

Conservation Status of the Red-bellied Guenon (*Cercopithecus erythrogaster erythrogaster*) in the Western Dahomey Gap in Southwestern Benin and the Adjacent Togodo Forest Reserve, South Togo

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Abstract: The distribution area of the red-bellied guenon (*Cercopithecus erythrogaster erythrogaster*) in the Dahomey Gap has not been fully documented. This study contributed to filling this information gap. Surveys were conducted in 21 villages located in the wetlands of southwestern Benin and southern Togo. We found that only a few small areas of forest along rivers and in swamps, difficult to access by humans, still sheltered primates. Three individuals of *C. e. erythrogaster* are reported for Toffangnanmè forest (Nakidahohoué village), a flooded and degraded forest surrounded by fields, and nine *C. e. erythrogaster* from the National Park of Togodo in Togo (NPT). The NPT may serve as the main refuge habitat for the red-bellied guenons in the study region. Interviews with local people in the area suggested the possibility that these monkeys may occasionally disperse from this refuge, entering adjacent habitats situated in the territory of Benin where thickets and fallows fringing cornfields are known to periodically host primates. Major threats to the conservation of *C. e. erythrogaster* documented in the area include poaching for crop protection, bush meat and the organ trade, as well as hunting for medicinal use, in addition to the increasingly detrimental habitat degradation due to agriculture and fuel wood collection.

Key words: Conservation, red-bellied guenon, Dahomey Gap, southwestern Benin, southern Togo

Résumé: *Laire de répartition du cercopithèque à ventre roux (Cercopithecus erythrogaster erythrogaster) dans le Dahomey Gap n'est pas encore bien cernée. Notre étude a permis à combler cette lacune. Des enquêtes ont été réalisées dans 21 villages situés dans les zones humides du Sud-ouest Bénin et au Sud Togo. Il ressort de nos investigations que seules les forêts galeries et les milieux marécageux, difficiles d'accès à l'homme abritent encore des primates. Trois individus de C. e. erythrogaster ont été observés à Nakidahohoué dans une forêt marécageuse dégradée, entourée de champs et jachères et 9 C. e. erythrogaster ont été observés dans le Parc National de Togodo au Togo (PNT). Le PNT constitue l'habitat principal des cercopithèques à ventre roux dans la zone d'étude. Les entretiens avec les populations de la zone d'étude révèlent la possibilité que ces singes fassent des incursions périodiques depuis le PNT dans les habitats adjacents situés au Bénin, constitués de fourrées et jachères proches des champs de maïs. Les principales menaces à la conservation de C. e. erythrogaster ont été le braconnage pour la protection des cultures, le commerce de la viande boucanée et des organes, la chasse pour des usages médico-magique, la dégradation de l'habitat par une agriculture extensive et le besoin en bois énergie et bois d'œuvre.*

Mots clé: Conservation, Cercopithèque à ventre roux, Dahomey Gap, Sud-ouest Bénin, Sud Togo

INTRODUCTION

The southern part of the Republic of Benin is located in the Dahomey Gap, the dry wedge of forest-savanna mosaic that interrupts the belt of the West African lowland rainforest. The Gap is thought to have acted as a natural barrier to the dis-

tribution of forest-dwelling mammals (Robbins, 1978; Djossa *et al.*, 2008). In 1994, the first wild populations of the red-bellied guenon (*Cercopithecus erythrogaster erythrogaster*) were discovered in Benin (Oates, 1996). The primate was known to scientists since 1866 (Gray, 1866) but only from captive individuals in zoos, and skins and skeletons deposited in museums (Hanon, 2003). The red-bellied guenon appears to be endemic to the Dahomey Gap.

Suitable habitats for the red-bellied guenon in southern Benin are now highly fragmented (Sinsin *et al.*, 2000). The geographical distribution of the subspecies is thought to extend from the Couffo River valley close to the Togo border in the west, to the Ouémé River valley close to the Nigerian border in the east. Preliminary studies of this monkey focused on the Ouémé valley, particularly the swampy forest of Lokoli, forest patches in the Togbota village area, and the Lama Forest Reserve. Until recently, the Couffo River valley habitats remained poorly investigated, and there was a need for ecological surveys in these habitats to fill information gaps on this subspecies (Tèhou & Sinsin, 1999). Accelerating and profound disturbances to these natural habitats have made ecological studies and conservation action even more relevant.

The surveyed forests are located in the Mono River valley, southwestern Benin, and southern Togo, in the lowlands where no thorough study has been conducted on the red-bellied guenon. The present study surveyed potential habitats of the red-bellied guenon in this region, estimated the size of populations to the extent possible, and, when any of these guenons were found, investigated constraints relevant to their conservation.

STUDY SITE

The survey took place in the Mono River valley in the marshland of Tchi that covers the southwestern part of Benin, and in a few adjacent areas of southern Togo. The marshland of Tchi is connected with the Lama Depression, which extends westwards from the Nigerian border in the southeast of Benin and forms a forest habitat "corridor" interrupted in many places by human activities. This depression has been created by soil erosion and forms a strip oriented from west-southwest to east-northeast (Slansky, 1962). It is low-lying, with elevations ranging from 20 m to a maximum of 60 m. The rainfall regime is bimodal (April-June and September-November) with an average of 1200 mm per year. Deep ferrallitic soils of poor fertility, alluvial soil and vertisol are described in the Mono and Couffo river valleys, and in the whole of the Lama Depression. A total of four localities were surveyed in Togo and 17 in Benin (Figure 1).

METHODS

Identification of red-bellied guenon refuge habitats

Surveys were conducted in Benin and in Togo from September to November 2008. Additional inventories were carried out in three localities in Togo in March 2011 (Figure 1: localities 19, 20 and 21). During this study, interviews were conducted with hunters, fishermen, farmers and rangers living near forest fragments or natural areas where primate populations were suspected. People were asked to enumerate which primate species occur in each habitat and to describe them in terms of colour, size, vocalization, habitat and behavioural characteristics (such as polyspecific association). In the various villages along the Mono River between Dzrékpon and Adjaralla, interviewees were then asked to choose the corresponding species in a field guide (Kingdon, 2001) and/or from photographs of the red-bellied guenon and common primate species known for Benin; this was done to further refine identification and to test whether interviewees distinguished well between different guenon species. When the presence of the red-bellied guenon was indicated, we made a survey in the indicated habitat to attempt confirmation of the monkey's presence.

Estimation of red-bellied guenon group sizes

Apart from the common methods used for assessing the primate abundance, such as line-transects (Southwick & Cadigan 1972; Lawes, 1991; Silveira *et al.*, 2003) and the point count method (Campbell, 2005), several other methods have been developed for counting cryptic primate species and/or species living in habitats with low visibility. In this study, direct observation of red-bellied guenon groups in Toffangnanmè (113.1 ha) (Benin) allowed us to make total counts of individuals present. Two teams of two observers walked simultaneously on two parallel transects of 1.5 km each to count guenons. Density was calculated using the following formula: $D = N/S$; where: D = density of animals per unit area (individual/km²); N = number of animals seen on transect; S = size of the habitat. In the National Park of Togodo (18000 ha) (Togo side), the approach differed. A survey was conducted in riparian forest by canoe along the Mono River, and a total of 12 km of transect were walked in the park; densities could not be computed based on these survey efforts.

Information important to the conservation of the red-bellied guenon in this region

For this aspect of the study, we used interviews to collect information from hunters, fishermen, farmers

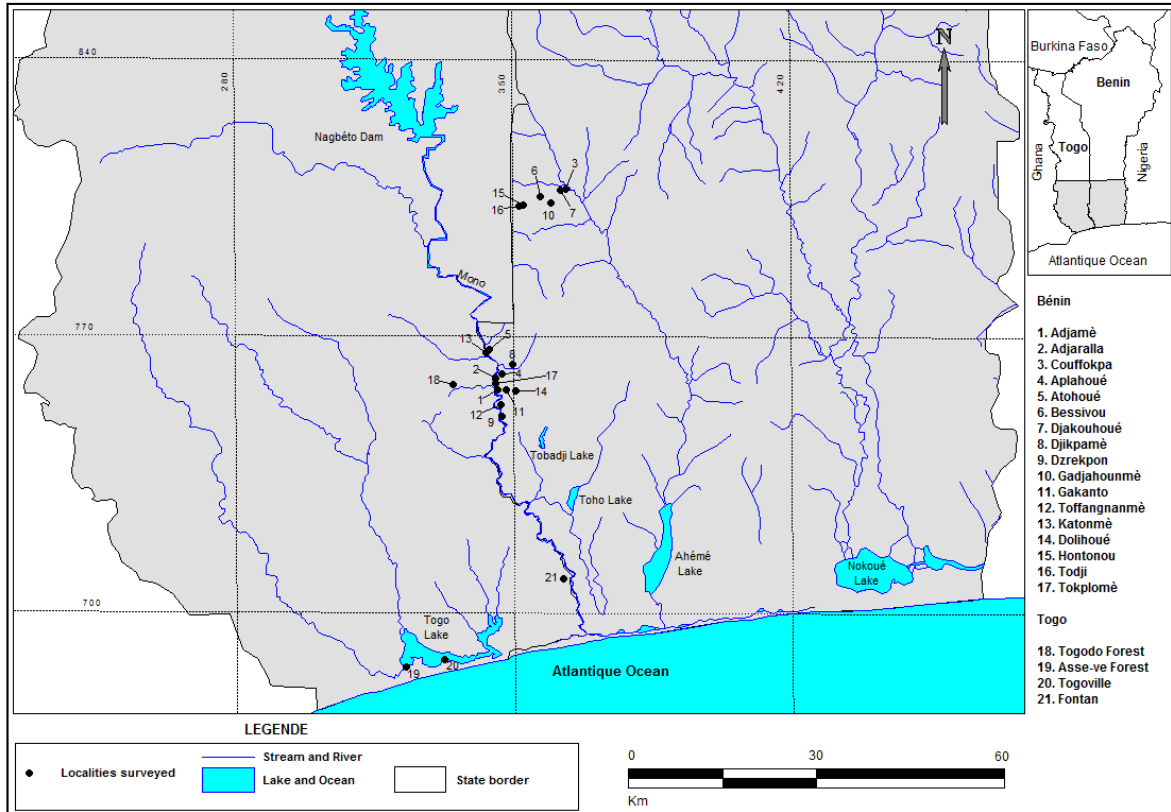


Figure1. Localities surveyed in Togo and in Benin

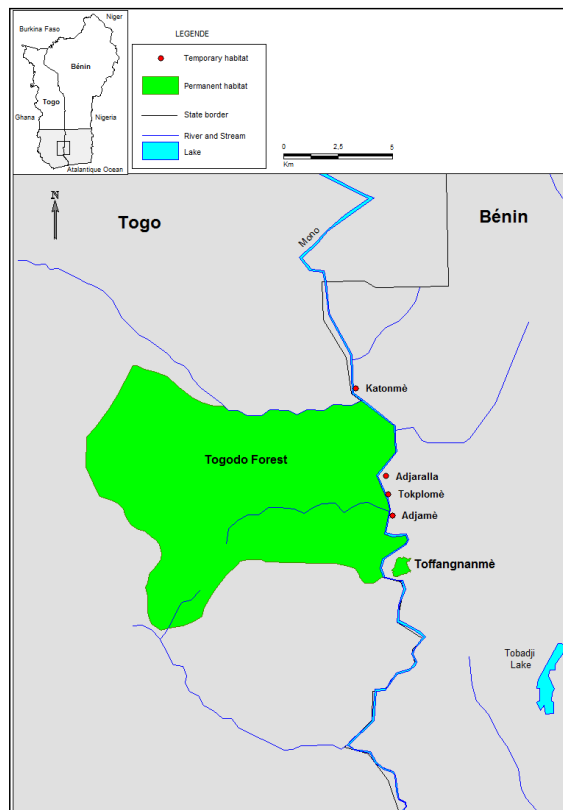


Figure 2. Red-bellied guenon refuge habitats in the marshland of Tchi

and dead animal sellers in communities living in the vicinity of identified refuge habitats. These, and our observations in the area, provided evidence of hunting for bushmeat and/or medicinal use, recorded habitat destruction, and identified traditional beliefs associated with guenons, in general, and particularly in relation to this endemic subspecies.

RESULTS

Refuge habitats of the red-bellied guenon

Six out of 21 surveyed habitats (28.6%) were identified as areas which either permanently, or perhaps temporarily, shelter the red-bellied guenon. The forest of Toffangnanmè and the National Park of Togodo (NPT) are permanent habitats for the red-bellied guenon. According to local reports, forest patches in Adjamè, Tokplomè, Katonmè and Adjaralla villages host these guenons only in the dry season when the river dries up (Figure 2), and these individuals are thought to come from the NPT. It should be noted, however, that this temporary use of forest patches in Adjamè, Tokplomè, Katonmè and Adjaralla as habitat by red-bellied guenons is based on local reports, only, and has not been confirmed by observations during the survey. We obtained no evidence of *Cercopithecus erythrogaster erythrogaster* in Couffokpa, Bessivou, Djakouhoué, Gadjahounmè, Hontonou and Todji (Figure 1).

Red-bellied guenon population density

During 387 h of surveys, we walked 183 km of transect in 21 forest patches (4 in Togo and 17 in Benin), and we observed 1-9 individuals per half day of observation. The results of these surveys are presented in Table 1. In Toffangnanmè, the red-bellied guenon's density was estimated to be 2.7 individuals/km². Nine individuals were observed in the gallery forests of the southern part of the NPT, but accessibility problems did not allow an estimation of density. Other primate species also were observed in the surveyed forest patches: tanzania monkey (*Cercopithecus aethiops tanzania*) and patas (*Erythrocebus patas*), mainly restricted to gallery forests and semi-deciduous forest. Mona monkeys (*Cercopithecus mona*) were observed in the Forest Reserve of Togodo.

It is commonly believed in the study area that primates represent the spirit of twins; a taboo resulting from this belief is that all twins and their relatives in the area are forbidden to hunt any primates. People explicitly state that killing a monkey puts the life of twins in danger and thereby attracts bad fortune for the family. Twenty-three percent of interviewees declared that they stopped hunting

from the moment twins were born in their family, a practice that could contribute to the conservation of the red-bellied guenon.

An active local NGO previously had sensitized these communities to the value of conserving the red-bellied guenon, stressing the possible development of ecotourism focussing on this flagship monkey. According to interviewees' statements, this has resulted in people avoiding hunting the red-bellied guenon in a few instances.

Our survey efforts during the present study, however, revealed that all monkey species were still hunted, including the red-bellied guenon. Three out of four hunters declared that they had killed this subspecies at least once, although half of them mentioned that they selectively hunted adult males. They reported hunting the red-bellied guenon for food, for selling, for medicinal purposes, and to prevent the monkeys from destroying their maize farms. In total, hunters declared that they possessed a total of 21 heads of this monkey. They also declared that a minimum of 4 to 11 red-bellied guenons were killed per capita, permitting a crude estimation of about 75 individuals killed in the past five years, if this is a valid statement of hunting pressure.

In addition, monkey habitats in the region are being impacted by anthropogenic disturbances. Large trees are felled to make canoes and to construct houses, and they also are debarked. Roots and leaves are collected for traditional medicines, and vegetation burning also occurs, associated with the hunting of small animals and farming activities.

DISCUSSION

Refuge habitats for the red-bellied guenon

We suggest that the National Park of Togodo (NPT) may serve as a main refuge habitat for red-bellied guenons in the study region, and that from this refuge the monkeys may periodically disperse into adjacent habitats situated in the territory of Benin. Again, however, the validity of these periodic "migrations" of the red-bellied guenons relies on local people's reports and have not been confirmed by direct observations during our surveys, due to funding and time restrictions. This information therefore needs to be treated with caution and should be further investigated. It is noted, however, that local migration of red-bellied guenons also has been reported previously (Hanon, 2003) in Togbota Agué in the Ouémé River valley in the eastern Dahomey Gap. The periodic "migration" of the red-bellied guenon from NPT, if it occurs, is similar to the migration of other animals in forest fragments located near the border of Benin. Based on

Table 1 - Primate species observed during the present study

Country	Location	Survey time	Primate species observed	Total number of individuals observed for each species
Benin	Adjamè	15 h	<i>C. aethiops tantalus</i>	4
			<i>C. mona</i>	2
	Adjarala	11 h	<i>C. aethiops tantalus</i>	3
			<i>C. mona</i>	3
	Bessivou/Djakouhoué	25.5 h	<i>E. patas</i>	10
	Couffokpa	34.5 h	<i>E. patas</i>	3
			<i>C. aethiops tantalus</i>	6
	Dolihoué	7 h	<i>C. aethiops tantalus</i>	5
	Katonmè	8 h	<i>C. aethiops tantalus</i>	3
	Nakidahohoué/ Toffangnanmè	47.5 h	<i>C. e. erythrogastrer</i>	3
			<i>C. aethiops tantalus</i>	5
	Todji	17 h	<i>C. aethiops tantalus</i>	2
Tokplomè	9 h	<i>C. aethiops tantalus</i>	3	
		<i>C. mona</i>	2	
Togo	National Park of Togodo	67 h	<i>C. aethiops tantalus</i>	1
			<i>C. mona</i>	17
			<i>C. e. erythrogastrer</i>	9
	Fontan forest	40 h	<i>C. mona</i>	7
			<i>C. aethiops tantalus</i>	4
	Togoville sacred forest	30 h	<i>C. aethiops tantalus</i>	3
			<i>C. mona</i>	4
	Asseve forest	60 h	<i>C. mona</i>	7
<i>C. aethiops tantalus</i>			5	

such observations, Gaffan (2001) previously has argued for the need to create a protected area on the Benin side aimed at improving wildlife conservation.

Red-bellied guenons also were present in Toffangnanmey forest patch where there is similar habitat to that of the NPT. Teichroeb (2003) reported being told by E. Fouchard¹ that red-bellied guenons were present in the forests of Asseve, Forêt Degadi, and the sacred forest of Togoville in 1995. We did not find Degadi forest during the survey and the forest also was unknown to Togo's foresters. In addition, however, no hunter at sites surveyed in south Togo recognized the red-bellied guenon during this study. These findings suggest two hypotheses. The first is that the red-bellied guenon probably did not exist in these forests in the past, and that individuals received by the Mulhouse Zoo in France in the 1980s had come from Benin, from the National Park of Togodo, or from other locations that have not yet been identified in the region. Indeed, the wild animal trade involves different actors from various areas, such that the animals received by E. Fouchard could have come from any part of West Africa. The second hypothesis posits that the red-bellied guenon existed in these forest patches but that the interviewed persons had not recognized it before it disappeared from their areas; this does not seem very likely. Furthermore, we obtained no evidence of *Cercopithecus erythrogaster erythrogaster* in Couffokpa, Bessivou, Djakouhoué, Gadjahounmè, Hontonou or Todji. Only one hunter at Couffokpa recognised the red-bellied guenon and suggested that we search in the gallery forests of the Mono River.

Dense habitats such as high forest in the Dahomey Gap are fairly rare and this region has been considered as a zoogeographical barrier for forest species (Bergmans, 1997), a proposition which some argue needs to be reconsidered (Robbins, 1978; Djossa *et al.*, 2008). The existence of forest refuges connected to the fluvial networks during the dry periods of the Pleistocene (Colyn *et al.*, 1991; Deleporte & Colyn, 1999) could explain the presence of the red-bellied guenon, a forest-dependent species found in gallery forests and other riparian habitats. These river-valley habitats have soils which retain water year-round that favours vegetation growth and the survival of rain forest during the dry periods (Sinsin *et al.*, 2002; Hanon, 2003; Campbell, 2005; Nobime *et al.*, 2009). Such riparian forest could have acted as an outpost for rain forest species in glacial times (Kellman *et al.*, 1994). At present, the degradation of natural habitats in the lowlands of Tchi has restricted much of the fauna to remnant rain forest relics, gallery forests and old fallows.

¹ Fouchard is the manager of TOGANIM, an organization that exports exotic animals. In the 1980s, the Mulhouse Zoo, France, received from this organization 7 red-bellied guenons said to have been caught in small sacred forests of southern Togo.

Monkey population density

Although the attempted census in Togodo National Park was partial and done in a limited time period, it suggested that this Park may host the most important population of *Cercopithecus e. erythrogaster* in the study area. Although Campbell *et al.* (2008) did not observe red-bellied guenons in Togodo forest, later work by Nobimè *et al.* (2009) did report its presence there, but did not estimate population density. The density of 2.7 individuals/km² suggested for *Cercopithecus erythrogaster erythrogaster* in Nakidahohoué is lower than the values reported by Campbell (2005) in the Lama Forest Reserve, and by Assogbadjo and Sinsin (2002) in the swamp community forest of Lokoli (17.5 individuals/km² and 6.6 individuals/km², respectively). The low density of the red-bellied guenons from the study area may be related to the intensity of human pressures on fauna in general, and particularly on this monkey, as habitat fragmentation and disruption have direct impacts on primate group size, density and composition (Decker, 1994; Clarke *et al.*, 2002; Wong & Sicotte, 2006).

Opportunities and constraints on the conservation of the red-bellied guenon

There are no protected areas in the entire south-western region of Benin. The traditional way to preserve natural resources in the area has consisted of declaring some forests and animal species sacred. Despite the existence of taboos protecting primates (Fargey, 1991; Djègo, 2003; Le Saj *et al.*, 2005; Champeau *et al.*, 2008; Nobime *et al.*, 2008; Dakpogan, 2009), many African primates are threatened, here as elsewhere. Indeed, in the whole forest region of Central and Western Africa, a set of factors (including poverty and new religious practices) contribute to make commercial hunting a threat for many primates' survival, including the great apes (Rose, 1996). We were told by the interviewees of Toffangnanmey, Adjamey, Gakanto and Dzrekpon in Benin that the poachers coming there are mainly from Togo, but resident in Benin. Although a segment of the region's human population left the NPT at the time of reclassification of its lands, many of these people settled in Benin but still continue poaching monkeys, warthog, buffalos, duikers, birds and reptiles in the NPT, which they reach with canoes from the Benin side.

Another major threat in the study area is the continuing fragmentation of habitats. The high fertility soils of the lowlands and the valleys of the Mono River valley attract an ever increasing number of farmers each year; the resulting anthropogenic activities certainly will continue to negatively impact the conservation of the red-bellied monkey.

CONCLUSION

New red-bellied guenon habitats were found during this study, although we found no direct evidence of the red-bellied guenon's presence in southern Togo, other than in the NPT, or in Couffokpa, Bessivou, Djakouhoué, Gadjahounmè, Hontonou or Todji in Benin. Our investigation suggests that the National Park of Togodo may serve as the main refuge habitat for red-bellied guenons in the study region, and there are unconfirmed reports that from this refuge, the monkeys may intermittently disperse into adjacent habitats situated in the territory of Benin. Threats to the red-bellied guenon are poaching for crop protection, food, and for a bush skulls and bones trade that provides substantial incomes, in addition to the increasing major threat of continued fragmentation of habitats.

Due to the very limited population size of the red-bellied guenon in the study region and the prominence of the anthropogenic pressures on habitats, there is a need for urgent conservation actions in order to guarantee the conservation of this endemic subspecies. The NPT could benefit substantially from a restoration program to increase its ability to offer suitable habitats to wildlife, in general, and to the red-bellied guenon, in particular.

The complete distribution area of the red-bellied guenon in Benin and in Togo is not yet well-known and requires additional research, in particular the upstream parts of the Mono and Ouémé Rivers. Also unclear is its presence in Nigeria, just on the other side of the Benin border, and the full extent of its eastward distribution. More focused attention from the scientific community could benefit the full assessment of this subspecies, and its conservation status.

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LITERATURE CITED

Assogbadjo, A.E & B. Sinsin. 2002. Diversité, structure et comportement des primates de la forêt marécageuse de Lokoli au Benin. *Biogeographica* 78(4): 129-140.

Atutonou, A. 2005. Contribution à la gestion durable du Parc National de Togodo-Sud, Togo. Mémoire de DESS, ERAIFT, Kinshasa, RDC.

Campbell, G. 2005. Distribution, Census and Habitat Preferences of Primate Species in the Dahomey Gap (West Africa), with Particular Emphasis on the Red-bellied Guenon (*Cercopithecus erythrogaster erythrogaster*). MA thesis, University of Calgary, Canada.

Campbell, G., J. Teichroeb & J.D. Paterson. 2008. Distribution of diurnal primate species in Togo and Benin. *Folia Primatologica* 79:15-30

Champeau, J., A. Besolo, E. Rasolondraibe, E. Quéméré, C. Rabarivola, B. Crouau-Roy & L. Chikhi. 2008. Le propithèque de Tattersall: conservation d'une espèce de lémurien menacée. In CEPA Magazine N° 19-20-2009. Pp. 20-35.

Clarke, M.R, C.M. Crockett, E.L. Zucker & M. Zaldivar. 2002. Mantled howler population of Hacienda La Pacifica, Costa Rica, between 1991 and 1998. Effects of deforestation. *American Journal of Primatology* 56: 155-163.

Colyn, M., A. Gautier-Hion & W. Verheyen. 1991. A reappraisal of aleoenviromental history in Central Africa: Evidence for a major fluvial refuge in the Zaïre Basin. *Journal of Biogeography* 18: 403-407.

Dakpogan, S.C.D. 2009. Stratégie de conservation et de valorisation des primates dans la région du lac Ahémé au Sud-Benin. Mémoire DESS FSA/UAC, Benin.

Decker, B.S. 1994. Effects of habitat disturbance on the behavioral ecology and demographics of the Tana River red colobus (*Colobus badius rufomitratu*s). *International Journal of Primatology* 15: 703-737.

Deleporte, P. & M. Colyn. 1999. Biogéographie et dynamique de la biodiversité: application de la PAE aux forêts planétaires d'Afrique centrale. *Biosystema* 17: 39-43.

Djègo, G.S. 2003. Détermination de la population de colobe magistrat (*Colobus vellerosus*) et statuts de conservation au Benin. Mémoire DESS FSA/UAC Abomey-Calavi, Benin.

Fargey, P.J. 1991. Assessment of the conservation status of the Boabeng-Fiema Monkey Sanctuary, Kumasi, Ghana. Unpublished report to the Flora and Fauna Preservation Society (Fauna & Flora International).

- Gaffan, P.E. 2001. Contribution à l'étude des possibilités de création, d'aménagement et de gestion d'aires protégées dans les départements du Mono et du Couffo. Thèse de DESS, FSA/UNB.
- Hanon, H. 2003. Vers une stratégie de préservation du singe à ventre rouge au Bénin. Des arguments de terrain. In *Parcs et Réserves - Volume 58 n°2* ; 7 pp.
- Lawes, M.J. 1991. Estimates of population density and correlates of the status of the samango monkey *Cercopithecus mitis* in Natal, South Africa. *Biological Conservation* 60: 197-210.
- Le Saj, T, J.A. Teichroeb & P. Sicotte. 2005. The population status of *Colobus vellerosus* at Boabeng Fiema sacred grove, Ghana. In *Commensalism and Conflict: The Human-Primate Interface*. J.D. Paterson & J. Wallis, eds. American Primatological Society Publishing, Norman, OK. Pp. 350-375.
- Kellman M., R. Tackaberry, N. Brokaw & J. Meave. 1994. Tropical gallery forests. *National Geographic Research & Exploration* 10: 92-103.
- Nobimè, G., O.G. Gaoué & B. Sinsin. 2008. Distribution des espèces de primates au Bénin et ethnozoologie. *International Journal of Biological & Chemical Sciences* 2(3): 346-354.
- Nobimè ,G, B. Sinsin & J-M. Lernoald. 2009. Ecological factors determining the distribution of the red-bellied guenon *Cercopithecus e. erythrogaster* in Benin and Togo. *International Journal of Biological & Chemical Sciences* 3(3): 606-611.
- Oates, J.F. 1996. Survey of *Cercopithecus erythrogaster* populations in the Dahomey Gap. *African Primates* 2(1): 9-11.
- Rose, A.L. 1996. Commercial exploitation of great ape bushmeat. In *Rapport du Séminaire sur l'Impact de l'Exploitation Forestière sur la Faune Sauvage*. R. Ngoufo, J. Pearce, B. Yadjji, D. Guele, et L. Lima, eds. Cameroon MINEF et WSPA, Bertoua. Pp. 18-20.
- Silveira, L., A.T.A. Jacomo & J.A.F. Diniz-Filho. 2003. Camera trap, line transect census and track surveys: a comparative evaluation. *Biological Conservation* 114: 351-355.
- Sinsin, B., G. Nobimè, A.C. Tèhou, P. Bekhuis & S. Tchibozo. 2002. Past and present distribution of the red-bellied guenon (*Cercopithecus erythrogaster erythrogaster*) in Benin. *Folia Primatologica* 73: 116-123.
- Sinsin, B., A.C. Tèhou, G. Nobimè & S. Tchibozo. 2000. Répartition et abondance du singe à ventre rouge *Cercopithecus erythrogaster* dans les régions de la Lama et d'Adjohoun (Bas-Bénin). LEA/ FSA/UNB. Cotonou, Bénin.
- Slansky, M. 1962. Contribution à l'étude géologique du Bassin sédimentaire côtier du Dahomey et du Togo. Mém. B.R.G.M., 11.
- Southwick, C.H & F.C. Cadigan Jr. 1972. Population studies of Malaysian primates. *Primates* 13: 1-18.
- Teichroeb, J. 2003. Primate Distribution in Southern Togo & Benin: Potential Field Sites for Primate Research. Unpublished report to the University of Calgary, Canada.
- Tèhou, A.C & B. Sinsin. 1999. Ethologie et écologie des troupes d'éléphants (*Loxodonta africana*) de la zone cynégétique de la Djona au Bénin. *Nature et faune* 15: 49-61.
- Wong, S.N.P & P. Sicotte. 2006. Population size and density of *Colobus vellerosus* at the Boabeng-Fiema Monkey Sanctuary and surrounding forest fragments in Ghana. *American Journal of Primatology* 68: 465-476.

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Red-bellied Guenon Cercopithecus erythrogaster erythrogaster.
Photograph by Mariano Gboja Houngbédji.
