Note on the seasonal use of lowland and highland habitats by the West African Chimpanzee Pan troglodytes verus (Schwarz, 1934) (Primates: Hominidae): Implications for its conservation

Papa Ibou Ndiaye 1, Gérard Galat 2, Anh Galat-Luong 3 & Georges Nizinski 4

1 UCAD, Université Cheikh Anta Diop, Département de Biologie animale, B.P 5005, Dakar-Fann, Senegal
2 IRD - ICR, Université Cheikh Anta Diop - Institut de Recherche pour le Développement, Département Ressources vivantes, and IUCN Species Survival Commission, Route des Pères Maristes, Dakar, Senegal
3 IRD, Institut de Recherche pour le Développement, UMR 211 Bioemco, 5 rue du Carbone, 45072 Orléans cedex 2, France
4 IRD, Institut de Recherche pour le Développement, UMR 211 Bioemco, 5 rue du Carbone, 45072 Orléans cedex 2, France

In recent years wild Chimpanzee populations have declined by more than 66% (Butynski 2001). This decrease is of particular concern for the Western Chimpanzee, including the West African subspecies Pan troglodytes verus Schwarz, 1934. The IUCN 2011 Red Data Book lists P. t. verus as Endangered (A4cd; Humle et al. 2008). It has already disappeared in the wild from Togo, Benin and The Gambia (Campbell & Radley 2006) and is very rare or close to extinction in Burkina Faso, Ghana, Guinea-Bissau and Senegal (Kormos et al. 2003). The survival of the West African Chimpanzee is, therefore, a very high conservation priority. Galat et al. (2000) carried out a large-scale survey (more than 100 villages surveyed) of its distribution area in Senegal, but according to Carter et al. (2003) a systematic survey of the total area of Senegal inhabited by Chimpanzees has yet to be conducted, which partially explains the difficulties encountered in their conservation. At the time the present study was undertaken, between March 1998 and March 1999, it was generally acknowledged that Chimpanzees were only to be found in Niokolo Koba National Park (PNNK) (Larivière & Dupuy 1978). Available scientific information thus dealt with the PNNK Chimpanzee population, for instance in the studies conducted at Mount Assirik by McGrew et al. (1981), Baldwin et al. (1981, 1982), Tutin et al. (1981); McGrew (1983), Tutin et al. (1983), Bermejo et al. (1989), Galat et al. (1994) and Galat-Luong (1995). During our study we discovered a relatively abundant Chimpanzee population outside of the protected area, living within the transitional area between PNNK in Senegal and Badiar Park in Guinea and the southern part of the national hunting reserve, namely Zone of Cynegetic Interest (Ndiaye 1999; Galat et al. 2000; Galat-Luong et al. 1999–2000; Pruett 2002; Pruett et al. 2001, 2002). The most recent data on the population of Chimpanzees living outside the protected area stem from studies focused on diet (Pruet & Kuntsen 2003; Pruett 2006; Bogart & Pruett 2011; Pruett & Lindshield 2012), use of tools (McGrew et al. 2005; Pruett & Bertolani 2007; Bogart & Pruett 2008), behavior in relation to the high temperatures of the savannah habitat (Pruet 2007), drinking water...
filtering (Galat-Luong & Galat 2000; Galat-Luong et al. 2009), nesting behavior (Stewart et al. 2007; Pruetz et al. 2008), intestinal parasites (Howells et al. 2011) and seed reingestion (Bertolani & Pruetz 2011). For the present study we assessed the influence of the season and topography on the distribution of *Pan troglodytes verus* Chimpanzees within their habitat outside of the PNNK, which is not previously reported.

**Material and Methods:**

**Study area:** Our study was conducted in the southeastern region of Senegal, in the Kedougou region (12°33’N & 12°11’W) (Fig. 1), outside the protected areas. A Sudano-Guinean type of climate prevails, as defined by Aubreville (1949), sometimes making way for forests with clear understory. Annual rainfall within the 1995–1998 period ranged from 1000mm to 1600 mm, with a mean annual temperature of around 28.6°C (t\(_{\text{max}}\) = 35.2°C, t\(_{\text{min}}\) = 21.9°C) (Galat et al. 2009). The dry season is from November to April and the rainy season from June to October. During the rainy season, the gallery forests are flooded. The month of May is a transition point between the dry and the rainy season. Certain forest or gallery forest areas located along the course of Gambia River or at the head of the rivers have typical Guinean species such as *Pterocarpus erinaceus, Anogeissus leiocarpus, Parkia biglobosa*, and *Syzygium guineense*, among others. These could well be relics from a time when there was greater forest cover, which in turn was reduced by the contemporary climactic drying trend (Mühlenberg et al. 1990). The gallery forest recession may also be attributed to the high number of bushfires lit during the dry season for clearing by farmers and livestock breeders and for visibility by hunters (hardly any visibility when the grassy vegetation, often over 2m tall, is intact). Throughout the dry season, practically all of the species, except for forest gallery cells that still retain their greenery, lose their leaves (vegetative dormancy). Most of them do not regrow their leaves until right before the first rains.

**Method:** A basic assumption is that a Chimpanzee builds a nest every evening before spending the night in it (Fruth & Hoffmann 1996). Such nests are generally not reused. The nest density within a site is thus useful for indirect measurement of the population density (Fleury-Brugiere & Brugiere 2010). The nest density, together with other criteria such as their age, can also give other indications on the presence or absence of these Chimpanzees.

In a previous study (Galat-Luong et al. 1999–2000), in a 15,000km survey carried out in a vehicle, we first identified Chimpanzee nesting sites in southeastern Senegal. Then in the present study over 80 days between March 1998 and March 1999 we covered Chimpanzee nesting sites on foot for 380km outside of protected areas and sampled data on the season (dry or rainy), location (highlands with 200–300 m of altitude or valleys with less than 30m of altitude) and age (old or recent, e.g., less than two weeks old, with green leaves that indicate their freshness; Papa Ibnou Ndiaye pers. obs.). Data were analyzed statistically by applying chi squared test.

**Results:** From March 1998 to March 1999 we recorded a total of 1,397 nests, 436 of which were recent. The distribution of recent nests in the valleys and highlands according to the season is given in Table
New observations on *Pan troglodytes verus* (Chimpanzee) at Fongoli, Senegal. Total observations: 329.

### Table 1. Distribution of recent nests (with green leaves less than two weeks old) in the highlands and on the valleys according to the season.

<table>
<thead>
<tr>
<th>Distribution of recent nests</th>
<th>Wet season</th>
<th>Dry season</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlands</td>
<td>105</td>
<td>2</td>
<td>107</td>
</tr>
<tr>
<td>Valleys</td>
<td>129</td>
<td>200</td>
<td>329</td>
</tr>
<tr>
<td>Total</td>
<td>234</td>
<td>202</td>
<td>436</td>
</tr>
</tbody>
</table>

1. The statistical analysis of these findings indicated a significant difference between seasons in the type of habitat used (Chi-square = 112.730, df = 1, two-tailed P < 0.0001).

**Discussion:** The analysis of the results in Table 1 show that the frequency of recent nests was higher in the valleys during the dry season, while in the highlands this frequency was much significantly higher during the rainy season. The proportions of recent nests observed in the valleys and the highlands throughout the different seasons of the year showed that, during the dry season, Chimpanzees were more frequently nesting in the gallery forests, likely due to the availability of drinking water, food and the vegetation density, which created a humid microclimate (Papa Ibnou Ndiaye 1999 unpub. obs.). Conversely, flooding of valleys during the rainy season and the diminution of the availability of suitable nesting trees may have prompted the Chimpanzees to move to higher grounds (hills and gallery forests on plateau edges). According to Balcomb et al. (2000), the density of fruit trees and food sources is a determining factor in the distribution of Chimpanzees living in the wild. In Kibale National Park in Uganda, these authors observed an abundance of Chimpanzee nests in areas in which there were concentrations of trees whose fruits constituted a major component of these primates’ diet. For Schoeninger et al. (1999), Savanna Chimpanzees are highly dependent on food from trees, and they feed both in the gallery forest closest to the river and in the dry forest beyond. According to Stanford & O’Malley (2008), 93% of the Chimpanzee nests recorded (N = 3414) in Bwindi National Park (Uganda) were in fruit trees, which is also in line with the observations of Basabose & Yamagiwa (2002) in Kahuzi-Biega National Park (Congo) and of Brownlow et al. (2001) in Budongo forest (Uganda). Hernandez-Aguilar (2006, 2009) noted that availability of foods and water are determining factors for the distribution of the Chimpanzees in Issa, Ugalla. Our study showed that the elevation and liability to flooding can also have an impact on seasonal Chimpanzee distributions.

**Conclusion:** The results of our study showed that *Pan troglodytes verus* Chimpanzees migrate within their habitat. These migrations seem to be determined by the seasons. The habitats where they nested were gallery forests in valleys in the dry season and highlands (hills and plateau edge galleries) in the rainy season. It is therefore essential to preserve these habitats in order to ensure the survival of these Chimpanzees in Senegal - this must be a biodiversity conservation priority. When creating or managing a protected area (e.g. a “Community Heritage Area” by local people) for the purpose of preserving Chimpanzees on the basis of their presence in a gallery forest or on a hillside, it would thus be necessary to preserve both habitats, i.e., lowland forest galleries and the surrounding highlands, along with a migration area to allow them transit between these two habitats. The present results will provide conservation managers with information on how to protect the species and help them to make appropriate management decisions.

**REFERENCES**


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West African Chimpanzees seasonal habitat use


