ABSTRACT

The red-bellied guenon (Cercopithecus e. erythrogaster) is an endangered subspecies of primate endemic to the Dahomey Gap. To better understand its distribution pattern, interviews with local people in 180 localities in south Benin and southeast Togo and ground surveys were conducted from 2000 to 2007. The species was found inhabiting eight localities in swamp forests, gallery forests and seasonally-flooded semi-evergreen forests. Two of these are protected areas: the Lama Forest of Benin and the Togodo Reserve of Togo. Appropriate conservation actions are necessary for the red-bellied guenon, including improved law enforcement and regular monitoring.

Key words: Red-bellied guenon, Cercopithecus e. erythrogaster, distribution, Benin, Togo, conservation.

INTRODUCTION

The originally named museum skin of Cercopithecus erythrogaster has red hair on its chest and abdomen and may have originated in Benin. Grubb et al. (1999) recognized that there are two subspecies: Cercopithecus e. pococki from Nigeria and Cercopithecus e. erythrogaster Gray 1866 from Benin. C. e. pococki has a grey belly and C. e. erythrogaster a red belly. The relatively recent confirmation that the red-bellied guenon survives in southern Benin, exemplifies the lack of ecological studies and biodiversity surveys in the Dahomey Gap. A wild population of red-bellied guenons was discovered in 1994 (Oates, 1996). We are sure people had seen them before; but Oates was the first to publish a sighting with a geographical distribution limited to forests of the southern Benin (Oates, 1996; Sinsin et al., 2002). Further information about the spatial distribution of the subspecies and the characterization of its remaining habitats are particularly important to ensure the survival of this endangered taxon (Sinsin et al., 2002; Campbell et al., 2008). Conservation agencies and scientists have acknowledged the necessity for spatial knowledge of biodiversity for purposes of planning, management and conservation evaluation (Acharya, 1999).

Here we map the current distribution of the subspecies C. e. erythrogaster, provide evidence of its presence in Togo, and assess the ecological factors which impact its distribution and continued existence.

MATERIALS AND METHODS

Study area

This study took place in Southern Benin and in Southeast Togo between 1°30 and 2°50 East longitudes and between 6°20 and 8° North latitude. From an ecological perspective, this region covers four habitat types within a forest-savannah mosaic: dry...
semi-deciduous forest, seasonally humid semi-deciduous forest, swamp forest and gallery forest.

Benin and Togo are located within the so-called Dahomey Gap, in which Sudan-type savanna vegetation extends as far as the sea, through a hiatus in the West African rain forest, covering some 200 km from South East Ghana to South East Benin (Guillaumet, 1967; Schnell, 1976; Onochie, 1979; Whitmore, 1990; Martin, 1991; Maley, 1996; Salzmann and Hoelzmann; 2005). Nevertheless in areas where topography favours the semi-permanent presence of water, elements of the humid forest and its associated fauna have been retained (Adjanohoun, 1968; Kokou, 1998; Kokou et al., 1999; Le Gall et al., 2002). Currently, across the entire Dahomey Gap, the original pattern of vegetation is largely obscured by the omnipresent impact of dense human settlements and ever increasing exploitation through agriculture (Jenik, 1994; Kokou and Caballé, 2000). This human influence has reduced humid forest cover to isolated forest islands and riparian forests stretching along rivers.

Data collection

Nobimè visited dry and humid forest islands, riparian forests, and stream vegetation areas in the administrative departments of South Benin (Atlantique, Ouémé, Plateau, Mono, Couffo, Colline and Zou) and South Togo (Maritime). The studies took place in a total of 180 localities among rural villages situated in the districts of Sakété, Zangnanado, Abomey, Allada, Bopa, Dogbo, Laô, Athiémè, Djakotomey, Toviklin, Pobè, Kétou, Savè and Aplahoué, and in the Ouémé river valley, as well as in the Lama depression and localities near Togodo reserve (Tabligbo district) in Togo.

The approach was to conduct an interview survey of local people (and especially with local authorities and hunters) in areas considered likely to harbor the red-bellied guenon. Interviews with the local population throughout the different phases of the study provided information concerning the species’ habits, past presence, and the localities where it could still be encountered. A poster featuring good-quality images of several guenon species was employed to ensure differential identification of the monkey in question by the surveyed persons. Once localities had been identified with the local population as having a past or present guenon presence, surveys within the species habitat were conducted. Of the 180 localities where the population was interrogated, direct surveys of potential habitats was undertaken in eight.

RESULTS

Spatial distribution and habitat types

Of 180 localities surveyed, 62 were identified by the inhabitants as having had a red-bellied guenon population at some stage; eight of these localities continue to harbor the subspecies, as confirmed by direct observation (Figure 1; Table 1). This included the first sighting of the red-bellied guenon in Togo, where Nobimè observed two polyspecific groups of red-bellied guenons and mona monkeys (Cercopithecus mona) in the Togodo Reserve.

Causal factors of the presence of red-bellied guenon

The areas where people reported that the red-bellied guenon was previously found are characterized by humid habitats: swamp forests, gallery forests and dense semi-deciduous forests, which are flooded in the rainy season. In addition to the protected forests of Lama and Togodo, the wetland vegetation of the Ouémé River, the swamp forest of Lokoli, and the gallery forests of Opkara and Mono are presently the preferred habitat of the red-bellied guenon.

Major causes of red-bellied guenon habitat degradation.

Pressures exercised by villagers as they continue to cut trees for firewood and to clear land for agriculture, lead to a forecast of continuing decline in the monkey’s occupation area. Riparian forests provide fertile soil for cultivation, so in the Mono-Couffo department the local human population has already entirely destroyed the gallery forests.

All hunters in the Mono gallery forest in Benin and Togo are based in Benin for poaching in Togodo reserve. This reserve is the only one with high animal biodiversity (primates, antelopes, buffalo, and lion) in the region.
Figure 1: Surveyed zone for red-bellied guenon in Benin and Togo.
Table 1: Features of localities where red-bellied guenons occur in Benin and Togo.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Habitat area (ha)</th>
<th>Vegetation type</th>
<th>Human encroachment</th>
<th>Fragmented</th>
<th>Habitat type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lama protected forest (Benin)</td>
<td>16,250</td>
<td>Dense semi-deciduous forest (<em>Diospyros mespiliformis</em>, <em>Dialium guineense</em>, <em>Cynometra megalophylla</em>)</td>
<td>Protected area: poaching</td>
<td>No</td>
<td>Seasonal swamp forest</td>
</tr>
<tr>
<td>Lokoli (Benin)</td>
<td>500</td>
<td>Dense semi-deciduous forest (<em>Raphia hookeri</em>, <em>Alstonia congensis</em>, <em>Xylopia rubescens</em>, <em>Ficus congensis</em>)</td>
<td>Community forest: tree cutting, farming, raphia palm exploitation</td>
<td>Yes</td>
<td>Swamp forest</td>
</tr>
<tr>
<td>Gnanhouizoumè (Benin)</td>
<td>50</td>
<td>Dense semi-deciduous forest (<em>Diospyros mespiliformis</em>, <em>Dialium guineense</em>, <em>Cynometra megalophylla</em>)</td>
<td>Community forest: tree cutting, farming</td>
<td>Yes</td>
<td>Seasonal swamp forest</td>
</tr>
<tr>
<td>Togbota (Benin)</td>
<td>5 – 10</td>
<td>Dense semi-deciduous forest (<em>Diospyros mespiliformis</em>, <em>Dialium guineense</em>, <em>Cynometra megalophylla</em>, <em>Cola laurifolia</em>, <em>Berlinia grandiflora</em>, <em>Pterocarpus santalinoides</em>)</td>
<td>Community forest: tree cutting, farming</td>
<td>Yes</td>
<td>Gallery forest</td>
</tr>
<tr>
<td>Houanvè (Benin)</td>
<td>3</td>
<td>Riparian forest (<em>Cola laurifolia</em>, <em>Berlinia grandiflora</em>, <em>Pterocarpus santalinoides</em>)</td>
<td>Community forest: tree cutting, farming</td>
<td>Yes</td>
<td>Gallery forest</td>
</tr>
<tr>
<td>Okpara (Benin)</td>
<td>3 – 5</td>
<td>Riparian forest (<em>Cola laurifolia</em>, <em>Berlinia grandiflora</em>, <em>Pterocarpus santalinoides</em>)</td>
<td>Community forest: tree cutting, farming</td>
<td>Yes</td>
<td>Gallery forest</td>
</tr>
<tr>
<td>Mono (Benin, Togo)</td>
<td>0.5 - 1</td>
<td>Riparian forest (<em>Cola laurifolia</em>, <em>Berlinia grandiflora</em>, <em>Pterocarpus santalinoides</em>)</td>
<td>Community forest: tree cutting, farming</td>
<td>Yes</td>
<td>Gallery forest</td>
</tr>
<tr>
<td>Togodo reserve (Togo)</td>
<td>31,000</td>
<td>Dense semi-deciduous forest and riparian forest (<em>Diospyros mespiliformis</em>, <em>Dialium guineense</em>, <em>Cynometra megalophylla</em>, <em>Cola laurifolia</em>, <em>Berlinia grandiflora</em>, <em>Pterocarpus santalinoides</em>)</td>
<td>Protected area: poaching and tree cutting</td>
<td>No</td>
<td>Gallery forest</td>
</tr>
</tbody>
</table>
DISCUSSION
The red-bellied guenon, present in gallery forests, wetland and swamp forests of Southern Benin and Togo, is an endemic subspecies of the Dahomey Gap.

During a humid phase of the Holocene, the Dahomey Gap was probably covered with evergreen lowland forest (Salzmann and Hoelzmann, 2005). This suggests that extant patches of natural forest in Southern Benin are remnants of the former semi-evergreen lowland forest that has been largely destroyed by humans. For species distributed in the lowland rainforest during the Holocene, these forest remnants, such as the Lama protected forest, are important refuges (Nagel et al., 2004).

According to Levaux (1990), Roggeri (1995) and Brugière et al. (1999), riparian forests are important in the conservation of a large range of plants and animals, constituting a natural habitat or the last refuge for many species, but also they contain many endemic species and threatened species. The Ouémé River and its forested banks are rich in bird life, and serve as a focal point of primates and animals of many kinds (Natta, 2003), including the red-bellied guenon. In the red-bellied guenon habitat, there is little human activity for the three months or more per year when the area is flooded, providing therefore a good refuge (Sinsin et al., 2002).

Our studies have also shown that the red-bellied guenon is present in gallery forests of the Mono River system, including the Togodo Reserve of Togo.

Conclusions and recommendations for conservation
Human pressures in Benin and Togo have led to the degradation, destruction and fragmentation of riparian gallery forests. They are now endangered ecosystems. Although small in size, the remaining seasonally-flooded and riparian forests are important in the conservation of numerous animals and the Lama protected forest, the gallery forests of Oueme, Mono and Opkara, and the Lokoli swamp forest are important refuges for red-bellied guenon. The uniqueness, vulnerability and diversity of these forests are the most important criteria rendering their protection a priority. Logging within the protected areas and riparian forests should be prevented, and limited within buffer zones around these areas. Law enforcement capabilities should be strengthened to reduce greatly illegal, unregulated and unmanaged hunting. Major donors and conservation bodies should be encouraged to put into place trust funds to support the required law enforcement, research, monitoring, evaluation, information and conservation education programs, especially in and around the existing protected areas (Lama protected forest, Togodo reserve) and the surviving riparian forests. This could be done within the context of a regional wetland conservation project covering Benin and Togo. The Benin and Togo governments must coordinate their actions against poachers in the Mono river region.

Domestic food alternatives to bushmeat and alternative livelihoods should be developed and promoted, particularly around protected areas and riparian forests. These measures might include small mammal breeding, fish breeding, bee keeping, and mushroom production.

The Dahomey Gap’s populations of primates should be regularly surveyed and monitored so that numbers, distributions, trends, and threats are well known and appropriate conservation actions taken.

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