RESEARCH ARTICLE

The status of giraffe in South Africa: The importance of private land for conservation

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Giraffe (*Giraffa* spp.) populations are naturally distributed across 21 African countries but have declined by approximately 30% over three and a half decades, from 150 000 to 117 000 individuals, due to a variety of anthropogenic threats. Of the four species of giraffe, the southern giraffe (*Giraffa giraffa*) has the largest known population with the highest abundance found in the range state of South Africa. A population assessment in 2019 estimated 21 053–26 919 individuals. However, these estimates were extrapolated from a small data set and lacked data from private properties in the Eastern and Western Cape, Free State and KwaZulu-Natal. To provide updated abundance estimates and range for southern giraffe in South Africa, we conducted a country-wide population survey using multiple data sources and methods, including online questionnaires, reviews of peer-reviewed and grey literature, *in situ* property owner interviews, citizen science sightings, and data requests from provincial authorities. Our database included records from all nine provinces, covering 86 public and 913 private lands, and resulted in an estimate of 29 536 (likely range = 21 744–39 859) southern giraffe in South Africa. Limpopo and the Eastern Cape reported the highest abundance. Kruger National Park hosted the largest public population with 12 412 (range = 10 345–14 554) southern giraffe. Private land, which previously was not sufficiently counted, accounted for 49.4% of the total estimate. Importantly, we consider our updated southern giraffe estimate conservative as not all stakeholders were willing to contribute. Additionally, the potential impact of hybridization between the two subspecies of the southern giraffe requires further research to accurately assess their status in South Africa. Despite this restriction, our revised population estimate and distribution for southern giraffe will contribute to improved conservation efforts in South Africa.

Keywords: giraffe, giraffe population, southern giraffe, South Africa, conservation, private land, abundance, range, survey, anthropogenic threats, hybridization, population assessment, private properties, wildlife ranching, conservation areas, population update.

INTRODUCTION

Giraffe (*Giraffa* spp.) are naturally distributed across 21 countries in Africa, yet the overall population had decreased by approximately 30% from 150 000 to 117 000 individuals in the last three and a half decades to 2020 (Brown *et al*., 2021; O'Connor *et al*., 2019). This population decline is largely attributable to anthropogenic threats such as habitat loss, land degradation, climate change, poaching, and civil unrest, which have resulted in fragmented populations across their range (Brown *et al*., 2021; Muller *et al*., 2018). Genetic analysis (Fennessy *et al*., 2016) first proposed four distinct species of *Giraffa* which was subsequently supported by numerous genetic studies (Bertola, 2024; Coimbra *et al*., 2021, 2023; Petzold & Hassanin, 2020; Winter, Fennessy & Janke, 2018) as well as a detailed *Giraffa* skull morphology study (Kargopoulos *et al*., 2024). Given these declines, the studies emphasize the importance of adopting the updated giraffe taxonomy to implement their effective conservation measures across their range (Muneza *et al*., 2025).

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Of the four species, the southern giraffe (*Giraffa giraffa*), distributed across southern Africa, is the only species which has seen a steady increase in population numbers and range in recent decades (Brown *et al*., 2021; O'Connor *et al*., 2019). Their largest known population occurs in South Africa across a mix of national parks, provincial properties, and privately owned conservation areas (hereafter referred to as 'private land') (Shumba *et al*., 2020; Taylor *et al*., 2021). Although private lands are recognized as a successful avenue for complementary conservation, they have also been under much scrutiny as their direct contribution towards biodiversity conservation is understudied and therefore unclear (Cousins, Sadler & Evans, 2008). Nonetheless, most private lands continue to contribute positively to the conservation of southern giraffe and other wildlife, supporting broader biodiversity efforts in South Africa.

National population assessments for southern giraffe in South Africa were conducted in 2016 during the International Union for Conservation of Nature (IUCN) Red List Assessment (Deacon & Parker, 2016) and then again in 2019 (Deacon & Tutchings, 2019). The 2019 survey, supported by Wildlife Ranching South Africa, estimated the largest population in Limpopo, with smaller populations in Gauteng, Mpumalanga, North West, and Northern Cape. However, it lacked private land data from the Eastern Cape, Free State, KwaZulu-Natal, and Western Cape. Their approach used a modified extent of occurrence estimate and extrapolated data, assuming giraffe occurred on all properties registered with Wildlife Ranching South Africa and thus was a major shortcoming of the work (Deacon & Tutchings, 2019). An estimated 21 053–26 919 individuals included protected areas but focused only on previously assumed 'natural distribution' throughout South Africa (Bond & Loffell, 2001; Maciejewski & Kerley, 2014; Paulse, Couldridge, Cupido & Deacon, 2023; Skead, 2011; Van Niekerk, 2018; Van Niekerk *et al*., 2019). This historical range is called into question by historical explorer accounts, hunting records, fossil evidence, and naturalist writings, which highlight that giraffe once occurred throughout South Africa and in previously deemed extralimital areas (Cramer & Mazel, 2007; Deacon & Tutchings, 2019). For example, early European explorers reported several sightings of giraffe in the Northern Cape (Lacy, 1899; Le Vaillant, 1790; Lichtenstein, 1812; Paterson, 1790; Rookmaaker, 1981). Fossil records exist from KwaZulu-Natal (Cramer & Mazel, 2007), and fossil giraffe tracks exist in the Western Cape (Helm *et al*., 2018). However, anthropogenic impacts over the past few hundred years, limited historical literature, and increasing climate change effects may have altered the species' past, present, and future distribution (Veldhuis *et al*., 2019). As such, it is essential to establish an evidence-based approach to defining their known range rather than relying on limited, assumed historical distribution (Taylor *et al*., 2021). Despite its limitations, the 2019 assessment was the last published attempt to systematically collect country-wide giraffe distribution data in South Africa.

Accurate assessments of wildlife numbers, distribution, and threats are essential for effective conservation planning and policy development. Providing an updated understanding of the current southern giraffe range and estimates can give valuable insight into important ecological indicators such as resource and habitat viability, trophic dynamics, climate change adaptation, sustainable use, and monitoring conservation success over time (Bond *et al*., 2013; Bond, Lee, Ozgul & König, 2019; Bond, Ozgul & Lee, 2023; Dunn *et al*., 2021; James, Bond, Ozgul & Lee, 2022; Martínez-Freiría, Tarroso, Rebelo & Brito, 2016; O'Connor *et al*., 2019). This approach in turn can help inform policy and decision-making. To address this, we conducted a systematic assessment of the southern giraffe distribution and abundance in South Africa using data from provincial wildlife surveys and questionnaires administered to property owners. In addition, we also reviewed the natural distribution for southern giraffe throughout South Africa, and based on historical evidence, we suggest a reassessment of their natural distribution.

METHODS

Data collection

To assess the current abundance and distribution of southern giraffe in South Africa, we collected and collated occurrence/abundance data from 2014 to 2025. The data covered all nine provinces and encompassed nationally administered land, provincially administered land, and private lands. Data sources included:

1) Primary literature: We searched published - scientific literature using online databases (Google Scholar, JSTOR and ResearchGate). The online search included combinations of keywords: 'giraffe', 'South Africa', 'large herbivore conserva-

tion', 'private land conservation areas', 'historic distribution'. We limited the publication year to ≥2014 and only used publications providing information on giraffe population sizes in South Africa and any contact information that could be utilized for further investigation *via in situ* or telephonic interviews guided by the questionnaire detailed in (3) below.

2) Grey literature: We searched grey literature using Google Search and included a combination of keywords: 'giraffe', 'South Africa', 'large herbivore conservation', 'private land conservation areas', 'historic distribution' 'tourist lodges', 'wildlife tourism', 'conservation', 'private conservation', 'national parks' (relevant to each province) and 'wildlife hunting'. The resulting websites that provided information on southern giraffe presence or absence were recorded as well as contact details for further investigation *via in situ* or telephonic interviews guided by the questionnaire detailed in (3) below.

3) Public questionnaire: We developed a publicly accessible online questionnaire using ArcGIS Survey123 (see Table A1 in the Appendix), with *a priori* ethical approval (Protocol Reference Number: UMP/Hoffman/231112181/PhD/2023). The questionnaire focused on topics including southern giraffe population dynamics, historical translocations, and property size. The questionnaire was distributed online by various conservation and wildlife organizations: Southern African Wildlife Management Association, SA Hunters, Waterberg Research Support Centre, and all provincial authorities. Additionally, the survey link was posted on the Giraffe Conservation Foundation social media sites, and directly distributed to property owners, managers and ecologists on request or *via* word of mouth. The public questionnaire was either filled in directly by property owners/managers, or by *in situ* interviews guided by the questionnaire with property owners, managers, wildlife veterinarians, and experts in the field. Participants provided informed consent and had the opportunity to stay anonymous, especially when providing sensitive information such as property name and exact location.

4) Provincial authority wildlife survey data: We contacted all provincial nature and conservation authorities with formal data requests for associated southern giraffe population size and location (property name, regions, and size). As there is no obligation by owners to provide giraffe-specific population data to provincial authorities, data availability was largely dependent on what each provincial authority collects from property owners and thus varied among provinces. Population estimates came from a variety of sources, including aerial wildlife surveys, ground sample surveys, long-term monitoring, and best guesstimates. In line with best practice, the Giraffe Conservation Foundation Africa-wide Database (C. Marneweck pers. comm.) includes estimates with an upper and lower range based on the method of data collection.

5) Wildlife Ranching Database: We utilized a detailed database on wildlife ranching developed by the Endangered Wildlife Trust (www.ewt.org.za) between 2014 and 2016 (Taylor, Lindsey & Davies-Mostert, 2016). This database included population data of southern giraffe on 275 private lands.

6) Citizen science databases: We queried the Global Biodiversity Information Facility (GBIF) (https://www.gbif.org) (GBIF, 2024), using filter terms Country: South Africa, Occurrence status: present, and Scientific name; Giraffidae. We further filtered by year, ≥2014.

Analysis

First, we mapped the current distribution of southern giraffe throughout South Africa, using data from all six sources. Then, using available population-level data (sources 1–5), we mapped their current abundance across South Africa. We used RStudio (R version 4.2.1, R Core Team 2022) to calculate all summaries and maps, with packages tidyverse (Version: 1.2.1; Wickham *et al.*, 2019), sf (Version: 0.7-1; Pebesma, 2018), and rnaturalearth (Version 0.1.0; South, 2017). Coordinates of each property, or the nearest town if anonymity was preferred, were provided by each participant or the provincial authority. If coordinates were still not available, we mapped the location of the centre of the property, where possible.

The population estimates came from a variety of methods including aerial total counts, aerial surveys (sample counts), ground surveys (various), long-term monitoring, and best guesstimates. To reflect the uncertainty and biases in each method, we followed the methodology of the African Elephant Database (Thouless *et al.*, 2016) and assigned an Information Quality Index (IQI) to each

record based on the method used. Individual registration or ground sample counts were rated highest (Jachmann, 2002; Lamprey *et al.*, 2020; Lee & Bond, 2016) followed by aerial sample count (2), ground or aerial total count (3), and informed guess (4), or degraded data >10 years old (5). In cases where a confidence interval or standard error were supplied in the source material, an upper and lower estimate range were calculated (+ (×1.5) and – (×0.5)). If no estimate range, standard error, or confidence interval was provided in the source material, we created a likely range with the estimate as the lower limit and the upper range based on the IQI. Giraffe are difficult to count from the air, with rear-seat observers missing approximately 60% of giraffe (Lamprey *et al.*, 2020). We therefore calculated the upper estimate of this likely range by multiplying aerial total counts with 1.6 and ground total counts by 1.2 (Buckland, Rexstad, Marques & Oedekoven, 2015). Guesstimates or estimates derived from unknown methodologies were assigned approximate bounds using multipliers of ×0.5 (for lower estimate) and ×1.5 (for upper estimate). Accordingly, we define the 'estimate range' as the most robust attainable interval between lower and upper bounds, derived from the best available data. This includes a combination of lower and upper confidence intervals (CIs) where reported by sources, and calculated bounds where CIs were not available. The overall lower bound/estimate reflects the sum of all available lower CIs or adjusted estimates above calculations, and the upper bound/estimate includes all upper CIs or adjusted estimates based on above calculations. While we acknowledge the need for following robust meta-analytical approaches (Nakagawa & Cuthill, 2007), the data we collated are not standardized, directly comparable, sufficiently detailed, or clearly documented in terms of the methods used. Therefore, we have refrained from calculating confidence intervals across multiple data sources, as doing so could be misleading given the underlying data limitations. Instead, we present an estimate and associated likely range. We urge readers to therefore interpret these results with caution and recognize that the reported ranges reflect the inherent uncertainties in the available data.

For sites with >1 data entry, the best estimate available was selected by adding the IQI score with the years since and retaining the estimate with the lowest score. These methods follow the methodology used in the Giraffe Africa Database (Marneweck *et al.* in prep).

To summarize giraffe abundance and property data across provinces and land types, we created means and standard errors from the raw data grouped accordingly, using the *summarize* function of the dplyr package (Wickham, Francois, Henry & Muller, 2023).

RESULTS

We collected data from 913 private and 86 public properties, totalling 999 full property records. We collected a further 3572 occurrence records from three citizen science databases. Based on these data, we estimate 29 536 (21 744–39 859) southern giraffe in South Africa (Table 1).

Private and public properties were distributed throughout all nine provinces with 289 properties in the Eastern Cape (254 with southern giraffe present), 181 (152) in the Free State, 42 (42) in Gauteng, 55 (50) in KwaZulu-Natal, 159 (144) in Limpopo, 37 (36) in Mpumalanga, 48 (40) in the North West, 54 (22) in the Northern Cape, and 134 (97) in the Western Cape (Figs 1 & 2; Table A2 and Figs A3 & A4 in the Appendix).

Southern giraffe on private lands made up 49.4% (n = 14 578) of the total national estimate, with the Eastern Cape contributing the largest percentage of the private land estate (29.1%, n = 4243). Limpopo had the largest provincial population, primarily due to the Kruger National Park population (n = 12 412).

Excluding Limpopo, KwaZulu-Natal had the highest mean population size with 60.80 ± 7.95 individuals per property. The Eastern, Northern, and Western Cape, Free State, and KwaZulu-Natal together accounted for approximately 34.1% of the national estimate.

DISCUSSION

Here, we use systematic literature reviews and targeted landowner questionnaires to deepen understanding of southern giraffe distribution and abundance across these diversified areas. Our results support the notion that southern giraffe are widely, though unevenly, distributed throughout the country. The extralimital range of southern giraffe in South Africa (*i.e.* Eastern, Northern and Western Cape, Free State, and KwaZulu-Natal) has been discussed over the last few decades (*e.g.* Castley, Boshoff & Kerley, 2001; Cornelius, Watson & Schmidt, 2012; Deacon & Parker, 2016; Parker & Bernard, 2005; Spear & Chown, 2009;

Table 1. Summary of southern giraffe population data collected in South Africa between 2014 and 2025.

Province	Property type	No. of properties surveyed	Mean ± S.E. giraffe population size	No. of properties with giraffe	Total estimate (range)
Eastern Cape	Public	8	13.75 ± 5.51	4	55
Eastern Cape	Private	281	16.99 ± 1.80	250	4243
Eastern Cape	Total	289	16.94 ± 1.77	254	4298 (2334–6365)
Free State	Public	10	30.5 ± 29.5	2	60
Free State	Private	171	6.51 ± 0.56	150	962
Free State	Total	181	6.82 ± 0.66	152	1022 544–1500)
Gauteng	Public	0	0	0	0
Gauteng	Private	42	13.45 ± 3.22	42	564
Gauteng	Total	42	13.45 ± 3.22	42	564 (349–851)
KwaZulu-Natal	Public	12	82.82 ± 19.50	11	911
KwaZulu-Natal	Private	43	54.59 ± 8.46	39	2128
KwaZulu-Natal	Total	55	60.80 ± 7.95	50	3039 (2197–4262)
Limpopo	Public	17	769.94 ± 718.82	17	13 089
Limpopo	Private	142	33.24 ± 4.63	128	4207
Limpopo	Total	159	120.21 ± 85.071	144	17 293 (13 854–22 126)
Mpumalanga	Public	2	40 ± 32	2	80
Mpumalanga	Private	35	10.06 ± 2.49	34	338
Mpumalanga	Total	37	11.72 ± 2.92	36	418 (240–596)
North West	Public	6	100.5 ± 43.24	6	603
North West	Private	42	17.82 ± 4.95	34	593
North West	Total	48	30.23 ± 8.72	40	1196 (970–1867)
Northern Cape	Public	12	51.33 ± 14.95	3	154
Northern Cape	Private	42	39.47 ± 17.85	19	748
Northern Cape	Total	54	41.09 ± 15.47	22	902 (785–1155)
Western Cape	Public	19	6.00	1	6
Western Cape	Private	115	8.34 ± 1.19	96	798
Western Cape	Total	134	8.32 ± 1.18	97	804 (472–1136)
Nationwide	Public	86	325.19 ± 265.588	46	14 598
Nationwide	Private	913	18.5 ± 1.23	791	14 578
Nationwide	Total	999	35.36 ± 14.69	837	29 536 (21 744–39 859)

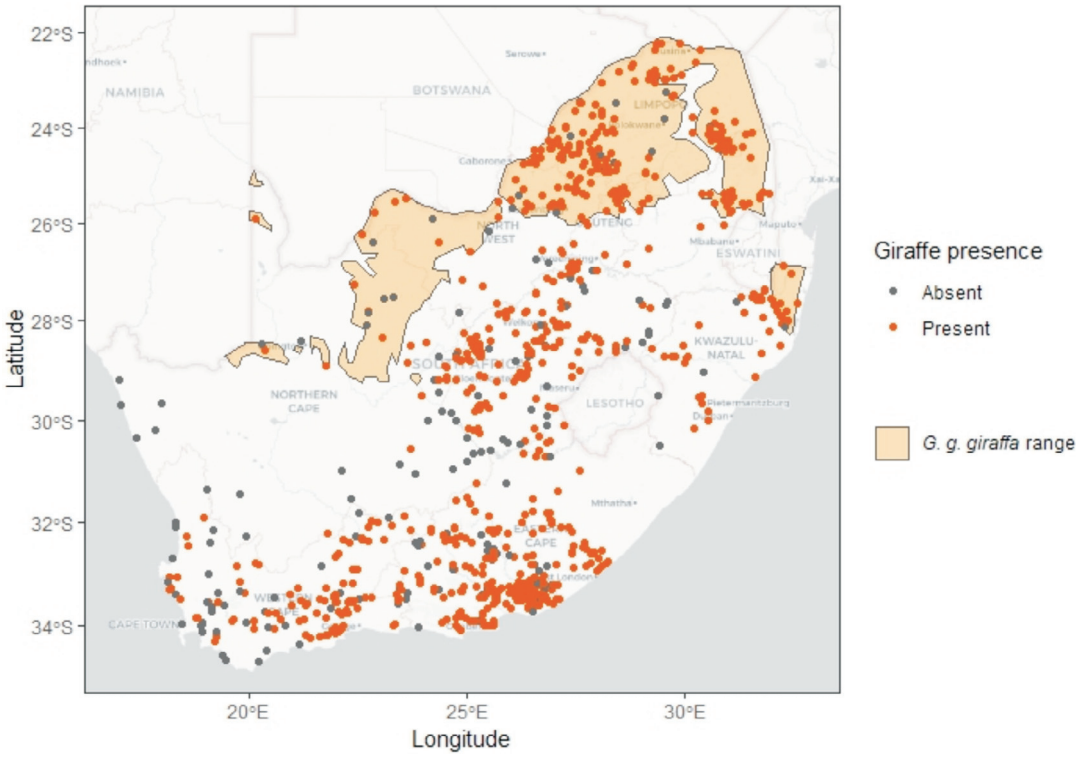

Fig. 1. Current records of southern giraffe presence/absence on private and public properties in South Africa collected between 2014 and 2025 compared to their previously reported range on the IUCN Red List (Muller *et al.*, 2018).

Van Niekerk, 2018; Viljoen, 2013), mostly focusing on habitat deterioration caused by assumed extralimital giraffe, rather than critically evaluating whether this status is warranted. Our literature review provides increased insight into their historical occurrence across South Africa, suggesting the extralimital status is not appropriate. Fossil records, historical giraffe tracks near Still Bay, and early explorer accounts support a broader historical range (Cramer & Mazel, 2007; Helm *et al.*, 2018; Le Vaillant, 1790; Paterson, 1790; Rookmaaker, 1981; Skead, 2011). Although limited, these data warrant a reassessment of their natural distribution. Understanding this range is increasingly important in light of climate change and shifting habitat use.

Our sample size and range represent a more comprehensive assessment of the country's southern giraffe population than earlier assessments. Although the stronghold population distribution remains in Limpopo, largely supported by the largest public land population in Kruger National Park, our new assessment has resulted in a far greater country-wide distribution, especially in the Eastern Cape which contains approximately 14.56% of the total country-wide estimate. The national population has experienced continuous growth from the 8000 individuals reported in the 1970s (Dagg & Foster, 1976) and this is largely attributed to legal reforms that enabled private ownership and farming of wildlife (Carruthers, 2008; Cousins *et al.*, 2008). Similarly, the change in legislation has aided in the conservation of other species, including the southern white rhinoceros (*Ceratotherium simum*), with private landownership increasing from 25% in 2010 to 53% in 2021 (Chapman & White, 2020; Clements, Balfour & Di Minin, 2023).

Comparing the current and previous estimates reveals significant disparity in the previously deemed extralimital provinces. The 2019 estimate resulted in an overestimated population at the time from the countrywide extrapolation based on the 2016 estimate with a small amount of additional data from the Wildlife Ranching South Africa survey (Deacon & Tutchings, 2019). In contrast, our study relied on a significantly larger dataset, making a direct comparison with previous surveys

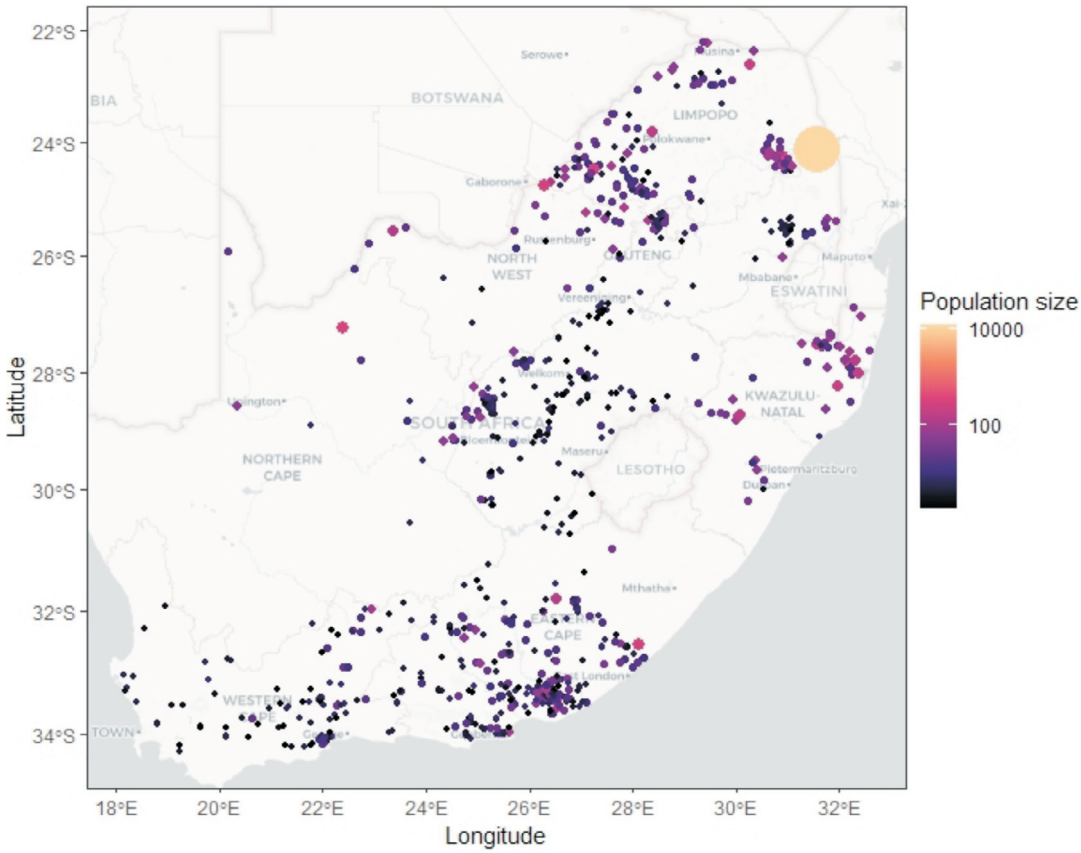

Fig. 2. The current known population sizes of southern giraffe on private and public properties across South Africa. Size of points is proportional to population size.

not feasible. The policy enabling private land-ownership of wildlife continues to play a contributing factor to a range increase of southern giraffe across South Africa as they are a key tourism species (Cousins *et al.*, 2008; Goss & Cumming, 2013; Maciejewski & Kerley, 2014; Mangachena, Geerts & Pickering, 2023; Mangachena & Pickering, 2023; Spear & Chown, 2009). While it is challenging to determine the exact market value of nature tourism in South Africa, species such as southern giraffe, African savanna elephant (*Loxodonta africana*), southern white rhinoceros, and large predators on private lands are amongst the most sought-after experiences for international tourists (Macdonald *et al.*, 2015; Mangachena & Pickering, 2023). As a result, apart from Limpopo and the North West, most southern giraffe in the country are privately owned. Private lands continue to play a major role in the conservation of southern giraffe and other wildlife in South Africa, especially for large herbivores (Cousins *et al.*, 2008; Taylor *et al.*, 2021). It is unlikely that many private lands are focused specifically on the conservation of southern giraffe, as there is limited information available on private conservation initiatives. Nonetheless, with approximately 79% of land in South Africa under private ownership (De Vos & Cumming, 2019; Shumba *et al.*, 2020), private properties with southern giraffe represent a substantial portion of the species' conservation estate within the country. While these updated population estimates are relatively conservative, they provide a valuable baseline for future monitoring and conservation planning.

It is clear that private wildlife ownership has played an integral part in wildlife conservation in South Africa, with similar conservation initiatives being implemented globally (*e.g.* Brown & Mitchell, 2014; Kamal, Grodzińska-Jurczak & Brown, 2015; Shanee, Shanee. & Horwich, 2015). It is predicted

that without private land, global conservation initiatives, *e.g.* funding, habitat availability, etc., 148 recognized ungulate species would face uplisting on the IUCN Red List (Hoffmann *et al.*, 2015). This is particularly crucial where national or public lands exhibit limitations such as size and financial means (Brashares, Arcese. & Sam, 2001; Middleton *et al.*, 2022; Wittemyer, Douglas-Hamilton & Getz, 2005; Woodroffe & Ginsberg, 1998). However, integrating private land into conservation areas can be challenging, especially in countries lacking legal framework and incentives for the landowner (Kamal *et al.*, 2015). These limitations also affect data availability, and the collection of detailed southern giraffe population data in South Africa has been an ongoing challenge considering the lack of detailed knowledge of private land giraffe ownership in the country.

Unlike for perceived priority species such as African savanna elephant (Blanc & Barnes, 2007), a centralized repository of occurrence data for *Giraffa* spp. for their entire range only exists with the Giraffe Conservation Foundation. In South Africa, it is mandatory for private landowners of species such as the African savanna elephant to provide population numbers together with management plans and strategies to the provincial authorities (Van Aarde, Jackson & Ferreira, 2006; Young & Van Aarde, 2011). However, there is no such obligation for giraffe owners and anecdotal accounts indicate that private landowners, managers and wardens have relatively limited historical knowledge of giraffe on their properties, including origin and translocation information. This lack of record-keeping may have implications for maintaining genetic vigour and preventing subspecies hybridization, the latter reportedly common in some areas of South Africa (Van Niekerk *et al.*, 2019). Although the Angolan giraffe (*Giraffa giraffa angolensis*) and South African giraffe (*Giraffa giraffa giraffa*) have no known natural range overlap, historical translocations of Angolan giraffe from Namibia to South Africa (Van Niekerk *et al.*, 2019) have resulted in human-induced hybridization between the two southern giraffe subspecies. A comprehensive country-wide genetic analysis of the population is needed as a priority to investigate this in detail, especially as this will impact their future conservation status and management in South Africa.

We believe that there is a need to build upon this spatial database on southern giraffe to better estimate abundance and distribution on both provincial and national levels, as well as their long-term conservation management. In light of this growing need across all giraffe ranges, the Giraffe Conservation Foundation established the Giraffe Africa-wide Database that underpins future State of Giraffe assessments (C.J. Marneweck unpubl.). In addition, it is recommended that a detailed country-wide genetic sampling and whole genome analysis be undertaken to provide a comprehensive insight into the current subspecies composition, and likely hybridization status, of the southern giraffe in South Africa. These datasets would in addition provide a baseline for monitoring the conservation status of all southern giraffe across all range states in southern Africa. Bordering countries such as Eswatini, Mozambique, and Zimbabwe remain with relatively smaller fragmented southern giraffe populations that in some areas are also increasing (O'Connor *et al.*, 2019; Brown *et al.* 2021), while Botswana and Namibia's giraffe population is larger yet challenging to assess given expansive and varied land use across their range.

With more reliable baseline estimates for southern giraffe in South Africa, key areas with existing data gaps, *e.g.* Northern Cape, have emerged. As we were unable to obtain data from all the private land giraffe owners, our estimate is a minimum and the total number of giraffe in the country is likely higher. However, our estimates provide valuable insight into the status of southern giraffe in South Africa and can assist with emerging countrywide management pertaining to their conservation. The results from this work also provide a baseline for future national and Africa-wide IUCN Red List assessments of southern giraffe and will help to inform their targeted conservation and management. Based on historical data, the southern giraffe population can currently be described as increasing in South Africa although further understanding of their genetic health is key for their long-term conservation management.

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REFERENCES

Bertola, L. (2024, May 30). How many giraffe species are there? Understanding this is key to their protection. *The Conversation* [electronic newsletter]. Johannesburg, South Africa: The Conversation.

Blanc, J.J. & Barnes, R.F. (2007). *African elephant status report 2007: An update from the African elephant database*. Gland, Switzerland: IUCN. https://books.google.com/books?hl=en&lr=&id=t6tcxXz80XsC&oi=fnd&pg=PP1&dq=African+Elephant+Database+&ots=-QoMvEJZP3&sig=uZ6uXizya1ka_4zsai3sgK100Uk

Bond, I., Child, B., de la Harpe, D., Jones, B., Barnes, J. & Anderson, H. (2013). Private land contribution to conservation in South Africa. In *Parks in transition* (pp. 29–61). Abingdon-on-Thames, U.K.: Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9781849772129-4/private-land-contribution-conservation-south-africa-ivan-bond-brian-child-derek-de-la-harpe-brian-jones-jon-barnes-hilary-anderson

Bond, M.L., Lee, D.E., Ozgul, A. & König, B. (2019). Fission–fusion dynamics of a megaherbivore are driven by ecological, anthropogenic, temporal, and social factors. *Oecologia*, 191(2), 335–347. https://doi.org/10.1007/s00442-019-04485-y

Bond, M.L., Ozgul, A. & Lee, D.E. (2023). Effect of local climate anomalies on giraffe survival. *Biodiversity and Conservation*, 32(10), 3179–3197. https://doi.org/10.1007/s10531-023-02645-4

Bond, W.J. & Loffell, D. (2001). Introduction of giraffe changes acacia distribution in a South African savanna. *African Journal of Ecology*, 39(3), 286–294. Wiley Online Library. https://doi.org/10.1046/j.1365-2028.2001.00319.x

Brashares, J.S., Arcese, P. & Sam, M.K. (2001). Human demography and reserve size predict wildlife extinction in West Africa. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 268(1484), 2473–2478. https://doi.org/10.1098/rspb.2001.1815

Brown, J. & Mitchell, B. (2014). Private initiatives for protected areas in South America. In *Partnerships for protection* (pp. 173–183). Abingdon-on-Thames, U.K.: Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9781315071398-23/private-initiatives-protected-areas-south-america-jessica-brown-brent-mitchell

Brown, M.B., Kulkarni, T., Ferguson, S., Fennessy, S., Muneza, A., Stabach, J.A. & Fennessy, J. (2021). Conservation status of giraffe: evaluating contemporary distribution and abundance with evolving taxonomic perspectives. In *Imperiled: The encyclopedia of conservation* (pp. 471–487). Amsterdam, Netherlands: Elsevier. https://doi.org/10.1016/B978-0-12-821139-7.00139-2

Buckland, S.T., Rexstad, E A., Marques, T.A. & Oedekoven, C.S. (2015). *Distance sampling: methods and applications*. Cham, Switzerland: Springer International Publishing. https://doi.org/10.1007/978-3-319-19219-2

Carruthers, J. (2008). 'Wilding the farm or farming the wild'? The evolution of scientific game ranching in South Africa from the 1960s to the present. *Transactions of the Royal Society of South Africa*, 63(2), 160–181.

Castley, J.G., Boshoff, A.F. & Kerley, G.I.H. (2001). Compromising South Africa's natural biodiversity – Inappropriate herbivore introductions. *South African Journal of Science*, 97(9), 344–348.

Chapman, L.A. & White, P.C. (2020). The future of private rhino ownership in South Africa. *Wildlife Research*, 47(6), 441–447.

Clements, H.S., Balfour, D. & Di Minin, E. (2023). Importance of private and communal lands to sustainable conservation of Africa's rhinoceroses. *Frontiers in Ecology and the Environment*, 21(3), 140–147. https://doi.org/10.1002/fee.2593

Coimbra, R.T.F., Winter, S., Kumar, V., Koepfli, K-P., Gooley, R.M., Dobrynin, P., Fennessy, J. & Janke, A. (2021). Whole-genome analysis of giraffe supports four distinct species. *Current Biology*, 31(13), 2929-2938.e5. https://doi.org/10.1016/j.cub.2021.04.033

Coimbra, R.T.F., Winter, S., Muneza, A., Fennessy, S., Otiende, M., Mijele, D., Masiaine, S., Stacy-Dawes, J., Fennessy, J. & Janke, A. (2023). Genomic analysis reveals limited hybridization among three giraffe species in Kenya. *BMC Biology*, 21(1), 215. https://doi.org/10.1186/s12915-023-01722-y

Cornelius, A.J., Watson, L.H. & Schmidt, A.G. (2012). The diet of giraffe (*Giraffa camelopardalis*) on a wildlife ranch in the mosaic thicket of the southern Cape, South Africa. Unpublished report.

Cousins, J.A., Sadler, J.P. & Evans, J. (2008). Exploring the role of private wildlife ranching as a conservation tool in South Africa: stakeholder perspectives. *Ecology and Society*, 13(2), art43. https://doi.org/10.5751/ES-02655-130243

Cramer, M.D. & Mazel, A.D. (2007). The past distribution of giraffe in KwaZulu-Natal. *South African Journal of Wildlife Research*, 37(2), 197–201. https://doi.org/10.3957/0379-4369-37.2.197

Dagg, A.I. & Foster, J.B. (1976). *The giraffe: its biology, behavior, and ecology*. New York, U.S.A.: Van Nostrand Reinhold.

De Vos, A. & Cumming, G.S. (2019). The contribution of land tenure diversity to the spatial resilience of protected area networks. *People and Nature*, 1(3), 331–346. https://doi.org/10.1002/pan3.29

Deacon, F. & Parker, D. (2016). A conservation assess-

ment of *Giraffa camelopardalis giraffa*. In M.F. Child, L. Roxburgh, E. Do Linh San, D. Raimondo & H.T. Davies-Mostert (Eds), *The Red List of mammals of South Africa, Swaziland and Lesotho*. Pretoria and Midrand, South Africa: South African National Biodiversity Institute and Endangered Wildlife Trust.

Deacon, F. & Tutchings, A. (2019). The South African giraffe *Giraffa camelopardalis giraffa*: a conservation success story. *Oryx*, 53(1), 45–48. https://doi.org/10.1017/S0030605317001612

Dunn, M.E., Ruppert, K., Glikman, J.A., O'Connor, D., Fennessy, S., Fennessy, J. & Veríssimo, D. (2021). Investigating the international and pan-African trade in giraffe parts and derivatives. *Conservation Science and Practice*, 3(5), e390.

Fennessy, J., Bidon, T., Reuss, F., Kumar, V., Elkan, P., Nilsson, M.A., Vamberger, M., Fritz, U. & Janke, A. (2016). Multi-locus analyses reveal four giraffe species instead of one. *Current Biology*, 26(18), 2543–2549.

GBIF. (2024). *GBIF occurrence download* [Dataset]. https://doi.org/10.15468/dl.gppvmk

Goss, J.R. & Cumming, G.S. (2013). Networks of wildlife translocations in developing countries: an emerging conservation issue? *Frontiers in Ecology and the Environment*, 11(5), 243–250. https://doi.org/10.1890/120213

Helm, C., Cawthra, H., Cowling, R., De Vynck, J., Marean, C., McCrea, R. & Rust, R. (2018). Palaeoecology of giraffe tracks in Late Pleistocene aeolianites on the Cape south coast. *South African Journal of Science*, 114. http://dx.doi.org/10.17159/ sajs.2018/20170266

Hoffmann, M., Duckworth, J.W., Holmes, K., Mallon, D.P., Rodrigues, A.S.L. & Stuart, S.N. (2015). The difference conservation makes to extinction risk of the world's ungulates: ungulate conservation. *Conservation Biology*, 29(5), 1303–1313. https://doi.org/10.1111/cobi.12519

Jachmann, H. (2002). Comparison of aerial counts with ground counts for large African herbivores. *Journal of Applied Ecology*, 39(5), 841–852.

James, N.L., Bond, M.L., Ozgul, A. & Lee, D.E. (2022). Trophic processes constrain seasonal ungulate distributions at two scales in an East African savanna. *Journal of Mammalogy*, 103(4), 956–969. https://doi.org/10.1093/jmammal/gyac050

Kamal, S., Grodzińska-Jurczak, M. & Brown, G. (2015). Conservation on private land: a review of global strategies with a proposed classification system. *Journal of Environmental Planning and Management*, 58(4), 576–597. https://doi.org/10.1080/09640568.2013.875463

Kargopoulos, N., Marugán-Lobón, J., Chinsamy, A., Agwanda, B.R., Brown, M.B., Fennessy, S., Ferguson, S., Hoffman, R., Lala, F., Muneza, A., Mwebi, O., Otiende, M., Petzold, A., Winter, S., Zabeirou, A.R.M. & Fennessy, J. (2024). Heads up – four *Giraffa* species have distinct cranial morphology. *PLOS ONE*, 19(12), e0315043. https://doi.org/10.1371/journal.pone.0315043

Lacy, G. (with University of California Libraries). (1899). *Pictures of travel, sport, and adventure*. London, U.K.: C.A. Pearson. http://archive.org/details/picturesoftravel00lacyiala

Lamprey, R., Pope, F., Ngene, S., Norton-Griffiths, M., Frederick, H., Okita-Ouma, B. & Douglas-Hamilton, I. (2020). Comparing an automated high-definition oblique camera system to rear-seat-observers in a wildlife survey in Tsavo, Kenya: taking multi-species aerial counts to the next level. *Biological Conservation*, 241, 108243. https://doi.org/10.1016/j.biocon.2019.108243

Le Vaillant, F. (1790). *Travels from the Cape of Good-Hope: into the interior parts of Africa, including many interesting anecdotes* (Vol. 1). London, U.K.: Printed for W. Lane. https://books.google.com/books?hl=en&lr=&id=1DMQAAAAYAAJ&oi=fnd&pg=PA2&dq=LE+VAILLANT,+F.+1790.+Travels+from+the+Cape+of+Good+Hope.&ots=c42rGBT3jg&sig=UypjruHIx13b4xjaSmRv8v9MAVE

Lee, D.E. & Bond, M.L. (2016). Precision, accuracy, and costs of survey methods for giraffe *Giraffa camelopardalis*. *Journal of Mammalogy*, 97(3), 940–948.

Lichtenstein, H. (1812). *Travels in southern Africa in the years, 1803, 1804, 1805 and 1806*. London, U.K.: Henry Colburn. https://books.google.com/books?hl=en&lr=&id=PAUMAAAAYAAJ&oi=fnd&pg=PA1&dq=+Travels+in+southern+Africa,+in+the+years+1803,+1804,++1805+and+1806&ots=rfacEut4HJ&sig=zNoXRiQAoffif8DdO-eqUbJDDl0

Macdonald, E.A., Burnham, D., Hinks, A.E., Dickman, A.J., Malhi, Y. & Macdonald, D.W. (2015). Conservation inequality and the charismatic cat: *Felis felicis*. *Global Ecology and Conservation*, 3, 851–866. https://doi.org/10.1016/j.gecco.2015.04.006

Maciejewski, K. & Kerley, G.I. (2014). Understanding tourists' preference for mammal species in private protected areas: Is there a case for extralimital species for ecotourism? *PLOS ONE*, 9(2), e88192.

Mangachena, J.R., Geerts, S. & Pickering, C.M. (2023). Spatial and temporal patterns in wildlife tourism encounters and how people feel about them based on social media data from South Africa. *Journal of Outdoor Recreation and Tourism*, 44, Part A, 100642. https://doi.org/10.1016/j.jort.2023.100642

Mangachena, J.R. & Pickering, C.M. (2023). Why are some animals popular with wildlife tourists: insights from South Africa. *Journal of Ecotourism*, 22(2), 312–328. https://doi.org/10.1080/14724049.2021.2019261

Marneweck, C.J., Brown, M.B., Ekandjo, P., Fennessy, S., Ferguson, S., Hoffman, R., Kipchumba, A., Muneza, A.B. & Fennessy, J. (In prep.). State of Giraffe Report 2025: An update from the Giraffe Africa-wide Database (GAD). Windhoek, Namibia: Giraffe Conservation Foundation.

Martínez-Freiría, F., Tarroso, P., Rebelo, H. & Brito, J.C. (2016). Contemporary niche contraction affects climate change predictions for elephants and giraffes. *Diversity and Distributions*, 22(4), 432–444.

Middleton, A., Stoellinger, T., Bennett, D.E., Brammer, T., Gigliotti, L., Flint, H.B. & Maher, S. (2022). The role of private lands in conserving Yellowstone's wildlife in the twenty-first century. *Wyoming Law Review*, 22, No. 2, Article 4.

Muller, Z., Bercovitch, F., Brand, R., Brown, D., Brown, M.

& Bolger, D. (2018). *Giraffa camelopardalis (amended version of 2016 assessment). The IUCN Red List of threatened species 2018*. Gland, Switzerland: IUCN.

Muneza, A., Brown, M., Fennessy, S., Ferguson, S., Hoffman, R., Janke, A., Kargopoulos, N., Kipchumba, A., Koepfli, K-P., Marneweck, C., Petzold, A., Stabach, J., Winter, S. & Fennessy, J. (2025). Effective conservation and management of giraffe require adopting recent advances of their taxonomy. *Biodiversity and Conservation*, 34, 1211–1229. https://doi.org/10.1007/s10531-025-03021-0

Nakagawa, S. & Cuthill, I.C. (2007). Effect size, confidence interval and statistical significance: a practical guide for biologists. *Biological Reviews*, 82(4), 591–605. https://doi.org/10.1111/j.1469-185X.2007.00027.x

O'Connor, D., Stacy-Dawes, J., Muneza, A., Fennessy, J., Gobush, K., Chase, M.J., Brown, M.B., Bracis, C., Elkan, P., Zaberirou, A.R.M., Rabeil, T., Rubenstein, D., Becker, M.S., Phillips, S., Stabach, J.A., Leimgruber, P., Glikman, J.A., Ruppert, K., Masiaine, S. & Mueller, T. (2019). Updated geographic range maps for giraffe, *Giraffa* spp., throughout sub-Saharan Africa, and implications of changing distributions for conservation. *Mammal Review*, 49(4), 285–299. https://doi.org/10.1111/mam.12165

Parker, D.M. & Bernard, R.T F. (2005). The diet and ecological role of giraffe (*Giraffa camelopardalis*) introduced to the Eastern Cape, South Africa. *Journal of Zoology*, 267(2), 203–210.

Paterson, W. (1790). *A narrative of four journeys into the country of the Hottentots and Caffraria: in the years 1777*, *1778*, *1779*. London, U.K.: J. Johnson. https://books.google.com/books?hl=en&lr=&id=FepWAAAAcAAJ&oi=fnd&pg=PA1&dq=Travels+in+Africa.+A+narrative+of+four+journeys+into+the++country+of+the+Hottentots,+and+Caffraria,&ots=7jNx5xyH_h&sig=trmEeByG3Q1A4CbG5gTrc04U6FI

Paulse, J., Couldridge, V., Cupido, C. & Deacon, F. (2023). The diurnal activity budgets of extralimital giraffe (*Giraffa camelopardalis giraffa*) in the Western Cape Province, South Africa. *African Journal of Ecology*, 61(3), 746–751.

Pebesma, E.J. (2018). Simple features for R: Standardized support for spatial vector data. *The R Journal*, 10(1), 439.

Petzold, A. & Hassanin, A. (2020). A comparative approach for species delimitation based on multiple methods of multi-locus DNA sequence analysis: a case study of the genus *Giraffa* (Mammalia, Cetartiodactyla). *PLOS ONE*, 15(2), e0217956. https://doi.org/10.1371/journal.pone.0217956

Rookmaaker, L.C. (1981). The observations of Robert Jacob Gordon (1743–1795) on giraffes (*Giraffa camelopardalis*) found in Namaqualand. *Journal – SWA Scientific Society*, 36, 71–90.

Shanee, N., Shanee, S. & Horwich, R.H. (2015). Effectiveness of locally run conservation initiatives in north-east Peru. *Oryx*, 49(2), 239–247.

Shumba, T., De Vos, A., Biggs, R., Esler, K.J., Ament, J.M. & Clements, H.S. (2020). Effectiveness of private land conservation areas in maintaining natural land cover and biodiversity intactness. *Global Ecology and Conservation*, 22, e00935. https://doi.org/10.1016/j.gecco.2020.e00935

Skead, C.J. (2011). *Historical incidence of the larger land mammals in the broader Eastern Cape* (2nd edn). Port Elizabeth, South Africa: Centre for African Conservation Ecology,

South, A. (2017). rnaturalearth: World map data from natural earth. R package version 0.1. 0. Vienna, Austria: The R Foundation. https://CRAN.R-Project.Org/Package=Rnaturalearth

Spear, D. & Chown, S.L. (2009). The extent and impacts of ungulate translocations: South Africa in a global context. *Biological Conservation*, 142(2), 353–363.

Taylor, W.A., Child, M.F., Lindsey, P.A., Nicholson, S.K., Relton, C. & Davies-Mostert, H.T. (2021). South Africa's private wildlife ranches protect globally significant populations of wild ungulates. *Biodiversity and Conservation*, 30(13), 4111–4135. https://doi.org/10.1007/s10531-021-02294-5

Taylor, W., Lindsey, P. & Davies-Mostert, H. (2016). *An assessment of the economic*, *social and conservation value of the wildlife ranching industry and its potential to support the green economy in South Africa*. Midrand, South Africa: Endangered Wildlife Trust. https://doi.org/10.13140/RG.2.1.1211.1128

Thouless, C., Dublin, H., Blanc, J., Skinner, D., Daniel, T., Taylor, R., Maisels, R., Frederick, H. & Bouché, P. (2016). *African elephant status report 2016: an update from the African Elephant Database* (Occasional Paper Series of the IUCN Species Survival Commission, No. 60, p. 309). Gland, Switzerland: IUCN.

Van Aarde, R.J., Jackson, T.P. & Ferreira, S.M. (2006). Conservation science and elephant management in southern Africa: elephant conservation. *South African Journal of Science*, 102(9), 385–388.

Van Niekerk, M.E. (2018). *Genetic diversity in fragmented southern African giraffe populations* (Ph.D. thesis). Bloemfontein, South Africa: University of the Free State. https://scholar.ufs.ac.za/bitstream/handle/11660/10043/VanNiekerkME.pdf?sequence=1&isallowed=y

Van Niekerk, M.E., Deacon, F. & Grobler, P.J. (2019). The genetic status of the introduced giraffe population in central South Africa. *Koedoe*, 61(1). https://doi.org/10.4102/koedoe.v61i1.1570

Veldhuis, M.P., Kihwele, E.S., Cromsigt, J.P.G.M., Ogutu, J.O., Hopcraft, J.G.C., Owen-Smith, N. & Olff, H. (2019). Large herbivore assemblages in a changing climate: incorporating water dependence and thermoregulation. *Ecology Letters*, 22(10), 1536–1546. https://doi.org/10.1111/ele.13350

Viljoen, S. (2013). *Habitat use and diet preference of extralimital giraffes in the Kgalagadi Transfrontier Park*. (B.Sc. Hons thesis). Cape Town, South Africa: University of Cape Town. https://open.uct.ac.za/handle/11427/14013

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T., Miller, E., Bache, S., Müller, K., Ooms, J., Robinson,

D., Seidel, D., Spinu, V., … Yutani, H. (2019). Welcome to the Tidyverse. *The Journal of Open Source Software*, *4*(43), 1686. https://doi.org/10.21105/joss.01686

Wickham, H., Francois, R., Henry, L. & Muller, K. (2023). *dplyr: A grammar of data manipulation*. https://cir.nii.ac.jp/crid/1370584339779773824

Winter, S., Fennessy, J. & Janke, A. (2018). Limited introgression supports division of giraffe into four species. *Ecology and Evolution*, 8(20), 10156–10165.

Wittemyer, G., Douglas-Hamilton, I. & Getz, W.M. (2005). The socioecology of elephants: analysis of the processes creating multitiered social structures. *Animal Behaviour*, 69(6), 1357–1371. https://doi.org/10.1016/j.anbehav.2004.08.018

Woodroffe, R. & Ginsberg, J.R. (1998). Edge effects and the extinction of populations inside protected areas. *Science*, 280(5372), 2126–2128. https://doi.org/10.1126/science.280.5372.2126

Young, K.D. & Van Aarde, R.J. (2011). Science and elephant management decisions in South Africa. *Biological Conservation*, 144(2), 876–885.

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APPENDIX

Table A1. ArcGIS survey 123 questionnaire utilized to collect data on southern giraffe populations throughout South Africa.

Question	Answer structure
About you	
Submission date	Date of survey
Contact name	Participant name
Contact cell	Participant cell number
Contact email	Participant email
Would you like to receive the results of this research?	Yes/no
About your property	
Property location	Coordinates
Province	
Property type	
Property name	
SA farm number	
Property size	
Year established	
Your giraffe	
Giraffe population size	Numeric
Male giraffe	Numeric
Female giraffe	Numeric
Survey or estimate method	Aerial, other survey, best guess, other
Giraffe utilisation	
Do you use your giraffe for any of the following activities?	
Ecotourism	Yes/no
Live sales	Yes/no
Live sales offtake	Numeric
Meat sales	Yes/no
Meat sales offtake	Numeric
Culling	Yes/no
Culling offtake	Numeric
Trophy hunting	Yes/no
Trophy hunting offtake	Numeric
Other	
Giraffe introduction/relocation	
Have you ever moved giraffe onto your property from an outside location?	Yes/no
Introductions	
Year introduced	Numeric
Total introduced	Numeric
Males introduced	Numeric
Females introduced	Numeric
Giraffe origin	
Have you ever moved giraffe off your property to an outside location?	Yes/no
Relocations	
Year relocated	Numeric
Total relocated	Numeric
Males relocated	Numeric
Females relocated	Numeric
Giraffe destination	
DNA	
Would you be willing to have a GCF staff member visit your property to take a DNA sample of your giraffe?	Yes/no

Table A2. Summary of southern giraffe population data collected per province and land across South Africa between 2014 and 2025.

Province	Type	Property type	No. properties surveyed	No. properties with giraffe present	No. properties with property size known	No. properties with giraffe population size known	Total estimate	Mean property size	S.E. property size	Mean giraffe population size	S.E. giraffe population size
All Provinces	Private	Subtotal	913	791	912	913	14 578	35.85	3.52	18.51	1.24
All Provinces	Public	Subtotal	86	46	73	86	14 958	762.51	297.54	325.20	265.59
All Provinces	Total	Total	999	837	985	999	29536	89.70	22.97	35.36	14.69
Eastern Cape	Private	Private Farm	118	90	118	89	1285	24.37	5.25	14.29	2.66
Eastern Cape	Private	Private Reserve	163	160	162	157	2958	37.81	11.70	18.51	2.37
Eastern Cape	Public	Subtotal	281	250	280	281	4243	32.15	7.12	16.99	1.80
Eastern Cape	Public	National Park	4	0	4	0	0	1264.53	649.06	NA	NA
Eastern Cape	Public	Provincial Reserve	4	4	4	4	55	18.16	14.11	13.75	5.51
Eastern Cape	Total	Subtotal	8	4	8	8	55	641.34	381.84	13.75	5.51
Eastern Cape	Private	Total	289	254	288	289	4298	49.07	13.48	16.94	1.77
Free State	Private	Private Farm	85	69	85	58	386	6.64	2.09	5.75	0.72
Free State	Private	Private Reserve	86	81	86	78	576	8.00	3.68	7.15	0.84
Free State	Public	Subtotal	171	150	171	171	962	7.32	2.12	6.51	0.56
Free State	Public	National Park	1	0	1	0	0	340.00	NA	NA	NA
Free State	Public	Provincial Reserve	9	2	9	1	60	82.51	40.50	30.50	29.50
Free State	Total	Subtotal	10	2	10	10	60	108.26	44.44	30.50	29.50
Free State	Private	Total	181	152	181	181	1022	12.90	3.52	6.82	0.66
Gauteng	Private	Private Farm	36	36	36	35	400	18.05	6.07	11.14	2.17
Gauteng	Private	Private Reserve	6	6	6	6	16	78.27	44.33	27.33	18.72
Gauteng	Total	Subtotal	42	42	42	42	564	26.65	8.49	13.45	3.22
Gauteng	Private	Total	42	42	42	42	564	26.65	8.49	13.45	3.22
KwaZulu-Natal	Private	Private Farm	21	19	21	19	774	27.46	6.21	40.74	10.26
KwaZulu-Natal	Private	Private Reserve	22	20	22	19	1354	65.92	17.33	67.75	12.88
KwaZulu-Natal	Public	Subtotal	43	39	43	43	2128	47.13	9.73	54.59	8.46
KwaZulu-Natal	Public	Provincial Reserve	12	11	12	11	911	409.49	199.46	82.82	19.50
KwaZulu-Natal	Total	Subtotal	12	11	12	12	91	409.49	199.46	82.82	19.50
KwaZulu-Natal	Private	Total	55	50	55	55	3039	126.19	47.33	60.80	7.95
Limpopo	Private	Private Farm	99	85	99	72	1663	22.96	4.14	19.72	3.68
Limpopo	Private	Private Reserve	43	42	43	37	2541	110.09	21.02	60.62	10.79
Limpopo	Public	Subtotal	142	127	142	142	4204	49.34	7.71	33.24	4.64
Limpopo	Public	National Park	3	3	3	3	12 412	6811.67	6337.67	4137.33	4066.39

Continued on p. 299

Table A2 (continued)

Province	Type	Property type	No. properties surveyed	No. properties with giraffe present	No. properties with property size known	No. properties with giraffe population size known	Total estimate	Mean property size	S.E. property size	Mean giraffe population size	S.E. giraffe population size
Limpopo	Public	Provincial Reserve	14	14	1	14	677	235.00	NA	48.36	11.71
Limpopo	Total	Subtotal	17	17	4	17	13 089	5167.50	4773.50	769.94	718.83
Limpopo	Private	Total	159	144	146	159	17 293	189.57	133.37	120.22	85.07
Mpumalanga	Private	Private Farm	26	26	26	23	200	18.66	10.75	7.81	2.41
Mpumalanga	Private	Private Reserve	9	8	9	7	138	66.76	22.58	17.38	6.89
Mpumalanga	Public	Subtotal	35	34	35	35	338	31.02	10.34	10.06	2.49
Mpumalanga	Public	Provincial Reserve	2	2	2	2	80	377.71	102.30	40.00	32.00
Mpumalanga	Total	Subtotal	2	2	2	2	80	377.71	102.30	40.00	32.00
Mpumalanga	Private	Total	37	36	37	37	418	49.76	16.79	11.72	2.92
North West	Private	Private Farm	35	27	35	14	300	20.65	5.76	11.59	3.54
North West	Private	Private Reserve	7	7	7	7	293	152.04	124.97	41.86	18.02
North West	Public	Subtotal	42	34	42	42	593	42.55	21.50	17.82	4.95
North West	Public	Provincial Reserve	6	6	6	6	603	2.96	1.18	100.50	43.24
North West	Total	Subtotal	6	6	6	6	603	2.96	1.18	100.50	43.24
North West	Private	Total	48	40	48	48	1196	37.60	18.88	30.23	8.72
Northern Cape	Private	Private Farm	26	14	26	12	187	107.91	37.64	13.50	3.91
Northern Cape	Private	Private Reserve	16	5	16	5	561	152.54	74.28	112.20	59.26
Northern Cape	Public	Subtotal	42	19	42	42	748	124.91	36.26	39.47	17.85
Northern Cape	Public	National Park	6	3	6	3	154	2498.22	1414.80	51.33	14.95
Northern Cape	Public	Provincial Reserve	6	0	6	0	0	83.16	31.68	NA	NA
Northern Cape	Total	Subtotal	12	3	12	12	154.00	1290.69	766.62	51.33	14.95
Northern Cape	Private	Total	54	22	54	54	902.00	383.97	179.80	41.09	15.47
Western Cape	Private	Private Farm	70	62	70	59	490.00	15.18	3.84	7.95	1.71
Western Cape	Private	Private Reserve	45	34	45	34	308.00	69.00	20.94	9.06	1.26
Western Cape	Public	Subtotal	115	96	115	115	798.00	36.24	8.82	8.34	1.19
Western Cape	Public	National Park	4	0	4	0	0.00	1065.65	561.18	NA	NA
Western Cape	Public	Provincial Reserve	15	1	15	1	6.00	222.82	85.90	6.00	NA
Western Cape	Total	Subtotal	19	1	19	19	6.00	400.26	148.79	6.00	NA
Western Cape	Private	Total	134	97	134	134	804.00	87.86	24.56	8.32	1.18

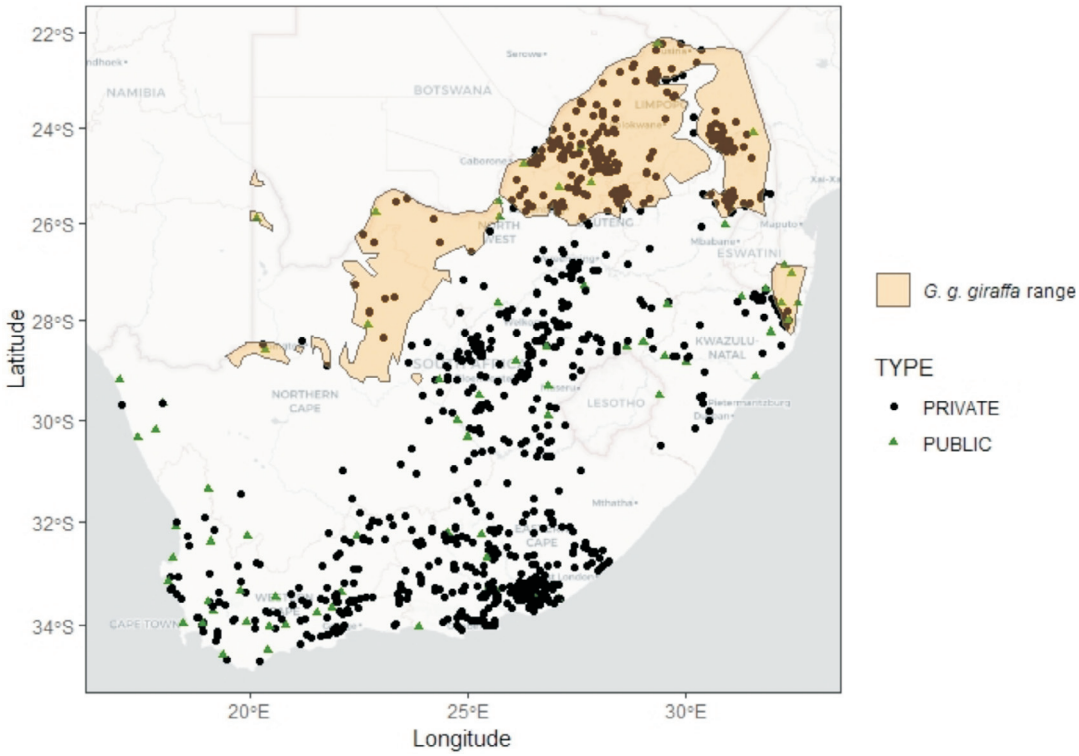

Fig. A1. Current records of southern giraffe *Giraffa giraffa* occurrence in South Africa collected between 2014 and 2025 compared to their previously reported range by IUCN RedList (Muller *et al*. 2018). Divided into public and private, the range encompasses private farms, private reserves, provincial nature reserves and national parks.

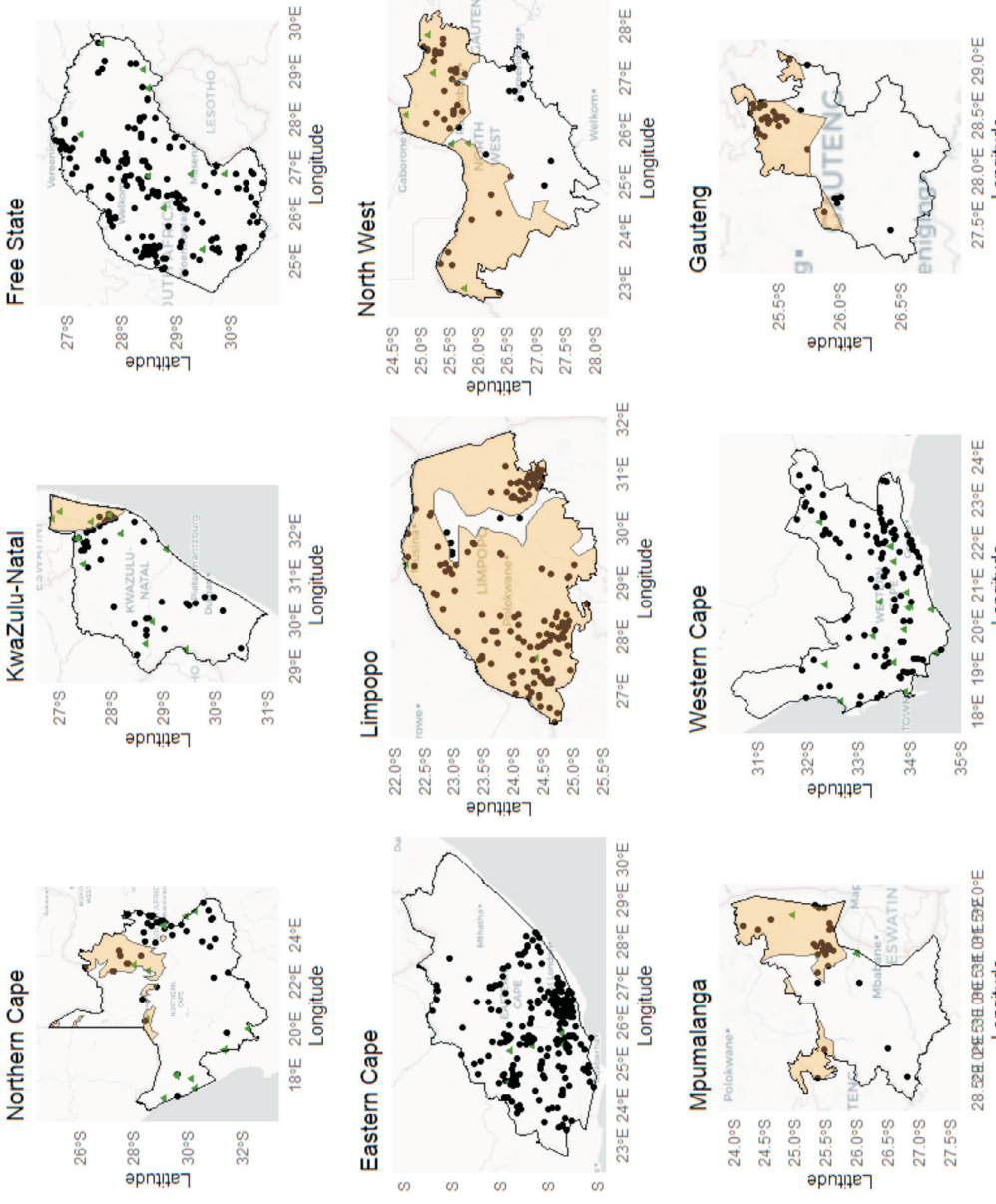

Fig. A2. The distribution of all southern giraffe population data collected across South Africa zoomed for each province. Orange polygon indicates the 2016 IUCN Red List range in South Africa (Muller *et al.* 2018).