



RESEARCH ARTICLE

SPATIAL DISTRIBUTION OF PRIMATE SPECIES IN THE PROTECTED AREA TOGODO IN TOGO
AND THREATS TO THEIR SUSTAINABLE CONSERVATION

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ABSTRACT

Due to the increasing pressure exerted on Protected Areas in Togo by neighboring populations, the fauna and its habitat are constantly threatened. To sustainably manage the natural potential of the complex, a thorough knowledge of the state of conservation of resources such as non-human primates appears necessary. Indeed, the numbers and distribution of non-human primates are true indicators of wildlife conservation in that their poaching is evidence of the scarcity of game because they are rarely targeted by hunters and poachers. The purpose of this study is to present the situation on the diversity of non-human primates that the complex contains, as well as the forms and scale of the threats to which they are subjected. Six areas have been identified in which two approaches have been developed: (i) interviews of local residents, hunters, farmers and water and forest officials with a view to obtaining information on the status of primates and their coexistence with local residents (ii) inventory with geolocalization of the studied populations. The data collected were processed by Ms Excel 2013, software R version 3.1.3, and free software Qgis 2.14 for mapping. A total of 391 individuals belonging to six (6) species were counted over a distance of 250.14 km for 212.5 hours in both parts of the complex, the three main ones being *Chlorocebus aethiops tantalus* (vervet), *Erythrocebus patas* (the patas), *Cercopithecus mona* (the mone). The outcomes of this study show that poaching is the primary cause of declines in populations of non-human primates. Its magnitude reflects a strong human pressure on the non-human primates studied, a sign of difficulties experienced by hunters and poachers in finding other types of game. This is followed by the destruction and disruption of habitats through agriculture, transhumance and logging. As a result, non-human primates in the protected area complex will be in real danger of extinction if appropriate conservation action is not taken in time.

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INTRODUCTION

Thanks to Governor General Albert LEBRUN, who had taken necessary measures during the colonial period to protect forest areas subject to severe degradation, 83 national natural sites (now known as protected areas) 14% of the national area was created in Togo between 1939 and 1957 (MERF, 2001). These protected areas, legally exempted from anthropogenic pressures since the time of Albert LEBRUN, have since been real habitats for many species constituting, a cornerstone for the conservation of animal and plant biodiversity.

However, socio-political unrest in Togo between 1991 and 1993 during the democratic transition led to the invasion of most of these protected areas and accelerated the decline in forest area (MERF, 2000). As a corollary, we observe, among other things, the occupation of certain protected areas on 10 to 90% of their area (SPANB, 2014), notably the anarchic cutting of woody species, poaching and so on. The Togodo Protected Areas Complex (CAPT), which is of great ecological interest because of the richness of its biodiversity (Courcelaud, 2000), has also not been spared by this scourge. The Togodo South National Park (PNTS) and the Togodo North Wildlife Reserve (Togodo Nord) are very representative of the relict ecosystems of the Dahomey Corridor ecoregion. In addition to the last herds of forest buffaloes in Togo, the wildlife has been

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decimated to the socio-political turmoil of the 1990s (Adjonou, 2010), many primates including the red-bellied monkey (*Cercopithecus erythrogaster erythrogaster* Gray) endemic species of Dahomey Gap (Houngbedji et al., 2012, Agbessi et al., 2017) long considered to have disappeared from its natural habitat until 1987 when a live specimen was sent from Lomé to Mulhouse Zoo in France. Like this subspecies, few recent studies on the diversity and distribution of non-human primates in Togo in general and on the Protected Areas Complex in particular were undertaken. Only two summary inventories carried out by Houngbédji (2010), specially important for the red-bellied monkey (southern part of the Protected Areas Complex) and by Campbell (2005) on Togo primates were recorded. Faced with this lack of precise data on non-human primates, this study provides an inventory of all their sites of occurrence of the complex in order to determine their diversity and their spatial distribution as well as the different forms of threats weighing on their survival.

of the Dahomey corridor (Kokou, 1998, Courcelaud, 2000, cited by Adjonou et al., 2010). Guinean-type forests make the transition from semi-deciduous forest to dry forest. We can also distinguish fallow-crop mosaics in places around its peripheries. The soils are characterized by the formation of clayey sand, ferruginous sands and very degraded bar land (Edorh, 2005).

Study Method

The methodological approaches used to identify the sites of occurrence of the non-human primates were village surveys and pedestrian surveys in the complex (recce method).

The surveys

They were carried out in six riverside villages with 39 hunters in the form of personalized interviews thanks to interview guides and questionnaires.

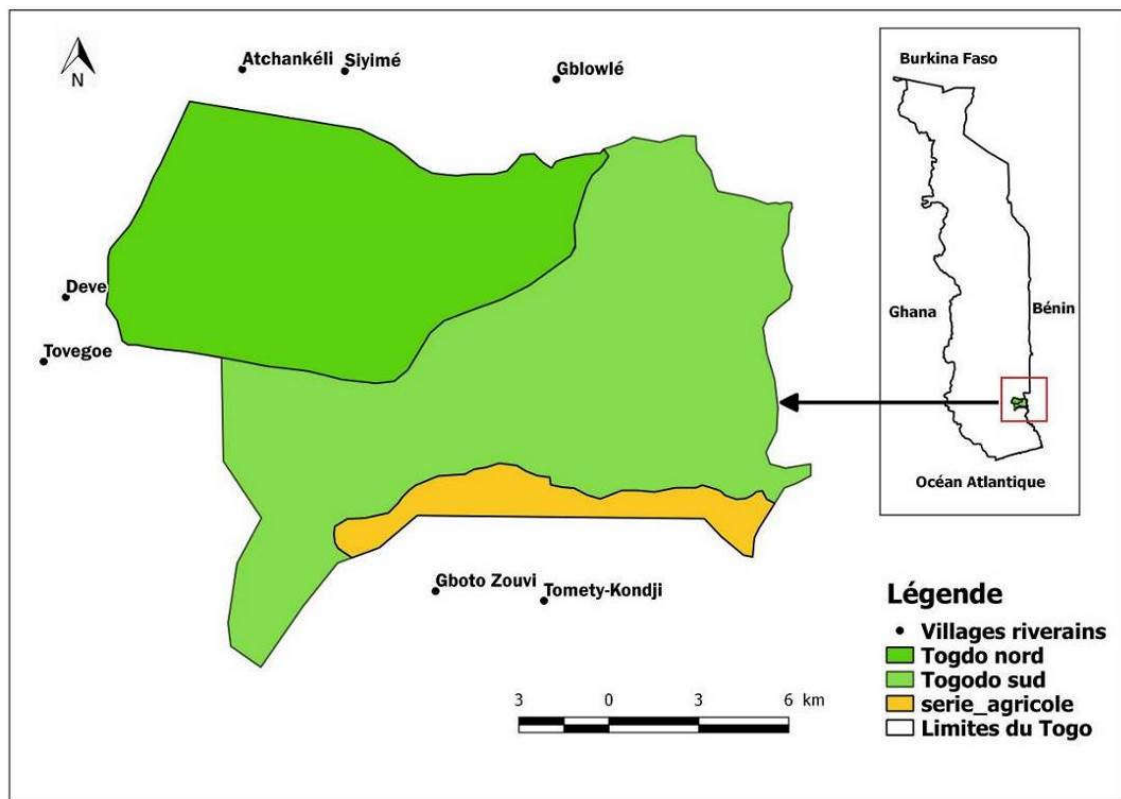


Figure 1. Location of study area

MATERIAL AND METHODS

Study Area

This study was conducted in Togo on the 25,500 ha protected area complex consisting of two contiguous areas located in the Togolese part of the Dahomey Gap: the Togodo South National Park (15,000 ha) and the Togodo Wildlife Reserve North (10500 ha) (Figure 1). The climate is of the subequatorial type, with two dry seasons alternated by two rainy seasons. There is a large rainy season from March to July and a small rainy season from September to October, while the small dry season covers the end of July to September and the large dry season from November to February. Precipitation is variable from 800 to 1200 mm per year and from 60 to 90 days of annual rainfall (Edorh, 2005). The average annual temperature is around 27 ° C. The complex consists of a mosaic of forests and savannahs characteristic of the passage

Jonathan Kingdon's Guide to African Mammals (2006), John F. Oates's West Africa primates (2011), and illustrations of various primate images encountered in Togo were used to facilitate the identification of non-human primates of the Complex. The data collected included presence / absence, probable habitats of non-human primates (geographic distribution) and their different forms of threats.

Pedestrian surveys: Pedestrian surveys not only enumerated non-human primates in the studied sites of the complex that were indicated by the guides in the six zones, but also to identified both their habitat and possible traces of anthropogenic activities. The method of recce, also called the recognition step, was used for this purpose. It was therefore a direct census based on the count of the studied species which were directly observed with the naked eye or with the binoculars. Three teams of three people (one guide, one hunter and one forester) traveled through the protected area complex

for 7 days per area, using the poacher tracks or the monitoring tracks. Each team has a technical sheet containing the following informations: time of observation of the monkeys, group size, habitat type, GPS coordinates of the contacts (the position of the observer), the estimation of the distance between the observer and the individual, the activity at the time of observation. The inventory starts every day at 5:30 am and ends at 2 pm or 3 pm or 5 pm. To avoid double counting, teams started the inventory at the same time. Also, the fact that the groups of monkeys move little, makes it possible to count them only once.

Data Processing

Biophysical data : In order to identify the different species of monkeys and their sites of occurrence in the complex of protected areas, a binary presence / absence system was used. The different species of non-human primates are considered as present:

- if the respondents testify of their existence in the environment and are able to identify them clearly among other non-human primates on the illustration board and to bring us to their site of occurrence or;
- if during the pedestrian surveys in the complex at least one visual contact is recorded.

The different monkeys are then considered absent if they are neither reported nor identified by the interviewees nor encountered during forest prospections. Inventory of occurrence sites was thus carried out using this information. Extent of Occurrence was estimated using the IUCN Extent of Occurrence Guidelines (2001). With the collected data (GPS points of contacts with species, traces of anthropogenic activities) during the inventory, the occurrence sites were represented as well as the spatial distribution of the species recorded and the indices of human presence by the free software Qgis 2.14.

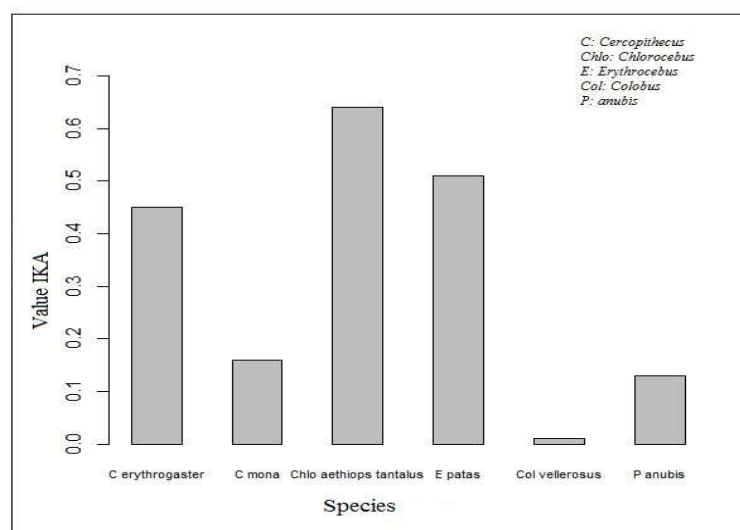


Figure 2. Abundance Kilometric Index (IKA) of the different species for the whole park

Tableau 1. Numbers of primate species enumerated in the complex

Prefectures	Localities	Species	Number of individuals	Observing effort (H)	Distance by locality (km)
HAHO (Togodo Nord)	DEVE	<i>C. e. erythrogaster</i>	69	65	96,34
		<i>C. mona</i>	6		
		<i>Chlo. aethiops tantalus</i>	52		
		<i>Erythrocebus patas</i>	2		
		<i>Colobus vellerosus</i>	1		
	ATCHANKELI	<i>C. e. erythrogaster</i>	11	20	22,7
		<i>C. mona</i>	11		
		<i>Chlo. aethiops tantalus</i>	9		
		<i>Erythrocebus patas</i>	4		
		<i>C. e. erythrogaster</i>	3	21,5	
YOTO (Togodo Sud)	SIYIME	<i>C. mona</i>	2		21,3
		<i>Chlo. aethiops tantalus</i>	1		
	GBOWLE	<i>Pas de contact</i>	0	22	30,2
		<i>C. e. erythrogaster</i>	13	53	
	TOMETY-KONDJI	<i>C. mona</i>	6		49,4
		<i>Chlo. aethiops tantalus</i>	73		
		<i>Erythrocebus patas</i>	45		
GBOTO-ZOUVI	<i>Papio anubis</i>	5		30,2	
	<i>C. e. erythrogaster</i>	3	31		
	<i>C. mona</i>	11			
	<i>Chlo. aethiops tantalus</i>	6			
	<i>Erythrocebus patas</i>	50			
		<i>Papio anubis</i>	5		

C : Cercopithecus, a : aethiops, e : erythrogaster, Chlo : Chlorocebus

Data on the different forms of threats: In order to better understand the perception of the local residents in relation to the threats to the populations of the monkeys, data were collected during the interviews through the questionnaires. The issues discussed relate to the hunting of animals in general and non-human primates in particular. The questionnaires were then analyzed using the descriptive statistics tools of Ms Excel 2013 to measure the different threats on these primates.

RESULTS

Number of non-human primates, their areas of occurrence and spatial distribution in the protected area complex

Observations were made over a distance of 250.14 km for about 9 days (213 hours).

This resulted in the enumeration of three hundred ninety-one (391) individuals belonging to six species, namely, *Chlorocebus aethiops tantalus* (vervet), *Erythrocebus patas* (patas), *Cercopithecus mona* (mone), *Cercopithecus erythrogaster erythrogaster* the red-bellied monkey), *Papio anubis* (baboon), *Colobus vellerosus* (the colobe magistrat). Since no standard method to calculate absolute density was used, only the kilometer abundance index (IKA) (expressed in the number of individuals encountered per km traveled) was calculated for each species. Figure 2 gives the precision on the kilometric index of abundance of each species encountered in the Protected Areas complex:

The results of the identification and counting of non-human primates, as well as the observation efforts and the distances traveled are shown in Table 1 according to the different prefectures and localities.

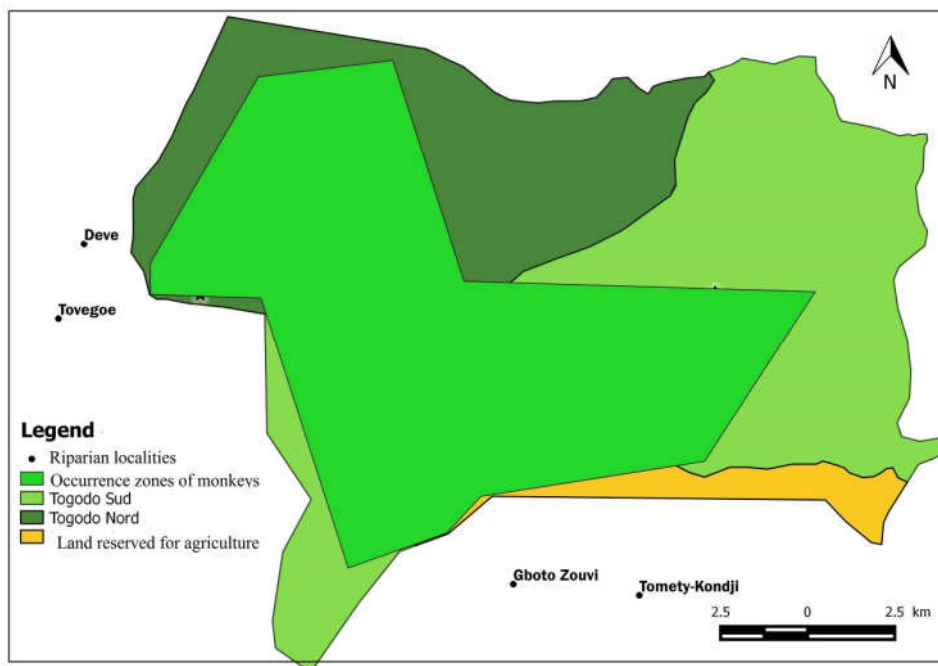


Figure 3. Area of occurrence of monkeys during the census

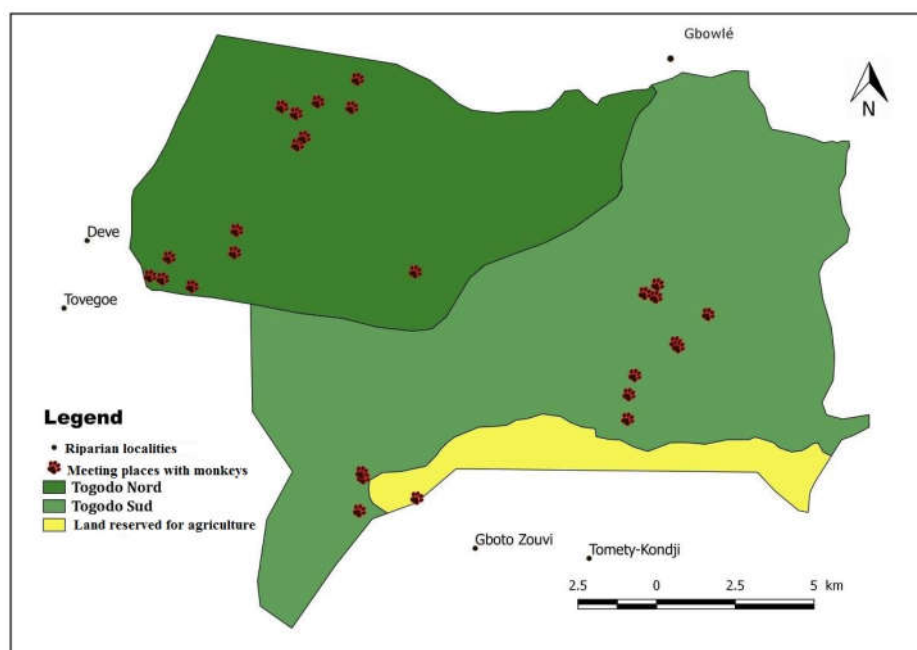
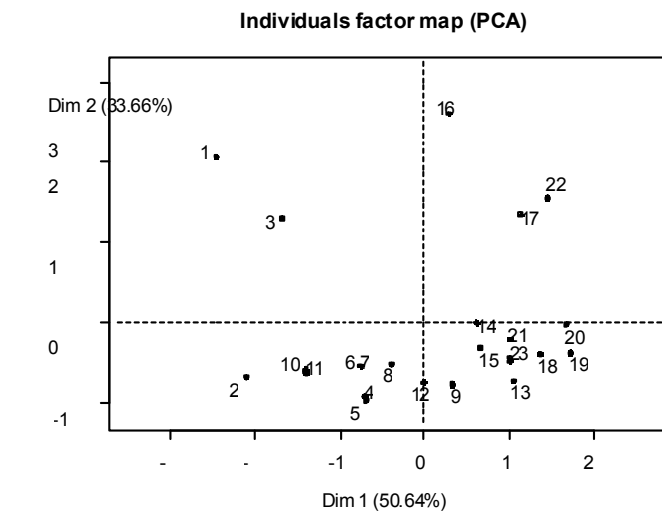


Figure 4. Contacts with non-human primates

The area of occurrence is estimated at 12,027.4 ha or 47.17% of the total area of the complex. It is shown in Figure 3. The spatial distribution of all the monkeys met is shown in Figure 4. Figure 5 shows the PCA result of the distribution of non-human primates counted in the complex.



- Les paramètres nécessaires sont manquants ou erronés*
- | | |
|------------------------------------|-----------------------------------|
| 1 C. e. erythrogaster | 14. Pas de contact |
| 2 C. e. erythrogaster | 15 C. e.erythrogaster. |
| 3 Chlo. aethiops tantalus | 16 C. mona. |
| 4 Erythrocebus patas | 17 Chlorocebus aethiops tantalus. |
| 6. Chlorocebus a. tantalus | 18. Erythrocebus patas |
| 7. Cercopithecus. mona | 19. Papio anubis |
| 8. Chlo aethiops tantalus | 20. C. e. erythrogaster |
| 9. Erythrocebus patas | 21 Chlorocebus a tantalus |
| 10. Cercopithecus e. erythrogaster | 22. E. patas |
| 11. Cercopithecus mona | 23. Papio anubis |
| 12. Chlorocebus aethiops tantalus | |

Figure 5. PCA Result of the Distribution of Non-Human Primates in the Complex

The different forms of threats identified

Poaching, transhumance and habitat degradation or loss of non-human primates pose serious threats to their conservation in the complex. Specifically, there are two types of threats: direct threats or poaching and indirect threats or degradation of monkey habitat. Poaching is practiced with more and more sophisticated rifles or even with dogs in the complex of protected areas, by poachers installed in the riverside villages in particular. It also justifies their proximity to the complex. It is practiced both day and night. More than 50% of interviewees recognize their practice at all times and in all seasons (dry and rainy). Photo 1 and 2 illustrate the resurgence of poaching in the complex.

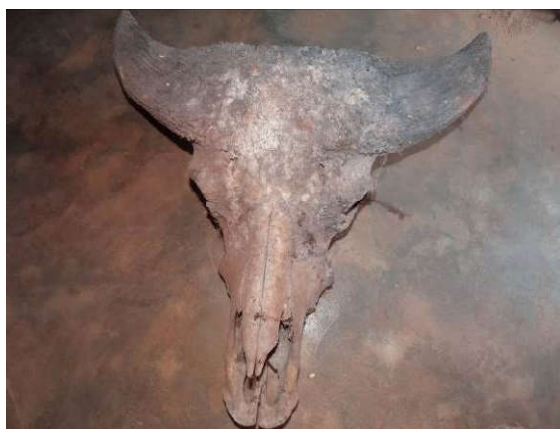


Photo 1. skull of a buffalo in a poacher



Photo 2. bones of a Erythrocebus patas encountered in a poacher

Figure 6 illustrates the different uses of shot or captured monkeys

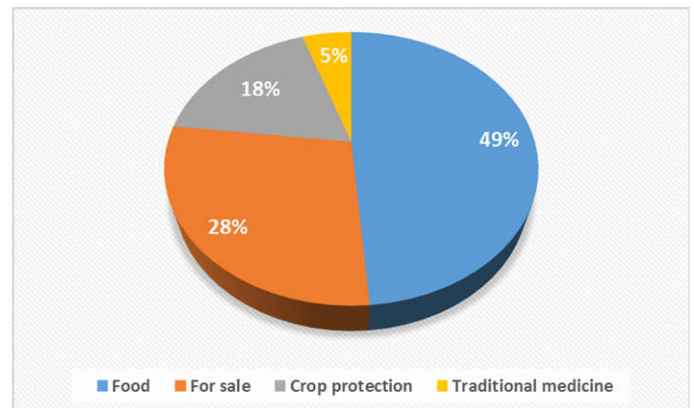


Figure 6. Use of shot or captured monkeys

Indirect threats include transhumance, deforestation, degradation of the woody stratum and / or loss of monkey habitat (photos 3e and 3f) and the construction of a hydroelectric dam in the of the complex.



Photo 2. logging (e) and a scarecrow in a field in the complex to hunt monkeys (f)

Figures 7 and 8 illustrate respectively the different anthropogenic pressures and the extent of activities on monkeys in the Protected Areas Complex.

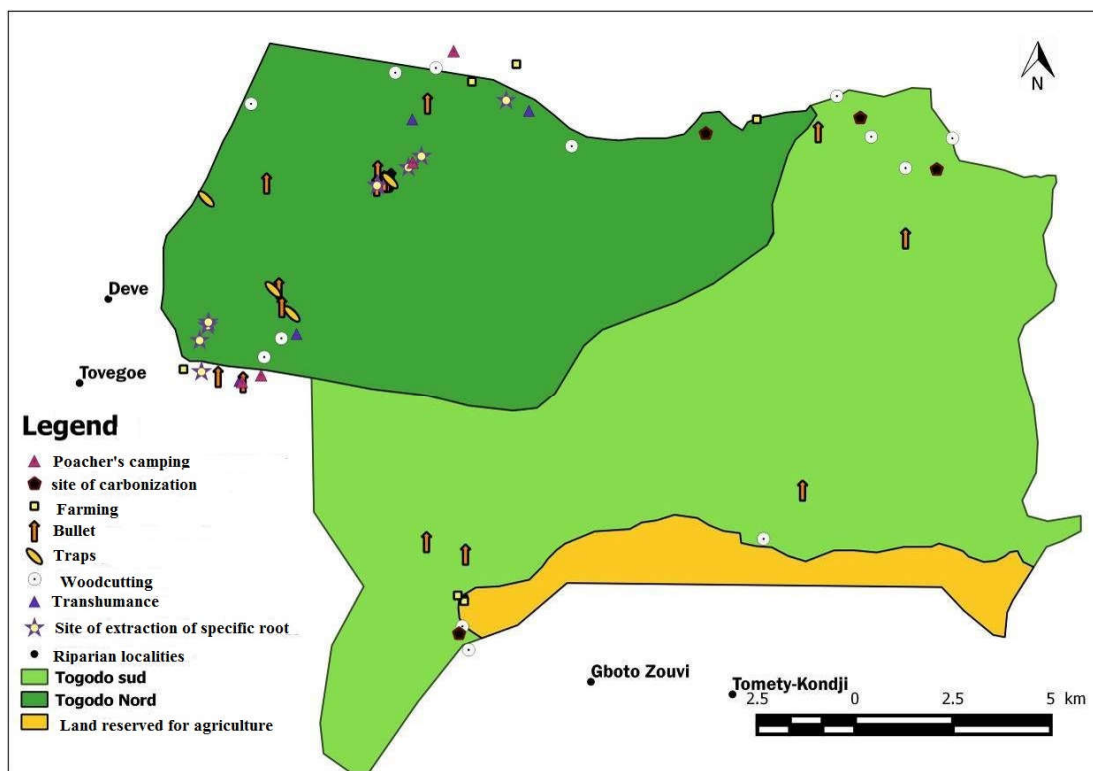


Figure 7. Different anthropogenic pressures

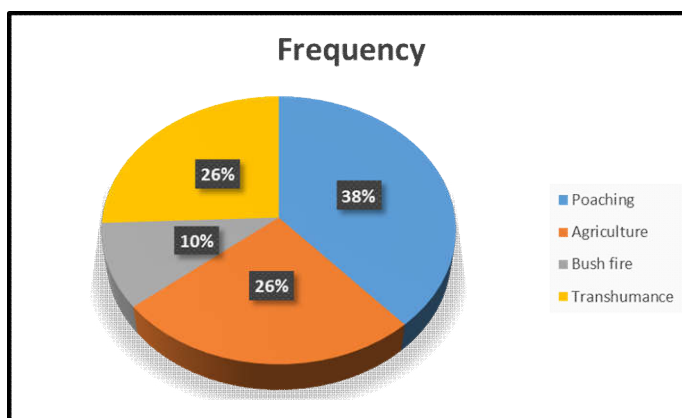


Figure 8. The extent of anthropogenic activities in monkey habitats

DISCUSSION

Number of non-human primates, their areas of occurrence and spatial distribution in the protected area complex

The analysis of the results of surveys carried out in the six protected riparian villages (Tovégoé, Dévé, Siyimé, Tométy-Kondji, Atchankéli and Gbowlé) revealed that the six species of monkeys subject to identification are frequently encountered with the exception of the colobus magistrat (*Colobus vellerosus*) and the baboin (*Papio anubis*). Only one colobus magistrat was observed in Devé whereas only ten individuals of *Papio anubis* were encountered in the area of Tométy-Kondji for two contacts. A total of 39 traditional hunters from riparian villages were interviewed. During pedestrian surveys, individuals of red-bellied monkeys were mainly encountered in semi-deciduous forests characterized by lianas which are the most frequented places. There are also galleries forests (especially in the Siyimé area), savannas, degraded forests and fallow crops.

Prospecting in the six villages allowed direct observations of monkey species except in the Gbowlé area despite the existence of some gallery forests that could harbor non-human primates. This is due to the fact that this area is heavily disturbed by poaching and other anthropogenic activities that have resulted in the escape of non-human primates. It is also in this zone that logging is the most important. The three hundred and ninety-one (391) individuals of non-human primates identified made it possible to identify and materialize their area of occurrence, but also to identify their habitat. Of the three hundred and ninety-one (391) individuals, 99 are red-bellied monkeys (*Cercopithecus erythrogaster erythrogaster*), which are endemic sub-species in the Dahomey Gap shared by Togo and Benin. This confirms the regular presence of this sub-species in Togo, contrary to the work of Sinsin (2002) and Nobimè (2005), which only reported it in the Benin part of the Dahomey Gap. These results complement, on the one hand, the work of Oates (1994) and Campbell (2005) who, despite their prospecting under similar conditions, did not make direct observations of the subspecies in Togo even though Campbell

(2005) declared to have heard a vocalization that would be his cry. The number of 99 individuals recorded in the complex partly confirms the result of 9 individuals inventoried only in the southern part of the complex by Houngbédji (2010) but under slightly different conditions such as the duration of 72 hours only and, also most of the observations were made from the Bein shore. This number, although lower than that of the Lama forest, confirms Houngbédji's assertion (2015) that the source habitat would be the Togodo protected area complex compared to the Tchi depression (southern Benin) in view of its extent (greater than the Chi depression) and the diversity of potential niches therein. On this basis, it could be said that the specimen sent to Mulhouse Zoo in France by the merchant Eric Fouchard in the 80s would be extirpated from southern Togo. Indeed, well before the 1990s, Togo was cited as a model for the protection of wildlife and its habitat. However, the integral management of protected areas has had its limitations, with flooding by riparian populations in revolt during the democratic transition period between 1991 and 1993. This has forced animals to flee to neighboring countries and other habitats in Togo like Godjin Godjé which is a sacred forest located a few kilometers from the complex for example. The work of Oates (1995) took place just after these turbulent periods characterized by the invasion of the protected areas by the riparian populations with drastic consequences on the Togolese fauna. For example, a large part of the red-bellied ape community would have left the complex of protected areas and other forests to seek refuge in some of the forests of neighboring Benin.

In addition to the more or less marked presence of monkeys with abundance of 0.45 individuals per kilometer, the vervets (*Chlorocebus aethiops tantalus*) with 0.64 as IKA and patas (*Erythrocebus patas*) with as IKA 0.51 individual per kilometer. In addition to these three species most represented in the complex, there are three others that are the least represented by their relatively low IKA compared to those of the aforementioned species. These include mona (*Cercopithecus mona*), baboons (*Papio anubis*) and colobus magistrates (*Colobus vellerosus*), respectively 0.16, 0.13 and 0.01 as a kilometric index of abundance. From the result of the PCR obtained using software R and the matrix composed of three variables (contact size, contact area and habitat type) and twenty-three (23) individuals, we deduce that the first axis (abscissa axis: 33.66% of the information) isolates individuals of large numbers (from 45 to 73 individuals) of individuals of small size (from 1 to 11 individuals). The ordinate axis has 50.64% of information. The crossing of the two axes gives a total of four groups. The first group consists of the grouping of two species *Cercopithecus erythrogaster* encountered in Dève whose total size of individuals is equal to 69 and of *Chlorocebus aethiops tantalus* enumerated to Dève also and has a strength of 52 individuals. Their contact takes place respectively in the forests galleries and light forests. The second group, on the other hand, discriminates the individuals of two species mostly encountered in the savannas or in very degraded forests.

These are the *Chlorocebus aethiops tantalus* (73 individuals) encountered in Tométy-Kondji and *Erythrocebus patas* (50 individuals), whose contact was made at Gboto-Zouvi and always *Erythrocebus patas* (45) whose contact took place in Tométy-Kondji. The third group corresponds to the species found in clear forests, gallery forests, and even relics of deciduous dense forests. *Cercopithecus erythrogaster*

erythrogaster Gray (3 counted at Siyimé) is distinguished. This result confirms the field observations in relation to the association between *Cercopithecus mona* and *Cercopithecus erythrogaster erythrogaster*, which derive important benefits from food and protection in the event of danger. The fourth group presents a priori forest species such as the *Cercopithecus mona* (11 individuals at Gboto-Zouvi) and the *Cercopithecus erythrogaster erythrogaster* (13 individuals at Tométy-Kondji) which are found in the savannas and near the fields as is often with *Erythrocebus patas* (4 individuals in Atchankéli) and *Chlorocebus aethiops tantalus* (6 individuals in Gboto-Zouvi). This could be explained by the adaptive capacity of *Cercopithecus erythrogaster erythrogaster* to degraded forests, savannas and fields and fallow lands. However, this adaptation, although it appears to be beneficial, can harm them by making them vulnerable to their predators, poachers.

The different forms of threats to non-human primates

Poaching

Although unauthorized hunting is prohibited in Togo's protected area by Article 79 of the Forest Code, it is practiced in the complex especially during the night. This constitutes a serious threat to the animal species of the complex in general and to the monkeys in particular. The animals are slaughtered without any selective technique due to reduced visibility. Neither the pregnant or suckled females nor the young are spared. Those who hunt at night consider that this is a strategic choice to escape the vigilance of the agents of the water and forests that are not used to patrol the night. Also, during the night hunting effort is quickly rewarded and one can dedicate to the agriculture during the day. For the followers of the day, although the vigilance is redoubled, the prey are quickly spotted and they feel safe without risk of wiping by accident, a lost ball of a comrade. As for those who hunt as well day and night, it is for them to maximize the chances of taking preys, because some animals like most monkeys are active very early in the morning. Most poachers come from the neighboring villages of Benin and do not hesitate to settle in the complex where they create camps. More than 75% of the hunters surveyed remembered killing at least one monkey in the last 5 years (about 29 individuals), even though this happened fortuitously in most cases. For some, it is in the traps placed by other poachers or cultivators that they generally find them.

For traders, traps are placed for the protection of their fields located near the complex when the technique of scarecrow or weeding along the perimeter of the fields proves ineffective to protect their field. Besides the use of rifles and traps, are also used for hunting, predatory dogs that facilitate the slaughter or capture of monkeys in particular. In front of the dogs sufficiently trained as well to the race, digs and the detection of hidden prey, the technique of concealment in the undergrowth of the belly red belly weakens. Also, it is necessary to fear the rage that these dogs can transmit to the monkeys in case of bites. The monkeys, once slaughtered or captured, are used for food, for ethno-zoological use or for marketing purposes. Indeed, poaching and the search for fertile land are, in essence, the main reasons for the extension of the various villages bordering the complex. Thirty-eight (38%) of interviewees agree that poaching is the biggest threat to red-bellied monkeys and that their numbers decrease gradually compared to previous years. Nearly 15% believe that transhumant populations are the cause. About 8% think they move little or

remain hidden in unknown places; which means that they are not met more often than before. Some have asserted that the different parts of the primates intervene in the preparation of traditional products and magical practices. They did not want to provide any further details. The strong anthropic pressure would then explain in part the difficulty and the long distances traveled sometimes before meeting them in more or less calm places. According to Edwards (1992), uncontrolled hunting remains one of the most important threats. This is accentuated by the population explosion, which is accompanied by an increase in demand for bushmeat near farms close to conservation areas (Ndengue-Mekongo, 2011).

Indirect Threats

These include transhumance, deforestation, the illegal presence of transhumants or the loss of non-human primate habitat through degradation and the construction of a hydroelectric dam within the complex's right-of-way.

Transhumance

The presence and passage of cattle herds in the complex in search of pasture has a repelling effect on monkeys fleeing to other shelters such as the Godjé-Godjin sacred forest about ten (10) kilometers from the complex or towards other host habitats in neighboring Benin. In addition to the spatial competition and disturbance of the ecological niches of non-human primates by the presence of transhumants, there is also the trampling and grazing of young shoots that may evolve into fruit trees and shrubs that can be consumed by monkeys. The seasonal passage of herds of cattle also leads to impoverishment of the soil by the trampling of cattle and the risk of spreading diseases.

Deforestation, degradation and habitat loss of non-human primates

Nearly throughout the Togodo protected area complex, both at the periphery and inside, abusive logging of wood and non-wood forest products occurs. Many operators, most of them Beninese, cross the Mono River, which separates the complex from their territory and penetrate it clandestinely. The result is anarchic cuts of wood, especially on the Gblowle side, which they pass through the river to resell in Benin. What has been observed over the last ten years is the mass killing of kapokier (*Bombax costatum*), which they transform into canoes before moving them home by the Mono River, which serves as a natural boundary between the two countries. In some villages such as Gboto-Zouvi, the fields are contiguous to the complex. The buffer zone is not respected. Many pesticides and fertilizers are used by farmers in these fields whose derivatives are found in the streams that run through the complex. All this escapes the vigilance of forest water agents and poses serious dangers for monkeys, herbivores and birds that regularly frequent waterways and gallery forests. Indeed, although it is a protected area (category II), the complex is not managed effectively.

The manager or curator is usually a senior technician of Waters and Forests trained in three years after the baccalaureate in an agricultural institute of the country. It does not have any other training in protected area management. It is assisted only by 4 agents of the forestry administration for the surveillance of the southern part of the complex of 15 000 ha. The same applies to

the northern part of 10,500 ha. Their only means are their old "Mas 36" weapons and their physical strength for patrols. They have neither a budget nor a plan for managing and planning activities. The patrols are organized on information with the means of board and do not cover all the complex. The very small staff is the reason. There are no trails for patrol, the ones used are for poachers who master them better than the patrol officers. It has been reported that officers of the forestry administration are sometimes the victims of influence peddling by members of the Togo army who hunt without a license. This means that the resources invested to protect the complex are far below expectations. This encourages the poachers who go so far as to bribe the agents according to certain indiscretions. Thus, it appears that officers perceive their use in protected areas as a disciplinary sanction against them.

Many carbonization foci as well as extensive agriculture in response to the needs of an ever-increasing population are in essence the main causes of deforestation and factors that contribute to the degradation and disruption of biodiversity habitat including monkeys. In the face of the lack of resources due to these anthropogenic activities, some non-human forest primates are obliged to feed on fields located in the peripheral areas of the complex, which are discovered by poachers or trapped in traps growers. This is the case of the endemic subspecies of Togo, the more vulnerable red-bellied monkey. All these not only accentuates fragmentation and isolation but also the vulnerability of the populations of the subspecies.

Installation of the hives in the buffer zones of the complex

In some buffer zones such as Gboto-Zouvi, hives are installed, threatening the integrity of the complex and favoring the passage and entry of poachers into the complex. This promiscuity also encourages other anthropogenic activities in the complex. Buffer zones, which are spaces separating protected areas from areas that are exploited by riparian villages, are not only encroached in places by agriculture but also exploited for beekeeping initiated by the development NGO called Friends of the Earth (ADT). The hives are thus arranged peeled together along the buffer zones generating permanent presence of the residents and incursions into the complex. These buffer zones are not sufficiently marked and materialized. The aim of the buffer zones is to create an unattractive zone between the conservation area and the surrounding crops. This involves clearing the secondary forest at the boundary and establishing an area of a certain width between the boundary of the conservation zone and the crops (Triplet, 2009). Once again, this is an official gate open to poachers and loggers.

Construction of the Adjarala hydroelectric dam

The construction of the Adjarala hydroelectric dam is a joint project between Togo and Benin to curb the electricity gap that the two countries face. However, it encroaches on a large part of the complex and a detailed analysis of the lake's right-of-way has revealed significant land losses, including 9,100 ha of farmland, 3,335 ha of savanna and 560 ha of forest islands (Adjonou, 2010). Beyond the decline in forest area and the loss of biodiversity, there is a risk of fragmentation, disruption or disappearance of monkey habitat and the invasion of populations bordering on the rest of the complex as well as the resurgence of poaching which will be favored by the opening of the tracks facilitating access to the complex. In addition, the structure may constitute a physical obstacle to their movement.

They may find themselves trapped, facilitating their capture or slaughter by poachers. Number of prospected areas where non-human primates were observed are also affected. This presages the disappearance of non-human primate species including the endemic subspecies, the red-bellied monkey that is only found on this site if no precaution is taken.

Conclusion

This study provided a better understanding of the spatial distribution and conservation status of monkey populations in the Togodo protected area complex. It is recognized that non-human primates, like other animal species, are threatened by poaching and destruction at a frightening rate of their habitat due to rapid population growth. It is urgent that a certain number of protective and safeguarding actions be carried out by all the actors of conservation in order to save them from their extinction.

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