

Short Communication

A population estimate of the Endangered chimpanzee *Pan troglodytes vellerosus* in a Nigerian montane forest: implications for conservation

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Abstract *Pan troglodytes vellerosus*, the Nigerian-Cameroon chimpanzee, is the most recently recognized chimpanzee subspecies and is categorized as Endangered on the IUCN Red List. Current estimates, based on a range of sources, suggest the total number of individuals to be between 5,000–8,000. This study used a transect survey to estimate the population of *P. t. vellerosus* within the Nigerian submontane forest of Ngel Nyaki Forest Reserve, in Taraba State. The forest is an isolated fragment of c. 7.5 km². Total nest building population size (n = 12.5) and population density (1.67 weaned chimpanzees km⁻²) were estimated from the number of nests observed along line transects. The maximum nest-group size (n = 11) suggests that this population comprises a single community. The low estimated population numbers within Ngel Nyaki forest, compounded by the forest's isolated location, highlight the urgent need for conservation action.

Keywords Forest fragmentation, Ngel Nyaki Forest Reserve, Nigeria, *Pan troglodytes vellerosus*, small population, transect survey.

The Nigerian-Cameroon populations of the chimpanzee *Pan troglodytes vellerosus* were first recognized as a distinct subspecies in 1997 (Gonder *et al.*, 2007). The subspecies is currently categorized as Endangered on the IUCN Red List (IUCN, 2007), with a total population estimated at 5,000–8,000 (Kormos *et al.*, 2003; Sommer *et al.*, 2004; Inskipp, 2005). This subspecies is now restricted to fragmented populations in south and south-west Nigeria (Inskipp, 2005; Greengrass, 2006) and along the Nigeria/Cameroon border, ranging from the Gashaka-Mambilla area (mostly within Gashaka-Gumti National Park; V. Sommers, pers. comm.) south-west to Cross Rivers National Park (Inskipp, 2005; Fowler *et al.*, 2006). *P. t. vellerosus* also occurs in west Cameroon, with populations recorded from Korup National Park (Oates, 1996) and the Mone and Takamanda Forest Reserves (Sunderland-Groves *et al.*, 2003; Forboseh *et al.*, 2007). A recent survey

identified c. 1,000 individuals in the adjoining Ebo and Ndokbou forests, Cameroon (B. Morgan, pers. comm.).

As good conservation practice aims to preserve as much ecological, morphological, behavioural and genetic diversity as possible (Oates, 2006), the conservation of subspecies and populations is important. Estimates of the size of the various populations is therefore crucial. Here we report a census of *P. t. vellerosus* that resides within the 7.5 km² of submontane forest within the 46 km² Ngel Nyaki/Danko Forest Reserve, Taraba State, north-east Nigeria, which is at the western escarpment of the Mambilla Plateau and is geographically part of the Cameroon Highlands (Fig. 1).

The Reserve comprises two forest fragments, Ngel Nyaki (c. 5.3 km²) and the small (c. 2.2 km²) neighbouring Danko forest fragment. The forest is mid altitude to submontane at 1,400–1,600 m elevation, and is the only forest of this size remaining on the Mambilla Plateau. Monthly mean temperature does not exceed 30°C and mean annual rainfall is > 1,780 mm (Bawden & Tuley, 1966; Chapman & Chapman, 2001). In addition to being an Important Bird Area, the Ngel Nyaki Forest Reserve is relatively rich in other fauna, with putty-nosed monkeys *Cercopithecus nictitans* cf. subspecies *martini*, black-and-white colobus *Colobus guereza occidentalis*, mona monkey *Ceropithecus mona*, tantalus monkey *Ceropithecus aethiops* and olive baboon *Papio anubis* (Chapman & Chapman, 2001; Fowler *et al.*, 2006).

Chimpanzee were once common in Ngel Nyaki forest and neighbouring lower forest areas such as River Nwum and Akwaizantar but have drastically declined in numbers since the 1970s (Chapman *et al.*, 2004). From November 2005 to February 2006 we conducted the first assessment of the population density of *P. t. vellerosus* within Ngel Nyaki Forest Reserve using line transects of night nests. From the age of 3 years chimpanzees construct night nests; consequently, line transect surveys of nest densities are a reliable method to assess the population size and distribution of unhabituated chimpanzee populations (Whitesides *et al.*, 1988; Plumtre & Reynolds, 1997; Hall *et al.*, 1998; Johnson *et al.*, 2005).

Eight line transects running east–west were cut through the forest; a global positioning system was used for navigation. Transects varied in length (1–1.8 km), depending on how much forest was available, with a total length of

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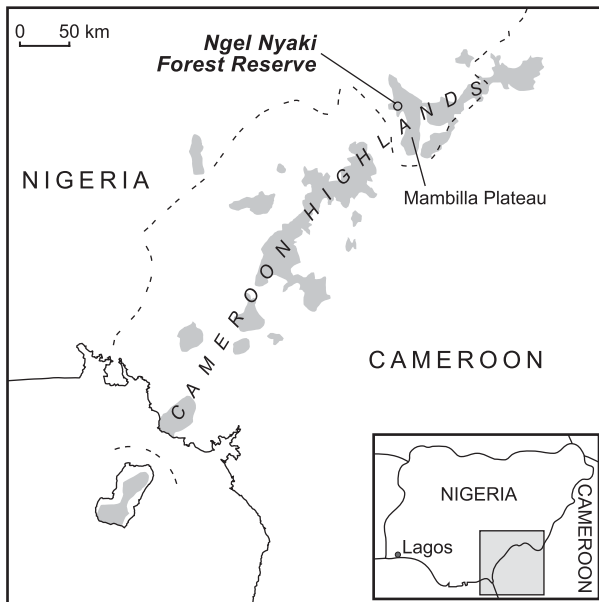


FIG. 1 The Ngel Nyaki/Danko Forest Reserve, on the Mambilla Plateau, Nigeria. Rectangle on the inset shows the location of the main figure in Nigeria (adapted from Borrow & Demey, 2001).

c. 10 km. Each transect was 500 m apart. All transects were walked five times, at 2-week intervals. Each walk consisted of 2–3 people, walking at an even pace (< 1 km per hour) and stopping every 10 m to look in all directions. All nests visible and within 30 m either side of transects were recorded by measuring the exact horizontal distance (to the nearest cm) from directly below the nest to the transect (Plumptre & Reynolds, 1997). Nest-group size was also recorded; nest groups included all nests of the same age within a 50 m radius of the initial nest that was sighted from the transect (Fowler, 2006). The indicator for nest decay was determined by marking a group of 11 newly built nests and monitoring their visibility and decay rates over time, allowing the age of nests on transects to be estimated and assigned a decay class. Day nests were distinguished from night nests by their simpler structure, being generally lower to the ground, and sparsely padded, consisting only of small side twigs (Wrangham *et al.*, 1994; Plumptre *et al.*, 2003; Matthews & Matthews, 2004; Johnson *et al.*, 2005).

Density estimates were calculated using the marked nest count method (*sensu* Plumptre & Reynolds, 1996; Kormos *et al.*, 2003; Plumptre & Cox, 2006). This method requires repeat visits ($n = 5$ in this study), and a sufficient number of transects to achieve a reasonable sample size (Plumptre & Reynolds, 1996; Plumptre *et al.*, 2003). All old nests were marked before the counts started, to avoid the requirement for a density correction factor for nest decay (Tutin *et al.*, 1995; Plumptre, 2000; Kormos *et al.*, 2003; Matthews & Matthews, 2004).

The software *Distance v. 3.5* (Thomas *et al.*, 2005) was used to calculate chimpanzee nest density, combining

individual nest counts from each of the eight transects (Plumptre & Reynolds, 1996). *Distance* uses a detection curve to model the decreasing probability of sighting nests with increasing distance from the line transect (Buckland *et al.*, 1993; Thomas *et al.*, 2002). The Akaike Information Criterion (Buckland *et al.*, 1993) was used to select the best model fitted to the nest site data. To estimate chimpanzee density we divided average nest density by the number of days passed between the first transect walk and the last ($n = 70$ in this study). Inconsistencies in chimpanzee nest-building behaviour, such as nest re-use and multiple nest building (per 24 hours), mean that additional correction factors for the conversion of nest density to chimpanzee density are sometimes used (Plumptre & Reynolds, 1997; Plumptre *et al.*, 2003). However, the frequencies of these two nest-building deviations are variable, sometimes even cancelling each other out (Plumptre *et al.*, 2003); we did not, therefore, attempt to accommodate these.

Overall, average nest density was estimated at 116.56 nests km^{-2} per 70 days (95% confidence limits 57.42–236.59). When corrected for the days elapsed over the study period, the estimated nest density of 1.67 nests km^{-2} per day represents the weaned chimpanzee density within Ngel Nyaki. Considering the 7.5 km^2 size of the forest, we estimated there were only 12.5 nest-building chimpanzees within Ngel Nyaki Forest Reserve. Furthermore, the largest nest-group recorded over the study period contained 11 nests in total. This suggests the total *P. t. vellerosus* population of Ngel Nyaki almost certainly comprises a single interbreeding community of 11–13 adults because there was no evidence of any other group inhabiting other parts of the forest at the time of this survey.

Despite the low total population the density of chimpanzees within Ngel Nyaki forest is relatively high compared to other surveyed populations, which have densities of 0.2–2.0 km^{-2} (Kormos *et al.*, 2003). This may be explained by the small forest area, which is fragmented, thus restricting the range of the chimpanzees. Although chimpanzees are known to inhabit savannah (Baldwin *et al.*, 1981; Wrangham *et al.*, 1994), no chimpanzees or chimpanzee nests were recorded outside the forest boundary at Ngel Nyaki, and the population range seems to be limited to the forest fragments, an important consideration for the conservation of this population. The forest fragments are currently surrounded by heavily grazed and regularly burnt open grasslands and savannah, providing few options for concealment and nesting.

The results of this study emphasize the importance of montane forest for chimpanzees in upland areas of Nigeria. However, the burgeoning human population of Taraba State is placing increased pressure on such forests, which are being replaced with subsistence farming (Chapman *et al.*, 2004; Sommer *et al.*, 2004). The immediate threats to Ngel Nyaki Forest Reserve are overgrazing by Fulani cattle

and the annual burning of grassland and savannah along the forest perimeter (Chapman *et al.*, 2004). Controlled 'early burning' away from the forest edge is helping to prevent fires encroaching into the forest (Chapman & Chapman, 2001; Chapman *et al.*, 2004), and the fencing of areas of grassland close to the Nigerian Montane Forest Project field station is allowing forest to regenerate there. While small compared with the threats, these protective strategies are the beginning of a more concerted conservation effort.

Our estimate of a small remnant population of *P. t. vellerosus* residing within Ngel Nyaki provides a baseline for future surveys. Although it cannot be ascertained from this study whether the chimpanzee population is in decline, their low numbers, combined with the isolated and fragmented nature of the forest, suggests their future is tenuous, and highlights the need for urgent conservation action. To this end, we have provided the findings of this survey to the Nigerian Conservation Foundation and to the Wildlife Conservation Society, who are currently surveying transboundary populations of chimpanzees in the Gashaka-Mambilla area.

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Biographical sketches

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