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Research Article

DIET OF THE YELLOW-BILLED TURACO *TAURACO MACRORHYNCHUS* (FRASER, 1839) IN BANCO NATIONAL PARK, ABIDJAN, CÔTE D'IVOIRE

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ABSTRACT

The Yellow-billed Turaco *Tauraco macrorhynchus* (Musophagidae) is a species of bird that plays a fundamental role in seed dispersal, thus contributing to forest regeneration. However, data on the diet of this species, which is high in numbers in the park, are not available to contribute to its sustainable protection. Studying its diet helps to understand and maintain the balance of the ecosystem, in particular, the Banco national park (BNP). Using the abundance points index (API) method, individuals of the species were sampled in six habitat facies in the park. In addition, a survey of the plant species and their respective organs consumed by everyone was made in the morning from 6 a.m. to 12 p.m. and in the afternoon, from 2:30 p.m. to 6 p.m. The data collected were subjected to nonparametric, univariate (Kruskal-Wallis at the 5% threshold) and multivariate (CFA) analyses, using the Statistica 7.1 software the Kruskal-Walli's test**.**

Keywords: Ivory Coast, Forest, Banco National Park, Diet, Turaco.

INTRODUCTION

Ecosystems provide animal species with a variety of natural environments necessary for their expansion and survival (Mbété *et al.,* 2010). Birds, the most widespread vertebrates, have colonized all environments and adapted to various habitats (Blondel, 1975). However, the presence of a species in each habitat is related to the presence of its preferred habitat and the availability of food resources (Keitt *et al.* 2002). Turacos, bird's endemic to Africa south of the Sahara, live in a variety of habitats (Borghesio and Ndang'ang'a, 2003).

They are arboreal birds, usually frugivorous, that contribute to the regeneration of forest ecosystems through seed dispersal (Sun and Moermond, 1997). Some species of turacos are forest specialists, real forest bird's dependent on forests that are not very disturbed. In fact, they play a key role in the ecological indication of forest ecosystems (Bennun *et al.,* 2004).

Despite their ecological importance, there have been few specific studies of turacos, so the diet of most turacos is little or no known (Borghesio 1997). To contribute to a better knowledge of the diet of turacos, in particular the Yellow-billed turaco, *Tauraco macrorhynchus*, this study was initiated in different habitats within the Banco national park. This allows us to know it feeding habits to better protect it by preserving its habitat to guarantee its conservation. Therefore, this study can help to determine seasonal observation circuits with a view to promoting vision tourism within the Banco national park.

MATERIALS AND METHODS

Study area

The Banco national park (BNP) covers an area of 3474 hectares and extends between 5°21' and 5°25' north latitude

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and 4°01' and 4°05' west longitude (Figure 1). The climate of the BNP is sub-equatorial with four seasons. The average annual rainfall is 1550 mm, and the average annual temperature is 26°C (OIPR, 2019). The BNP is a dense moist evergreen psammohygrophilous forest with *Turraeanthus africanus* Welw (Meliaceae) and *Heisteria parvifolia* Smith (Olacacae) (Lauginie *et al.,* 1996). On the banks of the Banco river, there is a swampy forest and an open-canopy gallery forest dominated by tall trees such as *Alstonia boonei* R. Br (Apocynaceae). The BNP also contains anthropogenic formations consisting of former forest plantations. The arboretum, which covers about fifteen hectares, has about 750 plant species, 47 of which are exotic (Lauginie, 2007). Former plantations of *Theobroma cacao* Linnaeus (Malvaceae) under forest, *Bambusa vulgaris* Schrad bamboo groves (Poaceae) are mainly located on the banks of the lower course of the Banco river (Lauginie 2007).

The hydrographic network is made up of surface water, including the Banco river, eight km long, and water from the talweg drainage system (Cougny *et al.,* 1995). The fauna of the BNP is rich and diverse. There are 58 species of Mammals (Bitty *et al.,* 2013) and nearly 500 species of insects (Bigot and Boireau, 2002). The avifauna of the BNP is rich in 217 species, the majority of which are sedentary. Some species such as the Brown-cheeked Hornbill *Bycanistes cylindricus* (Temminck, 1831), the Green-tailed Bulbul *Bleda eximius* (Hartlaub, 1855), the Bronze-tailed Jackdaw *Hylopsar cupreocauda* (Hartlaub, 1857) are threatened (Kouadio *et al.,* 2014; Assa, 2021). The BNP is based on tertiary sands giving highly desaturated ferralitic soils. It's very rugged relief is characterized by a succession of undulations and low plateaus that dominate the Ebrie lagoon from 50 to 100 m (Lauginie, 2007).

Material

For the realization of this study, a pair of binoculars (10 x 50 BRESSER Hunter) was used for bird watching. For the shots of the birds, a digital camera (SONY DSC-HX 300 (X50)) was used; a GPS (GPS MAP 60 CS) was used to locate and geolocate observation stations and a vegetation map of the BNP (Lauginie, 2007) was used to characterize the types of plant formations. A ribbon was used to materialize the count points.

Data collection method

Turacos sampling method

The study took place from August 2015 to June 2016 in the Banco national park (BNP) (Figure 1). In the BNP, six habitats have been identified because of their ecological characteristics (Table 1). Given the extent of the forest, the sampling method used was that of abundance points index of (API) (Blondel, Fery and Frochot, 1970). A total of 42 count points, seven of which were per habitat, were identified and installed along the development paths. Each count point was identified using a GPS and marked with a red ribbon. The distance between two consecutive points counts was 300 m (Bibby *et al.,* 1998) to avoid duplication in the count (Yaokokoré, 2001). Daytime inventories were carried out from 6 a.m. to 12 p.m. and from 2:30 p.m. to 6 p.m. Within a radius of 50 meters around each count point, all visual or sound contacts of the species were recorded. At the end of the various surveys, the abundance points index (API) of the species inventoried is obtained by keeping only the highest value for all the surveys (Blondel *et al.,* 1970).

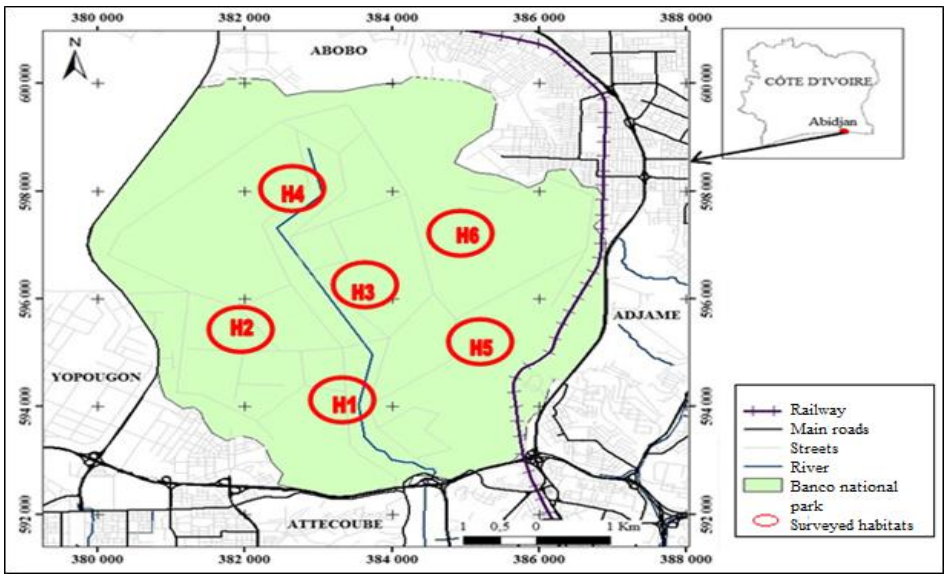

Figure 1. Banco national park map and census habitats localisation.

Table 1. Ecological characteristics of habitats surveyed in the Banco national park (BNP).

Habitats characteristics					
H1	**H2**	**H3**	**H4**	**H5**	**H6**
A mosaic of terra firma forest, swamp forest and periodically flooded forest on the lower reaches of the Banco River	Forest on dry land with silvicultural regeneration treatments, habitat dominated by *Turraeanthus africanus* with sparse undergrowth	Anthropized environment consisting of dwellings, food crops, a fish farm and the arboretum.	Forest mosaic composed of upland forest, riparian forest and periodically flooded forest	Portion of forest on dry land that has undergone intensive silvicultural treatment with bamboo groves	Portion of undisturbed forest on dry land with primary forest facies

H1: habitat 1; H2: habitat 2; H3 : habitat 3 ; H4 : habitat 4 ; H5 : habitat 5 ; H6 : habitat 6.

Method of determining food resources

To determine the food resources of the Yellow-billed Turaco, the organs of the plants it exploited were directly observed. Thus, a seasonal inventory of trophic resources by monitoring turacos and direct observation of plant species and their organs (fruits, seeds, buds, leaves and flowers) were carried out. Similarly, the frequency of occurrence of Yellow-billed Turaco in relation to food resources was calculated.

Data analysis methods

The data collected made it possible to calculate the relative frequency (Fr), which is the relative importance of each species in relation to the total population (Fr = (ni/N) x 100). The relative abundance of species was calculated based on the abundance point index (API) of each species. The API is obtained by keeping for each of them only the highest value for all the enumeration sessions (Blondel *et al.,* 1970). Frequency of occurrence (FC) was used to quantify the frequency of exploitation of trophic resources. This frequency is the ratio of surveys in which the turaco harvests a given plant species to the total number of surveys (FC = (Si/St) x100), Si is the number of surveys in which the turaco harvested a given plant species, and St is the total number of surveys. To establish the correspondence between the food resources consumed by the turaco according to the seasons, a correspondence factor analysis (CFA) was carried out. Similarly, the non-parametric statistical test (Kruskal-wallis) was performed to determine if there is a significant difference ($p < 0.05$) between the abundance of turaco and the environmental variables studied. The analyses were used using STATISTICA 7.1 software.

RESULTS AND DISCUSSION

In the BNP, the Yellow-billed Turaco *Tauraco macrorhynchus* (Figure 2) has an abundance point index (API) of 319 individuals for a cumulative population of 618 individuals. The species is present in all habitats except in the highly anthropogenic habitat (H3) (Table 2). Analysis of the data shows that in the BNP, the abundance of Yellow-billed Turaco *Tauraco macrorhynchus* varies from season to season. The Kruskal-Wallis test applied to the data matrix indicates a significant difference at the $\alpha = 5\%$ cut-off (p-value = $0.002 < \alpha = 0.05$). The peak of abundance is observed during the short dry season (SDS) with 89 individuals. While the lowest peak is observed during the long dry season (LDS) for a punctual abundance of 34 individuals. On the other hand, during the long and short rainy seasons, the occasional abundance of the Yellow-billed Turaco varies little with values of 53 and 58 individuals respectively (Figure 3).

Figure 2. Photograph of the Yellow-billed Turaco, *Tauraco macrorhynchus* (Fraser, 1839).

Table 2. Relative abundance of the Yellow-billed Turaco *Tauraco macrorhynchus* according to the habitats Surveyed in the Banco national park.

	Habitats					
Species	H1	H2	H3	H4	H5	H6
Tauraco macrorhynchus	55	96	-	60	50	58

H = habitat

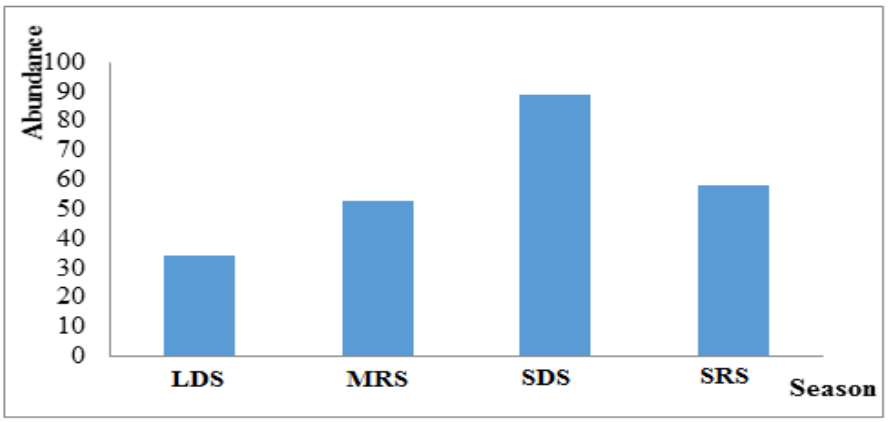

Figure 3. Seasonal variation in abundance of *Tauraco macrorhynchus* in Banco national park.
LDS: Long dry season; **MRS**: Main rainy season; SDS: Short dry season**SRS**: Short Rainy Season.

Yellow-billed Turaco *Tauraco macrorhynchus* consumed the organs of 11 plant species belonging to seven families. Its frequency of occurrence varies from one plant species to another. Occurrence is high for plant species such as *Musanga cecropioides* (FC = 43.42%), *Guarea cedrata* (FC = 6.58%). On the other hand, it is very low for other plant species such as *Strombosia glaucescens*, *Canarium Schweinfurthii*, *Dacryodes klaineana* (FC = 1.32%) (Table 3). In addition, its frequency varies from one organ to another. It is higher for fruit (FC = 93.98%) and lower for buds (4.51%) and leaves (%) (Figure 4 and Figure 5).

Table 3. Frequency of exploitation of plant species by *Tauraco macrorhynchus* in the Banco national park**.**

Family	**Plant species**	**Frequency of occurrence (FC) in %**
Fabaceae	*Piptadeniastrum africanum* (Hook. F)	3,95
Burseraceae	*Dacryodes klaineana* (Pierre) H.J.Lam	1,32
	Canarium Schweinfurthii Engl.	1,32
Meliaceae	*Guarea cedrata* A.Chev.	6,58
	Turraeanthus africanus Welw	1,32
	Ficus exasperata Vahl	1,32
Moraceae	*Ficus goliath* A.chev	1,32
	Ficus mucuso Welw	2,63
Rubiaceae	*Morinda lucida* Benth.	1,32
Strombosiaceae	*Strombosia glaucescens* Engl.	1,32
Urticaceae	*Musanga cecropioides* R.Br. & Spud Tedlie	43,42

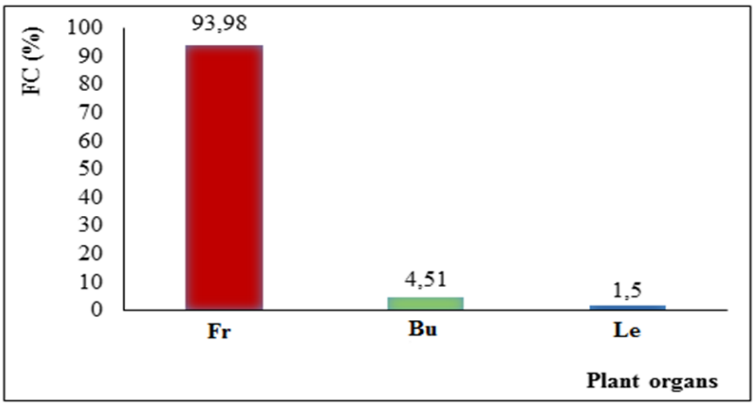

Figure 4. Frequency of consumption of plant organs by *Tauraco macrorhynchus* in the Banco national park; **Fr** = fruit; **Bu** = buds; **Le** = leaves, FC = Frequency of **occurrence** (%).

a. Fruit of *Musanga cecropioides* **(**Urticaceae) **b.** Fruit of *Guarea cedrata* (Meliaceae)

Figure 5. Photographs of fruit eaten by *Tauraco macrorhynchus.*

The exploitation of plant species by *Tauraco macrorhynchus* in the BNP varies from season to season. Thus, *Musanga cecropioides* (Urticaceae) was exploited regularly in all seasons of the year. However, *Guarea cedrata* (Meliaceae) and *Piptadeniastrum africanum* (Fabaceae) were seasonally exploited for two and three seasons respectively. In contrast, the other plant species were harvested on an ad hoc basis during a single season (Figure 6).

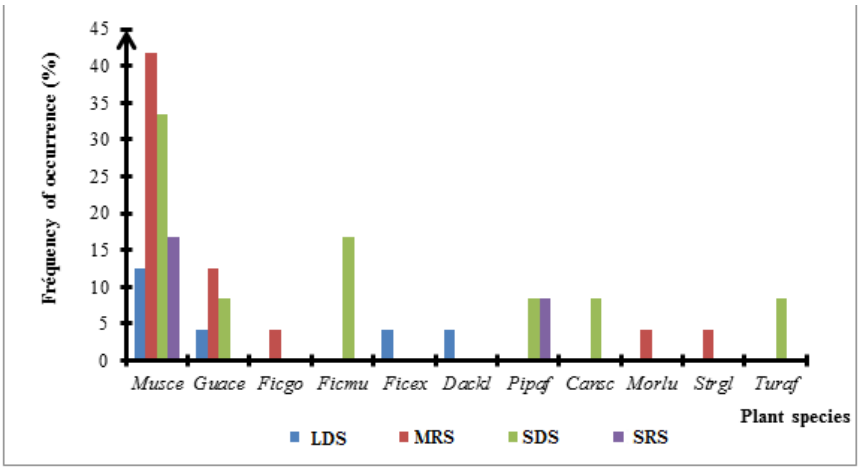

Figure 6. Seasonal variation in the frequency of consumption of food resources of *Tauraco macrorhynchus* in the Banco national park.**LDS**: Long dry season **MRS**: Main rainy season **SDS:** Short dry season **SRS:** Short rainy season

Musce: *Musanga cecropioides; Guace*: *Guarea cedrata; Ficgo*: *Ficus goliath; Ficmu: Ficus mucuso; Ficex*: *Ficus exasperata; Dackl: Dacryodes klaineana; Pipaf*: *Piptadeniastrum africanum; Cansc*: *Canarium Schweinfurthii; Morlu*: *Morinda lucida; Strgl*: *Strombosia glaucescens; Turaf*: *Turraeanthus africanus*.

In addition, the correspondence factor analysis (CFA) applied to the plant species and season variables, highlights three ecological groups based on the first factor axis with the greatest inertia (52.93%). The first group, consisting of five species, is positively correlated with this axis. These are plant species exploited by *Tauraco macrorhynchus* during the SDS. These are *Guarea cedrata* (Meliaceae), *Turraeanthus africanus* (Meliaceae), *Ficus mucuso* (Moraceae), *Piptadeniastrum africanum* (Fabaceae) and *Canarium Schweinfurthii* (Burseraceae). On the other hand, the second group, consisting of three plant species, is negatively correlated with the first axis. However, three plant species *Morinda lucida* (Rubiaceae), *Ficus goliath* (Moraceae), *Strombosia glaucescens* (Strombosiaceae) are associated with MRS. These are the plant species exploited by the turaco during this season. The third group includes three other plant species *Ficus exasperata* (Moraceae), *Dacryodes klaineana* (Burseraceae) and *Musanga cecropioides* (Urticaceae) are associated with both LDS and SRS. These are the plant species exploited by *Tauraco macrorhynchus* during these two seasons (Figure 7). During MRS and SDS, there is a great availability of food resources for the turacos. The Kruskal-Wallis test performed indicates that there is no significant difference between plant species according to the seasons ($p > 0.05$). Similarly, the Kruskal-Wallis test carried out indicates that the abundance of turacos in feeding activity does not vary significantly according to plant species ($p > 0.05$).

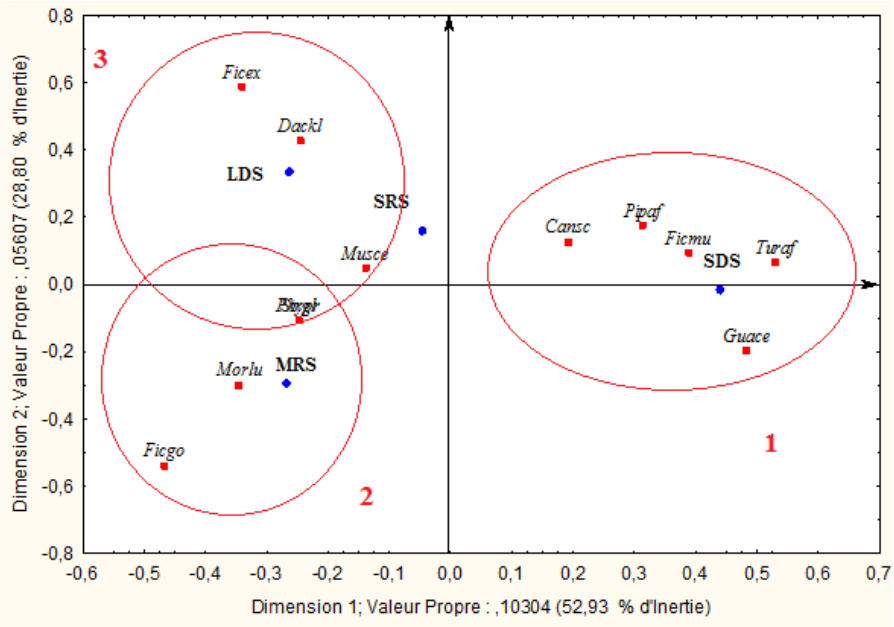

Figure 7. Seasonal variation in the diet of *Tauraco macrorhynchus* in Banco national park.

LDS: Long dry season; **MRS**: Main rainy season; **SDS:** Short dry season; **SRS:** Short rainy season

Musce: *Musanga cecropioides; Guace*: *Guarea cedrata; Ficgo*: *Ficus goliath; Ficmu: Ficus mucuso;* Ficex: *Ficus exasperata; Dackl: Dacryodes klaineana; Pipaf*: *Piptadeniastrum africanum; Cansc*: *Canarium Schweinfurthii; Morlu*: *Morinda lucida; Strgl*: *Strombosia glaucescens; Turaf*: *Turraeanthus africanus*

In the Banco national park (BNP), the Yellow-billed Turaco *Tauraco macrorhynchus* is one of the common and abundant species in all habitats, except in highly anthropogenic habitats. Indeed, *Tauraco macrorhynchus* is a species specializing in forests that only appears in forests with little disturbance in the interior (Bennun *et al*., 2004: Okon *et al*., 2023). As a result, the strong presence of *Tauraco macrorhynchus* in the BNP would reflect its relatively good state of conservation. However, this abundance varies with the seasons. The abundance of *Tauraco macrorhynchus* is high during the main rainy season (MRS) and the short dry season (SDS) and low during the long dry season (LDS). Indeed, this variation in abundance is linked to food resources because, according to Yeboah *et al*. (2008), the main rainy season (MRS) and the short dry season (SDS) correspond to the fruiting period of plant species, resulting in a high availability of fruits in natural environments. On the other hand, the low abundance of turaco during the LDS is linked to the decline in food resources. *Tauraco macrorhynchus* consumed much more fruit than other plant organs. This may be explained by the fact that the species has a preferentially

frugivorous diet that exploits the fruits of a wide range of plant species (Sun *et al*., 1997).

However, the species incidentally consumes leaves and buds because according to Izhaki and Safriel (1989), the low protein content of fruits is another alternative to fill the protein deficit by consuming leaves and buds of available plants. As the Yellow-billed Turaco *Tauraco macrorhynchus* is a resident species (Thiollay, 1985), the fluctuation in its abundance in habitats cannot be linked to migratory phenomena. However, because plant species do not have the same fruiting period, this forces the species to make short seasonal movements by moving from one feeding site to another (Sun and Moermond 1997). In the BNP, the Yellow-billed turaco *Tauraco macrorhynchus* consumed much more of the fruits of *Musanga cecropioides* (Urticaceae). Indeed, *Tauraco macrorhynchus*, although exploiting a variety of food resources, has food preferences that force it to selectively use the food resources available in natural environments (Candy, 1984). The movement of the species from one feeding site to another could also be linked to the search for preferential food resources. In the BNP, the Yellow-billed turaco *Tauraco macrorhynchus* is strongly associated with *Musanga cecropioides* (Urticaceae) whose fruits it consumes and enjoys. As a result, its presence in habitats would be strongly correlated with a high density of *Musanga cecropioides* (Urticaceae).

CONCLUSION

This study found that the Yellow-billed Turaco *Tauraco macrorhynchus* is common in low-disturbed forest habitats. Its abundance in the BNP varies from season to season. She has a diet dominated by fruits. The availability of its preferential food resources contributes to its presence in forest habitats. The results of the study make it possible to know the diet of the Yellow-billed turaco, which from the outset has several advantages for its conservation. Also, environmental changes (the availability of food resources) can be detected from seasonal variations in its diet. Thus, as part of the sustainable management and enhancement of the BNP, it is necessary to determine seasonal observation circuits of the turaco to promote ecotourism.

ACKNOWLEDGMENT

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

REFERENCES

Assa, E. S. (2021). *Biodiversité et facteurs de distribution des oiseaux du sous-bois de la forêt du Parc National du Banco (Abidjan, Côte d'Ivoire)* (Thèse de doctorat). Université Félix Houphouët-Boigny.

Bennun, L., Davies, G., Howell, K., Newing, H., & Lankie, M. (2004). *La biodiversité des forêts d'Afrique : Manuel pratique de recensement des vertébrés* (1st ed.). Earthwatch Institute (Europe).

Bibby, C., Jones, M., & Marsden, S. (1988). *Expedition field technique: Bird surveys*. Expedition Advisory Centre, London.

Bigot, I., & Boireau, P. (2002). Nouvelles données sur le peuplement des Lépidoptères Pterophoridae de la Côte d'Ivoire. *Bulletin de la Société Linnéenne de Provence*, *53*, 33–37.

Bitty, E. A., Kadjo, B., Gonedele, B. S., Okon, O. M., & Kouassi, K. P. (2013). Inventaire de la faune mammalogique d'une forêt urbaine, le Parc national du Banco, Côte d'Ivoire. *International Journal of Biological and Chemical Sciences*, *7*(4), 1678–1687.

Blondel, J., Ferry, C., & Frochot, B. (1970). La méthode des indices ponctuels d'abondance (IPA) par des relevés d'avifaune par station d'écoute. *Alauda*, *38*, 55–71.

Blondel, J. (1975). Structure et dynamique des peuplements d'oiseaux forestiers. In P. Pesson (Ed.), *Actualité d'écologie forestière : sol, flore, faune* (pp. 367–388).

Borghesio, L. (1997). Field observations on Prince Ruspoli's Turaco *Tauraco ruspolii*. *Scopus*, *19*, 83–91.

Borghesio, L., & Ndang'ang'a, K. P. (2003). Habitat selection and the conservation status of Fischer's turaco *Tauraco fischeri* on Unguja, Tanzania. *Oryx*, *37*(4), 444–453.

Candy, M. (1984). Habits and breeding biology of the Great blue turaco *Corythaeola cristata*. *Journal of East African Natural History Society*, *190*, 1–19.

Cougny, G., Pedia, P., Andoh-Allé, J., Ziriga, O., Bilé, M., Egnankou, M. W., & Kouakou, A. K. (1995). *Etude d'impact environnemental du projet de rénovation et d'extension de l'Ecole forestière et d'aménagement d'une ferme piscicole dans le Parc National du Banco*. Egide-Aegis Consultants et Direction de la Protection de la Nature.

Izhaki, I., & Safriel, U. N. (1989). Why are there so few exclusively frugivorous birds? Experiments on fruit digestibility. *Oikos*, *54*, 23–32.

Keitt, T. H., Bjornstad, O. N., Dixon, P. M., & Citron-Pousty, S. (2002). Accounting for spatial pattern when modeling organism–environment interactions. *Ecography*, *25*, 616–625.

Kouadio, K. P., Yaokokoré-Béibro, K. H., Odoukpé, K. S. G., Konan, E. M., & Kouassi, K. P. (2014). Diversité avifaunique du Parc National du Banco, Sud-Est Côte d'Ivoire. *European Journal of Scientific Research*, *125*(2), 384–398.

Lauginie, F., Poilecot, P., Akindes, F., Beligné, V., Bonfoh, K., & Ouattara, D. (1996). *Monographie des parcs nationaux. Projet WWF-CI008. Revue générale des Parcs Nationaux et Réserves de Côte d'Ivoire* (Document 5). DDC, Minagra et WWF.

Lauginie, F. (2007). *Conservation de la nature et des aires protégées en Côte d'Ivoire*. CEDA/NEI.

Mbété, P., Ngokaka, C., Akouango, F., Bonazebi, N., & Vouidibio, J. (2010). Evaluation des quantités de gibiers prélevées autour du Parc National d'Odzala-Kokoua et leurs impacts sur la dégradation de la biodiversité. *Journal of Animal & Plant Sciences*, *8*(3), 1061–1069.

Office Ivoirien des Parcs et Réserves (OIPR). (2019). *Plan d'aménagement et de gestion du Parc National du Banco 2019–2028*. Ministère de l'Environnement et du Développement Durable.

Okon, O. M., Kouadio, K. P., Assa, E. S., Koué-Bi, T. M., & Yaokokoré-Béibro, K. H. (2023). Structure de la végétation et distribution des touracos (Musophagidae) dans quelques milieux naturels du Centre et du Sud-est de la Côte d'Ivoire. *International Journal of Innovation and Applied Studies*, *40*(2), 459–466.

Sun, C., & Moermond, T. C. (1997). Foraging ecology of three sympatric turacos in a montane forest in Rwanda. *The Auk*, *114*(3), 396–404.

Sun, C., Moermond, T. C., & Givnish, T. J. (1997). Nutritional determinants of diet in three turacos in a tropical montane forest in Rwanda. *The Auk*, *114*(2), 200–211.

Thiollay, J. M. (1985). The birds of Ivory Coast: Status and distribution. *Malimbus*, *7*, 1–59.

Yaokokoré-Béibro, K. H. (2001). *Avifaune des forêts classées de l'Est de la Côte d'Ivoire : Données sur l'écologie des espèces et effet de la déforestation sur les peuplements cas des forêts classées de la Béki et de la Bossématié (Abengourou)* (Thèse de doctorat). Université de Cocody.

Yeboah, S., Deikumah, J. P., & Henaku-Owusu, E. (2008). The status of three species of turacos in the Kakum Conservation Area in the Central Region, Ghana. *West African Journal of Applied Ecology*, *13*, 104–110.