

Mongoose species in southern Benin: Preliminary ecological survey and local community perceptions

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Abstract

Information on the ecology and local perception of particular species is required for their conservation and management in tropical forests, where their range has either disappeared or their numbers are shrinking due to anthropogenic factors. We combined indigenous knowledge and wildlife observations to record four species of mongooses in the Lama and Niaouli forests. Three diurnal species, such as the cusimanse (*Crossarchus obscurus*), the ichneumon mongoose (*Herpestes ichneumon*), and the marsh mongoose (*Atilax paludinosus*), were directly observed, and one nocturnal species (the white-tailed mongoose: *Ichneumia albicauda*) was identified by interviews. Factorial correspondence analysis shows that the marsh and the white-tailed mongooses are more frequent in the lowland habitat, whereas the ichneumon mongoose is often sighted near villages and the cusimanse is more generalist. Mongooses are used for food, medicine, and mythic purposes. They are recognized as snake predators and thus their presence is appreciated by local communities to reduce snake bites (84.3% of interviews in Niaouli). Some species, such as cusimanse, are seen as natural pesticides. Our results suggest that the larger area of the Lama classified forest (4777 ha) allows for more intra-site movements as opposed to the inter-site movements observed in the Niaouli forest due to its small size (120 ha). We suggest further investigations of the ecology and ethology of the conservation of mongoose in Benin.

Keywords: Benin; ecology; local perception; mongoose.

Introduction

Local knowledge of an ecosystem may exceed scientific knowledge. It is being increasingly recognized as valuable for improving scientific understanding, conservation programs, and management practices (Williams and Baines 1993, Berkes et al. 2000, Moller et al. 2004). However, factors, such as demographic expansion and widespread poverty, characterized by unemployment, few

local economic opportunities, and dependency on limited natural resources are the main reasons for the over-exploitation, habitat degradation, and over-hunting of wildlife in emerging countries from the tropical zone (Shackleton et al. 2002). In southern Benin, large mammal species are rare due to the scarcity of rainforest habitats, which are patchily distributed into small forested islands (Kidjo 2000, Voglozin 2003, Akpona 2004, Djagoun 2005). Consequently, vigorous surveillance measures developed in protected areas have increasingly discouraged poaching of those large animals in the country (Codjia and Assogbadjo 2004). On the other hand, the numerous species of small mammals that inhabit rainforest, including rodents, insectivores, small carnivores, chiropterans, and some primate species have been surveyed less (Voglozin 2003); thus, their hunting has remained presumably intense, notably given that their small size allows them to hide easily from park guards (Lamarque 2004). Small carnivores from Benin are extremely poorly documented, although a few preliminary ecological surveys and ethnozoological studies have been carried out on otters and mongooses (Kidjo 2000, Voglozin 2003, Akpona 2004, Djagoun 2005, Dossa 2005). Contrary to otters (*Hydrictis maculicollis*, *Aonyx capensis*), which have become increasingly rare in southern Benin due to direct destruction and river disturbances (Akpona 2004), some mongoose species (*Herpestes ichneumon*, *Atilax paludinosus*, *Ichneumia albicauda*, *Crossarchus obscurus*) seem to persist in their habitats despite heavy anthropogenic pressures, such as the destruction of their habitat and a diversified, traditional use by local populations (Djagoun 2005). This aspect is not important in a worldwide view, but may be crucial for local village communities in tropical countries, especially in wide areas of the African moist tropics, where local people are living in poor conditions. It thus appears crucial to characterize habitat use in mongooses and to investigate local community perceptions in order to propose the development of future sustainable conservation strategies for animals which play a significant ecological role in the forests of southern Benin where large carnivores are completely absent.

Methods

Study site

Field surveys were conducted in two rain forests, the Lama classified forest and the Niaouli community forest and their surrounding villages during 6 months, covering dry and rainy seasons. Lama and Niaouli forests are located in the Sudano-Guinean climatic zone which characterizes southern Benin (White 1983, Figure 1). The specificity of the southern Benin area is its situation in

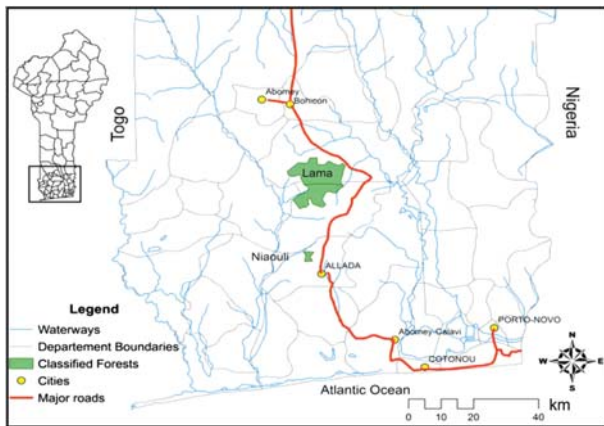


Figure 1 Map showing the two study sites (Lama classified forest and Niaouli community forest).

the Dahomey Gap zone (Nagel et al. 2004). Both forests benefit from a subequatorial climate with two unequal rainy seasons alternating with two dry seasons. The annual rainfall is 1100 mm with a maximum evaporation of 500 mm, and the annual average temperature is 29.9°C (ranging between 22.3°C and 31.5°C). The Lama classified forest (4777 ha) is larger than the Niaouli community forest (120 ha), and is subdivided into three main zones: the natural forest, which is strictly protected (“Noyau central”), the forest plantations, and the bordering zone, where local communities are allowed to use natural resources. Several emblematic species of mammals are encountered in this forest, including the mona monkey (*Cercopithecus mona*), the red-bellied monkey (*Cercopithecus erythrogaster erythrogaster*), which is endemic to Benin, the vervet monkey (*Cercopithecus aethiops*), and threatened ungulates, such as the sitatunga (*Tragelaphus spekei*), the royal antelope (*Neotragus pygmaeus*), the black duiker (*Cephalophus niger*), and the yellow-backed duiker (*Cephalophus silvicultor*) (Kassa 2001, Sinsin et al. 2002). The Niaouli community forest is subdivided into two phytocenoses: the hollow forest, which is located in the septentrional depression of the northern limit of the site and is crossed by the Ava River (a tributary of the Couffo River), and the plateau forest, rising approximately 35 m above the hollow forest (Hountondji 1998). This forest is recognized to be a refuge zone for an impressive diversity of birds (Agboton 1999). Conversely, the meso-mammalian fauna is totally absent. The dominant ethnic groups living around the Lama classified forest and the Niaouli community forest are, respectively, the Holli and the Aizo.

Study design and data collection

To gather exhaustive datasets, we adopted an interdisciplinary methodology which combined direct observations of the animals and prospection of presence of indices, to ethnozoological surveys towards local communities. Direct observations and prospection of presence of indices were carried out irregularly over a period of 6 months from August 2005 to January 2006. It was carried out by fixing points across the road in habitat preference zones previously determined through inter-

views of local community people (see below) and the prospection of presence of indices. Observations were made from 07:00 h to 19:00 h, where we recorded species identification, period of observation and number of individuals. Two villages were chosen on the basis of dominant socio-cultural groups and their proximity and accessibility to natural resources (Codjia and Assogbadjo 2004), namely Agadjaligbo (Lama) and Sangon (Niaouli). A total of 50 people, including hunters (30%), farmers (60%), and park guards (10%), were surveyed in each village. The informants were between 20 and 65 years old. Local perception of the diversity of mongoose species was determined through focus group discussions (5–6 surveys/group), using a poster featuring high quality images of the species presumed to be present in southern Benin to ensure that the interviewees recognized the species and to limit risk of confusion. According to Kingdon (1997), those species are: *Crossarchus obscurus*, *Atilax paludinosus*, *Herpestes ichneumon*, *Herpestes naso*, *Ichneumia albicauda*, *Mungos gambianus*, *Galerella sanguinea*. When required we informed locals about the morphology, behavior, and diet of each species in order to make the identification easier.

Following Prance (1991), we considered that a species was well known by a given local population when the frequency of its nomination was great among the interviewed groups, thus a ‘consensus’ was reached. When a mongoose was identified as being present in the study zone by the majority of informants, we considered that this species was more important to local communities, in terms of resources or use. The combination of semi-structured methods and household interviews (Shackleton et al. 2002) allowed us to collect local perceptions on preferred habitats of each species of mongooses, specific trapping techniques, as well as information on their role as dietary, medicinal, cultural items, and the vernacular name of the mongoose. Triangulation was used to verify information among interviewees. We used SASv8.2 (SAS Institute Inc., Cary, NC, USA) to characterize habitat preferences among mongoose species, according to local perception through correspondence factorial analysis (CFA). For this purpose, we recorded the number of remarks made by the people who had once observed mongooses and characterized their habitats (fallow, forest, plantation, neighborhood of the village and farm), as previously defined in our survey guide.

Results

Diversity of mongoose species in southern Benin

Three species of mongooses were directly observed in the two study sites. In the Lama classified forest, *Crossarchus obscurus* was the most frequently observed (42 of the 53 total contacts), followed by *Herpestes ichneumon* (10 contacts) and *Atilax paludinosus* (1 contact). In the Niaouli community forest, only two species were observed, namely *C. obscurus* (39 contacts) and *A. paludinosus* (3 contacts). One species, *Ichneumia albicauda*, was not directly observed but was listed by local communities (4% and 2% in Lama and Niaouli, respectively). Concerning the local perception of mongoose species

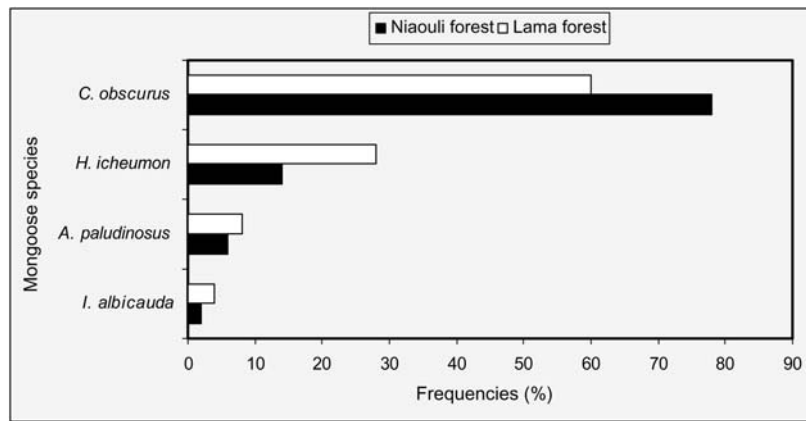


Figure 2 Diversity of mongoose species according to local perception.

diversity population, the cusimanse (*C. obscurus*) was the most observed in the two sites (78% and 60% in Niaouli and Lama, respectively). A total of 14% of interviewees listed the presence of *H. ichneumon* in the Niaouli forest vs. 28% in the Lama forest reserve. *A. paludinosus* was listed by 6% of interviewees in the Niaouli forest and 8% in the Lama forest reserve (Figure 2). The cusimanse and the marsh mongoose are locally called “Kékê¹” and both the white-tailed mongoose species and ichneumon mongoose are known as “Ewoudjo¹” by the Holli ethnic group. In the Aizo ethnic group, ichneumon mongoose is known as “wô djê²”, the cusimanse and the white-tailed mongoose species are called “wô koukou³” and the marsh mongoose is known as “wô adjagbé⁴”.

Habitat preferences of mongooses

According to local perception, each mongoose species had specific, favorite habitats, readily identifiable from CFA (Figure 3). The first axis of variation (horizontal axis), with an eigenvalue of 0.242 showed that the marsh mongoose and white-tailed mongoose are more frequent in the lowland habitat. The second axis of variation (vertical axis), with an eigenvalue of 0.469 separated forest, plantations, fallow, and farm from villages, the later being identified as the favorite habitat for the ichneumon mongoose. On the other hand, the presence of the cusimanse mongoose was correlated to a wide spectrum of habitats, such as fallow, forest, plantations, and farms. Our results based on field surveys confirm local perception on the habitat preference of mongooses. We compare the number of contacts made during the rainy and dry seasons in the Niaouli forest and the Lama forest to the results obtained from interviews. Local populations observed more mongoose species in the surrounding agro-ecosystems. Our results show that *Crossarchus obscurus* is observed more during the dry season, according to local perception (84.4%) and direct obser-

vations (71.3% of contact) in the Lama forest reserve (Figure 4A). Direct observations in the Niaouli forest showed that the same species was observed more during the rainy season (79.2%) than during the dry season (20.8%), which contradicted information given by interviewees. A total of 64.4% of interviewees (Figure 4B) stated that the dry season was the most favorable period for the observation of mongooses (*C. obscurus*) in the surrounding forest agro-ecosystems. The differences observed between direct observations and local perception may be indicative of seasonal migration of mongooses from the forest habitats to the surrounding forest agro-ecosystems during dry seasons in the Niaouli forest, but this hypothesis remains to be verified.

Local community perceptions

Mongoose species were directly used as meat (60% of interviewees) and as medicine (32%) in southern Benin. Only 8% of the interviewees recognized the mythical function of mongooses, and more particularly the marsh mongoose (*Atilax paludinosus*), whose head is used to consult the oracle. The quasi totality of interviewees who knew mongooses (78%) admitted that they were useful killers of dangerous snakes present in farms, such as vipers and cobras. They also recognized that the cusimanse consumed termites and locusts which caused damage to surrounding flora and agriculture. It was also observed that 11% of interviewees did not appreciate the mongoose meat because of its unpleasant musky odor coming from their scent glands. The cusimanse (*Crossarchus obscurus*) and the ichneumon mongoose (*Herpestes ichneumon*) were the most often captured according to local perception (48% and 39% of the interviewees, respectively). Captures of the marsh (*Atilax paludinosus*) and white-tailed (*Ichneumia albicauda*) mongoose were relatively much lower (9% and 4%, respectively). Although hunting with dogs and guns was the most common technique to trap mongooses, each species was attributed specific techniques which were successfully used to capture them. We inventoried two trapping techniques: jaw trap and keep net. The marsh mongoose was often captured with keep net, whereas the cusimanse and the ichneumon mongoose were

¹ This is a general name for multiple species, the precise name is unavailable.
² This name refers to the reddish color of the fur.
³ This name indicates a noisy behavior associated with this species.
⁴ This name indicates that this species destroys fishing traps.

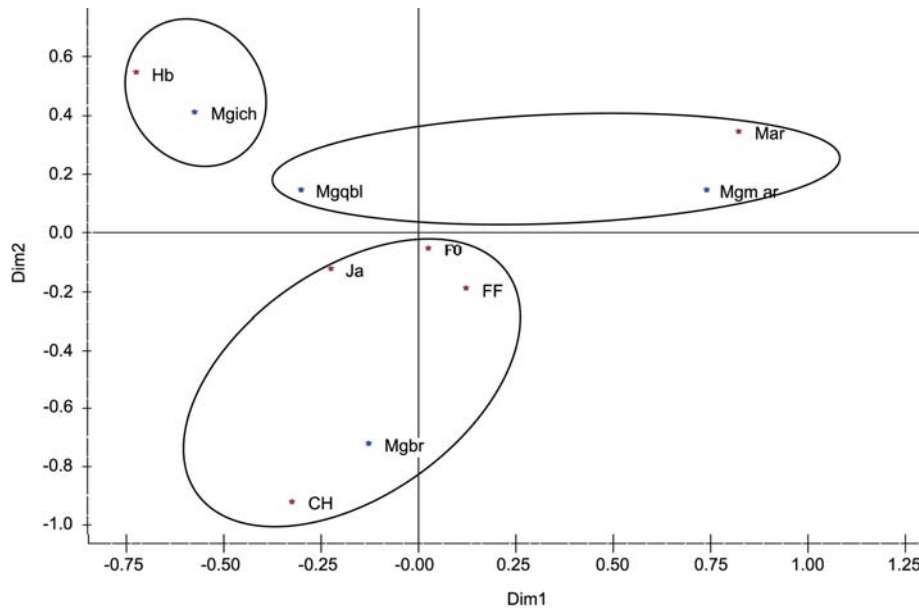


Figure 3 Factorial correspondence analyses of habitats characterized by local communities among mongoose species. CH: farm; FF: forest; FO: plantation; Hb: village; Ja: fallow; Mar: lowland habitat; Mgbr: cusimanse; Mgich: ichneumon mongoose; Mgm ar: marsh mongoose; Mgqbl: white-tailed mongoose.

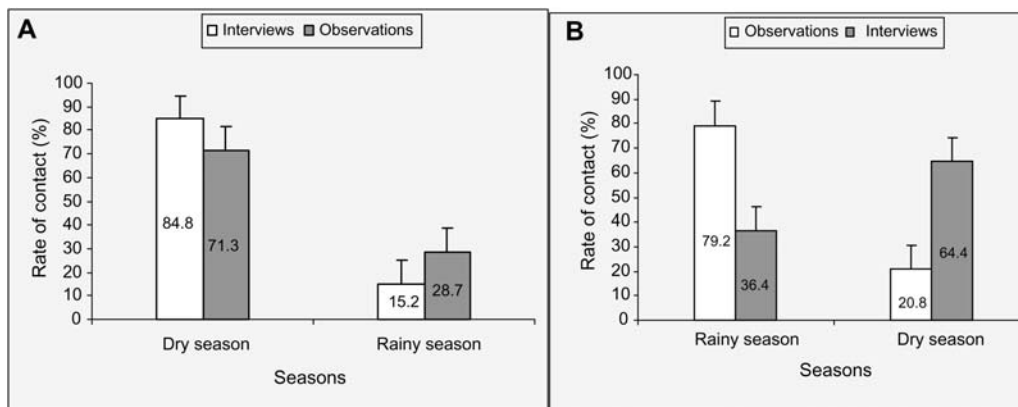


Figure 4 Comparison of the frequency of mongoose species observation for each season (dry and rainy) according to direct observations and interviews (A: Niaouli; B: Lama).

mostly hunted using traditional guns and dogs, and the white-tailed mongoose was mostly killed using jaw traps.

Discussion

Preliminary ecological survey of mongooses in southern Benin

A total of four species of mongooses (*Crossarchus obscurus*, *Herpestes ichneumon*, *Atilax paludinosus*, and *Ichneumia albicauda*) are present in Lama classified forest and Niaouli community forest. This confirms the distribution map of mongoose species established by Kingdon (1997). The species of slender mongoose (*Galerella sanguinea*) which is also presumed to occur in Benin (Kingdon 1997) was not observed. Voglozin (2003) identified, through interviews, the presence of slender mongoose in the Lama forest reserve, but the species have not been observed in the last 10 years. Also, the slender

mongoose lives throughout savannahs and semiarid plains of sub-Saharan Africa and generally tends to avoid densely forested areas, such as those found in the Lama forest and the Niaouli forest.

This study was implemented during the day and this could be the reason for the absence of the white-tailed mongoose in our observations, considering its nocturnal behavior (Kingdon 1997). We suggest more investigations are necessary to deal with the main reasons for the absence or rarity of this species in southern Benin. Our survey of the favorable habitats of mongooses in southern Benin showed that they used a variety of habitats, including closed and open vegetative formations and the *Chromolaena odorata* fallows. The ichneumon mongoose was most often sighted around households in search of poultry. This tendency was also observed by Voglozin (2003) in the Lama forest reserve, and causes conflicts with individuals. As a consequence, the species is not well-appreciated by local populations. The cusimanse exploited all habitats available in the Lama and Niaouli

forests, including agricultural fields, fallows, and forests, as well as plantations; a similar ubiquity was observed across the whole western African range (Kingdon 1997). The *Atilax paludinosus* and *Ichneumia albicauda* species are often observed by local populations in lowland habitat. According to Halternorth et al. (1985), these mammals prefer to live in forested areas near water. In addition, the marsh mongoose species is semi-aquatic and have feet with naked palms adapted to fishing rather than digging (Kingdon 1997). The study of Djagoun (2005) revealed the strong dependency of cusimanse (*Crossarchus obscurus*) on available food resources in their habitats. The rarity of food resources during the dry season may imply migration of the cusimanse to the surrounding forest agro-ecosystems of the Niaouli forest, searching for palm fruits, for instance. According to Kingdon (1997), cusimanse usually consumes insects and other invertebrates, but is also known to enter shallow waters to eat crabs and frogs. However, Voglozin (2003) demonstrated that palm nuts can be used with success to capture cusimanse in the Lama classified forest. This method has also been used by Djagoun (2005) to study the abundance and distribution of this species in the Niaouli community forest. Moreover, the stomach content of a cusimanse captured in the palm plantation in the Niaouli forest contained, in bulk, the palm nut fruit and ant species (Figure 5).

The ease of capture offered by invertebrates and their dense distribution in the Niaouli forest allows the cusimanse to easily eat invertebrates (e.g., locusts, earthworms, ants, maybug larvae, millipedes) relative to vertebrates. But this resource becomes particularly rare in the dry season due to the aridity of the soil which does not allow the developmental cycle of several invertebrates. Thus, mongoose species may migrate to the surrounding, anthropized agro-ecosystems (palm groves), compensating for food deficit. Indeed, small mammals may adapt to changing conditions or changes in resources by widening their ecological and trophic niches (Dajoz 1979, Williams and Marsh 1998). In the Lama forest, the cusimanse species were less visible during the rainy season. It was suggested that the permanent availability of food resources during this period caused mongoose species not to forage in alternative habitats



Figure 5 Stomach content of a cusimanse captured in the palm plantation around the Niaouli forest, showing palm nut (*Elaeis guineense*) and heads of ants (*Formica fusca*).

(Coubéou 1995, Voglozin 2003, Dossa 2005). It is important to specify that the surface of the Lama classified forest (4777 ha) is extensively superior to the Niaouli forest, thereby encouraging intra-site rather than inter-site (outside forest zone) displacements. The surface of the Niaouli forest (150 ha) is probably too small to provide enough resources to the mongoose species, which can be very prolific (up to 3 litters/year for the cusimanse mongoose; Rood 1990), and by extension, to a wide spectrum of other mammals.

Local community perceptions and interactions with mongooses

Although poorly representative of the southern Benin wildlife (Coubéou 1995), mongooses, such as cusimanse, are easy to capture and are sometimes considered food delicacies because of their rarity (60% of interviewees). Moreover, the marsh mongoose has been widely researched by local communities because of its role in mythological practices. However, hunting pressure may be limited by the fact that mongooses, in general, are sold at relatively low prices (100 to 200 FCFA which corresponds to 0.15 to 0.30 cent). Another favorable factor which could limit the hunting pressure is the favorable perception by local populations of the role of mongooses as regulators of dangerous animals (snakes) and pests (insects). Mongoose populations inhabiting the relic forest areas of southern Benin may also be disturbed by human activities, such as the collection of wood and seeking of water. For instance, in the north-western part of the Niaouli forest, a problem which persisted was the exploitation of the site by individuals to collect water. We recorded 89 individuals who exploited the water pounds each day early in the morning (between 07:00 and 09:00 h), and in the evening (between 17:00 and 18:30 h). These activities may represent a serious disturbance of the daily activities of the mongoose, because the periods of water collection correspond to the most active periods for the mongooses, as identified by our diurnal direct observations. Such disturbances may also explain the lower percentage of contacts made in the hollow forest of Niaouli (20.8% vs. 79.2% in the plateau), as well as the rarity of some humid habitat-related species, such as the marsh and white-tailed mongooses.

Conclusion

Mongoose species and their 'ecology' are relatively well known by local communities. Their local status is an antagonistic balance between a commonly hunted animal and poultry thief, and a pest regulator. To what extent hunting, habitat fragmentation, and disturbances are significantly affecting populations of mongooses in southern Benin is not known. However, our preliminary results suggest that further investigations on the ecology and ethology of the mongooses are needed to identify factors which determine their ecological niches and affect their survival. Taking into account the relationship between mongooses and local populations, any conservation measures of the species should integrate local communities and locals' perceptions.

Acknowledgements

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