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Chad: A stronghold for the endangered Kordofan giraffe

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Introduction

Comprehensive molecular deoxyribonucleic acid (DNA) analysis (Bertola et al. 2024; Coimbra et al. 2021, 2022, 2023; Fennessy et al. 2016; Winter, Fennessy & Janke 2018), supported by skull morphology analysis (Kargopoulos et al. 2024), shows four distinct species of giraffe (*Giraffa* spp.) and seven subspecies (Muneza et al. 2025). The Kordofan giraffe (*Giraffa camelopardalis antiquorum*), a subspecies of the northern giraffe (*G. camelopardalis*), was widely distributed across central and southern Chad before the 20th century (UNEP 2004). A population of 5000–6000 was estimated across Chad and the neighbouring Central African Republic in the late 1950s to early 1960s (Blancou 1958, 1963). Anecdotal records indicate that giraffe were locally extirpated from substantial parts of their former range by uncontrolled, illegal hunting and the anthropogenic effects of drought (East 1999). While their numbers were assumed to have increased in southeastern Chad by the late 1960s (Happold 1969), the Chadian civil war reversed this positive trend by the 1980s, severely impacting wildlife populations and their conservation. Published data on the occurrence and distribution of the Kordofan giraffe remain limited. With an estimated population decline of 90% from the 1980s to the 2010s, the subspecies was listed as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List in 2018 (Fennessy & Marais 2018). However, by 2020, the population had reportedly increased to an estimated 1325 individuals (Brown et al. 2021).

Chad is now considered a conservation stronghold for the Kordofan giraffe with an increasing population, despite a recent reduction in its historical range (Brown et al. 2021; O'Connor et al. 2019). Here, we collate and describe the most up-to-date data on the Kordofan giraffe population in the country, with a special note on new, recent discoveries. To account for differences in methodology and the difficulty in counting giraffe from the air, an upper and lower limit for each estimate is calculated based on the survey method (if not provided in the source material), following best practice as described in Marneweck et al. (2025). Specifically, for aerial total counts, we used an upper estimate corrected by 1.6 (Lamprey et al. 2020). For guesstimates, we used an upper and lower estimate of ± 1.5. This range allows us to gain a better understanding of the quality and reliability of the estimate. For more details, please see Marneweck et al. (2025). All figures were created in R v4.5.1 using packages tidyverse (Wickham et al. 2019), sf (Pebesma 2018), and rnaturalearth (Massicotte & South 2025).

Zakouma National Park

Officially declared a National Park (NP) in 1963, the first aerial survey of the 3000 km^2 Zakouma NP (Figure 1) was conducted in 1986 and estimated 300 Kordofan giraffe (Bousquet 1986). The 1990s saw a stable population, estimated at 890 in 1991 (Bousquet 1991), 800 in 1995 (Dejace, Gauthier & Bouche 2000), 830 in 1999 (East 1999) and 942 in 2002 (Mackie 2002).

Fluctuating reports in the early 2000s are because of differing methodologies associated with difficulty in counting giraffe from above, typically resulting in underestimates (Lee & Bond 2016). From the more reliable methods (aerial total counts), 154 individuals were counted in 2000 (Planton 2000), 292 in 2005 (Fay et al. 2005) and 383 in 2006 (Fay et al. 2006). The 2008 estimate of 1409 provided by Poilecot (2008) was very likely overestimated, as noted by the author, and not included in our overall trend (Figure 2).

In partnership with the government and local communities, African Parks, a non-governmental international conservation organisation, has managed Zakouma NP since 2010. This collaboration has resulted in more regular and consistent surveys, showing a steadily increasing Kordofan

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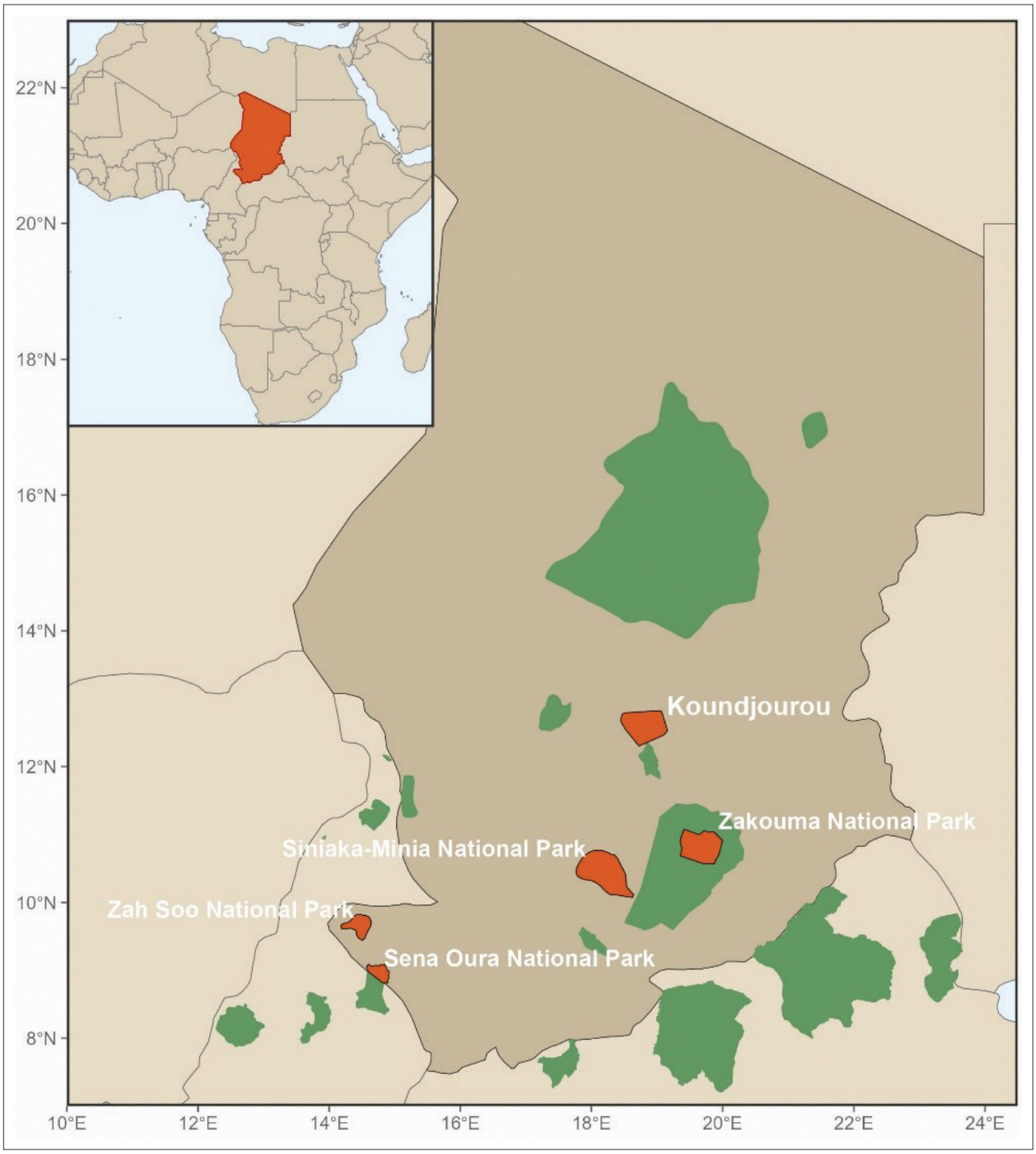

FIGURE 1: Map of Chad's five main conservation areas with confirmed Kordofan giraffe presence (orange) and the World Database of Protected Areas highlighted in green.

giraffe population. African Parks' aerial surveys have provided a consistent methodology from which we can observe a positive population trend. From aerial total counts, 612 Kordofan giraffe were counted in 2009 (Potgieter et al. 2009), 572 in 2010 (Potgieter et al. 2010), 753 in 2011 (Potgieter et al. 2011) and 703 in 2012 (Potgieter et al. 2012). At the same time, Potgieter et al. (2012) estimated that, more realistically, the population numbered 800–1000 individuals. The Kordofan giraffe population continued to increase, with 934 individuals counted in 2014, mostly occurring in the eastern half of the park (Antonínová et al. 2014), 947 in 2016 (Potgieter et al. 2016), 1233 in 2018 (Potgieter et al. 2018) and 1546 in 2021 (Fraticelli et al. 2021). The latest estimate is 1380 individuals in 2024 (781–1979; Bussière et al. [2024]). Additionally, approximately 103 Kordofan giraffe persist in the Greater Zakouma wildlife corridors surrounding Zakouma NP to the north and west (Bussière et al. 2024; Potgieter et al. 2019).

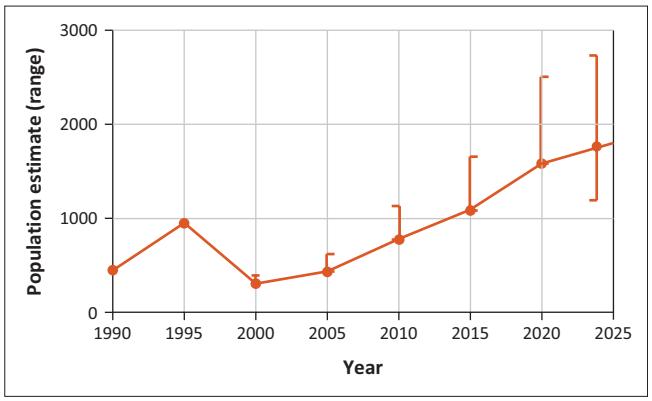

FIGURE 2: Summary of the Kordofan giraffe abundance in Chad since ~1990.

The Kordofan giraffe population in Zakouma NP has markedly increased over the past 20 years under the collaborative management of African Parks with the Chadian government, making Zakouma NP the flagship area for Kordofan giraffe. To further support their conservation, African Parks and the Giraffe Conservation Foundation (GCF) GPS-tagged 36 Kordofan giraffe in Zakouma NP between 2019 and 2025 to better understand their movements within and outside of the park boundaries.

Siniaka-Minia National Park

Originally designated as a reserve in 1965, the Chad government signed a partnership agreement with African Parks to manage the 4643 km^2 Siniaka-Minia NP (Figure 1) in 2017, following the successful collaborative management partnership of Zakouma NP. Siniaka-Minia NP, Zakouma NP, Bahr Salamat Faunal Reserve (FR) and adjoining wildlife corridors collectively represent the 28 162 km^2 Greater Zakouma Ecosystem (GZE).

There are records of a small population of Kordofan giraffe in the Siniaka-Minia NP, and a study of GPS-tagged giraffe demonstrates seasonal movements to and from Zakouma NP, which could indicate connectivity between these populations (Clark et al. 2023). In 2018, 12 Kordofan giraffe were counted (Fennessy & Marais 2018), 158 (19–328) were estimated in 2019 (Potgieter et al. 2019), 29 were counted in 2022 (Dias 2022) and 16 were counted in 2023 (Dias 2023). In 2024, an aerial survey estimated that there were 115 (13–318) Kordofan giraffe in Siniaka-Minia NP (Bussière et al. 2024).

In 2025, African Parks and GCF GPS-tagged five Kordofan giraffe in Siniaka-Minia NP to better understand their movements within and outside the park boundaries to assist their long-term conservation, monitoring and management.

Bahr Salamat Faunal Reserve

While Bahr Salamar FR is part of the GZE, a recent survey found no Kordofan giraffe here (Bussiere et al. 2024). However, their historical presence was noted as a non-resident species in the 1980s (Brugière & Scholte 2013). Considering that Kordofan giraffe move seasonally between Zakouma NP and the wider Bahr Salamat FR (Clark et al. 2023), the Bahr Salamat FR could remain a viable habitat for supporting Kordofan giraffe in the future.

Koundjourou

Wings for Conservation, Wild Africa Conservation, and GCF recently identified a previously unreported Kordofan giraffe population in the Koundjourou area (Figure 1) of central Chad (Rabeil et al. 2023a). In this communal area of conservation importance, a 2022 aerial survey counted 34 individuals, marking the first official record of Kordofan giraffe in the area (Rabeil & Dias 2022). A follow-up survey in 2023 counted 51 Kordofan giraffe (Rabeil et al. 2023b). Currently, the Koundjourou area and its wildlife have no formal protection, and their future is precarious. As the northernmost Kordofan giraffe population, we hope that the Chadian government takes note of the importance of protecting this habitat and considers the necessary conservation and management actions in light of the recently developed 'Stratégie nationale de conservation de la girafe (*Giraffa camelopardalis antiquorum*) au Tchad 2024–2034' (République du Tchad 2024).

Zah Soo National Park

Located in the country's southwest close to Cameroon, Zah Soo NP (815 km^2; Figure 1) was gazetted in 2022 and, together with the Binder-Léré FR (900 km^2; 1974), represents the Binder-Léré Protected Area Complex. In 2021, Noé, a French non-governmental conservation organisation, signed a partnership with the Chadian government for the management of the Binder-Léré Protected Area Complex (Noé 2021). Few records of the Kordofan giraffe exist in the region. In 2014, six individuals were counted in Binder-Léré FR, and < 10 individuals were noted in 2018 (Fennessy & Marais 2018). In 2020, a few individuals were observed in the region, but the exact number was not reported. It is likely that these Kordofan giraffe are not resident year-round and inhabit the southwest of the park, which abuts community land (R. Harvey, pers. comm.). A 2024 aerial survey of Zah Soo NP counted three Kordofan giraffe (Padeuh et al. 2024), confirming their continued presence in the protected area complex.

In 2025, Noé and GCF GPS-tagged one giraffe in Zah Soo NP to better understand Kordofan giraff movements within and outside the park boundaries and to assist their long-term conservation, monitoring and management.

Sena Oura National Park

Gazetted in 2009, the Sena Oura NP (798 km^2; Figure 1) and the Bouba N'djida NP in Cameroon form part of a 6500 km^2 transboundary Sena Oura-Bouba N'djidda (BSB Yamoussa) Binational Complex. Currently, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and European Union provides targeted conservation management support for the park. In 2008, before the official gazetting of the park, a survey estimated a minimum of 64 Kordofan giraffe

(Prodalka 2008). In subsequent years, no giraffe were observed during aerial surveys in 2015 (Elkan et al. 2015) and 2018 (J. De Winter pers. comm.). In 2019, 4 individuals were observed and 18 in 2022 (J. De Winter, pers. comm.). Most recently, a video taken by the Warden of Sena Oura NP in May 2023 confirmed that the Kordofan giraffe still exist in the park, but most likely in low numbers (M. Chaïbo, pers. comm.). The exact number is unknown, but we estimate fewer than 10 individuals based on field team observations.

Importantly, as Kordofan giraffe are transboundary in the in the BSB Yamoussa Binational Complex (consisting of Bouba-Ndjidda in Cameroon and Sena Oura in Chad), it is likely that some individuals move between the two countries. A Wildlife Conservation Society 2018 report of the Cameroonian section of the BSB Yamoussa estimated 160 individuals, yet there was no specific mention of their proximity to Sena Ouara NP or their occurrence in Chad (J. De Winter pers. comm.). This report, along with the recent recovery of other species, such as the lion (Panthera leo) (Kuta 2023) in Sena Ouara NP, highlights the potential of this area for recovery and sustaining future viable populations of Kordofan giraffe.

Chari Baguirimi

In 2014, two Kordofan giraffe were observed in Chari Baguirimi in southwest Chad (M. Antonínová pers. comm.). However, no further information is available for this area, and we assume that no giraffe remain here.

Discussion

The latest and best available estimate (2025) of the Kordofan giraffe population in Chad is 1,657 (1,050 – 2,679; Figure 2), which represents approximately 70% of the entire wild Kordofan giraffe population, and 24% of the Northern giraffe species population (Marneweck et al. 2025). Zakouma NP is home to over 80% of the country's Kordofan giraffe population and therefore the primary stronghold for giraffe in Chad. While Chad reportedly had a 'severely depleted overall status of wildlife' in 1999 with declining wildlife population trends (East 1999), recent surveys indicate a slow, yet steady recovery. Several small Kordofan giraffe subpopulations exist throughout the country, including in the southwest BSB Yamoussa transboundary area, Zah Soo NP and the newly recorded population in the Koundjourou area. While their complete range and detailed numbers remain unknown, these additional observations show a positive trend and highlight the need for continued and extended surveys throughout the Kordofan giraffe's former range in Chad.

There is increasing interest in giraffe conservation in the country, which is highlighted by the recent development of the first-ever National Giraffe Conservation Action Plan (République du Tchad 2024). This document and its subsequent implementation are critical steps in securing the long-term success of Kordofan giraffe populations.

Chad is crucial to preserving some of the last remaining populations of large mammals that once thrived across West-Central Africa (Brugière & Scholte 2013). However, the scenario of a single significant population (such as the Kordofan giraffe in Zakouma NP) is risky because it makes this Critically Endangered taxon vulnerable to stochastic or catastrophic events (Kaczensky et al. 2011). Brugière and Scholte (2013) reported that Zakouma NP had a high biodiversity irreplaceability index, further highlighting its conservation significance. We encourage continued conservation efforts in the GZE.

While Zakouma NP remains the core of Kordofan giraffe conservation, long-term success for the subspecies will depend on expanding protection efforts and reducing insecurity across their historical range. Ensuring protection of the corridor areas within the GZE will be key to providing safe routes for giraffe population expansion. This is particularly important given the seasonal inundation of Zakouma NP with water, subsequently reducing the availability and accessibility of food. Considering the location of the current sub-populations, we strongly encourage conservation efforts in the corridor areas between the NPs to allow for potential transboundary movement. Specifically, in the GZE between Zakouma and Siniaka-Minia NPs, and the southwest, Zah Soo and Sena Oura NPs westward towards the greater transboundary Faro landscape (Faro-Bénoué-Bouba N'djida) in Cameroon.

Conclusion

Strengthening conservation initiatives in Chad's key habitats will also be crucial to ensuring a resilient and growing population. The recent momentum in Kordofan giraffe conservation in Chad offers a rare and valuable opportunity. Further, the perception of giraffe in the country is very positive, cited as a favourite species among many local communities (République du Tchad 2021). By capitalising on this progress and fostering collaboration at regional and international levels, we can help secure a thriving critically endangered Kordofan giraffe population across their current and future (possibly historical) range. As a stronghold for Kordofan giraffe on the continent, the success of their conservation in Chad and, more generally, in Central Africa should be highlighted and celebrated – as well as supported in the long term.

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Competing interests

The author reported that they received funding from GCF supporters, which may be affected by the research reported in the enclosed publication. The author has disclosed those

interests fully and has implemented an approved plan for managing any potential conflicts arising from their involvement. The terms of these funding arrangements have been reviewed and approved by the affiliated university in accordance with its policy on objectivity in research.

Authors' contributions

J.F. conceptualised the manuscript, and C.J.M. led the investigation and data curation. C.J.M., M.B.B., S.F., A.G., A.M., T.R., and J.F. contributed to data curation and to the writing and editing of the article.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

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Data availability

All data pertaining to the Kordofan giraffe population counts and estimates are hosted by the Giraffe Conservation Foundation in the Giraffe Africa Database (GAD), and summaries are available upon request from the corresponding author C.J.M.

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