TERRESTRIAL SMALL MAMMAL DIVERSITY AND ABUNDANCE IN TAÏ NATIONAL PARK, CÔTE D'IVOIRE

Bertin K. Akpatou[1,*], Kouakou H. Bohoussou[2,], Blaise Kadjo[1], Violaine Nicolas[3]**

[1]*Félix Houphouët-Boigny University, Côte d'Ivoire*
[2]*University of Man, Côte d'Ivoire*
[3]*National Museum of Natural History of Paris, France*
*e-mail: *bertinakpatou@yahoo.fr, **kbohoussouhil@gmail.com*

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A terrestrial small mammal species survey was carried out in the Taï National Park from March to June 2010, using Sherman's live traps and pitfall traps. The aim of the study was to determine the diversity and distribution of rodents and shrews in three different habitats: primary, secondary and swamp forests. During the study period, 263 terrestrial small mammals belonging to 17 species (six Soricidae species and eleven Muridae species) were captured out of 8,610 trap-nights. For Rodents, the most frequent species were *Malacomys edwardsi* (n = 76) followed by *Hylomyscus simus* (n = 53), *Praomys rostratus* (n = 51) and *Hybomys planifrons* (n = 27). For shrews, the most frequent species was *Crocidura buettikoferi* (n = 12) followed by *Crocidura eburnea* (n = 7). The species richness (S) and diversity index (H') were higher in the secondary forest (S = 15; H' = 2.12) than the ones of the primary forest (S = 10; H' = 1.79) and swamp forest (S = 8, H' = 1.74) respectively. In the primary forest, the population of terrestrial small mammals was dominated by four species: *Malacomys edwardsi* (n = 32), *Praomys rostratus* (n = 21), *Hylomyscus simus* (n = 15) and *Hybomys planifrons* (n = 13). In the secondary forest, *Hylomyscus simus* (n = 29), *Malacomys edwardsi* (n = 23) and *Praomys rostratus* (n = 18) were the most abundant. In swamp forest, the most abundant species were: *Malacomys edwardsi* (n = 21), *Praomys rostratus* (n = 12) and *Hybomys planifrons* (n = 11). Of the listed species, two species are worthy for conservation, *C. buettikoferi* (NT) and *G. buntingi* (DD), and ten were endemic to the Upper Guinea forests. These results confirm once again the important animal diversity of the Taï National Park, which harbours numerous species endemic to the Upper Guinea forests.

Key words: biodiversity, conservation status, Muridae, Soricidae, tropical rainforest

Introduction

Tropical areas are known for their high biodiversity compared to temperate regions (Brown, 2014). In fact, several hotspots have been defined in tropical regions. Some Upper Guinea forest blocks have been particularly identified as priority areas for biodiversity conservation in the world (Myers et al., 2000; Kuper et al., 2004). The Taï National Park (TNP), which covers 457 000 ha, is one of the largest intact blocks of biodiversity hotspots in the Upper Guinea. It is made up of forests which could have been maintained during the Pleistocene glacial and interglacial cycles (Maley, 1996; Anhuf et al., 2006). Thus, it has been able to function as a forest refuge during arid periods (Anhuf et al., 2006). This paleoclimatic phenomenon could explain its great biological richness and the existence of many endemic species (Maley, 2001).

In order to conserve this exceptional biological diversity, the TNP was created by decree on August 28, 1972. In 1978, it joined the international network of Biosphere Reserves and has been listed since 1982 on the UNESCO World Heritage sites. These actions thus, consecrate the recognition of its biological specificity at international level (Allport et al., 1994; Kone, 2004). Several conservation and scientific research programmes have been conducted in the TNP (Chatelain et al., 2001).

Studies in the TNP have focused mainly on botanical diversity (Ake-Assi & Pfeffer, 1975; Adou Yao & N'Guessan, 2005). At the level of fauna, the majority of the work carried out has been focused on large mammals, particularly on Primates: *Pan troglodytes verus* (Soiret et al., 2015; Ban et al., 2016) and the family Cercopithecidae (Kone, 2004; Kouassi, 2016). Compared to large mammals, very few studies have been conducted on terrestrial small mammals, in particular the composition of the community. The inventory data on Muridae and Soricidae in the TNP come from the work of Dosso (1975, 1983) and Barriere et al. (1999). The studies carried out on these groups in recent years are more focused on the diet of Soricidae (Churchfield et al., 2004) and the taxonomic review of the genera *Praomys* (Akpatou, 2009) and *Malacomys* (Bohoussou, 2016).

It is therefore difficult to appreciate the terrestrial small mammal communities in the TNP in terms of diversity and abundance. However, it is recognised that terrestrial small mammals form an important component of tropical natural environments (Adam et al., 2015; Bantihun & Bekele, 2015). Terrestrial small mammals play an important ecological role. They are an important component in the trophic chain, since they are prey for small carnivores, raptors and reptiles (Habtamu & Bekele, 2012) and also contribute to the regeneration of forests through the dissemination of seeds (Angelici & Luiselli, 2005). In addition, their reduced longevity, offset by strong population dynamics, enables them to react quickly to environmental conditions changes and habitat fragmentation (Delattre et al., 1992; Nicolas et al., 2009). Thus, the species richness and abundance of terrestrial small mammals are regularly used to measure the level of disturbance of different habitats (Nicolas et al., 2009; Avenant, 2011). And hence a better understanding of the composition of terrestrial small mammal communities can contribute to a better assessment of the conservation status and the functioning of particular forest ecosystems like that of TNP.

The purpose of this study was to compare the species richness and relative abundance of terrestrial small mammals in the three dominant TNP habitats, represented by primary, secondary, and swamp forests.

Material and Methods

Study area and habitats surveyed

This study was carried out in the TNP, located in southwestern Côte d'Ivoire (5°08′–6°24′N and 6°47′–7°25′W). The TNP is the largest intact block of lowland rainforest in West Africa. It covers an area of 457 000 ha and is extended to the north by the Wildlife Reserve of N'zo with 790 km^2 (Schweter, 1999; Kone, 2004). The TNP is situated 20 km east of Tai City. It is bounded by the River Cavally on the west, the River Sassandra on the east, the region of San Pedro on the south, and on the north by the Cavally region (Guiglo) (Fig. 1). The average annual rainfall is 1800 mm, the average annual temperature is 24°C. The TNP is subjected to a four-season subequatorial climate: two rainy seasons (March – June and September – November) and two dry seasons (July – August and December – February) (Collinet et al., 1984).

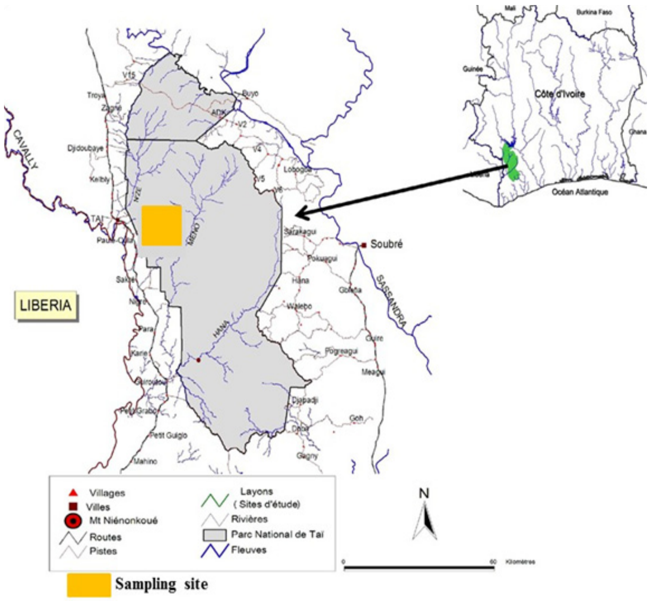

Fig. 1. Location of the study area in the Taï National Park, Côte d'Ivoire.

Rodents and shrews were inventoried in three types of habitats: primary forest, secondary forest, swamp forest, from March to June 2010 in the western part of the TNP (Fig. 1). The primary forest (5°50′N; 7°20′W) vegetation is characterised by *Phyllocosmus africanus* Klotzsch, *Corynanthe pachyceras* K.Schum., *Xylopia quintasii* Engl. & Diels, *Coula edulis* Baill., *Octoknema borealis* Hutch. & Dalziel, *Trichoscypha arborea* A. Chev., *Bombax brevicuspe* Sprague, *Parkia bicolor* A. Chev., *Bussea occidentalis* Hutch, and *Erythrophleum ivorense* A. Chev. In the secondary forest (5°49′N; 7°23′W), the most common species were *Uapaca guineensis* Müll. Arg., *Ricinodendron heudelotii* (Baill.) Pierre ex Heckel, *Pycnanthus angolensis* (Welw.) Warb, *Petersianthus macrocarpus* (P. Beauv.) Liben, *Funtumia africana* (Benth.) Stapf, *Entandrophragma angolense* (Welw.) C. DC., and *Entandrophragma cylindricum* Sprague. The vegetation of the swamp forest (5°50′N; 7°21′W) is dominated by *Thaumatococcus daniellii* (Benn.) Benth., *Megaphrynium macrostachyum* (Benth.) Milne-Redh., *Sarcophrynium brachystachyum* (Benth.) K.Schum., *Sacoglottis gabonensis* (Baill.) Urb., *Afzelia bella* var. *gracilior*, *Hypselodelphys violacea* (Ridl.) Milne-Redh., *Anthostema aubryanum* Baill., *Protomegabaria stapfiana* (Beille) Hutch., *Hunteria umbellata* (K. Schum.) Hallier f., and *Sacoglottis gabonensis* (Baill.) Urb. (Ake-Assi & Pfeffer, 1975; Adou Yao & N'Guessan, 2005).

Small mammal sampling

Two types of traps were used to capture terrestrial small mammals:

Sherman live traps. In each habitat, four plots of 5000 m^2 (100 m × 50 m) each were delineated and sampled. The different trapping plots were sat at about 500 m apart to avoid influences on each other during sampling. A total of 12 plots were prospected during this study. In each plot, ten equidistant trap lines of 10 m were arranged. On each trapping line, ten Sherman live traps (7.5 × 9 × 23 cm) were set, spaced 5 m apart, making a total of 100 Sherman live traps per plot. The traps were baited with fresh palm nuts (*Elaeis guineensis* Jacq.). Traps were checked every morning after sunrise. Traps were set for 7 consecutive nights, making a trapping effort of 700 trap-nights per plot, resulting in a total of 2,800 trap-nights per habitat. The plots were sampled one after the other.

Pitfall traps. A pitfall line of 50 m long was set in each habitat type. The pitfall line consisted of 10 buckets of 10 liters. The buckets were buried at intervals of 5 m. A barrier was constructed using an erected plastic cloth stretched along the pitfall line (Nicolas et al., 2009). The trapping campaign lasted for seven consecutive nights with a trapping effort of 70 trap-nights per habitat type.

The two types of traps (Sherman live traps and pitfall traps) were used because previous studies showed that their combined use enables to capture a wider range of taxa (Nicolas & Colyn, 2006; Nicolas et al., 2010a).

Species identification

Because of the existence of several sibling species, the identification of most small mammal species is not possible by external morphological characters only. In addition, the systematics and taxonomy of some genera of Muridae and Soricidae are not yet clarified (Hutterer, 2005; Happold, 2013). Consequently, all the captured specimens were euthanised and preserved at the Laboratory of Zoology and Animal Biology, «Félix Houphouët-Boigny» University (Côte d'Ivoire) or at the National Museum of Natural History (MNHN) of Paris. Species identification was based on data from external measurements (head and body length, tail length, hind-foot length, and ear length), and was confirmed, for species of *Malacomys*, *Praomys*, *Mus*, *Mastomys* and all shrews, by molecular analyses (sequencing of mitochondrial cytochrome b gene and / or nuclear gene of intron 7 BFIBR). The sequences obtained were compared to Genbank data by BLAST analysis. Molecular analyses were performed at the Molecular Systematics Service (UMS 2700) of the MNHN in Paris. The results of the molecular analyses are not presented in this document.

Small mammals were identified following the established taxonomic nomenclature (Meester & Setzer, 1971; Happold, 2013; Happold & Happold, 2013).

Data analysis

The composition and structure of terrestrial small mammal populations in different habitats were described using several ecological variables and indices. For each habitat, we determined the species richness (S), which corresponds to the total number of species sampled. The expected species richness of each habitat was estimated with Jack-knife1. The Shannon-Weaver (H') diversity indices were calculated as follows: $H' = -\Sigma(p_i)(\log_2 p_i)$, where p_i = number of individuals for each species/total number of individuals (Shannon, 1948). The evenness index (J) indicates how the species are distributed in the community, and is derived from H' ($J = H'/\log_2 S$). The values range from 0 (one dominant species) to 1 (all species equally represented in the community). H' and J were calculated by habitat. The trap success (T) was calculated as the ratio of the number of individuals captured to the total trap-nights in a habitat multiplied by 100 (Stanley & Foley, 2008). The relative abundance (RA) of individual species was computed as the ratio of the number of a particular species to the total number of all individuals captured in a habitat, RA = (ni/N) x 100; with ni = number of individuals of species i, N = total number of individuals captured.

The analysis of variance (one-way ANOVA) was used to compare the relative abundance of individual species from the seven common species across the three habitat types. The Mann-Whitney test was used to compare the Shannon-Weaver (H') indices between different habitat types. The analyses were performed using Statistica Software Version 7.1 and considered as significant when $p < 0.05$. Similarities in habitats faunal composition were calculated using the Jaccard index (Jaccard, 1901): Sij = [a / (a + b + c)] × 100, where:

a is the number of species present in both *i* and *j* habitats;

b is the number of species present in habitat *i* but not in *j*;

c is the number of species present in habitat *j* but not in *i*.

Results

Species composition

Table 1 gives an overview of the terrestrial small mammals captured in the Taï National Park (TNP). With a total trapping effort of 8610 trap nights, 263 terrestrial small mammals were captured. They were divided into two orders (Rodentia and Soricomorpha), two families (Muridae and Soricidae), and 17 species (six species of Soricidae and 11 species of Muridae).

The dominant species in the community were: *Malacomys edwardsi* Rochebrune, 1885 (n = 76); *Hylomyscus simus* Aellen & Coolidge, 1930 (n = 53); *Praomys rostratus* Miller, 1900 (n = 51); *Hybomys planifrons* Miller, 1900 (n = 27) and *Crocidura buettikoferi* Jentink, 1888 (n = 12). The least represented species were: *Hybomys trivirgatus* Temminck, 1853 (n = 9); *Lophuromys sikapusi* Temminck, 1853 (n = 7); *Malacomys cansdalei* Ansell, 1958 (n = 7); *Crocidura eburnea* Heim de Balsac, 1958 (n = 7); *Crocidura olivieri* Lesson, 1827 (n = 3) and *Dephomys defua* Miller, 1900 (n = 3). Six species record a very low capture with one or two specimens: *Mastomys natalensis* Smith, 1834 (n = 2); *Crocidura muricauda* Miller, 1900 (n = 2); *Mus setulosus* Peters, 1876 (n = 1); *Grammomys buntingi* Thomas, 1911 (n = 1); *Crocidura obscurior* Heim de Balsac, 1958 (n = 1) and *Crocidura nimbasilvanus* Hutterer, 2003 (n = 1).

Habitat preference and species distribution

The results of the ecological variables (Table 1) showed that the community of terrestrial small mammals of the secondary forest had the highest value of specific richness (S = 15) and the highest diversity indices (H' = 2.12; Jack-knife1 = 20.25), followed, respectively, by those of the primary forest (S = 10; H' = 1.79; Jack-knife1 = 13.00) and the swamp forest (S = 8; H' = 1.74; Jack-knife1 = 10.25).

The pairwise comparison of habitat diversity index values H' using the Mann-Whitney test revealed a significant difference between the secondary forest and the other two habitats (p = 0.03). On the other hand, no significant difference was observed between the H' diversity indices of the primary forest and the swamp forest (p = 0.31).

Regarding the evenness index, it remained high in the three sampled habitat types (swamp forest J = 0.83; secondary forest J = 0.78; primary forest J = 0.77).

Table 1. Diversity, relative abundance and trap success of murids and soricids trapped in Taï National Park

Family/ species	Primary forest			Secondary forest			Swampy forest			Total	RAt (%)
	N	RA (%)	T (%)	N	RA (%)	T (%)	N	RA (%)	T (%)		
Soricidae Fischer, 1815											
Crocidura buettikoferi Jentink, 1888	5	5.27	0.18	5	4.8	0.18	2	3.13	0.07	12	4.56
Crocidura eburnea Heim de Balsac, 1958	2	2.11	0.07	5	4.8	0.18	0	0	0	7	2.67
Crocidura olivieri (Lesson, 1827)	0	0	0	3	2.88	0.11	0	0	0	3	1.14
Crocidura muricauda (Miller, 1900)	1	1.05	0.03	1	0.96	0.03	0	0	0	2	0.76
Crocidura nimbasilvanus Hutterer, 2003	1	1.05	0.03	0	0	0	0	0	0	1	0.38
Crocidura obscurior Heim de Balsac, 1958	0	0	0	1	0.96	0.03	0	0	0	1	0.38
Total Soricidae	9	9.48	0.31	15	14.4	0.53	2	3.13	0.07	26	9.89
Muridae Illiger, 1811											
Dephomys defua (Miller, 1900)	0	0	0	3	2.88	0.11	0	0	0	3	1.14
Grammomys buntingi (Thomas, 1911)	0	0	0	1	0.96	0.03	0	0	0	1	0.38
Hybomys planifrons (Miller, 1900)	13	13.68	0.45	3	2.88	0.11	11	17.19	0.38	27	10.26
Hybomys trivirgatus (Temminck, 1853)	3	3.16	0.11	5	4.8	0.18	1	1.56	0.03	9	3.42
Hylomyscus simus (G.M. Aellen & Coolidge, 1930)	15	15.79	0.53	29	27.88	1.01	9	14.06	0.32	53	20.15
Lophuromys sikapusi (Temminck, 1853)	2	2.11	0.07	4	3.85	0.14	1	1.56	0.03	7	2.67
Malacomys cansdalei Ansell, 1958	0	0	0	0	0	0	7	10.94	0.25	7	2.67
Malacomys edwardsi Rochebrune, 1885	32	33.68	1.11	23	22.16	0.80	21	32.81	0.73	76	28.89
Mastomys natalensis (Smith, 1834)	0	0	0	2	1.92	0.07	0	0	0	2	0.76
Mus setulosus Peters, 1876	0	0	0	1	0.96	0.03	0	0	0	1	0.38
Praomys rostratus (Miller, 1900)	21	22.1	0.73	18	17.31	0.62	12	18.75	0.42	51	19.39
Total Muridae	86	90.52	3	89	85.6	3.10	62	96.87	2.16	237	90.11
Number of species (S)	10	–	–	15	–	–	8	–	–	–	–
Total of trap success (T)	–	–	3.31	–	–	3.63	–	–	2.23	–	–
Diversity indexes											
Shannon-Weaver (H')	1.79	–	–	2.12	–	–	1.74	–	–	–	–
Equitability (J)	0.77	–	–	0.78	–	–	0.83	–	–	–	–
Jack-knife1	13.00	–	–	20.25	–	–	10.25	–	–	–	–

Note: N = Number of individuals; T = Trap success; RA = Relative Abundance; RAt = Total of Relative Abundance, In the secondary forest, 104 terrestrial small mammals were captured. In this habitat, the species *Hylomyscus simus* (n = 29, RA = 27.88%), *Malacomys edwardsi* (n = 23, AR = 22.16%) and *Praomys rostratus* (n = 18, RA = 17.31%) were the most abundant (Figure 2). The species *Crocidura olivieri*, *Crocidura obscurior*, *Dephomys defua*, *Mastomys natalensis, Mus setulosus*, and *Grammomys buntingi* were only found in this habitat.

Ninety-five specimens were collected in primary forest. The terrestrial small mammal community was dominated by four species (Fig. 2): *Malacomys edwardsi* (n = 32, RA = 33.68%), *Praomys rostratus* (n = 21, RA = 22.1%), *Hylomyscus simus* (n = 15, RA = 15.79%), and *Hybomys planifrons* (n = 13, RA = 13.68%). *Crocidura muricauda* and *Crocidura nimbasilvanus*, with one individual per species, were the rarest species in this habitat. Furthermore, *Crocidura nimbasilvanus* was captured only in the primary forest.

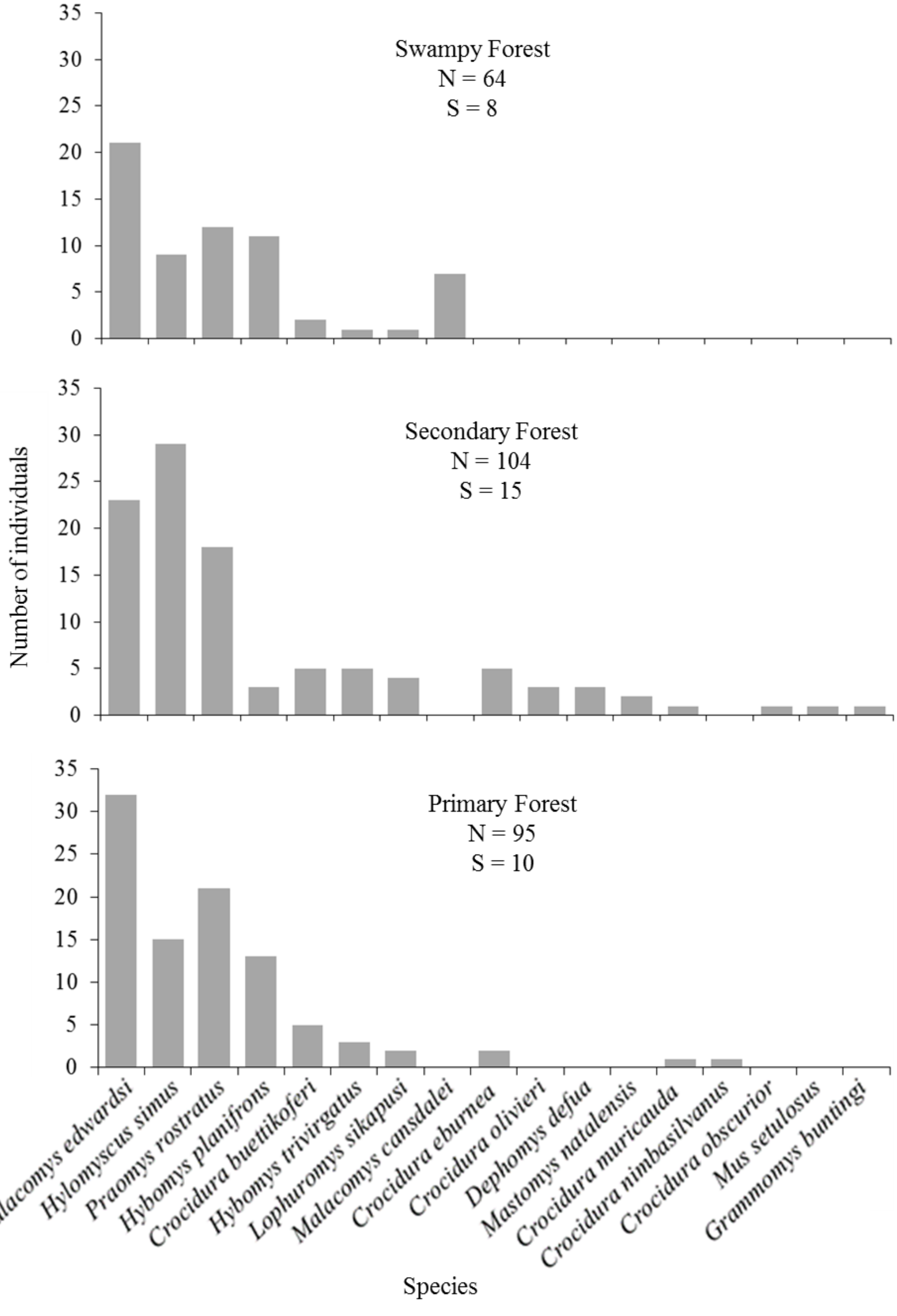

Fig. 2. Number of individuals of each species captured in three different habitats in Taï National Park. N = Total number of individuals, S = species richness.

In swamp forest, 64 terrestrial small mammals were captured. The most abundant species were: *Malacomys edwardsi* (n = 21, AR = 32.81%), *Praomys rostratus* (n = 12, AR = 18.75%) and *Hybomys planifrons* (n = 11; = 17.19%). The species *Malacomys cansdalei* (n = 7, AR = 10.94%) was collected only in swamp forest (Fig. 2).

The pairwise comparison of the relative abundances of the seven most common species with the Tukey test showed that the abundance of *M. edwardsi* differed significantly ($p < 0.01$) between primary forest and the other two habitat types. The abundance of *P. rostratus* varied significantly ($p < 0.01$) between primary forest and swamp forest. Regarding *H. simus* and *H. planifrons*, the abundance was significantly different ($p < 0.001$) between secondary forest and the other two habitat types. As for *H. trivirgatus*, it varied significantly ($p < 0.05$) between secondary and swamp forests. Neither the abundance of *L. sikapusi* nor of *C. buettikoferi* varied significantly between habitats.

Trapping success

For the 8610 trap nights, 263 terrestrial small mammals were captured, representing an overall trap success of 3.05% for the study area. All shrew species were captured in pitfall traps and all the rodent species in Sherman traps. Twenty-six shrews were captured in 210 pitfall nights for an overall bucket success of 12.38%. For the 8400 trap nights, 237 rodents were captured in Sherman traps, giving an overall trap success of 2.82%. The trapping success of soricids was higher in the secondary forest (T = 0.53%) than those in the primary (T = 0.31%) and swamp (T = 0.07%) forests (Table 1). As for murids, the highest value of trapping success was also recorded in the secondary forest (T = 3.1%), followed by primary forest (T = 3%) and swamp forest (T = 2.16%; Table 1). The total trapping success of terrestrial small mammals was T = 3.63% in the secondary forest, T = 3.31% in the primary forest and T = 2.23% in the swamp forest (Table 1).

Similarity

The similarity between the three habitat types, in terms of terrestrial small mammal species, measured using the Jaccard index, showed that primary forest and swamp forest were very similar (Sij = 63.63%). The primary forest shared 56.25% similarity with secondary forest. The lowest similarity was observed between secondary forest and swamp forest (Sij = 43.75%).

Discussion

The inventory of rodents and shrews in the Taï National Park (TNP) identified 17 species. The number of species obtained during a study depends on several factors: the types of traps and baits used, the trapping effort, the season and the type of habitat sampled (Dosso, 1983; Nicolas & Colyn, 2003; Nicolas et al., 2010b). This often makes it difficult to compare the specific richness obtained in different studies. But, a simple comparison of specific richness can provide information on the biodiversity of different habitats (Nicolas et al., 2010b). The present study collected 11 species of Muridae and six species of Soricidae in the TNP. This specific richness was inferior to the 19 species of Muridae recorded by Dosso (1975) and 10 species of Soricidae inventoried by Churchfield et al. (2004) in the TNP. The large size of the surveyed areas, the higher trapping effort and the longer periods (two years) characterising those studies could justify the observed difference. The TNP is one of the protected areas of Côte d'Ivoire which is home to a wide diversity of terrestrial small mammals compared to Banco National Park (Kadjo et al., 2013) and the Cavally and Haute Dodo Classified Forests (Decher et al., 2005). The type of traps used and the great heterogeneity of habitats of the TNP (Adou Yao & N'Guessan, 2005) could justify this great diversity of terrestrial small mammals. Indeed, habitat heterogeneity is recognised as an important environmental parameter capable to influence the diversity and distribution of terrestrial small mammals on a given site (Caro, 2002; Magige & Senzota, 2006; Mortelliti & Boitani, 2006). This is due to the colonisation capacity of different habitats by terrestrial small mammals (Caro, 2001; Fitzherbert et al., 2006).

In the current study, species richness was higher in the secondary forest than the one in the other two habitats. Similar results were obtained in other studies of rodents in the Democratic Republic of Congo (Mongo et al., 2012) and ants in Côte d'Ivoire (Kone et al., 2010). This great diversity of secondary forest is linked to the fact that this habitat combines ecological conditions allowing it to harbour, in addition to forest species, some species of open habitats. The swamp forest with its temporarily flooded soil was a limited habitable area for terrestrial small mammals. As a result, as already reported by Kadjo et al. (2013), the diversity indices were the lowest in that habitat.

The evenness index demonstrated that no species dominates the stand of different habitats, but several species co-dominants. Seven species, *Mal-*

acomys edwardsi, *Hylomyscus simus*, *Praomys rostratus*, *Hybomys planifrons*, *Hybomys trivirgatus*, *Lophuromys sikapusi*, and *Crocidura buettikoferi*, were inventoried in all the three sampled biotopes. This is due, on the one hand, to the mobility of the species and on the other hand to the connectivity between these habitats which are supposed to harbour metapopulations (Kindleman & Burel, 2008; Mongo et al., 2012).

The TNP secondary forest, which was an area of former coffee-cocoa plantations, showed a high similarity with the primary forest that suggests its progression towards a climax stage. The fact that the inventoried swamp forests were located within the primary forests could justify the high similarity between these two habitats.

The terrestrial small mammal community of the TNP was dominated by the genus *Malacomys* (31.5% of the total captured). A similar result was obtained in the Monogaga classified forest (Akpatou, 2009). The species of this genus live in rainforest habitats (Happold, 2013) and are very sensitive to fragmentation and degradation of their original habitat (Dosso, 1983). According to Dosso (1983), the size of the *Malacomys* populations is reduced inversely proportional to the degree of anthropisation of the forests. Extreme cases of disturbance may cause the local extinction of the species. The large proportion of the *Malacomys* species observed in this study could be related to the good conservation status of the TNP in general and of primary forests in particular, in which the *Malacomys* species were dominant. Unlike *M. edwardsi*, which appeared in all three habitats, *M. cansdalei* preferred wetland habitats (Happold, 2013). *Hylomyscus simus* and *Praomys rostratus* were the other two second most abundant species. *Hylomyscus simus* was dominant in secondary forest while the largest population of *Praomys rostratus* was collected in primary forest. *Praomys* and *Hylomyscus* are the most common genera in the Ivorian forests (Decher et al., 2005; Akpatou, 2009). The genus *Hybomys* is represented in the TNP by two species (*H. planifrons* and *H. trivirgatus*), of which the former (*H. planifrons*) is the most abundant. These two species are associated with primary and secondary forests (Happold, 2013). During this study, *H. planifrons* preferred primary and swamp forests. Regarding the occurrence of *H. trivirgatus*, it is significantly low in swamp forest. *Lophuromys sikapusi* is commonly caught in fallows, crops and degraded forests (Dosso, 1983). During this study, it was captured in small numbers in the three surveyed habitat types. This demonstrates the quite ubiquitous character of this species (Happold, 2013). *Dephomys defua*, *Mastomys natalensis*, *Mus setulosus*, and *Grammomys buntingi* are the rarest species in TNP.

In the Soricidae, *Crocidura buettikoferi* was the dominant species. It was collected in all types of habitat. Its presence is regularly reported in savanna forest relics, fallows and plantations (Nicolas et al., 2009; Happold & Happold, 2013). *Crocidura eburnea* was the second most abundant species in TNP and was associated with primary and secondary forests. *Crocidura olivieri* was captured in small numbers, and only in secondary forest. It is widespread throughout the African continent and colonises urban habitats as well as forest and savannah habitats (Happold & Happold, 2013). Recent work has revealed the presence of several allopatric or parapatric genetic lineages in *C. olivieri* (Dubey et al., 2007; Jacquet et al., 2015). A systematic revision within this species is necessary. *Crocidura muricauda*, also ubiquitous (Happold & Happold, 2013), was collected in very small numbers in the primary and secondary forests. *Crocidura nimbasilvanus*, with one individual caught on 553 specimens of shrews inventoried by Churchfield et al. (2004) and a single specimen also collected in this study, appears to be rare in the TNP, compared to what has been observed in the Ziama Reserve in Guinea (Nicolas et al., 2009). The high abundance of *Crocidura obscurior* in the TNP reported by Barriere et al. (1999) and Churchfield et al. (2004) was not observed in this study, since we only captured one specimen. This is explained, at least in part, by the fact that in the studies of Barriere et al. (1999) and Churchfield et al. (2004) the species C. *eburnea* and *C. obscurior* were confounded: *C. eburnea* was long considered as synonymous of *C. obscurior* (Hutterer, 2005) before being recently elevated to the rank of species on the basis of molecular (sequencing mitochondrial and nuclear DNA) and morphometric (Jacquet et al., 2014) analyses.

The present study allowed the inventory of several species of terrestrial small mammals with special status or value for conservation. Of the 17 species of rodents and shrews recorded, 10 species are endemic to the Upper Guinea forests, about 58.82% of all species (six Muridae: *D. defua*, *G. buntingi*, *H. planifrons*, *H. simus*, *M. cansdalei*, and *P. rostratus*, and four Soricidae: *C. eburnea*, *C. muricauda*, *C. obscurior*, and *C. nimbasilvanus*). Two species are listed in the IUCN Red list (IUCN, 2017) as follows: Near Threatened (*C. buettikoferi*) and Data Deficient (*G. buntingi*). These results confirm once again the important animal diversity of the Taï National Park, which harbours numerous species endemic to the Upper Guinea forests (Konate & Kampman, 2010).

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РАЗНООБРАЗИЕ И ОБИЛИЕ МЕЛКИХ НАЗЕМНЫХ МЛЕКОПИТАЮЩИХ НАЦИОНАЛЬНОГО ПАРКА ТАЙ (КОТ Д’ИВУАР)

Б. К. Акпатоу[1,*], К. Х. Бохоуссоу[2,], Б. Кадйо[1], В. Николас[3]**

[1]*Университет Феликса Уфуе-Буани, Кот-д’Ивуар*
[2]*Университет города Ман, Кот-д’Ивуар*
[3]*Национальный музей естественной истории Парижа, Франция*
*e-mail: *bertinakpatou@yahoo.fr, **kbohoussouhil@gmail.com*

Исследование мелких наземных млекопитающих было проведено в национальном парке Тай с использованием живоловок Шермана и почвенных ловушек с марта по июнь 2010 г. Целью исследования было определение разнообразия и распространения грызунов и землеройковых в трех различных местообитаниях: коренном, вторичном и заболоченном лесах. В течение периода исследования (8610 ловушко-ночей) было поймано 263 особи мелких наземных млекопитающих, относящихся к 17 видам (шесть видов Soricidae и 11 видов Muridae). Среди грызунов наиболее часто встречались виды *Malacomys edwardsi* (n = 76), затем *Hylomyscus simus* (n = 53), *Praomys rostratus* (n = 51) и *Hybomys planifrons* (n = 27). Среди землеройковых наиболее часто встречающимися видами были *Crocidura buettikoferi* (n = 12) и *Crocidura eburnea* (n = 7). Видовое богатство (S) и индекс разнообразия Шеннона (H') были выше во вторичном лесу (S = 15; H' = 2.12) по сравнению с их значениями в коренном (S = 10; H' = 1.79) и заболоченном (S = 8, H' = 1.74) лесах соответственно. В коренном лесу в сообществе мелких наземных млекопитающих доминировали следующие четыре вида: *Malacomys edwardsi* (n = 32), *Praomys rostratus* (n = 21), *Hylomyscus simus* (n = 15) и *Hybomys planifrons* (n = 13). Во вторичном лесу наиболее обильными видами были *Hylomyscus simus* (n = 29), *Malacomys edwardsi* (n = 23) и *Praomys rostratus* (n = 18). В заболоченном лесу видами с наибольшим обилием были *Malacomys edwardsi* (n = 21), *Praomys rostratus* (n = 12) и *Hybomys planifrons* (n = 11). Среди перечисленных видов охраны заслуживают следующие: *C. buettikoferi* (NT) и *G. buntingi* (DD), а десять являются эндемиками лесов Верхней Гвинеи. Эти результаты еще раз подтверждают значительное разнообразие животных национального парка Тай, где обитают многочисленные виды, эндемичные для лесов Верхней Гвинеи.

Ключевые слова: Muridae, Soricidae, биоразнообразие, влажный тропический лес, природоохранный статус