Habitat use by forest mammals in Dzanga-Ndoki National Park, Central Africa Republic

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Introduction

Deforestation of tropical rainforests in Africa is an urgent problem (Achard et al., 2002) and consequently studies on its fauna are relevant for efficient conservation programmes.

At present, scanty information is available on the ecology of African forest mammals. These include: the presence of forest mammals in the grassland, clearings and secondary forests (Prins & Reitsma, 1989; Maisels, 1996); estimates of local distribution, abundance and habitat use of forest buffalo (Molloy, 1997; Chamberlan, Maréchal & Maurois, 1998; Blake, 2002; Melletti, Penteriani & Boitani, 2007a; Korte, 2008); the crucial importance of natural forest fragments for mammals (White, 1994; Tutin, White & Mackanga-Missandzou, 1997); distribution and relative abundance of carnivores in multilayered forest (Martinoli et al., 2006); feeding ecology of leopards in rainforest (Henschel, Abernethy & White, 2005); and the ecology of forest elephant (Turkalo & Fay, 2001).

Being the mixed forest the most common habitat type in the area, representing the 72% of forested habitat in Dzanga sector of Dzanga-Ndoki National Park (Blom, 2001), thus we aspect that most mammal species use this habitat type.

The aim of this study was to contribute to the knowledge of some forest mammals by describing and comparing their habitat use. The study was conducted on the following ten species: western lowland gorilla (Gorilla gorilla gorilla, Savage & Wyman, 1847), leopard (Panthera pardus, Linnaeus, 1758), forest elephant (Loxodonta cyclotis, Matschie,1900), red river hog (Potamochoerus porcus, Linnaeus, 1758), forest buffalo (Syncerus caffer nanus, Boddaert, 1785), bongo (Tragelaphus euryceros, Ogilby, 1837), sitatunga (Tragelaphus spekei, Sclater, 1863), blue duiker (Cephalophus monticola, Thunberg, 1789), 'red' duikers group: black fronted duiker (Cephalophus nigrifrons, Gray, 1871), peter's duiker, (Cephalophus callipygus, Peters, 1876) and bay duiker (Cephalophus dorsalis, Gray, 1846), yellow-backed duiker (Cephalophus silvicultor, Afzelius, 1815).

Materials and methods

Study area

The field work was conducted from January 2002 to January 2004 inclusive, in the Bai-Hokou area (Fig. 1; 2°55¢N, 16°20¢E), located in the Dzanga sector of the Dzanga-Ndoki National Park, Central African Republic. For a detailed description of the study area, see the works of Carroll (1997), Blom (2001) and Melletti et al. (2007a).

Classification of habitat types

Following the categories proposed by Boulvert (1986), Carroll (1997) and Blom (2001), five types of forested habitat were distinguishable for the Dzanga-Sangha forest namely: mixed forest with 72% coverage of the study area with a mixture of open and very dense understorey; marantaceae forest (18%), composed by thick understorey dominated by Marantaceae; clearings (1%), with open grassy vegetation; seasonally inundated making up 5% with riparian forest along the watercourses; and mono-dominant patches of Gilbertiodendron dewevrei De Wild 1952 (4%), with open understorey.

Recce method

The recce is a count method using animal tracks and signs such as dung and footprints to determine the distribution

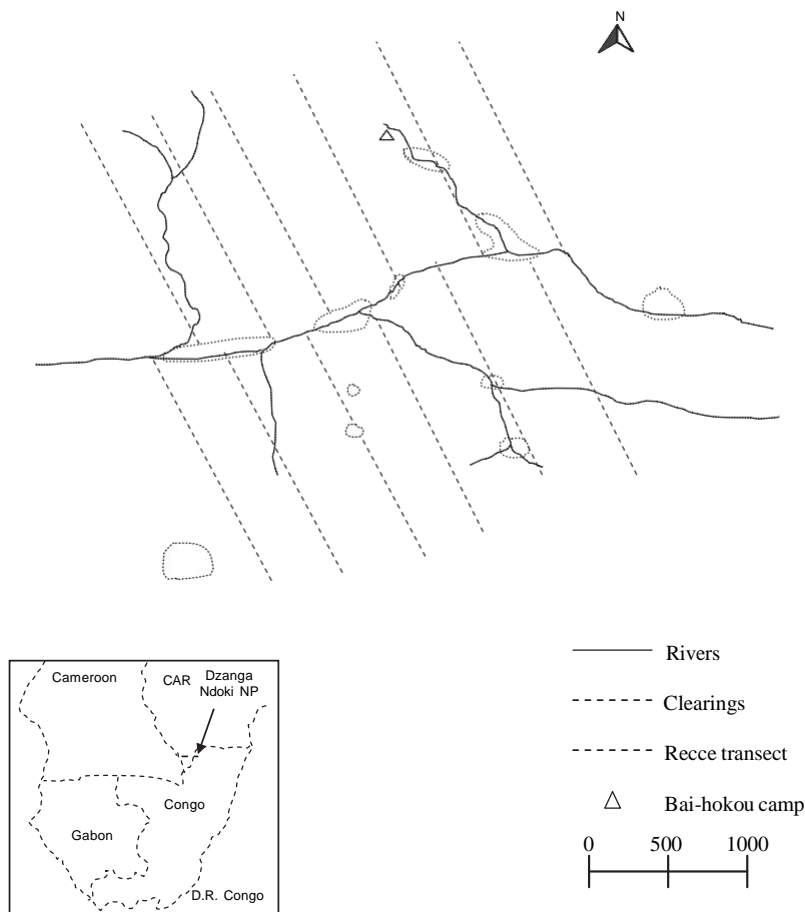*Correspondence: E-mail: mario.melletti@yahoo.it

Fig 1 Distribution of the twelve recce in the study area. Recce transects were walked during 2002 and 2003 wet and dry seasons

and relative degree of habitat use along a gradient (Walsh & White, 1999).

Recce sampling was conducted during the wet and dry seasons (Fig. 1). Each recce was walked by the same tracker (native guide), with the same compass direction. To make sure that every unit recce was walked through the same path, the whole recce was marked every 10 m by a white tape which was removed at the end of each sampling. Each recce started from the border of clearings or rivers spanned 2 km into the forest and was 250 m apart. Every year the twelve recce were walked twice with a total sampling effort of 96 h and 96 km in time and distance respectively.

The three species of red duikers were grouped together in the analysis due to the difficulty in distinguishing their individual tracks.

Chi-squared test was used to compare the frequencies of the recorded species among the different habitats and the statistical significance was set at (P £ 0.05).

Distributions of the observed frequencies were compared against an expected distribution for the ten forest mammals in the five habitat types.

Results and discussion

Except elephant, all forest mammals were encountered more frequently in the most available habitat type (Table 1), the mixed forest (72% coverage), whereas the forest elephant was mainly recorded in the monodominant patches.

Three species of large mammals (bongo, leopard and sitatunga) were excluded by chi-squared analyses because observations are <30 (Table 1).

The lowland gorilla was mainly recorded in mixed and marantaceae forest (Table 1), in accordance with previous studies that correlated high densities of gorillas with the presence of herbaceous vegetation belonging to the families of Marantaceae and Zingiberaceae (Tutin et al., 1997). In fact,

Table 1 Chi-squared values and observed against expected distributions of the ten forest mammals in Dzanga-Ndoki National Park 2002–2004, Central African Republic

Forest mammals	Mixed forest		Marantaceae f.		Clearing		Seasonally in. f.		Monodominant		x^2	df	P-value	n
	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.				
Western lowland gorilla	23	26.6	11	6.7	1	0.4	1	1.5	1	1.9	4.94	4	0.290	37
Leopard[a]	3	8.3	–	–	2	0.1	–	–	4	0.6	–	–	–	9
Forest elephant	20	157	2	39.2	6	2.2	3	8.7	187	10.9	3010.36	4	0.0001	218
Red river hog	119	117.4	13	29.3	10	1.6	10	6.5	11	8.2	54.95	4	0.0001	163
Forest buffalo	45	50	3	12.5	15	0.7	3	2.8	–	–	302.30	3	0.0001	66
Bongo[a]	17	20.2	–	–	1	0.3	1	1.1	4	1.4	–	–	–	23
Sitatunga[a]	10	12.2	–	–	2	0.2	1	0.7	–	–	–	–	–	13
Blue duiker	218	198.7	37	49.7	4	2.8	9	11	8	13.8	8.47	4	0.076	276
Red duiker group	383	352.8	58	88.2	3	4.9	23	19.6	23	24.5	14.34	4	0.006	490
Yellow-backed duiker	31	31.1	9	7.8	–	–	–	–	1	2.2	0.81	2	0.660	41

[a]Chi-squared test for n values <30 is not reliable.

in the study area, 86% of gorilla nests were found in marantaceae forest (C. Cipolletta, personal communication).

Forest elephants were predominantly recorded in monodominant forest (Table 1) that covers only 4% of the study area, in contrast to previous studies by White (1994) and Tutin et al. (1997) that showed this species uses mainly marantaceae forest in Gabon. Moreover, as also observed in our study, this mammal uses the clearings mainly in the dry season in northern Congo and in the Dzanga sector, where exploits this habitat because attracted by minerals in the soil (S. Blake, personal communication; Turkalo & Fay, 2001).

The preference of monodominant forest is not of easy interpretation. The use of different resources in determined periods of the year, such as the Gilbertiodendron dewevrei fruits regularly eaten by elephants, could be a possible explanation (A. Turkalo and A. Todd, personal communication).

Although the red river hog was encountered in all habitat types, it was mainly recorded in the mixed forest (Table 1). Similar habitat use was also recorded in Gabon (White, 1994; Tutin et al., 1997).

Red duikers occurred in all habitat types (Table 1). In Gabon, duikers mainly use forest gallery and tend to avoid marantaceae forests (White, 1994; Tutin et al., 1997), in accordance with our observations.

Besides mixed forest, the buffalo showed a strong association with forest clearings, which was the less available habitat (1%; Table 1). As evidenced by previous studies,

clearings play a crucial role for this species (Blake, 2002; Melletti, 2005; Melletti et al., 2007a), for feeding habitat, social interactions and grouping behaviour (Melletti et al., 2007b, 2008).

In conclusion, the recce method allows obtaining basic information on the occurrence of elusive forest mammals in the different patches of forested habitats, which should be interpreted and implemented with care, since patterns of habitat preference may be as a result of the detectability of the species within the diverse habitat types in space and time.

Acknowledgements

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