



Sierra Leone National Chimpanzee Census Programme

Any queries on the content of this document should be emailed to info@tacugama.com

BACKGROUND TO THE CENSUS

Scientifically accurate data on the current population of the Western Chimpanzee *Pan troglodytes verus* in Sierra Leone is lacking. Teleki and Baldwin undertook a nationwide survey in 1981 that estimated the chimpanzee population at 2,000; subsequent field surveys in the 1990's focused more on animal behaviour in known communities.

The overall goal of the project is to establish an accurate understanding of the current abundance and distribution of chimpanzees in Sierra Leone so that appropriate plans for their protection and conservation of their natural habitat can be established. This will be achieved through the delivery of the objectives that include: increased national wildlife research and conservation capacity; collection of vital data; determining the state and availability of suitable habitat; documenting evidence of human impact; identification of potential release sites for existing rehabilitated, captive animals; provision of information leading to a national conservation action plan; contributing to enhanced regional and continental species understanding.

In addition to these objectives, the project has also collected baseline information on the relative abundance and distribution of other mammals across Sierra Leone in order to determine the status and distribution of other important species.

The census fieldwork commenced in January 2009 and completed in May 2010.

CENSUS METHODOLOGY

Pre-survey questionnaires

A tested, one-page questionnaire was distributed to communities across Sierra Leone in October 2008 to identify where chimpanzees are known to be seen. The questionnaire aimed to confirm proper identification of chimpanzees, whether they are seen by community members, and requested a small amount of additional data to confirm dates of most recent sightings, distance from the community and numbers seen.

The questionnaire was delivered through forest guard visits, aiming to reach all 149 chiefdoms within Sierra Leone, with the support of the MAFFS Forestry Division and coordinated through the 13 district forest officers. Five completed questionnaires were targeted for each chiefdom.

A total of 420 questionnaires have been returned from 11 districts covering 86 chiefdoms across Sierra Leone.

Protected area transect survey

For large intact forest areas, standard line transect methods were used to count chimpanzee nests and other animal signs. Line transects of 2 km length were placed systematically across survey areas using a random start point.

Methods for data collection on line transects follow the “Best Practice Guidelines for Surveys and Monitoring of Great Ape Populations” (Kühl et al., 2008) and DISTANCE sampling techniques (Buckland et al. 2001). Straight-line transects were used to count chimpanzee nests and other animal signs. Density estimates for chimpanzee nests were determined from the standing crop nest count. Chimpanzee abundance was calculated from nest density by incorporating estimates of nest production and decay rate. For other animal signs, a relative abundance was obtained from the encounter rate (signs km^{-1}).

Teams walked along transects following a compass bearing in a straight line at a speed of 0.5-1 km hr^{-1} . Field teams consisted of four people, including two observers, one compass bearer and one local guide. One of the observers focused on the ground, looking for signs such as dung and feeding remains. The other observer focused on looking up for chimpanzee nests. Using two such dedicated observers reduced the chance that signs were missed. All observations were recorded and the coordinates marked using a Garmin GPSmap 60CSx.

On each transect, the following variables were recorded.

Chimpanzee Sign: Nest number, perpendicular distance to each nest, and age were recorded; assignment of nest age categories followed Tutin & Fernandez (1984). Additionally, other direct and indirect signs were recorded: visual sightings, feeding remains, dung, and vocalizations.

Other Mammals: Data was collected on direct and indirect signs of mammal species including duikers, monkeys, forest buffalos, etc.

Human Sign: Including signs of power-saw logging, hunting (hunters, snares, hunting camps, gun shells), human trails and farms.

Vegetation Type: Distance was marked at each point that the vegetation changed along the transect so that the percentage of each vegetation type could be estimated from the total distance.

Reconnaissance surveys

Opportunistic data was collected on animal sightings and signs of human activity while moving between transects. Depending on the terrain and the time available, the rigor with which this data was collected is variable. This therefore represents a minimum record of number of observations.

Block survey design for non-protected areas

Based on information from pilot interview studies in Sierra Leone and a transect survey in neighbouring Guinea, it was decided that randomly placed transects alone would have been unlikely to obtain enough observations of chimpanzee nests to produce a reliable abundance estimate for the whole country. Stratification by vegetation was not a valid option because chimpanzees seemed to occur in all vegetation types. Interview data alone would provide valuable information about chimpanzee distribution, but cannot be used to obtain chimpanzee abundances. Therefore a new technique has been piloted in Sierra Leone that uses a combination of interview and transect surveys to gather both qualitative and quantitative information on the abundance and distribution of

chimpanzees and other animals. This combination has allowed the transect effort to be targeted to increase sampling efficiency (reduce number of empty transects). It also allowed us to determine community attitudes towards chimpanzees, identify biodiversity threats and conservation opportunities, and determine the factors related to chimpanzee and other mammal densities.

The technique used interview data to pre-stratify a sample area into high and low probability of detecting chimpanzees. These data will provide an estimate of what proportion of the country can be considered high density and low density for chimpanzees. Transects carried out in each of these areas will give the average chimpanzee density in both high density and low density areas and allow a population estimate for the whole country. To this end, the sampling area to be pre-stratified with interview information was chosen as 9 x 9 km grid squares (blocks). Sierra Leone was thus divided into 9 x 9 km blocks and every 9th block was selected for detailed sampling giving 100 blocks across the country. Each selected block was divided into nine 3 x 3 km squares which were to be assigned individually as low or high density squares using interview criteria described below.

Interviews

Interview questions were directed at determining whether there were chimpanzee communities with their home ranges near the villages or within specific 3 x 3 km squares within the block. This information was gathered by asking if people knew of chimpanzee nest sites in the target area, how frequently chimpanzees had been seen or heard in the last 3-4 months, how many chimpanzees were seen in a group at any given time, and how often chimpanzees raided crops or fruit trees near the community. This data was collected for each square and used to score each square as having a low or high probability of finding nests. Two straight-line transects were located in each block, one in a high-density square and one in a low-density square.

Cell density was assigned by the following criteria:

Rules for assigning cell density

- 1) Do people know of chimpanzee nests in the target area? A yes answer meant that the square was automatically assigned as high density. If a negative answer was given, then the following three questions were used to derive a score for the square:
- 2) How often have chimps been seen or heard in the square in the last 3-4 months?
- 3) How often have chimps eaten crops or fruit trees in the square in the last 3-4 months?
- 4) What is the largest number seen at any one time in the last 3-4 months?

Question	Answer	Score
How often seen or heard?	Never	0
	1-2 times	1
	3 or more times	2
How often have chimps raided crops?	Never	0
	1-2 times	1
	3 or more times	2
What is largest number seen?	None	0
	1-3	1
	>3	2

A total score of 0-3 meant the square was assigned as a low density square. A score of 4-6 meant the square was assigned as a high density square. If there were no villages in or near the square where we could obtain information, then the density of adjacent squares was used to assign square density. If there were two adjacent squares with different assigned densities, then the score from the square with more similar vegetation type was used. If there were no adjacent squares with information, then cell density was taken from the nearest known square with the same vegetation. Landsat satellite images were used to determine vegetation types within each block.

In addition to gathering information about chimpanzees around the community, further questions were targeted at determining people's attitudes towards wildlife and existing conflicts with wildlife. We also gathered any anecdotal evidence relating to hunting or farming practices, perceived causes of chimpanzee decline, and information about other animals.

Map of Sierra Leone showing the division of the country into 9 x 9 km grid blocks. Selected blocks to be surveyed by a combination of interview and transect methods are shown as dark grey squares. The protected areas shown in green were surveyed separately using systematic line transects with a random start point.

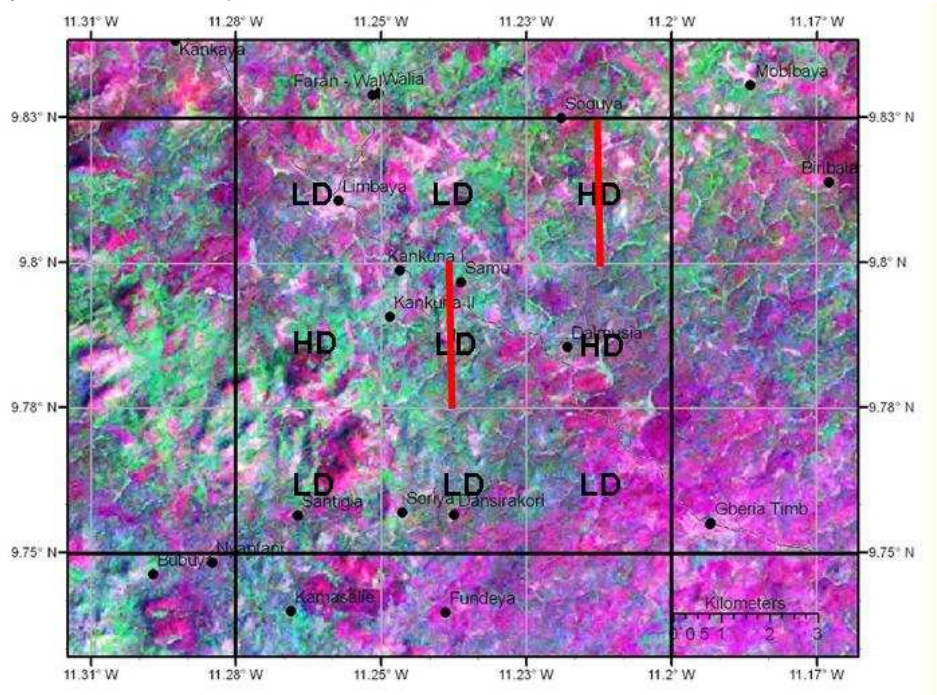


Block transect placement

A 3-km transect was always walked in the center square whether high or low density. If the center square was classified as high density, a second transect of 1.5 km was walked in a low-density square chosen at random from all the low-density squares in the block. If the center square was low density, a second transect of 3 km was walked in a high-density square chosen at random within the block. If the block was all high or all low density, then a 3 km transect was walked in the center square, and a 1.5 km transect

was walked in another square chosen at random. All transects were laid on a north-south bearing with the center of the square used as midpoint of the transect.

Map of Block 1 showing classification of each square in the block as High or Low Density and the placement of transects within the block. Each transect in this example is 3 km long because the center square is low density.



Analysis

Analysis of the chimpanzee nest data was done using Distance 5.0 software (Thomas et al. 2006).

Chimpanzee densities were calculated using the formula:

$$\text{Chimpanzees km}^{-2} = \frac{\text{No. nests km}^{-2}}{\text{mean nest duration} * \text{nest construction rate} * \text{proportion of weaned individuals}}$$

Nest duration

Due to the range of habitats across Sierra Leone, nest decay rates were calculated separately for those nests found in forests, woodland savanna, and oil palm trees. Nest duration in palm trees was measured with a range of 187-247 days. Pending final measurements for woodland savanna in Sierra Leone, a maximum nest duration was taken from woodland savanna in Guinea which estimated nest duration at 220 days (Ham 1997). Also pending measurements underway for forest in Sierra Leone, a conservative nest duration of 130 days was used based on preliminary studies in the Loma Mountains (A. Kortenhoven unpublished data).

Nest production rate

Chimpanzees usually build one sleeping nest every evening and abandon it the next morning. However, occasionally a day nest is built. Nest production rates must be calculated from observations of habituated chimpanzee communities. There is no such data available for Sierra Leone, but estimates are available from other African countries. Nest production rate has been estimated for Budongo forest, Uganda at 1.23 nests each day (Plumptre and Reynolds, 1997) and in Goulougo Triangle, Congo at 1.09

nests per day (SE = 0.05) (Sanz, 2004). Nest construction at Tai National Park in Côte d'Ivoire was 1.143 (SE 0.04) (Kouakou et al. 2009). For this study a rate of 1.143 nests per day was used.

Proportion of nest builders

In wild chimpanzee communities, it is usually only weaned individuals above approximately 4 years of age that build nests. The proportion of weaned individuals observed in habituated communities in Uganda range between 0.80 - 0.85 (Plumptre and Cox, 1996). One group of wild chimpanzees was observed in February/March 2010 in the Western Area Peninsula Forest Reserve (WAPFR) with camera traps and consists of 15 individuals, 12 of which are estimated to be old enough to build nests. This gives a proportion of 0.8, consistent with the Ugandan data. A proportion of 0.83 was used for this study.

Abundance calculations

Chimpanzee population estimates were made separately for forest reserves, Outamba-Kilimi National Park (woodland savanna habitat), and the rest of the country outside of protected areas. The total number of chimps outside of protected areas was calculated as the sum of chimpanzee numbers in high and low density areas. These were calculated from:

Number of chimps in high-density areas = HD chimp density x Proportion of HD squares x total non-protected area of SL

Number of chimps in low-density areas = LD chimp density x Proportion of LD squares x total non-protected area of SL

References

- Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, L. Thomas, 2001. *Introduction to distance sampling: estimating abundance of biological populations*. Oxford University Press, Oxford, UK.
- Ham, R. 1997. Nationwide chimpanzee census and large mammal survey, Republic of Guinea, unpublished report.
- Kouakou, C.Y., C. Boesch, H. Kühl, 2009. Estimating Chimpanzee Population Size with Nest Counts: Validating Methods in Tai National Park, *American Journal of Primatology* 71:447-457.
- Kühl, H., F. Maisels, M. Ancrenaz, and E.A. Williamson, 2008. Best Practice Guidelines for Surveys and Monitoring of Great Ape Populations, *Occasional Paper of the IUCN Species Survival Commission No. 36*, IUCN.
- Plumptre, A.J. and D. Cox, 2006. Counting primates for conservation: primate surveys in Uganda. *Primates* 47:65-73.
- Plumptre, A.J. and V. Reynolds, 1997. Nesting behavior of chimpanzees: Implications for censuses. *International Journal of Primatology*, 18(4) 475-485.
- Sanz, C., 2004. *Behavioral ecology of chimpanzees in a central African forest: Pan troglodytes troglodytes in the Goulougo Triangle, Republic of Congo*. PhD. Washington University, Saint Louis.
- Teleki, G. and L. Baldwin, 1981. Sierra Leone's Wildlife Legacy: Options for survival. *Zoonooz* 54(10): 21-27.
- Thomas, L., Laake, J.L., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Hedley, S.L., Pollard, J.H., Bishop, J.R.B. and Marques, T.A., 2006. Distance 5.0. Release 2. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. <http://www.ruwpa.st-and.ac.uk/distance>.