

Correspondences

Alarming decline of West African chimpanzees in Côte d'Ivoire

Geneviève Campbell^{1,*} Hjalmar Kuehl¹, Paul N'Goran Kouamé^{1,2,3,4} and Christophe Boesch^{1,2}

Côte d'Ivoire is thought to be one of the final strongholds of the endangered West African chimpanzee (*Pan troglodytes verus*). In a recent assessment of their conservation status, Côte d'Ivoire was estimated to support between 8,000 and 12,000 individuals, accounting for almost half of the remaining world population [1]; however, this estimate was based primarily on a nationwide chimpanzee survey that was conducted in 1989–1990 [2]. Since then, information on chimpanzee abundance and distribution within this region has been sparse. To update the status of chimpanzees in Côte d'Ivoire and evaluate their population trend, we repeated the 1989–1990 survey. Our results show that there has been an alarming decline in chimpanzee numbers, and that urgent action

is required to prevent them from disappearing entirely.

We conducted standing crop nest surveys from July to December 2007 along a total of 150 km of transects distributed amongst 11 sites (Figure 1; see also Supplemental Data available on-line with this issue). We observed a 90% (CI = 68–99%; Supplemental Data) decline in the total nest encounter rate over the 17 year period between the two surveys (Wilcoxon Exact test, $T+ = 66$, $N = 11$, $P = 0.001$; Figure 2). There was a significant decrease in the number of chimpanzee nests in all but three of the 11 sites surveyed (Figure 2; Supplemental Data). Two of these sites had already a negligible number of nests recorded during the first survey, while the third site, Taï National Park (Taï NP), has been an area that has benefited from intensive research and conservation efforts. Similarly, at all sites surveyed we recorded few feeding signs or vocalizations of chimpanzees or, for that matter, any other mammals.

This catastrophic decline is most likely explained by a 50% human population increase that has occurred in Côte d'Ivoire since the last survey was conducted (the estimated human population increased from approximately 12 million in 1990 to about 18 million people today; data from the International Data Base, U.S. Census Bureau). Increases in human density are generally associated with

greater poaching pressure and a higher deforestation rate [3]. Furthermore, civil unrest in the country since 2002 may have exacerbated these threats, especially inside protected areas. For example, we measured a 93% reduction in forest cover between 2002 and 2008 for Marahoué National Park (Marahoué NP; see Supplemental Figure S1).

The pressing need to base conservation policy on up-to-date data is underlined by the situation in Côte d'Ivoire. For instance, Marahoué NP is listed as a priority site with an estimated population of 900 chimpanzees (information from the Woods Hole Research Center's website http://www.whrc.org/africa/prioritypops/images/pan_troglodytes_verus.gif); however, our 2007 survey of 167.5 km of transects distributed throughout the park yielded a conservative population estimate of fewer than 50 individuals (unpublished data). Even in Taï NP, thought to represent one of the main refuges for chimpanzees within Côte d'Ivoire, our 2006–2007 survey along 362 km of transects revealed that only about 480 individuals survive, a tenth of the assumed population size [4].

Unfortunately, a similar scenario could apply to other countries within the western chimpanzee range, but we lack recent data to assess this. The largest remaining western chimpanzee population is assumed to be in Guinea

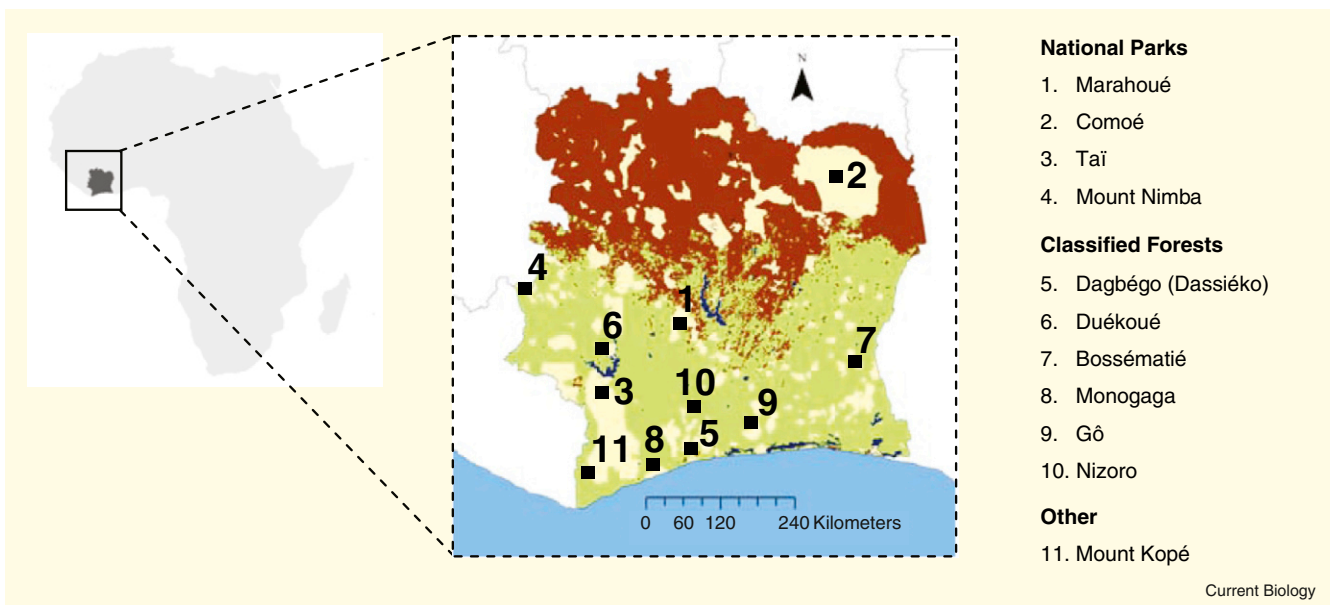


Figure 1. Map of sites surveyed.

The forest belt is represented in green, savanna-woodland in brown, and all protected areas in yellow.

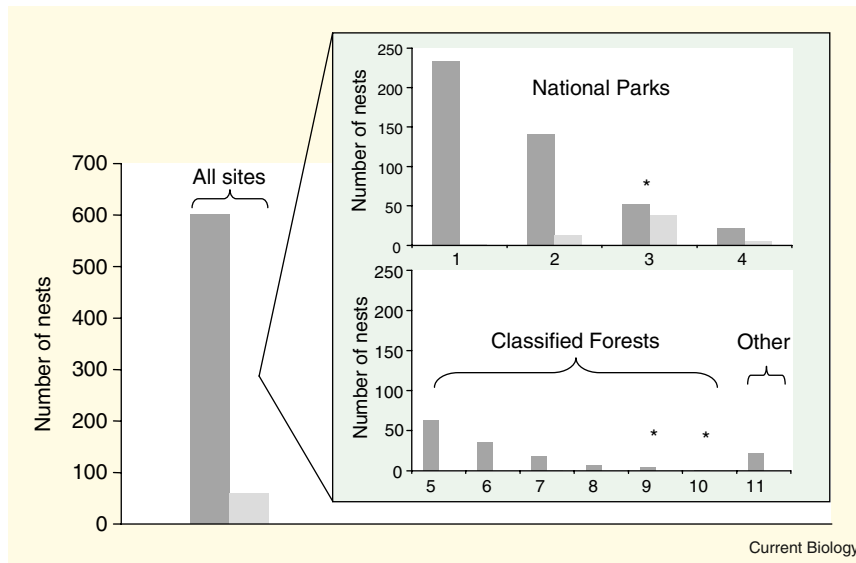


Figure 2. Comparison in number of chimpanzee sleeping nests found during both surveys. Number of chimpanzee sleeping nests found in the 1989–1990 survey (dark grey) compared to the number found during this study (light grey). Numbers on the x axis correspond to study sites, following the legend in Figure 1. The star symbol indicates the sites for which the decrease was not significant according to the binomial test.

but, as with Côte d'Ivoire, estimates of chimpanzee abundance are based on survey data collected more than a decade ago [5]. There is an urgent need to locate the remaining viable chimpanzee populations and implement long-term monitoring activities for their conservation. The IUCN/SSC A.P.E.S. (Ape Populations, Environments and Surveys) database (<http://apes.eva.mpg.de>) seeks to centralize all existing and future ape survey data to ensure that ape distribution and abundance are accurately monitored [6]. We encourage people to contribute data to this database so as to construct an accurate global picture of ape distribution and enable the identification of sampling gaps.

These striking results from Côte d'Ivoire illustrate the pressing need to intensify close surveillance of the rapidly declining animal populations. Only then can we quickly evaluate the efficacy of conservation actions and respond accordingly to prevent local extinction. Urgent measures must be taken to protect them from complete extermination.

Supplemental Data

Supplemental data are available at <http://www.current-biology.com/cgi/content/full/18/19/R903/DC1>

Acknowledgments

We would like to thank the “Ministère de l'enseignement supérieur et de la recherche

scientifique”, the SODEFOR (Société de Développement des Forêts) and the OIPR (Office Ivoirien des Parcs et Réserves) for granting permission to conduct research in Côte d'Ivoire and its protected areas. Many thanks to Denis Lia and Grégoire Nohon for their enthusiasm and invaluable help during surveys. We gratefully acknowledge the aid and support of Ilka Herbinger from the Wild Chimpanzee Foundation in Abidjan.

References

1. Kormos, R., Boesch, C., Bakarr, M.I., and Butynski, T.M. (2003). West African Chimpanzees: Status Survey and Conservation Action Plan (Gland: IUCN - World Conservation Union).
2. Marchesi, P., Marchesi, N., Fruth, B., and Boesch, C. (1995). Census and distribution of chimpanzees in Côte d'Ivoire. *Primates* 36, 591–607.
3. Harcourt, A.H., and Parks, S.A. (2003). Threatened primates experience high human densities: adding an index of threat to the IUCN Red List criteria. *Biol. Cons.* 109, 137–149.
4. N'Goran, P. (2007). Etat du parc national de Taï: Rapport de résultats de biomonitoring (Côte d'Ivoire: Unpublished report for the Wild Chimpanzee Foundation).
5. Ham, R. (1997). Nationwide chimpanzee survey and large mammal survey, Republic of Guinea (Guinea-Conakry: Unpublished report for the European Commission).
6. Kuehl, H., Williamson, L., Sanz, C., Morgan, D., and Boesch, C. (2007). Launch of the A.P.E.S. database. *Gorilla J.* 34, 20–21.

¹Department of Primatology, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, Leipzig 04103, Germany. ²Wild Chimpanzee Foundation, Germany and Côte d'Ivoire. ³UFR Sciences de la nature, Université d'Abobo-Adjamé, Abidjan, Côte d'Ivoire. ⁴Centre Suisse de Recherches Scientifiques, Abidjan, Côte d'Ivoire. *E-mail: genevieve.campbell@eva.mpg.de

Interactions between contrast and spatial displacement in visual motion processing

Aaron R. Seitz^{1,2}, Praveen K. Pilly³ and Christopher C. Pack⁴

The scaling of behavioral performance and neuronal responses with visual luminance contrast is one of the most basic and well-accepted aspects of visual processing [1,2]. This relationship between contrast and visual perception can be experienced informally (for example, by driving in fog), and numerous studies have confirmed that many visual skills are impaired under low-contrast conditions. A number of studies, however, have found a more complex interaction between contrast and visual processing. For single neurons, the spatiotemporal structure of visual receptive fields is different under conditions of low and high contrast [3–9], and psychophysical experiments have revealed counterintuitive cases where low-contrast conditions change the content [10] and even improve the accuracy [11] of visual perception. We have evaluated human subjects' ability to estimate the direction of moving dot fields presented at high or low contrast and compared these results to neural responses recorded from cortical area MT of alert macaque monkeys. The results reported here show that motion stimuli involving small spatial displacements yield better visual performance at lower contrast, and that this improvement is mirrored in the activity of MT neurons. These data link responses in area MT with behavioral performance and demonstrate that brighter is not always better for motion processing.

We first tested our subjects (N = 8) on their ability to estimate the motion direction of random dot fields presented at high (119 cd/m²) or low (12.7 cd/m²) luminance on a dark background (4.5 cd/m²), while varying the amount of displacement undergone by the stimulus dots