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Spatial distribution of mammalian fauna in a community forest at Wadrékro, Oumé department, west-central Côte d'Ivoire

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Abstract

The rate at which Ivorian forests are disappearing has become increasingly alarming. It is therefore necessary to conduct investigations in these natural ecosystems to reverse this trend. Accordingly, this study was carried out in a community forest in Wadrékro, in the Oumé department, to determine the spatial distribution of mammalian species recorded there. To achieve this objective, foot surveys were conducted using linear transects and reconnaissance walks or recces. Data analysis revealed that four (4) habitat types were colonized by mammalian fauna in this forest. The orders Artiodactyla and Rodentia showed a wide distribution, while the order Carnivora was restricted to the southern and eastern parts of the forest. At the species level, the Bushbuck and the Greater Cane Rat were the most widespread. These findings could be useful for the restoration of Ivorian forest cover.

Keywords: Distribution map; Mammals; Habitats; Community forest; Oumé

1. Introduction

Like other tropical countries, Côte d'Ivoire is deeply affected by biodiversity conservation challenges. Threats to Ivorian wildlife diversity arise from the destruction of natural habitats and the intense, uncontrolled harvesting of wild animals by hunters [1, 2]. Consequently, there is a decline in numerous animal species, among which mammals are among the most threatened [3, 4, 5]. Recent assessments of the conservation status of mammals present an alarming picture of ongoing declines, highlighting the urgent need for informed conservation actions [6]. In light of this situation, the conservation of animal populations, particularly mammalian fauna, has become a major concern in recent decades [7, 8]. Several studies have thus been conducted on mammals in their natural environments to establish sustainable management strategies [9]. Most of these studies have focused on protected areas, such as protected reserves [10, 11, 12, 13] and classified forests [14, 15, 16, 17]. However, mammalian fauna extends beyond the boundaries of these areas. Some community forests also contribute to mammal conservation in Côte d'Ivoire. Studies conducted in village forests support this assertion [17, 18, 19]. This study, carried out in the Oumé department, aims to determine the spatial distribution of mammalian fauna in the habitats of a village forest in Wadrékro.

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2. Material and methods

2.1. Study Area

This study was conducted in the central-western region of Côte d'Ivoire, within the Oumé department, between longitude 5°30 West and latitude 6°30 North, specifically in the locality of Wadrékro (Figure 1). The study area experiences a subequatorial climate characterized by two rainy seasons (March to June and September to October) and two dry seasons (November to February and July to August) [20]. The annual average temperature is 32°C, and the annual average rainfall is 1200 mm. The area is influenced by the Bandama River and its main tributary, the Téné River [21]. This region belongs to the mesophilic sector of the Guinean domain, featuring semi-deciduous vegetation [22], with dense forest dominated by Celtys spp. and Triplochiton scleroxylon, as noted by [23].

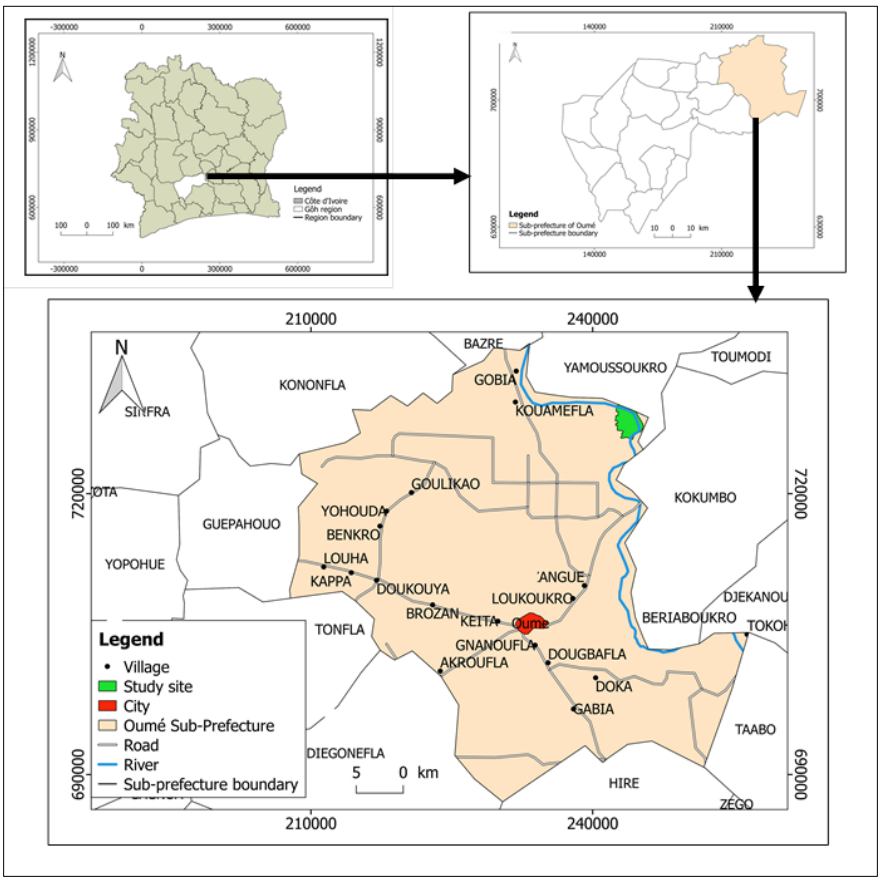


Figure 1 Location of the Study Site

2.2. Methodology

Data collection for this study was carried out in October 2024 using a combination of two effective and complementary methods to optimize results [19]: linear transects [24] and reconnaissance walks or recces [25]. In the village forest, the team conducted surveys along five 2 km-long linear transects, spaced 500 m apart. Mammal presence indicators and signs of anthropogenic pressures were recorded at a walking speed of 0.5 to 1 km/h. These inventories were conducted during the daytime, between 6:00 AM and 5:00 PM.

2.3. Data Analysis

Point-based mapping of animal distribution is a commonly used method in ecology and biogeography to spatially represent the distribution of a species. The spatial distribution of a species can then be analyzed by examining the distribution of points on the map, allowing the identification of areas of concentration, distribution limits, and zones of more sporadic presence, among others [26, 27]. For this purpose, QGIS 2.14.9 software was used to generate the spatial distribution of each mammal species recorded in the village forest. To establish a relationship between the different species encountered and the various habitats, the data were subjected to a Correspondence Factorial Analysis (CFA). CFA aims to represent, from a contingency table, the modalities of two qualitative variables in the same plane to

highlight strong associations between modalities. This analysis revealed habitat preferences of species influencing their geographical distribution. Data analysis was performed using descriptive statistical techniques with SPSS Statistics 22 software.

3. Results

3.1. Mammalian Species Richness of the Wadrékro Community Forest

The Wadrékro community forest is home to 14 mammal species, grouped into 9 families and 3 orders: Artiodactyla, Rodentia, and Carnivora. These species are distributed across 4 types of habitats: Secondary Forest (F), fallow land (J), cocoa fields (C), and food crop fields (V). The secondary forest and fallow land are the habitats with the greatest species richness, with 10 and 7 mammal species respectively. The other habitats (cocoa fields and food crop fields) are the least diverse, with 2 species each.

Table 1 List of Mammals Observed in the Wadrékro Forest

Order	**Family**	**Common name**	**Scientific name**	**Habitats**			
				FS	**JC**	**CC**	**CV**
Artiodactyla	Bovidae	Bushbuck	*Tragelaphus scriptus*	×	×		
		Red-flanked duiker	*Cephalophus rufilatus*	×			
		Black-backed duiker	*Cephalophus dorsalis*	×			
		Maxwell's duiker	*Philamtomba maxwellii*	×			
	Suidae	Red river hog	*Potamochoerus porcus*	×			
	Hippopotamidae	Common hippopotamus	*Hippopotamus amphibius*	×			
Rotendia	Hystricidae	African brush-tailed porcupine	*Atherurus africanus*	×			
	Thryonomyidae	Greater cane rat	*Thryonomys swinderianus*		×		×
	Nesomyidae	Gambian giant rat	*Cricetomys gambianus*	×	×		
	Sciuridae	Palm rat	*Xerus erythropus*			×	×
		Giant forest squirrel	*Protoxerus stangeri*		×	×	
Carnivora	Viverridae	African civet	*Civettictis civetta*	×	×		
	Herpestidae	Marsh mongoose	*Crossarchus obscurus*	×	×		
	Nandinidae	African palm civet	*Nandinia binotata*		×		

FS : Secondary forest ; **JC :** Fallow land ; C C: Cocoa field ; CV : Food crop field

3.2. Spatial Distribution of Mammals in the Wadrékro Forest

The spatial distribution of mammal species is almost homogeneous in the Wadrékro community forest. When considering the orders specifically, Artiodactyla and Rodentia were the most widespread, while the Carnivora order was present in the South and Center of the forest (Figure 2A). Regarding the distribution of the Artiodactyla order, the bushbuck was observed almost throughout the forest except in the West. For other species, the Maxwell's duiker, the red-flanked duiker, and the warthog were identified in the Southeast, while the black-backed duiker and the common hippopotamus were only seen in the North of the community forest (Figure 2B). Regarding the Rodentia order, the cape hyrax was almost distributed throughout the forest. For other species in this order, the Gambian giant rat was reported in the South and Center. The giant squirrel was observed in the East and Center, while the palm rat was identified only in the East and North. Finally, the African tree shrew was only identified in the East (Figure 2C). For the Carnivora order, the brown mongoose and the African civet were encountered in the South and East, while the mongoose was only spotted in the West (Figure 2D).

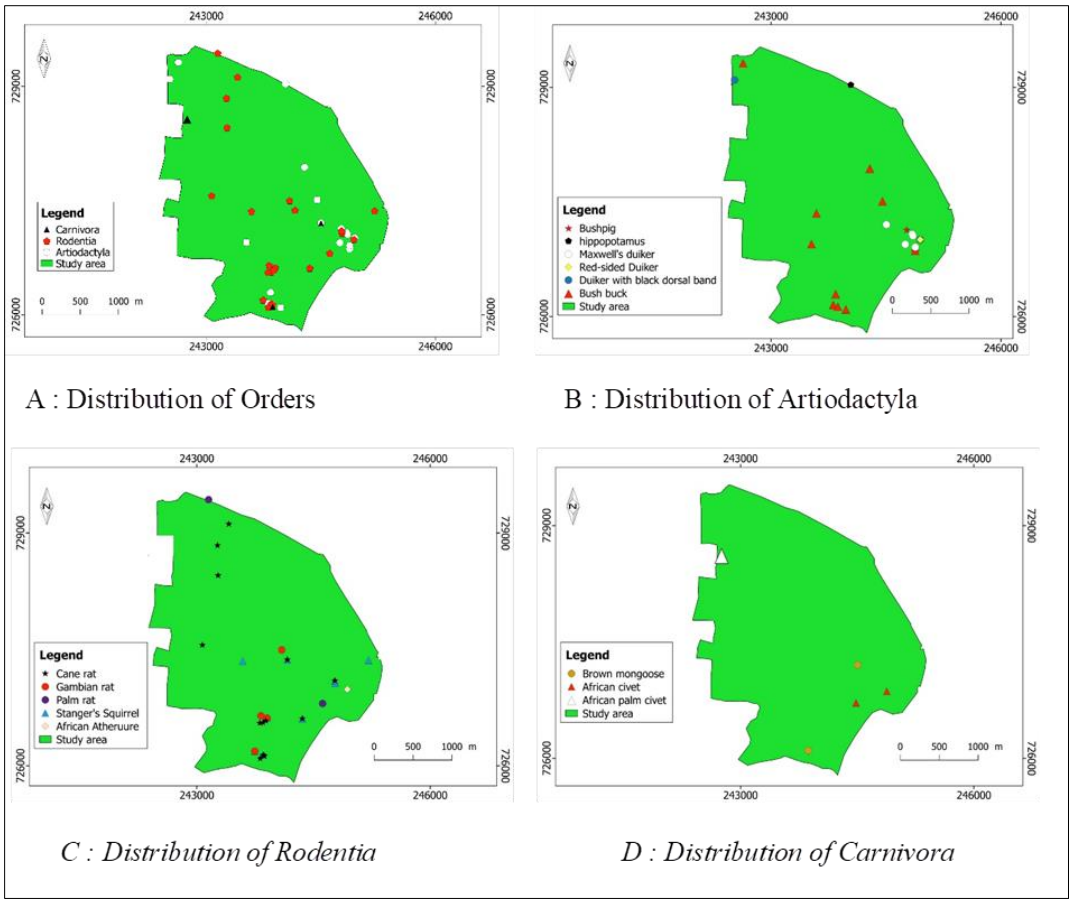
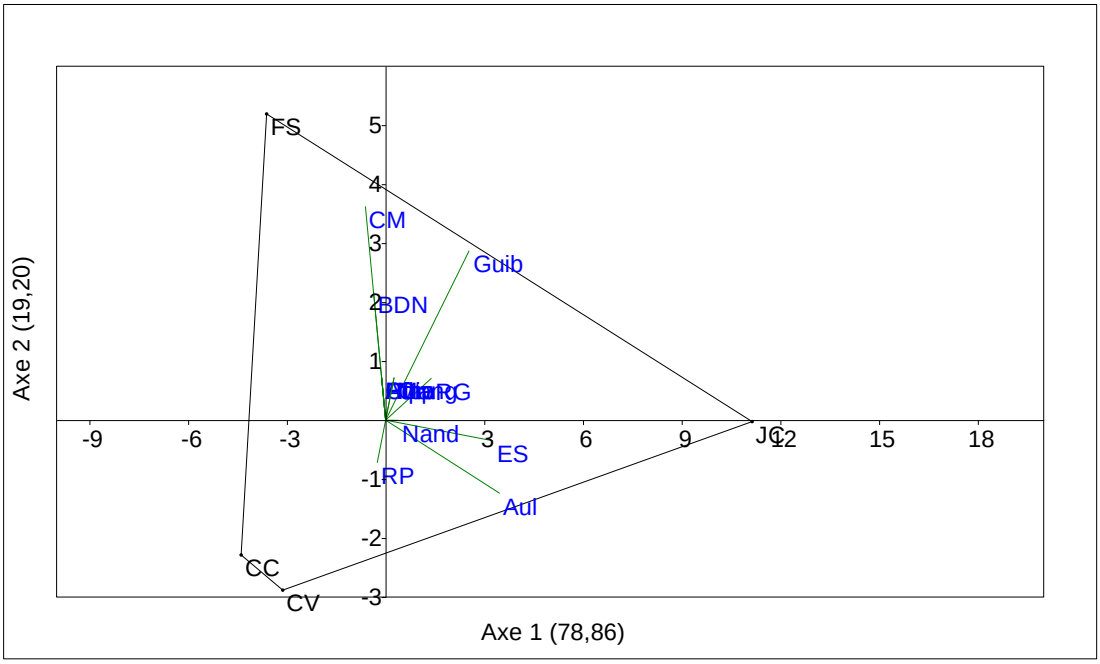


Figure 2 Distribution of Mammals in the Wadrékro Community Forest

3.3. Spatial Distribution of Mammals According to Habitats



(FS: Secondary Forest; JC: Fallow Land; CV: Food Crop Field; CC: Cocoa Field; Aul: Cape Hyrax; Ath: African Tree Shrew; ES: Giant Squirrel of Stanger; RG: Gambian Giant Rat; RP: Palm Rat; Guib: Bushbuck; CM: Maxwell's Duiker; BDN: Black-Backed Duiker; Cfr: Red-Flanked Duiker; Pota: Warthog; Hipp: Common Hippopotamus; Civ: African Civet; Mang: Brown Mongoose; Nand: Nandinia)

Figure 3 Distribution of Mammal Species Based on Habitats in the Forest

Four types of habitats were recorded in the Wadrékro community forest: secondary forest, fallow land, cocoa fields, and food crop fields. These habitats were differently colonized by mammal species. The bushbuck, African civet, Gambian giant rat, and brown mongoose were more commonly found in the secondary forest and fallow land. The Maxwell's duiker, black-backed duiker, red-flanked duiker, warthog, common hippopotamus, and African tree shrew were only associated with the secondary forest, while the cape hyrax was found in the fallow land and food crop fields. Furthermore, the African palm civet and the giant squirrel were more frequently found in the fallow land. Finally, the palm rat was primarily encountered in the cocoa fields and food crop fields in the forest (Figure 3).

4. Discussion

The analysis of the spatial distribution maps of mammals in the Wadrékro community forest reveals that the orders Artiodactyla and Rodentia were nearly homogeneous across the habitats of this forest. This distribution may be due to the availability and variability of food resources (leaves, seeds, fruits, etc.) as well as shelters (hollow trees, nests, burrows, etc.) offered by forest environments [28]. Indeed, these animals concentrate in areas where vegetation is abundant and nutritious, providing them with an adequate food source. The presence of plants with high nutritional values attracts a larger number of herbivores and granivores [29]. Furthermore, to protect themselves from predators and climatic conditions, these animals seek enclosed habitats such as forests and fallow land. Sometimes, these animals may compete for the same food resources, which could lead to their widespread distribution [30, 31, 32]. All these living conditions mentioned above are specific to certain species, such as the bushbuck, which is a species widely distributed in Sub-Saharan Africa. Its natural habitat is characterized by the presence of dense vegetation, with alternating wooded areas and clearings [33]. Although it prefers natural environments, the bushbuck has adapted to certain anthropogenic areas, such as plantations, agricultural zones, and peri-urban areas [34, 33, 35]. In addition to the availability and diversity of food resources, rapid reproduction and large litters enable these animals to quickly and abundantly colonize these environments [36]. This could explain the nearly homogeneous distribution of the Cape hyrax. Indeed, this animal has a highly diversified natural habitat. The Cape hyrax, also known as the "field rat," is an African species found in a wide variety of natural habitats, including forests, savannas, grasslands, and wetlands [37, 38]. Furthermore, in anthropogenic environments, the Cape hyrax benefits both from the reduction of its natural predators and from less food competition with other rodent species, significantly promoting its survival and proliferation [39, 19].

Considering the spatial distribution map of Carnivora, these species were less widespread within the Wadrékro community forest. This limited distribution seems to be due to the anthropogenic pressures on the forest [40]. Indeed, habitat fragmentation, urbanization, and human activities may restrict the proliferation of these animals. These various ecological factors could hinder the distribution of the African civet, brown mongoose, and Nandinia in the Wadrékro community forest. However, the presence and abundance of potential prey in a natural environment are key factors for the wide distribution of these species. These animals are generally more common in ecosystems rich in mammals, birds, and other vertebrates, which make up their prey. The diversity and size of prey populations influence the carrying capacity and density of Carnivora populations [41].

5. Conclusion

At the end of this study, it appears that the mammal orders identified in the Wadrékro community forest were distinctly distributed according to the habitats. Thus, the orders Artiodactyla and Rodentia had an almost homogeneous distribution, while the Carnivora order was observed only in a few locations. Specifically, the bushbuck and the Cape hyrax were the most widespread species in this forest. The information provided by this study will serve as a database for the conservation of community forests.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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