culture and traditions of this peo-

ple derive their vital strength from the various ecosystem services provided by nature through agriculture, fishing, and hunting. Thus, considering the interests of local populations in the development of natural resource management plans requires an understanding of these interests. However, these interests, such as dietary preferences, remain poorly documented from a resource conservation perspective. To address this gap, a study was conducted among the Gouro people living near Marahoué National Park in Côte d'Ivoire from 2010 to 2013. The objective of this study was to identify some of the motivations that lead these populations to hunt wildlife bird species useful to biodiversity conservation. Specifically, the study aimed not only to compile a list of the birds preferably consumed by local populations but also to describe the different conservation statuses of these wild birds highly prized for consumption.

MATERIAL AND METHODS

Study area

The Marahoué region is located between 6°28' and 7°45' North latitude and 5°23' and 6°26' West longitude (Côte d'Ivoire). Its capital is the city of Bouaflé, 60 km from Yamoussoukro and 310 km from Abidjan (Fig. 1). Its vegetation is a mosaic of forests and savannas. The ecological and biological importance of this region lies in the presence of the Marahoué National Park (PNM), around which numerous settlements have developed, inhabited by diverse ethnic groups, both native and newcomers. The Marahoué region encompasses more than 15 sub-prefectures and approximately one hundred Gouro villages (MPD, 2022). The main native people of this region is the Gouro people, that has highly developed agricultural practices and directly benefits from the services ecosystems of the Marahoué National Park, due to its proximity to this park.

Data collection

From 2010 to 2013, ethnoornithological data were collected through interviews with the Gouro population. The interviewees were chosen for their knowledge of wildlife, mainly birds, and in addition, for their consumption of those birds. Thus,

using the snowball sampling method (Johnston & Sabin, 2010), a total of 1146 people from 19 villages have participated in this survey. The age of the respondents ranged from 11 to 83 years old. A questionnaire guide was used to administer and orient the interviews (Ferreira et al., 2009). Along the survey, a field guide about Birds of Western Africa (Borrow & Demey, 2008) helped the local populations to identify bird species. The survey itself was conducted through focus group of 4 to 8 people. The aim was to gather more information, opinions and experiences about wild bird species (Kitzinger et al., 2004). Furthermore, this method made it possible to investigate the validity of information and consensus through discussion (Yaokokoré-Béibro et al., 2010). However, some individual interviews were conducted to clarify questions with elderly individuals who were unable to tolerate large groups. All these interviews were recorded using a voice recorder. At the beginning of each interview, informed consent was obtained orally after the study objectives were presented (Alves et al., 2009). During this data collection, respondents were asked to give their opinions on the consumption of each bird species. Thus, based on the work of Lougbegnon et al. (2011) and Dossou et al. (2012), this assessment was classified into 4 categories through a rating from 1 to 4 according to the degree of importance and preference: birds not appreciated were scored with 1, those that were very little appreciated were scored with 2, birds that were moderately appreciated were scored by 3 and those that were highly or very appreciated received a score of 4.

Data processing

The biogeographical status of the listed species was determined based on the work of Borrow & Demey (2023). As for the conservation status of these species, it has been established according to IUCN (2024). The interviewees were divided into two groups of consumers based on age groups (Haxaire, 2003). This refers to children (under 12 years old) and over 12 years old. It should be noted that adolescents (people between 12 and 17 years old) have been considered adults because, among the Gouro people, 12 is a transitional age for assuming responsibilities and participating in assemblies where decisions are made (Haxaire, 2003; Koué-Bi et al., 2015).

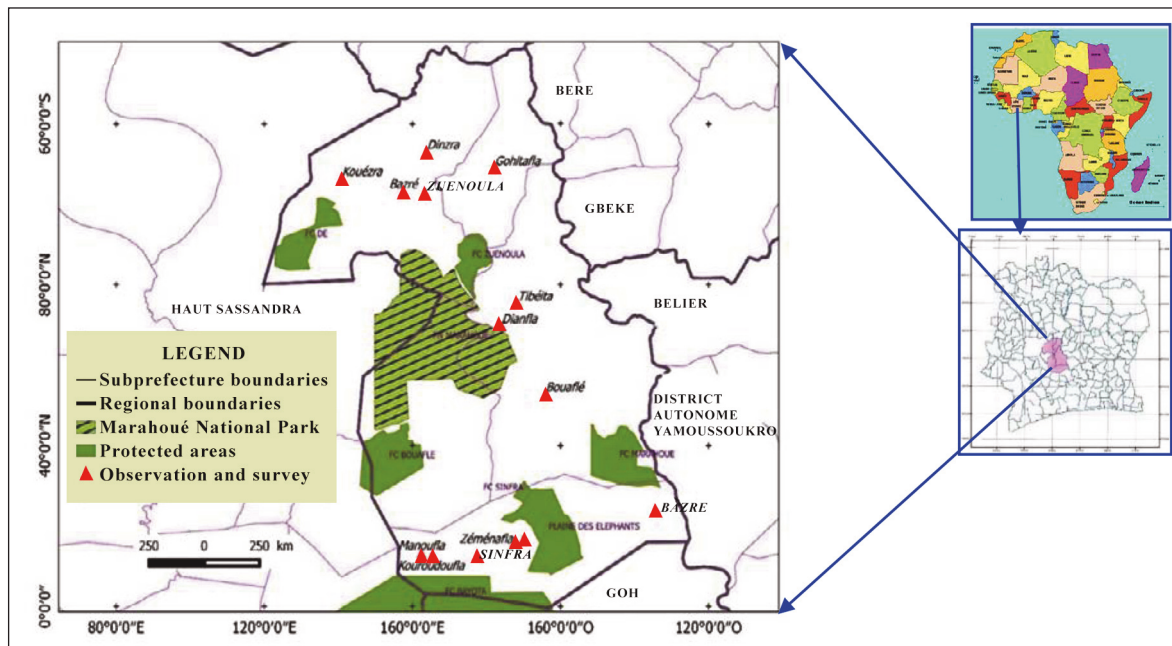


Figure 1. Map of the Marahoué region showing the visited locations for the surveys.

Regarding the relative importance of bird species, only the Use Value was considered, mainly because this work focuses specifically on a single use domain for these species: food. Therefore, the ethnoornithological unit use value (UV_i) was calculated for each bird species listed, based on the formula used by Loubegnon et al. (2011) and Awo et al. (2020):

$$UV_i = \frac{\sum s_i}{n}$$

UV_i = use value of species i,
 s_i = score given to species,
 n = number of respondents.

For each bird species, the Use Value is represented by the average of all the scores assigned to it. Thus, it is possible to differentiate the bird species that are highly valued in the diet of the Gouro people. A simple association correlation was then established between the use values and the different appreciation categories.

The established categories are “Highly Valued”, “Fairly Valued”, and “Not Highly Valued”.

All species were classified into one of these categories, rounded to the nearest whole number based on their use value (UV). Specifically, the birds whose use value (UV_i) was between 1 and 0 were classified as “Not Highly Valued.”

RESULTS

Biogeographical status of bird species exploited by the Gouro people

Surveys have shown that the Gouro people of the Marahoué region consume a total of 223 bird species, grouped into 58 families from 21 orders. Based on their biogeographical status, 77.13% of these birds are sedentary (172 species), while 51 others (22.87%) are migratory, including 22 partially migratory species and 29 strictly migratory species (Fig. 2). Among these partially migratory birds, we find, for example the Long-tailed Nightjar *Caprimulgus climacurus* Vieillot, 1824; the Malachite Kingfisher *Corythornis cristatus* (Pallas, 1764) and the Lanner Falcon *Falco biarmicus* Temminck, 1825. As for the 29 other strictly migratory species, 14 species are Palearctic migrants, including some birds like the Little Ringed Plover *Charadrius dubius* Scopoli, 1786, the Common Snipe *Gallinago gallinago* (Linnaeus, 1758) and the Montagu’s Harrier *Circus pygargus* (Linnaeus, 1758). The 15 other strictly migratory species are intra-African; such as the European Nightjar *Macrodipteryx longipennis* (Shaw, 1796), the Levillant’s Cuckoo *Clamator levillantii* (Swain-

son, 1829) and the White-throated Bee-eater *Merops albicollis* Vieillot, 1817.

Conservation status of consumed bird species

Considering the IUCN Red List of Threatened Species, almost all (97.75%) of the birds consumed in the Marahoué region by the Gouro people are of Least Conservation Concern. Only one species is Endangered (EN): the Timneh Parrot *Psittacus timneh* Fraser, 1844. Two other species are Vulnerable (VU): the Rufous Fishing Owl *Scotopelia ussheri* Sharpe, 1871 and the White-fronted Parrot *Bycanistes cylindricus*. Two other species are Near Threatened (NT): the Green-tailed Bulbul *Bleda eximius* (Hartlaub, 1855) and the Rufous-winged Black-winged Parrot *Illadopsis rufescens* (Reichenow, 1878).

Consumer categories of birds

This survey revealed that 57% of the bird species inventoried are consumed exclusively by minors (Fig. 3). This is the case for all species in the Cisticolidae family, such as Singing Cisticola *Cisticola cantans* (Heuglin, 1869), Whistling cisticola *C. lateralis* (Fraser, 1843) and Short-winged cisticola *C. brachypterus* (Sharpe, 1870). The same applies to all species in the Nectarinidae family as

for examples the Olive Sunbird *Cyanomitra olivacea* (Smith, A, 1840), the Red-breasted Sunbird *Chalcomitra senegalensis* (Linnaeus, 1766), and the Olive-bellied Sunbird *Cinnyris chloropygius* (Jardine, 1842). For the adults (young-adults, adults and elderly people), nine species (4% of the bird species inventoried) are exclusively reserved for them. These species come specifically from two families within the order Pelecaniformes: the first is Threskiornithidae family, with one species (Hagedash Ibis *Bostrychia hagedash* (Latham, 1790)) and the second is the Ardeidae family with three species which are the Squacco Heron *Ardeola ralloides* (Scopoli, 1769), the Goliath Heron *Ardea goliath* Cretzschmar, 1829 and the Purple Heron *Ardea purpurea* Linnaeus, 1766. In addition, all five other listed species of the Strigidae family are consumed exclusively by adults. These are the African scops owl *Otus senegalensis* (Swainson, 1837), the white-faced scops owl *Ptilopsis leucotis* (Temminck, 1820), the Sahel eagle owl *Bubo cinerascens* Guerin-Meneville, 1843, the spotted eagle owl *Bubo leucostictus* Hartlaub, 1855, and the red-billed fish owl *Scotopelia ussheri* Sharpe, 1871.

Besides these two categories of consumers, there is an intermediate category that includes birds consumed by everyone (minors and adults). This category represents nearly 39% of the species con-

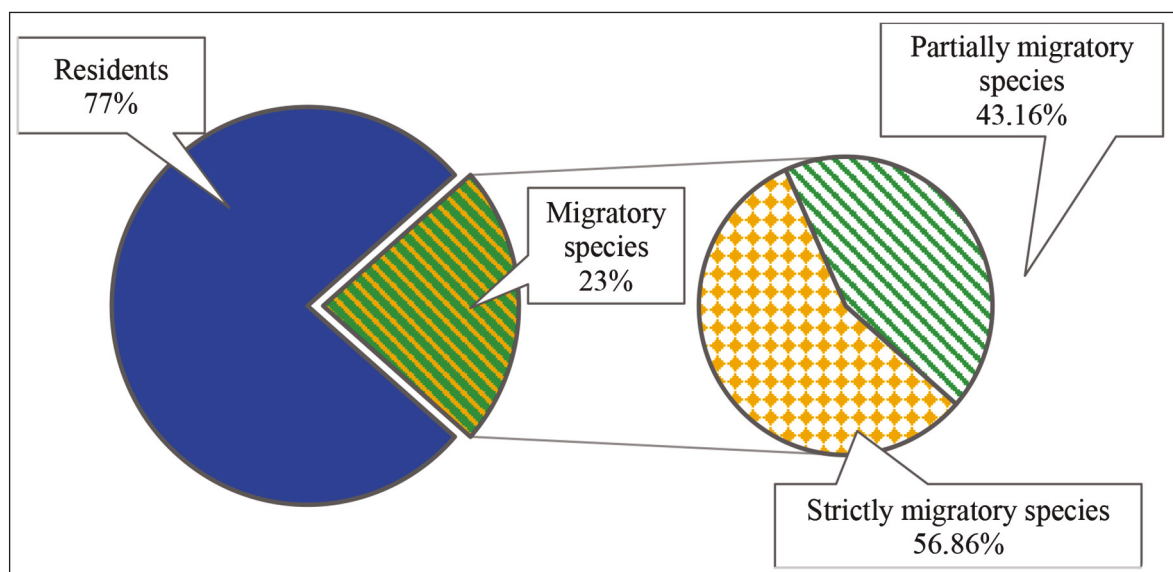


Figure 2. Biogeographical status of bird species consumed by the Gouro people of the Marahoué region.

sumed by the Gouro people (Fig. 3). In terms of examples, we can cite the White-faced Whistling Duck *Dendrocygna viduata*, the Gambia's Army Goose *Plectropterus gambensis*, the Montagu's Harrier *Circus pygargus* (Linnaeus, 1758) and the black kite *Milvus migrans* (Boddaert, 1783).

Types of meals

The survey revealed that captured bird species are consumed in two types of meals: individual meals and group meals, also called shared or family meals (Fig. 4). Thus, nearly 26% of the recorded species are consumed in shared meals, as is the case for the White-faced whistling duck *Dendrocygna viduata*, the Numidian guinea fowl *Numida meleagris*, the Purple Turaco *Musophaga violacea* Isert, 1788, the African Palm *Gypohierax angolensis* (Gmelin, 1788) and the Black Kite *Milvus migrans* (Boddaert, 1783). All the species consumed in shared meals come exclusively from 12 families. These are the Anatidae, Numidiidae, Phasianidae, Musophagidae, Columbidae, Podicipedidae, Anhingidae, Phalacrocoracidae, Ardeidae, Accipitridae, Falconidae and Psittacidae families.

As for birds consumed as individual meals, they account for nearly 74% of the total. This group is dominated by birds of the order Passeriformes. This is the case for the Olive-brown Sunmanga *Cyanomitra olivacea* (Smith, A, 1840), the Red-breasted Sunbird *Chalcomitra senegalensis* (Linnaeus, 1766), Village Weaver *Ploceus cucullatus* (Stadius Müller, 1776) and Red-faced cisticola *Cisticola erythrops* (Hartlaub, 1857).

Appreciation levels of bird species for consumption

In order of abundance, birds "not highly valued" for consumption are the most abundant, with 72 species, or 32% (Fig. 5). Among these species, we can mention the Plain Nightjar *Caprimulgus inornatus* Heuglin, 1869, the Shikra *Tachyspiza badia* (Gmelin JF, 1788), the Fork-tailed Drongo *Dicrurus adsimilis* (Bechstein, 1794) and the Red-collared Widowbird *Euplectes ardens* (Boddesrt, 1783). This group is followed by the "fairly appreciated species" and the "not appreciated species" which represent 31% and 29% of the bird species listed, respectively (Fig. 5). There is no significant differ-

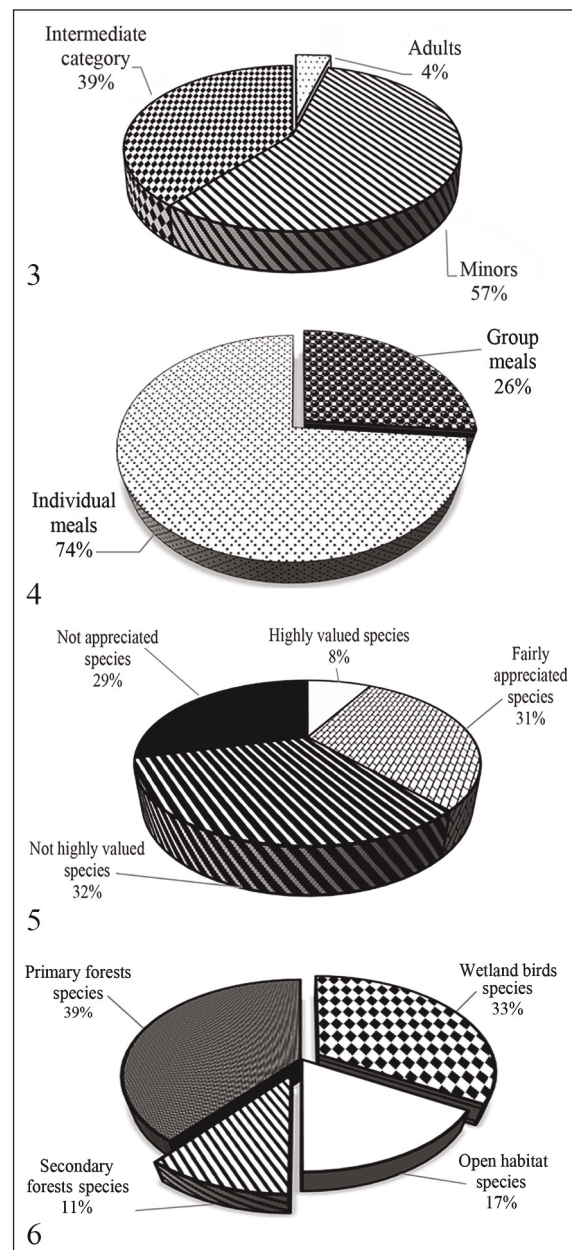


Figure 3. Proportion of birds according to consumer age categories among the Gouro of Marahoué. Figure 4. Proportion of consumers according to meal types containing bird meat. Figure 5. Distribution of edible bird species according to their level of appreciation among the Gouro people of the Marahoué region. Figure 6. Distribution of game birds highly valued by the Gouro people of Marahoué according to the birds' preferred habitat.

ence between the numbers in these three evaluation categories according to the Kruskal-Wallis test ($H(222, N=223) = 222.0000, p = 0.487$).

Finally, the "Highly valued" category is the least

abundant, with 18 species, representing 8% of all edible bird species inventoried among the Gouro people of the Marahoué region (Table 1). The most numerous in this category (5 species) belong to the Phasianidae family. These are the Latham's Francolin *Peliperdix lathamii*, White-throated Francolin *Campocolinus albogularis*, the Ahanta Spurfowl *Pternistis achantensis*, the Double-spurred Spurfowl *Pternistis bicalcaratus* and the Common Quail *Coturnix coturnix*. The Anatidae family come in second place (4 species) with the White-faced Whistling Duck *Dendrocygna viduata*, the Spur-winged Goose *Plectropterus gambensis*, the Hartlaub's Duck *Pteronetta hartlaubii* and the Garganey *Spatula querquedula*. Three highly prized species have been listed in the Bucerotidae family. These are the Brown-cheeked Hornbill *Bycanistes cylindricus*, the Black-and-white-casqued Hornbill *Bycanistes subcylindricus*, and the Black-casqued Hornbill *Ceratogymna atrata*. Two highly prized species come from the Numitidae family, namely the Helmeted Guineafowl *Numida meleagris* and the Eastern Crested Guineafowl *Guttera pucherani*. The families of Musophagidae, Podicipedidae, Anhingidae and Accipitridae each have one species.

Preferred habitat and conservation status of birds highly valued for consumption

The population of birds highly valued for consumption is dominated by birds of primary forests (39%) (Fig. 6). Wetland birds account for 33% and open habitat birds for 17% of the total number of birds with high food value. Birds of secondary forests are the least abundant, representing 11% of the species highly valued for consumption. Overall, forest birds account for nearly half of the population of birds that are highly prized for consumption.

Regarding the conservation status of these highly valued species, only the Brown-cheeked Hornbill *Bycanistes cylindricus* is vulnerable. All the others are of least concern. In addition, four of them are partial migrants; these are the Little Grebe *Tachybaptus ruficollis*, the White-faced Whistling Duck *Dendrocygna viduata*, the Helmeted Guineafowl *Numida meleagris* and the Common Quail *Coturnix coturnix*. The only strictly migratory species is the Garganey.

DISCUSSION

Biogeographical and conservation status of exploited bird species

Surveys have revealed that birds are among the animal protein resources for the Gouro people in the Marahoué region, with nearly 223 bird species consumed. The majority of these birds are sedentary. This specific richness of edible birdlife is significant, representing nearly 29% of the 781 bird species that live in Côte d'Ivoire (Yao-Kokoré-Béibro, 2022). Therefore, this research reveals that the Gouro people have integrated the consumption of poultry into their dietary habits. This practice is also common throughout the world, as can be seen, for example, among the peoples of northern Papua (Pangau-Adam & Noske, 2010) and the Nage people in Indonesia (Forth, 2010) who have adopted hunting practice, particularly bird hunting, as a means of supplementing their protein requirements. Furthermore, the consumption of such a large number of bird species could reflect the difficulties that populations may have in accessing other zoological groups, such as mammals. However, with the sedentary nature of these species, they would be more readily available to the population throughout the year. Indeed, it is quite understandable that the populations of the Pokola commune in Congo have turned to the consumption of mammals, due to their accessibility and availability (Mbeté et al., 2011). Additionally, the high number of birds harvested by the Gouro people is primarily driven by subsistence hunting, dissimilar in northern Papua where the Jayapura region is more focused on commercial hunting than on obtaining subsistence protein (Pangau-Adam & Noske, 2010; Pangau-Adam et al., 2012). Thus, considering only consumption as a use category for wild birds, it appears that only seven species are hunted for animal protein in the Jayapura region of northern Papua (Pangau-Adam & Noske, 2010) compared to 223 species among the Gouro people near the Marahoué River in Ivory Coast. It is this frantic quest for animal protein and commercial motives that would explain the harvesting of animals by local populations, without regard for either the biogeographical status of the animal species harvested or their conservation status (Chabi-Boni et al., 2019). Indeed, 23% of the species consumed by the Gouro people are migra-

tory, and five other species have a conservation status of concern, compared to 11 in Papua (Pangau-Adam & Noske, 2010). Therefore, it would be understandable that local populations have insufficient training and awareness regarding the preservation of these animal species and surveillance education (Pangau-Adam et al., 2012).

Bird consumer categories and meal types

Based on the categorization of birds by consumer, it appears that more than half of the birds (57% of bird species) inventoried are exclusively consumed by minors. Almost all of these birds belong to the order Passeriformes, which, incidentally, includes the largest number of bird species (Cibois & Fuchs, 2015). In addition, almost all species in

Species	Common names	Pr. Ha.	Bi. St.	Co. St.	Csm.	Tm	UV*
<i>Tachybaptus ruficollis</i> (Pallas, 1764)	Little Grebe	E	S/P		Ev	fa	3.93
<i>Anhinga rufa</i> (Daudin, 1802)	African Darter	E	S		Ev	fa	3.93
<i>Dendrocygna viduata</i> (Linnaeus, 1766)	White-faced Whistling Duck	E	S/M		Ev	fa	3.99
<i>Plectropterus gambensis</i> (Linnaeus, 1766)	Spur-winged Goose	E	S		Ev	fa	3.99
<i>Pteronetta hartlaubii</i> (Cassin, 1860)	Hartlaub's Duck	E	S		Ev	fa	3.99
<i>Spatula querquedula</i> (Linnaeus, 1758)	Garganey	E	P/O		Ev	fa	4
<i>Stephanoaetus coronatus</i> (Linnaeus, 1766)	Crowned Eagle	F	S		Ev	fa	3.92
<i>Coturnix coturnix</i> (Linnaeus, 1758)	Common quail	f	P/S		Ev	fa	4
<i>Peliperdix latham</i> (Hartlaub, 1854)	Latham's Francolin	FF	S		Ev	fa	3.91
<i>Campocolinus albogularis</i> (Hartlaub, 1854)	White-throated Francolin	f	S		Ev	fa	3.91
<i>Pternistis ahantensis</i> (Temminck, 1854)	Ahanta Spurfowl	F	S		Ev	fa	3.91
<i>Pternistis bicalcaratus</i> (Linnaeus, 1766)	Double-spurred Spurfowl	f	S		Ev	fa	3.91
<i>Guttera pucherani</i> (Hartlaub, 1861)	Eastern Crested Guineafowl	F	S		Ev	fa	4
<i>Numida meleagris</i> (Linnaeus, 1758)	Helmeted Guineafowl	f	S/M/P		Ev	fa	4
<i>Corythaeola cristata</i> (Vieillot, 1816)	Great Blue Turaco	FF	S		Ev	fa	3.92
<i>Bycanistes cylindricus</i> (Temminck, 1831)	Brown-cheeked Hornbill	FF	S	VU	Ev	fa	3.93
<i>Bycanistes subcylindricus</i> (Sclater, 1871)	Black-and-white-casqued Hornbill	F	S		Ev	fa	3.93
<i>Ceratogymna atrata</i> (Temminck, 1835)	Black-casqued Hornbill	FF	S		Ev	fa	3.93

Table 1. List of some birds preferentially consumed by the Gouro populations of the Marahoué region. Pr. Ha.: Preferred Habitat; Bi. St.: Biogeographical Status; Co. St.: Conservation Status; Csm: Consumer; Tm: Type of meal; UV*: Use Value; FF: Primary Forest; F: Secondary Forest; f: Open Environment; E: Wetland; S: Resident; P: Palearctic Migratory; O: Occasional; M: Intra-African Migratory; VU: Vulnerable; Ch: Child; Ind: Individual; Ev: Everyone (intermediary category); Fa: Family.

this order are more accessible because of their songs and calls, which allow them to be identified (Borrow & Demey, 2008). This could then expose them more easily and increase the number of captures. As for the minors' exclusive consumption of these species, it could be related to the size and shape of the bird species. Indeed, almost all passerines are small (Borrow & Demey, 2008; Cibois & Fuchs, 2015). This makes adults feel uncomfortable consuming them. Consequently, these species are more often eaten by minors and as individual meals rather than family meals.

Apart from these small species, all other species should be consumed in family meals, including by children and adults. However, nine species (4%) are consumed exclusively by adults and as individual meals. This peculiarity could be explained by various social considerations. Indeed, the Gouro people very often consider all species of the heron family (Ardeidae) as taboo, probably because of the white coloration of their plumage. Similarly, owls are directly associated with witchcraft among the Gouro people. Their consumption is normally forbidden for the general population, with a few exceptions. The same behavior is observed among the Nuer people of western Ethiopia, who have forbidden themselves from consuming any birds, as they consider birds to be messengers of God the Creator (Aticho et al., 2024). Consequently, these species are consumed only by a type of adult people and on the recommendation of shamans or fetish priests, not for reasons of animal protein, but rather for other motives such as the acquisition or enhancement of metaphysical powers, for example.

Preferred bird species for consumption

This study revealed that the majority of the Gouro people are capable of making choices regarding the consumption of bird protein. Considering preference as the primary criterion for segregating animal species in the diet, different groups of birds stand out among the Gouro, each with its own proportion. The group of "not highly valued" bird species is the most abundant (32%), followed by "fairly appreciated" species (31%) and "unappreciated" birds (29%). The difference between these proportions is not statistically significant. "Highly appreciated" species are the least numerous (18 species) and constitute 8% of the

wild bird consumed by the Gouro people. Most of these highly appreciated species belong to the order Galliformes. This same observation was made by Chabi-Boni et al. (2019) around the Pendjari Biosphere Reserve in northwestern Benin. These are birds of varying sizes and easily accessible (Ramade, 2008). This group of birds include quails, partridges, peacocks, roosters, hens, guinea fowl, and turkeys. They are highly prized by the local population for the flavor of their meat and their robust constitution. The same applies to ducks and hornbills, which are also eaten as part of family meals. Almost all of these appreciated species were found in abundance on the stalls in the markets of Yamoussoukro and Toumodi (Sikpo et al., 2023). This could explain why, due to their preference among local populations, these bird species are targeted for specific hunting purposes, both for commercial hunting and for personal consumption (Chabi-Boni et al., 2019; 2021). This research demonstrates that local populations are attached to wildlife as a means of subsistence (Ntiamoa-Baidu, 1987; Czudek, 2001; Ingram et al., 2021). This link is all the stronger given that local populations pay little attention to the conservation status and even the biogeographical status of the wildlife exploited for bushmeat (Sika et al., 2023). This explains the presence of certain species with special conservation status and other migratory species on the list of protein sources prized by these populations. It would then help to understand the lack of information and awareness among these populations regarding biodiversity conservation measures (Pangau-Adam & Noske, 2010). This deficiency highlights the opportunity to involve local populations and their interests in the development of various natural resource management plans from a participatory management perspective (Giazzi & Tchamié, 2007; Lamarque & Mensah, 2007).

CONCLUSIONS

This ethnoornithological study conducted among the Gouro people of the Marahoué region revealed that their dietary preferences for avian protein focus on 18 bird species. The majority of these species belong to two families within the order Galliformes and one family within the order Anseriformes. Among these highly valued species are the

Brown-cheeked Hornbill, classified as vulnerable, and five other migratory species, including the Garganey, a Palearctic migratory species. These findings highlight the interests of the local populations and their actual needs for animal protein. This result constitutes one of the first databases on the role of birds in the lives of local peoples. This data can support natural resource managers in developing various natural resource management programs. The study also underscores the shortcomings in raising awareness and providing information to local populations regarding the importance of preserving and conserving species with special conservation status.

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