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GNUSLETTER is the biannual newsletter of the IUCN SSC Antelope Specialist Group (ASG). First published in 1982 by the first ASG Chair Richard D. Estes, the intent of *GNUSLETTER*, then and today, is the dissemination of reports and information regarding antelopes and their conservation.

ASG Members are an important network of individuals and experts working across disciplines throughout Africa, Asia and America. Contributions (original articles, field notes, other material relevant to antelope biology, ecology, and conservation) are welcomed and should be sent to the editor. *GNUSLETTER* is published in English in electronic form and distributed widely to members and non-members, and to the IUCN SSC global conservation network. To be added to the distribution list please contact asgpo@marwell.org.uk.

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Front Cover. Dorcas Gazelle (*Gazella dorcas*) hunted by the Critically Endangered Northwest African Cheetah (*Acinonyx jubatus hecki*), Tassili, Algeria, April 2024 **(**© Redouane Tahri**)**

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FROM IUCN AND ASG

RECENT EVENTS

Green Status of Species assessments

The IUCN Green Status of Species complements the Red List by assessing the recovery of species' populations and measuring their conservation success. The Green Status has three essential facets of recovery: A species is **fully recovered** if it is present in all parts of its range, even those that are no longer occupied but were occupied prior to major human impacts/disruption; and it is **viable** (i.e., not threatened with extinction) in all parts of the range; and it is performing its **ecological functions** in all parts of the range. These factors contribute towards a "**Green Score**" ranging from 0–100%, which shows how far a species is from its "fully recovered" state. For further details of the Green Status process see: https://www.iucnredlist.org/about/green-status-species

ASG has begun the process of assessing the Green Status of all threatened antelopes and recently submitted the first set of draft assessments for review. These covered six threatened species in the Sahel-Sahara region (Addax, Dama Gazelle, Slender-horned Gazelle, Cuvier's Gazelle, Dorcas Gazelle, Red-fronted Gazelle) and seven species in the Horn of Africa (Dibatag, Speke's Gazelle, Heuglin's Gazelle, Soemmerring's Gazelle, Beira, Hirola, Mountain Nyala). The GSS assessment for Scimitar-horned Oryx is being prepared in collaboration with the Zoological Society of London, and the existing GSS assessment for Saiga is being updated in line with the 2023 Red List assessment.

The Global Cheetah Summit

The first Global Cheetah Summit took place from 28 to 31 January 2024 in Addis Ababa, Ethiopia, organised by the Cheetah Conservation Fund (CCF) in collaboration with the Ethiopian Wildlife Conservation Agency. The Summit brought together over 130 participants from more than 80 institutions from Africa, the Middle East, India, Europe, and the United States. This diverse group of international stakeholders represented governments, universities, NGOs, policy and economy institutes, local and Indigenous communities, and private enterprise. The summit culminated in the signing of the Addis Ababa Declaration for Global Cheetah Conservation.–A Call to Action. ASG was pleased to co-sign the declaration alongside many other organisations ASG also recorded a message of support, played at the opening session. Dr Tim Woodfine gave a presentation on behalf of Shara Conservation and ASG on the variable status of antelope populations – as a key cheetah prey resource – across different regions in cheetah range within Africa

CMS 14th Conference of the Parties (CoP 14)

The Fourteenth Meeting of the Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS CoP14) took place from 12-17 February 2024 in Samarkand, hosted by the Government of Uzbekistan. The agenda item of most relevance to antelopes saw the Sahelo-Saharan Megafauna (SSMF) Concerted Action upgraded to the status of a CMS Initiative, and formal approval of the revised SSMF Action Plan. The SSMF Initiative and the Action Plan cover seven threatened antelopes in the Sahel-Sahara Region as well as the Barbary Sheep *Ammotragus lervia*. Side-events featured a presentation by the Environment Agency Abu Dhabi on the reintroduction of Scimitar-horned Oryx, and presentations on Goitered Gazelle surveys in Kazakhstan, and Saiga conservation.

23rd annual meeting of the Sahelo-Saharan Interest Group (SSIG)

The meeting took place from 30 April to 2 May in Agadir, Morocco. It was co-organised by Sahara Conservation and hosted by the Moroccan Agence des Eaux et Forêts. The programme included several presentations on threatened antelopes, including Morocco's new National Strategy for Sahelo-Saharan Species, the CMS Sahelo-Saharan Megafauna Initiative, dama gazelle conservation in Chad 2001-2024, a pilot release of Dama Gazelles in Chad, behaviour of dama gazelle in Air Ténéré NNR, effects of environment on mhorr Dama Gazelle, haemoparasite infections at the wildlife/livestock interface, spatio-temporal overlap in released addax, estimating the addax population in Souss-Massa NP using distance sampling, anti-poaching and gazelle recovery in the Atlantic Sahara, the C2S2 Partnership for Species initiative, ORG.one genetic management to support reintroduction of Scimitar-horned Oryx, non-invasive techniques to monitor oryx, Western Giant Eland, protected areas in Chad, and the Ennedi Natural and Cultural Reserve. A short technical workshop was held to discuss breeding options for the captive Dama Gazelles at Ouadi Rimé-Ouadi Achim Reserve and on the final afternoon participants visited Souss-Massa NP.

World Species Congress

The World Species Congress, hosted by Reverse the Red, took place on 15 May 2024 as a 24-hour, online event. The content was adapted to the interests and needs of different regions and combined live and pre-recorded items highlighting evidence-based conservation actions to save species, and inspire conservationists to scale up success. Many satellite events took place regionally, nationally, and locally. The WSC also promoted the Reverse the Red **Species Pledge**, which is designed to show which organizations, groups, and agencies are committed to recovery actions for species. ASG has signed the species pledge, underlining our commitment to antelope conservation and recovery.

FORTHCOMING MEETING

Dama Gazelle Conservation Workshop III

The first Dama Gazelle Conservation Workshop was held in 2013, hosted by the Royal Zoological Society of Scotland in Edinburgh. This brought together conservationists from a wide range of institutions to save this Critically Endangered species from extinction. Discussions shared information on the species status in both the wild and captivity. Actions were proposed to improve the species chances for survival. *Dama Gazelle Conservation Workshop II* was held in December 2018, hosted by Al Ain Zoo, in the United Arab Emirates. This time, most of the species range states were represented. Proposed actions from Workshop I were evaluated and new possibilities were developed. *Dama Gazelle Conservation Workshop III* is scheduled to take place on 16-19 September 2024 in Kerrville, Texas. It will be hosted by the Second Ark Foundation, in collaboration with the Exotic Wildlife Association. The workshop will give conservationists the chance to see how dama gazelles are kept in the United States where more than a thousand animals are kept on private ranches. As well as conducting a five-year review of the strategy proposed at Workshop II, Workshop III will discuss how the dama gazelles in Texas and elsewhere in the United States can contribute to the survival of the species.

ANTELOPE RESOURCES

The Sudan Open Archive

The Sudan Open Archive offers free digital access to knowledge about all regions of Sudan. It is an expanding, word-searchable, full-text database of historical and contemporary books and documents. The current version, SOA 4.0, includes two new special collections: the first thirty-two volumes of Sudan Notes and Records, Sudan's flagship scholarly journal, and the collected papers of the late Sudan scholar, Richard Gray. This collection contains 1,307 documents comprising 40,668 pages. The Sudan Open Archive allows you to access the content of the collection easily via full-text searching and different browsing structures. First-time users can visit the "Help" page to more learn about the functionalities available.
https://sudanarchive.net/

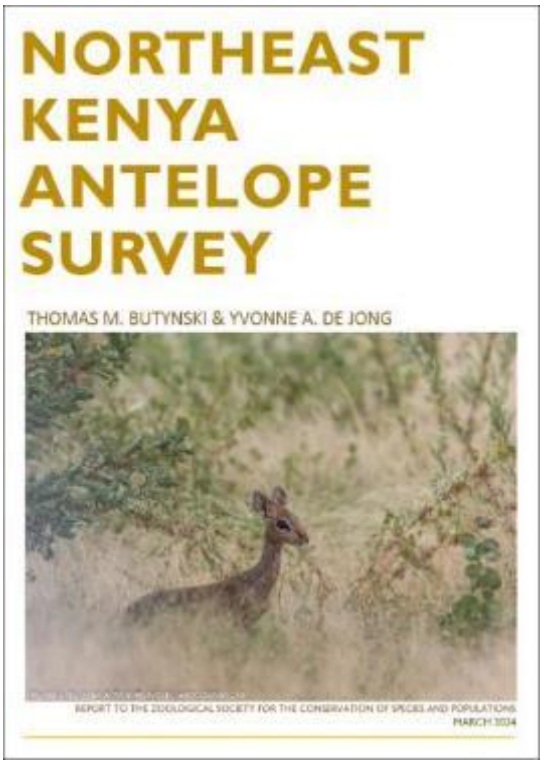
Saiga Resource Centre

The Saiga Resource Centre aims to provide a comprehensive database of literature, images and videos on the saiga antelope for use by the saiga conservation community. The Saiga Resource Centre website was conceived of as a means of charting progress towards the fulfilment of the CMS MoU on saiga antelope conservation. It was designed and implemented by the Saiga Conservation Alliance and the Association for the Conservation of Biodiversity in Kazakhstan, under contract from the CMS. The SRC acts as a portal and forum for those interested and involved in saiga conservation. With input from range states themselves and professionals in the field, as well as the general public, we aim to make the SRC into a comprehensive and accurate online service to support saiga conservation.
https://www.saigaresourcecentre.com/

RESEARCH AND NOTES FROM THE FIELD

Northeast Kenya Antelope Survey

Thomas M. Butynski and Yvonne A. de Jong
Eastern Africa Antelope Diversity and Conservation Program
Eastern Africa Primate Diversity and Conservation Program
www.wildsolutions.nl/northeast-kenya-antelope-survey



Northeast Kenya is the most poorly known region in eastern Africa as concerns the taxonomy, distribution, abundance, threats, and conservation status of its larger mammals. Nonetheless, this region has a high number of threatened genera and species. Among the larger mammals, 15 species of antelope are known to occur. Diurnal surveys, nocturnal surveys, and camera trap surveys were conducted to cover as much of northeast Kenya (~130,000 km²) as possible in four fieldtrips (total of 48 days, total distance driven 7,163 km). The objectives of the Northeast Kenya Antelope Survey were to: (1) considerably improve our understanding of the taxonomic status, distribution, relative abundance, and threats to the region's species of antelope; (2) contribute to the reassessments of their *IUCN Red List* degree of threat status; (3) provide practical, prioritized, recommendations for ameliorating the threats; and (4) bring local, national, and international attention to the unique biodiversity of northeast Kenya, using antelopes as a flagship group.

This survey was undertaken near the end of a 3–5-year drought. During this survey, antelope species were nowhere common outside of protected areas. Ten of the 15 antelope species of northeast Kenya were encountered. The species most frequently encountered was Kirk's Dik-Dik *Madoqua* (*kirkii*) *kirkii*, followed by Southern Gerenuk *Litocranius walleri walleri,* and Bright's Gazelle *Nanger notata*. The least common were Common Waterbuck *Kobus ellipsiprymnus ellipsiprymnus* and Greater Kudu *Tragelaphus strepsiceros*. The five species not encountered (Common Eland *Tragelaphus oryx*, Salt's Dik-Dik *Madoqua saltiana*, Common Duiker *Sylvicapra grimmia*, Peters's Gazelle *Nanger petersii*, Coke's Hartebeest *Alcelaphus buselaphus cokii*) have geographic ranges that are on the margins of this region.

During this survey, we obtained range extensions for Kirk's Dik-Dik (~130 km to the northeast) and Greater Kudu (~20 km to the east). The extension for Kirk's Dik-Dik is particularly important as this increases the area of sympatry with Günther's Dik-Dik *Madoqua* (*guentheri*) *guentheri* by ~18,000 km² to the north to the border with Ethiopia. This means that this species likely occurs in south Ethiopia. If so, this is a new large mammal for Ethiopia. Phenotypic

descriptions and photographs obtained during this survey are not only instrumental for fine-tuning the east limit of Smith's Dik-Dik *Madoqua* (*guentheri*) *smithii* and the west limit of Günther's Dik-Dik, but also for detecting phenotypic clines and hybrid zones.
Beisa Oryx *Oryx beisa* were not detected outside the protected areas in the southwest corner of the study area. We suspect, however, that unprotected herds remain scattered over northeast Kenya. Bright's Gazelle were most frequently encountered during the February–March 2023 survey when the drought was at its peak. It might be that this species was attracted to the edges of roads where some forage was present due to water run-off. Bright's Gazelle were sometimes seen near people, villages, and large herds of livestock.

Figure 1. *Adult male Bright's Gazelle* Nanger notata *and sandgrouse, northeast Kenya (© Yvonne de Jong and Tom Butynski)*

All antelope species in northeast Kenya are threatened to some extent by competition with livestock for food and/or water, habitat degradation, loss and fragmentation, as well as by poaching. Most of northeast Kenya is too arid for large-scale agriculture or even large-scale ranching. It appears that the antelope species most vulnerable in this region at this time are Beisa Oryx, Common Eland, and Greater Kudu. Common Impala *Aepyceros melampus melampus*, Common Waterbuck, and Coke's Hartebeest have, historically, only occurred in northeast Kenya along the fringes of the Ewaso N'jiro River. This seems to still be the situation. Maasai Bushbuck *Tragelaphus scriptus delamerei* continues to be present on Mount Marsabit and along the Ewaso N'jiro River. Both species of Dik-Dik are relatively adaptable to human-caused habitat changes. To a certain extent, livestock grazing might favor them.

Most of northeast Kenya is, historically, unsuitable for the water-dependent species, including Common Impala, Maasai Bushbuck, Common Waterbuck, Common Eland, and Coke's Hartebeest. We suspect that all of these species declined in abundance during the 3–5-year drought due to severe competition with livestock and, probably, intensified poaching. All of the water-independent antelope species known to, historically, occur in northeast Kenya are still present and widespread. With average to above average annual rainfall, these species are expected to recover well and to persist in this region long into the future. The data obtained during this survey can serve as a baseline for this expected recovery.

Figure 2. *Adult female Southern Gerenuk* Litocranius walleri walleri *in Commiphora woodland north of Habaswein, northeast Kenya (© Yvonne de Jong and Tom Butynski)*

Besides lagas (seasonally dry rivers), man-made perennial water sources (dams and boreholes) provide water to antelopes and other wildlife in some parts of northeast Kenya. Many man-made water sources are, however, unavailable to wildlife as they are fenced and/or occupied by people, livestock, and dogs. Although the vegetation in and around settlements is typically severely degraded by livestock, the human population in the region is relatively small and there are few roads. Therefore, large parts of northeast Kenya are little affected by people due to the scarcity of perennial sources of water.

Thirty-one mammal species, other than antelopes, were encountered during this survey, six of which are 'threatened' (Vulnerable, Endangered, Critically Endangered). We obtained altitudinal range extensions and/or geographic range extensions, and natural history data for Desert (Somali) Warthog *Phacochoerus aethiopicus delamerei*, Common Warthog *Phacochoerus africanus*, Somali Lesser Galago *Galago gallarum*, Olive Baboon *Papio anubis*, Pancake (Crevice) Tortoise *Malacochersus tornieri*, and several bird species, including Short-Toed Snake Eagle *Circaetus gallicus.*

Figure 3*: Adult female Smith's Dik-Dik* Madoqua (guentheri) smithii*, north of Marsabit, northeast Kenya (© Yvonne de Jong and Tom Butynski)*

All 10 antelope species distribution maps presented in this report, and some non-antelope species maps, will be further updated based on (1) geographic range extensions found during this survey, (2) application of soil and vegetation shapefiles that help identify areas of unsuitable habitat, and (3) our database which includes locality records compiled over the past 23 years.

Butynski, T.M. and De Jong, Y.A. 2024. *Northeast Kenya Antelope Survey*. Unpublished report to the Zoological Society for the Conservation of Species and Populations (ZGAP). Eastern Africa Antelope Diversity and Conservation Program, Nanyuki, Kenya. Website: www.wildsolutions.nl/northeast-kenya-antelope-survey

This survey was kindly made possible by funding from the Zoological Society for the Conservation of Species and Populations (ZGAP) through the inheritance of Michael Amend.

Current Status of Antelopes in Sudan

Ibrahim M. Hashim
Sudanese Wildlife Society

Twenty-one species of antelopes are found in Sudan (Kingdon & Hoffman 2013) of which 28.6% are gazelles (Table 1). These antelopes inhabit a variety of habitats comprising desert, savanna, forest, and montane ecosystems. Short status summaries for each species in Sudan were produced by Hillman & Fryxell (1998). Few field surveys or detailed studies have taken place in recent years.

Fourteen protected areas (PAs) have been proclaimed in Sudan since 1935 (Mohamed 2013). Their history goes back to those established during colonial rule and those established after independence. In this context, five (36%) PAs were proclaimed during the colonial rule (1930–1939), the remainder (64%) after independence, from 1980 to 2015. Apparently, two gaps in the history of wildlife conservation exist. The first gap spans 41 years between the last PA established during colonial rule and the first one established after independence. The second gap spans 10 years, representing the period between establishment of the first PA (in 1980) and the second (in 1990) after independence. These two gaps tremendously impacted wildlife *in situ*. Desert flagship species such as Scimitar-horned Oryx (Scientific names in Table 1) and Addax were exterminated during the 41-year gap. More recently, Tora hartebeest, Soemmerring's gazelle, and Tiang were extirpated in Dinder National Park and the Lwell hartebeest in Radom National Park (Mohamed 2013). It is worth mentioning that Frazer Darling, a wildlife biologist visited Sudan in 1961 at the request of the Sudanese government and recommended a national park or game reserve in northern Darfur to protect Addax and Oryx (Happold 1966). The desert national park (Wadi Howar) was finally established in 2000, 39 years later, when the two species were already exterminated.

Unplanned land use has fragmented ecosystems, thereby negatively impacting wildlife. Agricultural expansion into intact savanna ecosystems has increased so much that more than six ungulates are expected to be extinct in the wild or only surviving in captivity (WWF 2018). Livestock encroachment into protected areas compete with wildlife for forage resources, and overexploitation of wildlife further reduces their population size and genetic diversity (Anonymous 2005). The current conservation status of several of Sudan's antelopes is precarious. The status of other species in the country is unknown due to a lack of field surveys, resulting from a lack of resources for wildlife conservation and insecurity in several regions.

Hashim (1996, 1999) surveyed the area from Dinder National Park (DNP) to the Red Sea Hills. Soemmerring's Gazelles were not encountered. Heuglin's Gazelles were encountered in DNP but were threatened by poaching and cutting of *Balanites* trees that are used for shade. Small numbers of the gazelles were also observed in Kebu and Dweira forests near Al Qadaref city. Very small population numbers (< 10 at each site) were seen at three localities in the Red Sea Hills to the north of their known range. All showed long flight distances because poaching pressure was reportedly heavy. Heuglin's Gazelle is still present in DNP where a few animals were photographed recently (Bauer *et al.* 2018). Overall, numbers of Heuglin's gazelle in Sudan appear to be low, and comparison with earlier reports indicate that wildlife in general has declined in Dinder over the last 50 years (Mohammed *et al.* 2023).

A further issue hindering their conservation is that species are categorized nationally on the Wildlife Conservation General Administration (WCGA) Schedules 1-4 which are not compatible with their status on the IUCN Red List. WCGA Schedule 4 deals with the proclamation of protected areas, schedule 1–3 with the conservation of species. Schedule 1 lists species that are fully protected; no hunting or other uses are permitted. Species in Schedule 2 can be hunted only by issuing a special license i.e., they are partially protected. Species listed in Schedule 3 can be hunted by issuing a general license. A species in any Schedule can be uplisted or downlisted after intensive and extensive field studies, which rarely happens. The criteria used for the uplisting or the downlisting species are not identified and are presumably dependent on personal impression.

My objective here is to compare the WCGA Schedules with the species' global status on the IUCN Red List and their Provisional National Red List status to show how effective (or ineffective) are the Schedules in expressing the conservation status of antelope species (Table 1). Recently, within the framework of the country project entitled 'Strengthened Protected Areas System and Integrated Ecosystem Management in Sudan', funded by United Nations Development Program, a four-expert committee from WCGA, University of Khartoum, University of Bahri and Sudanese Wildlife Society was formed to reschedule lists of wildlife species based on their present status in the country and thus Provisional National Red List status is produced (see Table 1). Among the 21 antelope species (Table 1), 5 (23.8%) are in WCGA Schedule 1: Soemmerring's Gazelle (VU, IUCN 2016b), Dama Gazelle (CR, IUCN 2016c), Addax (CR, IUCN 2016a), Scimitar-horned Oryx (EN, IUCN 2023), and Tora Hartebeest (CR, IUCN 2017a). All these antelopes have been extirpated (EX) in Sudan.

Furthermore, five species (23.8%) are in WCGA Schedule 2. Among these both Lewel Hartebeest (EN, IUCN 2017b) and Tiang (LC, IUCN 2017c) are also EX in Sudan, and no studies are available to confirm the status of the remaining three species which are thus categorized as Data Deficient (DD = no recent field studies being done) in Sudan. Eleven antelope species (52.4%) are listed in Schedule 3, eight of which are considered DD. Some recent information on status in Sudan is available for Dorcas Gaelle (Scholte & Hashim 2013a), Red-fronted Gazelle (Scholte & Hashim 2013b) and Heuglin's Gazelle (Hashim 2013). Based on this and some other limited information, these three species are tentatively assessed as VU/EN, EN and EN, respectively in Sudan. It should be underlined that these categories are provisional and subjective, and a full national Red List assessment process is needed to confirm the status of these species. Eleven species of antelopes are thus classified as DD in Sudan, underlining the urgent need for field surveys to establish their current distribution and population size. It is likely that when better information becomes available, several, or even all, of these DD species may be shown to be threatened at the national level.

Presumably, the WCGA schedules were inherited from the period of colonial rule and have not been updated. Except for the Dorcas gazelle, which is listed in Schedule 2, all the remining 20 antelope species, according to the Provisional List, are proposed for inclusion in Schedule 1. These listings are based on personal experience because no recent field studies have been conducted. WCGA Schedules have weak or poorly defined criteria for describing the conservation status of antelopes in Sudan. It is highly recommended that the Schedule system be revised to consider the IUCN Red List category so that the conservation status of antelopes in Sudan is in line with the global conservation system. Urgent surveys are needed on all species of antelopes in Sudan to ascertain their status and support revision of the WCGA Schedules.

Table 1. Comparison between WCGA Schedules and IUCN Red List status

WCGA Schedule[1]	#	Species	IUCN Red List[2]	Provisional National Red List status[3]
1	1	Soemmerring's gazelle *Manger soemmerringii*	VU	EX
	2	Dama Gazelle *Manger dama*	CR	EX
	3	Addax *Addax nasomaculatus*	CR	EX
	4	Scimitar-horned Oryx *Oryx dammah*	EW	EX
	5	Tora Hartebeest *Allahu's buselaphus tora*	EN	EX
2	1	Lewella Hartebeest *Alcelaphus buselaphus lelwel*	EN	EX
	2	Salt's Dik-dik *Madoqua saltiana*	LC	DD
	3	Roan antelope *Hippotragus equinus*	LC	DD
	4	Tiang *Damaliscus lunatus tiang*	LC	EX
	5	Greater Kudu *Tragelaphus strepsiceros*	LC	DD
3	1	Dorcas gazelle *Gazella dorcas*	VU	VU/EN
	2	Red-fronted Gazelle *Eudorcas rufifrons*	VU	EN
	3	Slender-horned Gazelle *Gazella leptoceros*	EN	DD
	4	Heuglin's Gazelle *Eudorcas tilonura*	EN	CR/EN
	5	Oribi *Ourebia ourebi*	LC	DD
	6	Klipspringer *Oreotragus oreotragus*	LC	DD
	7	Common Duiker *Sylvicapra grimmia*	LC	DD
	8	Red-flanked Duiker *Cephalophus rufilatus*	LC	DD
	9	Kob *Kobus kob*	LC	DD
	10	Bohor reedbuck *Redunca redunca*	LC	DD
	11	Bushbuck *Tragelaphus scriptus*	LC	DD

[1]WCGA Schedule; [2]Global Red List status (www.iucnredlist.org); [3]Provisional assessment by the committee.

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Observations on Peters's gazelle

Kenneth K. Coe

The taxonomy of the Grant's gazelle (*Nanger granti*) group is not yet fully resolved. The three widely recognized forms, Grant's gazelle (*Nanger (g.) granti*), Bright's gazelle (*N. (g.) notata*), and Peters's gazelle (*N. (g.) petersii*), are regarded either as species (Siegismund *et al*. 2013) or as subspecies. Some features of the pelage and horn morphology, however, are not fully consistent across the range, particularly those between Grant's and Bright's gazelles. This study focuses on the identification and range extension of Peters's gazelle and the intermediate form between Peters's gazelle and Grant's gazelle, *serengetae*.

Peters's gazelle is perhaps the most morphologically distinctive form within the Grant's gazelle group: the overall pelage is more tawny; the male horns, when viewed from the front, are more parallel to each other; the dark patch above the nose is often faint or absent; the pygal stripes are well-defined, but the flank bands occur only in the young, *and the white of the rump does not extend much above the base of the tail, as the tawny body color continues as a thick stripe, extending down the dorsal side of the tail*.

It was thought that Peters's gazelle's historical range consisted of relatively open savanna from the southern corner of Somalia southward to the Galana River in Kenya, in no case more than approximately 150 km from the Indian Ocean. According to Daphne Sheldrick's *Animal Kingdom: The Story of Tsavo, the Great African Game Park*, initially she and her park colleagues indeed did not observe any Peters's gazelles south of the Galana in Tsavo East National Park. That is, until elephants changed the landscape. During the 1950s, the growing elephant population opened up what had been unsuitable gazelle habitat composed mostly of *Commiphora* thickets in Tsavo East, and, according to Sheldrick, the first Peters's gazelle was seen south of the Galana in 1958. There is evidence though that some southward range expansion had actually occurred prior to 1958. Even Sheldrick recounts that there was a hunter who claimed to have shot a Peters's gazelle near the southern boundary of Tsavo East some years before the park was gazetted in 1948, and the form "*serengetae*", which may represent an intermediate form between *N. g. granti* and *N. g. petersii*, was described from the eastern foothills of Mt. Kilimanjaro in 1913 (Siegsimund *et al*. 2013). Suffice it to say, the changing landscape has greatly aided Peter's gazelle's range expansion, as today they are common and widespread in Tsavo East wherever there is open savanna and is even reputed to occur in Mkomazi National Park across the border in Tanzania as well.

The s*erengetae* form is most commonly observed in the southern part of Tsavo West National Park near Lake Jipe. Safari Club International (SCI) recognizes s*erengetae* and points to a thin, rather than thick, main pelage-colored stripe extending down the dorsal side of the tail as being diagnostic. The extent of the population or the exact range of *serengetae* is little known. Anecdotally, the majority of the gazelles I have observed during my three separate visits to the Lake Jipe area of Tsavo West have shown full *N. g. granti* traits. A future study of the *serengetae* form could contribute to a further understanding of Peters's gazelle's range expansion and the confounding overall taxonomy of *N. granti*.

Figures 1-3 show the typical *N. g. petersii*. All the photos were taken from south of the Voi River in the southern section of Tsavo East National Park in Kenya.

Figure 1. *Note the tawny pelage, the relatively parallel horns, and the near absence of the dark patch above the nose in this male (© Kenneth K. Coe)*

Figure 2. *Note the main pelage color, continuing as a thick stripe, extending down the dorsal side of the tail (© Kenneth K. Coe)*

Figure 3. *Female and young. Note the flank band only in the young (© Kenneth K. Coe)*
Figure 4 shows a typical *N. g. granti* in Tsavo West N.P. about 7 km northwest of the town of Maktau.

Figure 4. *Note the diverging horns, the distinct dark patch above the nose, and the white of the rump extending well above the base of the tail in this male. This individual is much more reddish than is typical, possibly because it has taken on the color of the lateritic soil (© Kenneth K. Coe)*

Figures 5-6 show, possibly, *serengetae*, both taken inside Tsavo West National Park about 5 km east of Lake Jipe.

Figure 5. *Note the overall appearance of a typical N. g. granti (the diverging horns and the distinct dark patch above the nose) but for the thin, main pelage-colored stripe extending down the dorsal side of the tail (a serengetae trait) (© Kenneth K. Coe)*

Figure 6. *Note the slightly diverging horns, the very distinct dark patch above the nose (a N. g. granti trait), and the thin, main pelage-colored stripe running down the dorsal side of the tail (a serengetae trait). (© Kenneth K. Coe)*

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Observations of Bushbuck in Liberia

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The bushbuck (*Tragelaphus scriptus*) is a medium-sized antelope found throughout sub-Saharan Africa, from the West and Central African savanna zone south to the eastern and southern Cape regions of South Africa (IUCN SSC Antelope Specialist Group 2016). The range of the species includes the Upper Guinean Tropical Forest of West Africa, approximately 50% of which is in Liberia (Tappa *et al*. 2016). The bushbuck can be seen in many landscapes throughout Liberia, especially in secondary forests and degraded or open areas where they feed on young vegetation (Ciszek 1999).

The bushbuck can be found in Liberia's Marshall Wetlands which lie on the coast of the Gulf of Guinea, approximately 50 km southeast of the country's capital city, Monrovia. The Marshall Wetlands are a Ramsar site of international importance and a proposed protected area, currently undergoing a gazettement process that will designate the wetlands as a multi-use protected space. The area covers 121.68 km^2/12,000 ha and is surrounded by over 60 communities located in Grand Bassa and Margibi counties, with a combined human population of 86,000. The site is comprised of islands, creeks, swamps, and tropical forest near the mouths of the Farmington, Junk, and Little Bassa rivers, and is primarily covered by mature mangrove forests, with trees reaching heights of over 30 m, with secondary forests and savannah woodland further inland (RSIS 2006). Mean annual rainfall can exceed 3,000 mm in Liberia's rainy season which typically commences in April, peaks in July, and tapers in November, with temperatures ranging from 22–27°C (Liberia Environmental Protection Agency 2018). Liberia's dry season runs from November to April.

A biodiversity study was conducted within the Marshall Wetlands, during which 23 camera traps were installed in a variety of locations at 250–400 m intervals in secondary forest, left active for 60 days. Field guidebooks and online resources were utilized for species identification. Between 3 March and 5 May 2023, 313 wild individuals of multiple species were identified from the resulting camera trap images, including 21 bushbucks, comprising 6.7% of the wildlife recorded. Relative to other identified species, it can be hypothesized that bushbucks are common in the Marshall Wetlands.

Images captured included one individual bushbuck who had clearly suffered an injury from a snare trap, an illegal hunting method commonly used in Liberia (Figures 1-2). The ring around the neck indicated that the individual likely struggled for several hours before managing to break free. Bushbucks are protected in Liberia but illegal hunting in the area had devastated

Figures 1-2. *Camera trap photos of a male bushbuck showing a scar encircling the animal's neck. It is estimated that the injury was caused by a snare trap (© Liberia Chimpanzee Rescue and Protection).*

populations in the Marshall Wetlands. However, the results of this study, show that illegal hunting has drastically reduced since the physical establishment of Liberia Chimpanzee Rescue & Protection's Sanctuary and Conservation Center in 2020, increasing the protection of the area through work with local communities, patrols, and the presence of the organization and its team. The bushbuck now enjoys free and secure movement in the Marshall Wetlands, exemplifying how a combination of increased protection, positive human presence (such as researchers, conservation organizations, local communities), and investment and collaboration can lead to successful and inclusive conservation of local biodiversity.

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Suni and Blue Duiker Identikit

Charles Foley

Anyone who has spent time walking in forests in East Africa will on occasion have caught a glimpse of a small antelope darting across the track or dashing off into the undergrowth before disappearing from sight. These glimpses are often too short for a reliable identification. Some species are not hard to identify even from rapid sightings. A large, dark or red-coated animal with spots or stripes and black and white on the legs is likely to be a Bushbuck *Tragelaphus scriptus*, whereas a smaller animal with a bright red coat is one of the red duiker species, of which the most widespread in the region is Harvey's Duiker *Cephalophus harveyi*. The difficult ones are the very small antelope that are uniformly grey or brown in colour. There are two small, darkish antelope in East African forests, which are both common: the Blue Duiker *Philantomba monticola* and the Suni *Nesotragus moschatus*. If the animal is seen when it is stationary and in good light, identification should be straightforward, but very brief sightings of a fast-moving animal or sightings at night are much more problematic. The same applies to camera trap images, especially black and white photos, or ones that show only part of the animal. Blue Duiker and Suni do not occur together in some parts of the region which makes identification easier, but where both species do overlap, some key identification features are needed to separate them.

These features are illustrated on the photos below. The main differences are 1. Body colour: Blue Duikers are a usually a slaty-grey colour (Figure 1) while Suni are light brown or a reddish-brown colour (Figures 2-3). However, be aware that Blue Duikers in parts of western Tanzania and Kenya can also be a sandy-brown colour (Figure 4). 2. Tail colour: Blue Duiker has a black stripe down the centre of the tail with two distinctive white stripes on either side of it (Figure 5); Suni has a longer, bushy tail which is uniformly coloured and generally the same colour as the body (Figure 6). 3. Tail movement: Blue Duiker tends to flick its tail *up and down*, while Suni moves its tail from *side the side*. 4. Pre-orbital gland: if you are lucky enough to get a good look at the animal's face, the gland on the duiker curves sharply underneath the eye while on the Suni it is straight (Figure 3). 5. Ears: Blue Duiker has smaller ears than Suni (compare Figures 3 and 4). 6. Horns: if you happen to get very close, the horns on the male Blue Duiker are shorter and only lightly ringed at the base, whereas those on male Suni are ringed for ¾ of the length from the base.

Figure 1. *Blue duiker (© Tanzania Mammal Atlas Project)*

Figure 2. *Suni (© Daudi Peterson)*

Figure 3. *Suni (© Charles Foley)*

Figure 4. *Blue duiker (© Tanzania Mammal Atlas Project)*

Figure 5. *Blue duiker (© Tanzania Mammal Atlas Project)*

Figure 6. *Suni (©Tanzania Mammal Atlas Project)*

ANTELOPE NEWS

A new reintroduction of Addax

On 22 December 2023, 10 Addax *Addax nasomaculatus* were released into the wild in the Ennedi Natural and Cultural Reserve (ENCR), in north-eastern Chad. The addax were transported to Ennedi from the reintroduction programme in Ouadi Rimé-Ouadi Achim Wildlife Reserve on 8 November 2023. This is the first step in a pilot project, which has the ultimate aim of establishing a population of >500 individuals in the area. The operation was conducted jointly the Government of the Republic of Chad, African Parks, and Sahara Conservation. It was supported by funding from the European Union, Dutch Postcode Lottery, and Fondation Segré. The Ennedi Natural and Cultural Reserve is a World Heritage Site covering 50,141 km^2 and it consists of a large massif containing sculpted geological formations and rock arches, and surrounding desert ecosystems. The reserve also harbours Dorcas Gazelle *Gazella dorcas* and Barbary sheep *Ammotragus lervia*. Scimitar-horned Oryx *Oryx dammah* and Dama Gazelle *Nanger dama* also formerly occurred in the Ennedi region. In the mountainous part of the reserve are many *gueltas* – deep water pools in rocky fissures: relict populations of crocodiles still occur in some of these. The higher elevation zones are home to several rare and endemic plants. African Parks assumed management of Ennedi in 2018 in partnership with the government of Chad. The area is now effectively protected, and as well as the addax, the red necked ostrich has been successfully reintroduced and plans to introduce other species are under way.

Source: *https://www.africanparks.org/addax-antelope-released-now-roaming-free-ennedi-natural-and-cultural-reserve*

Dama Gazelles released in Chad

Photo © Sahara Conservation

On 23 January 2024, six Dama Gazelles *Nanger dama* were released into Ouadi Rimé-Ouadi Achim Wildlife Reserve to boost the reserve's wild population of around 50 animals. Three of

the released animals were fitted with GPS tracking devices to monitor their movements and integration into the released group into the wild herd. The six released dama gazelles are partly of local origin and partly captive-bred from local stock. Following the recommendations in the 2019–2028 *Dama Gazelle Conservation Strategy*, Sahara Conservation and its partners started a small captive breeding programme in the reserve in 2020, involving an initial capture of female dama in the Manga region of Chad and one wild male from OROA, plus several passive captures, and a translocation of five gazelles from the Environment Agency – Abu Dhabi. Several births have resulted in a group of 29 dama gazelles to date.
Source: https://saharaconservation.org/releasing-collared-dama-gazelles/

Hirola update

Heavy flooding affected Garissa County including Hirola conservation areas in the wake of the El Niño rains in Kenya. The Tana river overflowed its banks, damaging farms and settlements in Garissa township and its environs. The aftermath resulted in the displacement of over 7,278 households. The Hirola Conservation Project (HCP) responded by collaborating with other organizations to provide aid and support to affected wildlife, farmers, and residents. In November 2023 HCP established four grass islands to restore 100 ha in the Bura-Arawale region. Unfortunately, the floods washed away most of the grass seeds, but the restoration teams and rangers responded quickly by digging water diversion trenches. As a result, two grass islands were successfully salvaged, and they are now witnessing promising signs of robust grass growth. HCP director and founder, Dr Abdollahi Hussain Ali held a meeting with the management board of the Ishaqbini Hirola Conservancy on 11 January 2024 to discuss strategic plans and potential areas of collaboration for 2024 including research, habitat restoration and community social projects. The Ishaqbini Hirola Conservancy is a recognized stronghold for Hirola and plays a pivotal role in the framework of the Hirola recovery plan.
Source: https://www.hirolaconservation.org

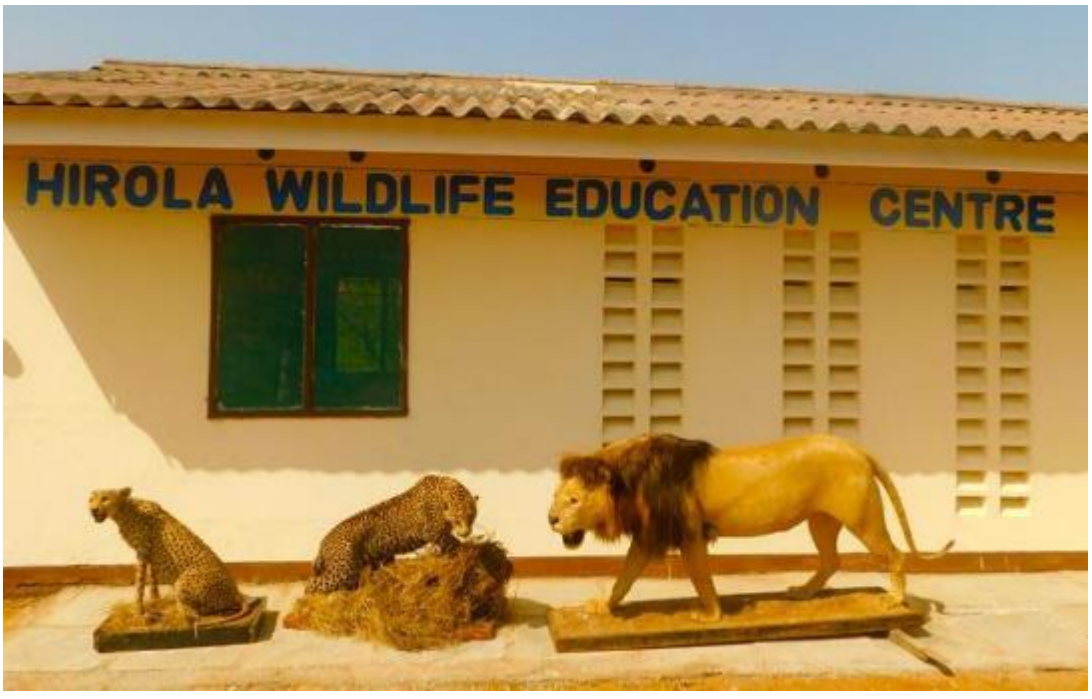


Photo © Hirola Conservation Project

More Mountain Bongos released in Kenya

On 7 May 2024, The Mount Kenya Wildlife Conservancy (MKWC) released another 10 adult Mountain Bongos *Tragelaphus eurycerus isacii* into the Mawingu Mountain Bongo Sanctuary, a 314 ha protected area of indigenous forest located within Mount Kenya Forest Reserve. The Sanctuary was established in 2022 by the Kenya Wildlife Service, Kenya Forest Service, and Mount Kenya Wildlife Conservancy. In 2023 10 Mountain Bongos were translocated into the sanctuary, and since then, four births have been recorded, demonstrating that these antelopes have settled into their new wild home. Kenya has an ambitious plan to achieve a national population of 750 Mountain Bongos in the next 50 years, enshrined in the long-term vision of the Mountain Bongo National Recovery and Action Plan published in 2019. The establishment of the sanctuary, and the two releases of Mountain Bongos to date, is an important milestone in the implementation of the medium-term goals of the Action Plan. Over the last two decades, the Mount Kenya Wildlife Conservancy has nurtured four generations of Mountain Bongo after repatriating them from various zoos in North America to start the breeding and rewilding programme. The release was witnessed by Her Excellency, Mrs. Rachel Ruto, the First Lady of the Republic of Kenya, and ASG member Dr Robert Aruho, Head of Conservancy at MKWC. Mount Kenya Wildlife Conservancy is a non-profit trust located a near Nanyuki town at the foot of Mount Kenya, a U.N. World Heritage Site. The Conservancy supports the ongoing breeding and rewilding of the Critically Endangered Mountain Bongo, provides professional veterinary care for orphaned, injured, and abandoned animals at the Conservancy's Animal Orphanage; and instils a passion for conservation among local youth through community education programmes. *Photo © MKWC.*

Source: https://www.mountkenyawildlifeconservancy.org/

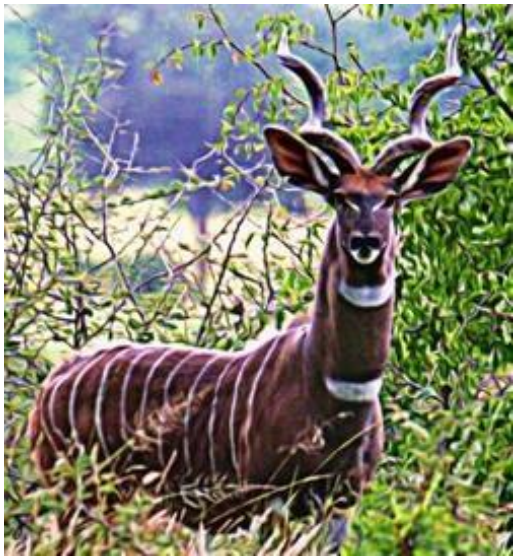
Supporting cross-border cooperation in the TRIDOM landscape

The Dja-Odzala-Minkébé (TRIDOM) landscape spans 191,541 km^2 across Cameroon, the Republic of the Congo, and Gabon, and is identified as a priority among the Congo Basin's landscapes by the Central African Forest Commission's (COMIFAC) convergence plan. The TRIDOM landscape is made up of 24% protected areas, 65% forest concessions, and 11% forestry, agriculture, housing, and infrastructure. PAs are: Covering about 97% cent forest with very rich biodiversity, TRIDOM is also crucial for climate regulation and water management. The TRIDOM landscape harbours seven species of duikers (*Cephalophus callipygus, C, dorsalis, C. ogilbyi, C. nigrifrons, C. silvicultor, C. leucogaster, Philantomba monticola*), Bates' pygmy antelope *Neotragus batesi*, bongo *Tragelaphus eurycerus*, sitatunga *T. spekii*, bushbuck *T. scriptus*, as well as African buffalo *Syncerus caffer* and water chevrotain *Hyemoschus aquaticus*.

A project to promote biodiversity and sustainable development in the TRIDOM landscape has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), with implementation led by Cameroon, Republic of the Congo, Gabon, and the Central African Forest Commission (COMIFAC). The project runs from 2023 to 2027. The key strategies are: To assist Cameroon, the Republic of the Congo, and Gabon to form cross-border cooperation agreements; to enhance exchange between different stakeholders to align protecting nature and socio-economic development; to support private companies in voluntary biodiversity conservation and socio-economic growth, focusing on different business models and efficient land management for financial stability and to collaborate with local communities and municipalities to develop and implement projects for the long-term use of natural resources.
https://www.giz.de/en/worldwide/141814.html

Tarangire Ungulate Observatory

The Tarangire Ecosystem of northern Tanzania is a global hotspot for wildlife but most of the area is not protected. Scientists from the Wild Nature Institute are conducting surveys of ungulates throughout the ecosystem to provide scientific data to inform conservation management. TUNGO uses science to conserve African wildlife by assessing which populations are healthy and which are declining, determining why, identifying migratory connections, and pinpointing where rare species are located. We also use data to help rangers become more efficient and effective at protecting wildlife from poachers.



The TUNGO project is studying the population dynamics of 20 species of ungulate in the Tarangire Ecosystem which is now experiencing severe losses of wildlife due to poaching and habitat loss. Our data-driven solutions provide necessary information to scientifically manage habitats, reduce poaching, maintain ecosystem connectivity, and judge when conservation efforts are succeeding. Robust, standardized, repeatable surveys are a necessary component of any African wildlife conservation effort. We provide these data for 20 species of ungulates, informing local African wildlife conservation efforts. Target ungulate species for our surveys are: Masai giraffe, cape eland, African buffalo, fringe-eared oryx, eastern white-bearded wildebeest, Coke's hartebeest, Grant’s gazelle, greater kudu, lesser kudu, gerenuk, impala, Thomson’s gazelle, common waterbuck, bushbuck, Bohor reedbuck, steenbok, klipspringer, bush duiker, and Kirk’s dik-dik. These species represent large- and small-bodied ungulates of open and closed savanna habitats and include browsers, grazers, and mixed feeders.
Source: https://www.wildnatureinstitute.org/tungo.html

Conservation boost for Upemba National Park

Upemba National Park in south-east DRC covers about 13,000 km^2 and is one of the most important biodiversity sites in the Congo Basin. It encompasses a range of habitats including several types of forests and a vast wetland along the western boundary. The site harbours the entire population of the Critically Endangered Upemba Lechwe *Kobus leche anselli* as well as sable and roan antelopes. Conservation non-profit organization the Forgotten Parks Foundation (FPF) manages Upemba N.P. under contract from the Congolese Institute for Nature Conservation (ICCN). FFP has signed an agreement to join the African Parks Incubation Programme. African Parks is a non-profit conservation organisation that takes on the complete responsibility for the rehabilitation and long-term management of national parks in partnership with governments and local communities through a Public-Private Partnership (PPP) model. The AP Incubator Programme was developed as a partnership model whereby African Parks supports partners and other organisations to reaching their conservation objectives more efficiently. Upemba currently faces challenges such as poaching, illegal gold mining, and slash and burn agriculture in its peripheral areas. In the next 10 years, Forgotten Parks hopes to protect and rehabilitate the park's wildlife and habitat back to healthy ecosystems as well as to support communities to become drivers of sustainable local green economies.

Source: *https://www.africanparks.org/forgotten-parks-foundation-joins-african-parks-incubation-programme*

Arabian Oryx in Qatar

The Arabian oryx is the national animal of Qatar. During the time of "Operation Oryx", prominent members of the Qatari royal family made their own contribution to oryx conservation. HE Sheikh Qassim bin Hamad Al Thani established an oryx reserve in Qatar and in 1967, HE Sheikh Faisal bin Qassim Al Thani organised an expedition to Shisr, Oman and captured 5 oryx to establish a breeding group in Qatar. This group, along with oryx in other private collections, became known as the Royal Herd. Oryx from the Qatari Royal Herd have since been sent to be reintroduction programmes in various parts of the region, including a project in Shaumari, Jordan. In 1979, the Qatar government created an oryx reserve, bringing together selected oryx from different collections. These animals have been distributed among more than 10 protected areas, while many more exist in private collections. The Al Mas'habiya Reserve in the southwest of the country covers 54 km^2 and contains an estimated 1,000 oryx. The reserve is fenced, so the animals are considered semi-wild. Other oryx sites include Al Shahaniya Reserve and the Al-Maha Sanctuary, a breeding centre. The total number of Arabian oryx in Qatar could now number as many as 10,000.

Sources: *https://www.discoverwildlife.com/animal-facts/mammals/oryx-qatars-national-animal https://www.enature.qa/specie/arabian-oryx-white-oryx/ https://www.enature.qa/sanctuaries/al-mashabiya-reserve/*

Arabian Oryx and Sand Gazelles born in Neom reserve, Saudi Arabia

Five Arabian oryx *Oryx leucoryx* and 25 Arabian sand gazelles *Gazella marica* have been born in Neom nature reserve in north-western Saudi Arabia. The two species, along with Arabian gazelle *Gazella arabica* and Nubian ibex *Capra nubiana* were first reintroduced to the reserve in December 2022. These reintroductions are part of a massive rewilding project inside the 25,000-km^2 Neom reserve.

Source: *https://www.thenationalnews.com/gulf-news/2023/08/01/neom-nature-reserve-welcomes-four-newborn-oryx-calves/*

Gazelle poachers jailed in Oman

Three people have been imprisoned for six months, fined 1,000, Omani Rials and faced confiscation of seized items for hunting and killing an Arabian Gazelle in Dhofar governorate. A statement issued by the Environment Authority (EA) said, 'The Court of Appeal in Salalah issued a ruling convicting three defendants of the misdemeanour of hunting and killing an Arabian gazelle in Dhofar governorate. The court decreed that all three defendants should face six months of imprisonment, a fine of 1,000 Omani rials, and the confiscation of seized items'.
Source: https://www.muscatdaily.com/2024/02/18/poachers-imprisoned-fined-for-hunting-arabian-gazelle/ 18 February 2024.

Six-legged gazelle photographed in Israel

A six-legged Mountain Gazelle *Gazella gazella* has been observed in the Nahal HaBasor reserve.in the southern Negev desert. The male gazelle has an extra pair of legs growing from its back, but the Society for the Protection of Nature in Israel, or SPNI, said that it had survived a complex litter and survived as a young individual, dealt with many predators, matured and as an adult has three female gazelles and sired a fawn the previous autumn. The extra legs on his back pose no challenge. SPNI attributed the gazelle's extra legs to a rare genetic disorder called organ proliferation, or polymelia.
Source: https://www.cbsnews.com/news/rare-six-legged-gazelle-discovered-in-israel/

Saiga News 29

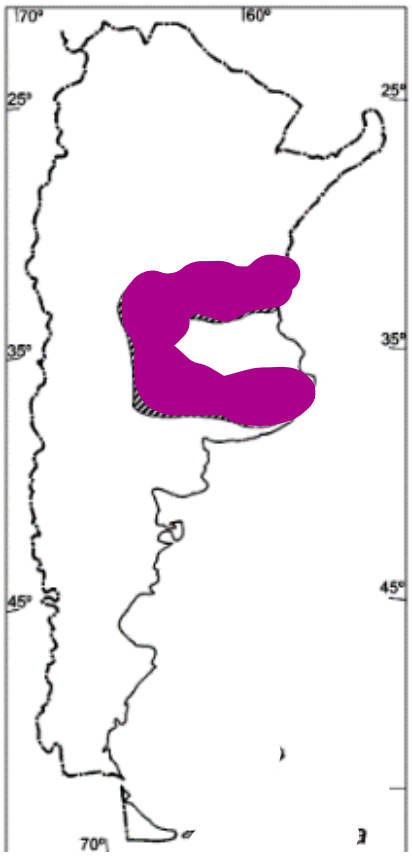
Saiga News 29 was published in December 2023 by the Saiga Conservation Alliance. It includes articles on saiga numbers in Kazakhstan, updates from Mongolia, using AI methods to estimate saiga numbers in Russia, reducing demand for saiga horn in Singapore and Japan, and other topics.
Saiga News is available from the Saiga Resource Centre (link below) in English and Russian and will be translated into five other range country languages.
https://www.saigaresourcecentre.com/content/saiga-news

Blackbuck outside South Asia

The Blackbuck *Antilope cervicapra* may be many people's candidate for the title of 'most elegant antelope' It is native to South Asia (mostly in India, more marginally in Pakistan, Nepal, Bangladesh) but has been introduced outside its indigenous range, where its popularity is more variable.

Argentina

It is believed that the first introduction took place in 1906 in La Pampa province, with further introductions in 1912 to Córdoba, Buenos Aires, Santa Fé, luego San Luis, Santiago del Estero and Entre Ríos provinces. Releases occurred in Corrientes at the end of the 1990s, and in the early 2000s in ranches of the departments of Esquina and Mercedes. In January 2018 some individuals were released in the centre-west of Santiago del Estero province. Blackbuck were released principally for sport hunting. The wide and continuous translocation and natural dispersal of blackbuck favours the growth and expansion of its populations due to escapes from hunting reserves, and the scarcity of natural predators. The species has become established in at least 11 provinces of north-central Argentina. There is a small wild population in Esquina department, Corrientes, which is expanding slowly. There are also historical or occasional sightings in Esteros del Iberá (Corrientes) and El Palmar National Park (Entre Ríos). In the last decade it has expanded into the mountain grasslands in the north of San Luis, west of La Pampa, and agroecosystems in the northeast of Buenos Aires province. In La Pampa province and the south of San Luis, the species is abundant, and considered an agricultural pest in some places, with groups of more than 100 recorded. On some cattle grazing properties in eastern Argentina, blackbuck became so numerous that culling 'by the hundreds' was necessary. In la Pampa, there was high mortality of blackbucks in 2013 due to winter snow. Its population trend is increasing but there is no reliable estimate of population size nor is there a monitoring programme. The lack of controls and regulations on the movement and entry of animals to new hunting areas, added to the poor physical barriers, suggests that the species could increase its distribution area as well as its presence in new provinces and ecoregions. The blackbuck has so far been scarcely studied in Argentina and it is recommended to: a) study its impact on crops; b) evaluate its role as a vector of parasites and diseases with potential negative impact on native fauna, livestock and humans; c) study the interactions with native fauna in relation to competition for herbivory and territory, d) study general aspects of their biology and ecology in their exotic range to compare them with their native range.



Map. Approximate range of Blackbuck in Argentina (Adapted from Novillo & Ojeda 2008).

Sources:

Ballari, S.A. Cirignoli, S., Monteverde, M., Kin, M.S., Aprile, G. (2019). Antilope cervicapra. En: SAyDS–SAREM (eds.) Categorización 2019 de los mamíferos de Argentina según su riesgo de extinción. Lista Roja de los mamíferos de Argentina. http://cma.sarem.org.ar

Novillo, A & Ojeda, RA (2008). The Exotic Mammals of Argentina. Biological Invasions 10: 1333–1344.

Texas

Blackbuck were first introduced to Kerr County in 1932 and are now found on ranches throughout the state. They have become one of the most popular species for hunters, available on many properties for around $2000-4500. Numbers were estimated at 21,000 in 1994 and 25,000 in 2018. About 80% are on the Edwards Plateau which contains a mix of grassland and brush. Their range is limited to the north and west by cold winters and to the south by predation by coyotes (*Canis latrans*), particularly on the young. Most blackbuck are kept on high-fence properties, but some small free-ranging populations have been established. The effects of these populations on native Pronghorn and deer have not yet been fully determined.

Sources:

Mungall, E.C & Sheffield, W.J. (1994). Exotics on the range. College Station: Texas A&M University Press.

Schmidly, D.J. & Bradley, R. D. (2016). The Mammals of Texas, Seventh Edition. University of Texas Press.

https://www.bookyourhunt.com/en/blackbuck-hunting-in-texas

https://eu.gosanangelo.com/story/news/local/scene/2018/07/29/blackbucks-native-india-and-pakistan-find-solid-footing-texas/824102002/

Australia

Blackbuck were first introduced into Western Australia in the early 1900s and by 1929 wild populations near Perth had reached 'pest proportions'. A culling operation was launched and the feral populations in Western Australia are now thought to have died out. A small number were successfully farmed in Victoria in 1986. A few blackbucks were released illegally for sport hunting onto a property on the Cape York peninsula in the late 1980s or early 1990s. Around 4-5 animals are believed to have survived in the wild for a few years, but following trapping and culling these animals are also considered to have died out. Blackbuck possess a number of attributes that confer long-term pest potential and they are subject to legal restrictions in Queensland, Western Australia, New South Wales and Victoria.

Source:

Csurhes, S. & Fisher, P. (2016). Invasive Animal Risk Assessment. Blackbuck Antelope. State of Queensland, Department of Agriculture and Fisheries, Biosecurity Queensland.

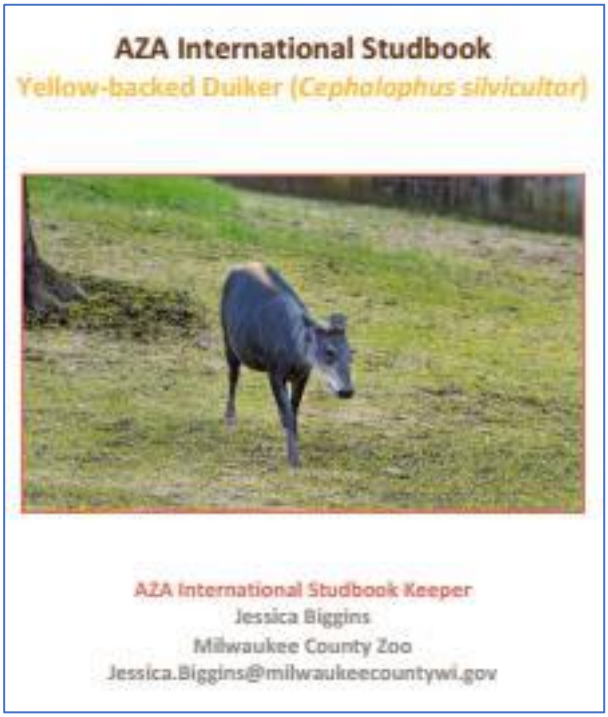
Male Blackbuck in their indigenous range. Velavadar National Park, Gujarat, India (© ASG)

AZA Ungulates

This is an American Zoo Association initiative whose mission is "To work together to promote ungulates in AZA institutions, and provide ungulate resources to enhance management". It unites the five ungulate Taxon Advisory Groups, including antelopes, in support of the conservation of ungulates in the wild. AZA Ungulates has reviewed and approved many ungulate conservation projects which are featured on the "TAG-Reviewed Conservation Projects" page of their website (with links to their respective websites). Antelope projects featured include the International Bongo Foundation, Bongo Surveillance Project, Sahara Conservation, Hirola Conservation Project, Northern Rangelands Trust, and General Secretariat for Conservation of the Arabian Oryx. Suggestions for additional projects can be sent to azaungulates@gmail.com.
Source: https://www.azaungulates.org/conservation

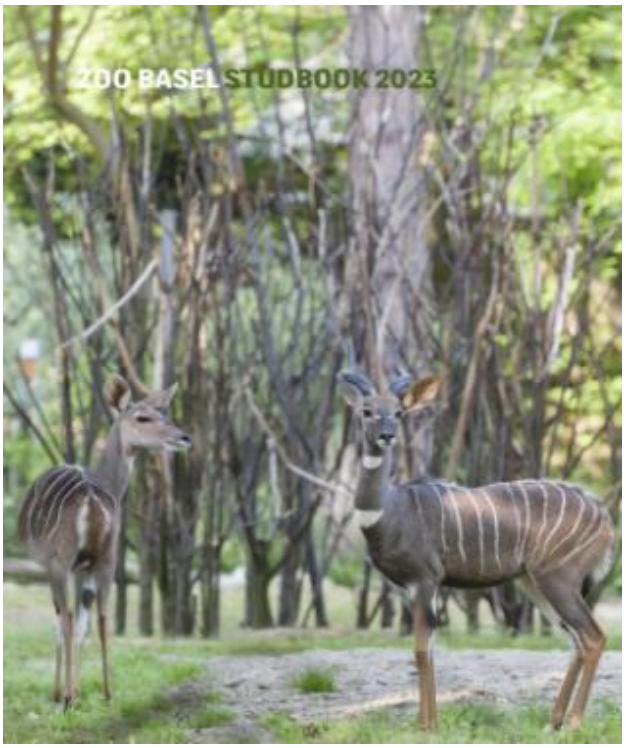
Yellow-backed Duiker studbook

The AZA International Studbook for Yellow-backed Duiker *Cephalophus silvicultor* was published on 23 December 2023 by the studbook keeper, Jessica Biggins, Milwaukee County Zoo, 10001 W. Bluemound Road, Milwaukee, WI 53326, USA. It consists of an Introduction, Field Descriptions, Taxonomy, Range, Habitat, Natural History, Captive History, Husbandry Notes, Bibliography, Population Analysis (age pyramid, census graph) Births, Transfers, Deaths, the Living Population, Historical Population, and Current and Historical Institutions.



Lesser Kudu studbook

An updated edition of the European Lesser Kudu studbook has been prepared by Beatrice Steck, the EEP coordinator, and published by Zoo Basel, Switzerland. On 31 December 2023, the European studbook records 89 (30.59) lesser kudus kept in 10 EAZA institutions. The age structure is not very healthy. There is a lack of males, and the sex ratio is skewed (33.7% males, 66.3% females). The biased sex ratio is due in part to the fact that most zoos keep only one or a few males with several females.
zoo@zoobasel.ch, www.zoobasel.ch



International Studbook for the Scimitar-horned Oryx

The 19th edition of the ISB for Scimitar-horned Oryx *Oryx dammah* has been published by Marwell Wildlife. It contains demographic and genetic information to inform holders of scimitar-horned oryx about the general status of the global population. The data are current through to 31 December 2023 and include all global institutions who provided information on their collection of Scimitar-horned Oryx, regardless of regional zoo association affiliations and membership of coordinated population management programmes. As of that date, the living population was 3276 (1441.1733.102) animals in 185 institutions across the African, American, Asian, European, and Oceania regions. Sophie Whitemore has now taken over the role of studbook keeper from Tania Gilbert.

The studbook is available to download at:
https://www.marwell.org.uk/conservation/achievements/studbooks/

RECENTLY PUBLISHED ARTICLES

AFRICA

Group size dynamics of the endangered mountain nyala (*Tragelaphus buxtoni*) in protected areas of the Arsi and Ahmar Mountains, Ethiopia

Ejigu Alemayehu Worku, Jakob Bro-Jørgensen, Paul H. Evangelista, Afework Bekele, Anagaw Atickem & Nils Chr. Stenseth (2023).
Global Ecology and Conservation 46: e02546.

Abstract

As an adaptive biological trait, group size may offer a useful metric for monitoring the welfare of wildlife species affected by their environmental surroundings. Here, we examine the drivers that cause variation in group size of the endangered mountain nyala (*Tragelaphus buxtoni*), including a range of natural ecological factors as well as the density of livestock. For this purpose, we collected data along transect lines during both wet and dry seasons focusing on the hitherto poorly studied populations in the Arsi Mountains National Park, Munessa-Kuke Controlled Hunting Area and Muktar Mountain Forest Reserve, which are managed for multiple use of a variety of natural resources. We found group sizes to be an average of 6.3, 4.4 and 4.1 individuals in the Arsi Mountains, Munessa-Kuke and Muktar Mountain study areas, respectively, and a combination of livestock density and habitat visibility explained as much as 74% of the variation in group size. We propose that whereas group size increases with forage availability (as measured by Normalized Difference Vegetation Index -NDVI) and in open habitats (probably due to a switch in antipredator strategy), the presence of livestock also has an independent, negative impact on group size because of the associated disturbance. The findings contribute to understanding the environmental drivers of variation in group size in social antelopes, particularly highlighting the need to improve livestock management to help conservation of species at risk.

Population size and diurnal activity patterns of Bohor reedbuck (*Redunca redunca* Pallas, 1767) in the compound of Alage Agricultural College, Central Rift Valley of Ethiopia

Derebe, Y., Girma, Z. & Alemkere, A. (2023). *Israel Journal of Ecology and Evolution* 69(03-04): 118-126. https://doi.org/10.1163/22244662-bja10048.

Abstract

Bohor reedbuck is a medium-sized, even-toed ungulate species endemic to Africa. Its population is gradually declining, and an estimation of the metapopulations is required to determine its current population status and as an input for conservation action. To this end, this study aimed to investigate this species' population size and diurnal activity patterns in the compound of Alage Agricultural College, Central rift valley of Ethiopia. A total count was conducted to determine the population size of Bohor reedbuck by dividing the study area into different blocks. Continuous focal animal observations were used to collect data on activity patterns by recording group activities with five minutes intervals. The results revealed that the mean population size of Bohor reedbuck counted during the study period was 51.4±8.55 (SE) with a density of 1.74 per km^2. Females formed the dominant group in the population. From the mean total population size of Bohor reedbucks, 47.42% were adults. The mean group size of Bohor reedbuck was 3.16±0.053 (SE). Feeding (n=366, 45.81%) was the dominant mean

diurnal activity pattern of Bohor reedbuck, followed by Resting (n=255, 31.91%), whereas grooming (n=28, 3.51%) was the least performed activity. There was a significant difference between the diurnal activities performed by Bohor reedbuck (P<0.05). The studied compound is an important refuge for this species, and minimum management.

Habitat shifts in response to predation risk are constrained by competition within a grazing guild

Creel, S., Becker, M.S., Goodheart, B., de Merkle, J.R., Dröge, E., M'soka, J., Rosenblatt, E., Mweetwa, T., Mwape, H., Vinks, M.A., Mukula, T., Smit, D., Sanguinetti, C., Dart, C., Christianson, D., Schuette, P., Simpamba, T. and Chifunte, C. (2023).
Frontiers in Ethology 2: 1231780. doi: 10.3389/fetho.2023.1231780

Abstract

Predators can affect prey not only by killing them, but also by causing them to alter their behavior, including patterns of habitat selection. Prey can reduce the risk of predation by moving to habitats where predators are less likely to detect them, less likely to attack, or less likely to succeed. The interaction of such responses to risk with other ecological processes remains relatively unstudied, but in some cases, changes in habitat use to avoid predation may be constrained by competition: larger, dominant competitors should respond freely to predation risk, but the responses of smaller, subordinate competitors may be constrained by the responses of dominant competitors. For large grazing herbivores, an alternative hypothesis proposes that smaller prey species are vulnerable to more predators, and thus should respond more strongly to predation risk. Our results support the hypothesis that responses to predation risk are strongest for larger, dominant competitors. Even though zebras were killed least often, they showed the strongest shift into cover when carnivores were present. Wildebeest, puku and oribi showed weaker habitat shifts, even though they were more frequently killed. These patterns remained consistent in models that controlled for differences in the hunting mode of the predator (stalking, coursing, or intermediate) and for differences among ecosystems. There was no evidence that smaller species were subject to predation by a broader set of predators. Instead, smaller prey were killed often by smaller predators, and larger prey were killed often by larger predators.

Genetic patterns in three South African specialist antelope species: Threats, conservation management and their implications

Metlholo Andries Phukuntsi, Desire Lee Dalton, Monica Mwale,| Jeanetta Selier, Thando Cebekhulu, Mamadi Theresa Sethusa (2022).
Conservation Science and Practice DOI: 10.1111/csp2.12767

Abstract

Genetic diversity is a fundamental measure of a populations ability to adapt to future environmental change. Subpopulations may carry unique genetic lineages that contribute to fitness and genetic diversity of species across their distribution range. Therefore, considerations, or lack thereof, of genetic diversity in wildlife management practices may result in either population persistence or extinction over time. Some management tools may pose a greater risk to a species' survival than others when populations are impacted. In South Africa, there has been great interest to translocate animals, sometimes with little consideration to the potential impacts on the species and/or populations survival. Thus, there is a need to collate scientific information to better inform decision-making and review these management practices and their effects on populations. Here, we focus on three antelope species, the blue duiker (*Philantomba monticola*), oribi (*Ourebia ourebi*), and tsessebe (*Damaliscus lunatus*). We review the genetic status of each species across South Africa, with regards to taxonomy, genetic

diversity and population structure, threats that may compromise the genetic diversity within species and across populations, conservation management actions and how they may compromise or benefit the genetic status and lastly make recommendations on possible alternative management actions and future research to inform conservation policy and sustainable management practice.

Differences in faecal nutritional components in three species of Saharan gazelles on standard diets in relation to species, age and sex

Stipan Čupić, Jorge Cassinello, Tomáš Kušta & Francisco Ceacero (2023).
Animals 13: 3408. https://doi.org/10.3390/ani13213408

Abstract

Various environmental, individual, and species-specific factors may affect digestive efficiency in wild ruminants. The study of faecal nutritional components is a commonly used technique to understand these effects, assuming that faecal nitrogen and fibre contents reflect the diet's nutritional quality and digestibility. Recent studies have highlighted the relatively high influence of factors like sex, age, weight or body condition on digestive efficiency. This manuscript is focused on the inter-specific variability in faecal nutritional components under the same feeding regime, using three captive populations of closely related gazelles as model species. Faecal samples from 193 individuals were analysed through Near InfraRed Spectroscopy. Species, sex and age influence on faecal nitrogen and fibres (ADF and NDF) were investigated. We found inter-specific differences in the faecal content of the three studied nutritional components. Cuvier's gazelle showed lower faecal nitrogen content, suggesting lower digestive efficiency than dorcas and dama gazelles. Sex and age also had a moderate effect, especially in faecal nitrogen, but these effects were not constant across the three studied species. On the contrary, faecal fibres were highly constant (i.e., dependent on diet quality). These results confirm that individual factors affecting faecal nutritional components are also species-specific.

Effects of land cover changes and forest fragmentation on three species of east African mini-antelopes

Said, M. K., & Misana, S. B. (2024).
African Journal of Ecology 62: e13170.

Abstract

Human beings have continued to decline and fragment mini-antelopes habitats. We studied the effects of land cover change on the conservation of the endangered Ader's Duiker (*Cephalophus adersi*), the Zanzibar blue duiker (*Cephalophus monticola sundevalli*) and the Suni (*Neotragus moschatus zanzibaricus*) in Zanzibar, Tanzania. Data were obtained from the 1975, 2009 and 2014 satellite images and geographical information systems, focus group discussions, transect-walk and observation. We found that the habitat of mini-antelopes had declined from 87.3% to 58.5% between 1975 and 2014 and become fragmented. The forest fragments increased from 35 to 139 patches while shrubs increased from 41 to 199 patches. Community members had the perception that the decline and fragmentation of the habitat had caused the numbers of mini-antelopes and their forage to decline. We also found that there were incidences of mini-antelopes eating crop plants such as cowpeas, yams and tomatoes in the farms during the night as an adaptive mechanism for forage decline. Conclusively, land cover changes from human activities have caused negative effects on the mini-antelopes. There is, therefore need for the local people, the government and private individuals or corporations to introduce collective conservation initiatives, including the establishment of conservation areas to conserve the mini-antelopes.

Selective deforestation and exposure of African wildlife to bat-borne viruses.

Fedurek, P., Asiimwe, C., Rice, G. K., Akankwasa, W. J., Reynolds, V., Hobaiter, C., ... & Goldberg, T. L. (2024).
Communications Biology 7(1): 470.

Abstract

Proposed mechanisms of zoonotic virus spillover often posit that wildlife transmission and amplification precede human outbreaks. Between 2006 and 2012, the palm *Raphia farinifera*, a rich source of dietary minerals for wildlife, was nearly extirpated from Budongo Forest, Uganda. Since then, chimpanzees, black-and-white colobus, and red duiker were observed feeding on bat guano, a behavior not previously observed. Here we show that guano consumption may be a response to dietary mineral scarcity and may expose wildlife to bat-borne viruses. Videos from 2017–2019 recorded 839 instances of guano consumption by the aforementioned species. Nutritional analysis of the guano revealed high concentrations of sodium, potassium, magnesium and phosphorus. Metagenomic analyses of the guano identified 27 eukaryotic viruses, including a novel betacoronavirus. Our findings illustrate how "upstream" drivers such as socioeconomics and resource extraction can initiate elaborate chains of causation, ultimately increasing virus spillover risk.

[Quote from page 2 of the article (Editor's addendum): "Cameras captured solitary red duikers on 682 occasions on 210 different days. Duikers either licked guano directly or drank adjacent water next to the pile."].

AMERICA

Contrasting management paradigms for pronghorn in the arid Southwest and their northern range: a review

Bean, W. T., Butterfield, H. S., Fiehler, C., Hacker, D., Howard, J. K., ... & Batter, T. J. (2024).
The Journal of Wildlife Management 88: e22523.

Abstract

Pronghorn (*Antilocapra americana*), a symbol of western North America, experienced diverging population trajectories since the mid-twentieth century, with northern populations showing signs of recovery while those in the arid Southwest have struggled to persist. We conducted a systematic literature review of papers published through August 2023 to understand 3 questions. What are the habitat conditions needed for pronghorn to persist? What management actions can be taken to foster higher quality habitat? Do these actions differ for populations in the arid Southwest compared to their northern counterparts? Although the fundamental habitat requirements for pronghorn persistence have remained constant since the early 2000s, it has become clear that precipitation is a key factor influencing pronghorn populations in the arid Southwest. The precise mechanisms by which precipitation influences pronghorn population dynamics are not yet clear, whether through the availability of free water, by affecting forage quality, or indirectly via predator-prey dynamics. Although range-wide forage enhancement may be impractical, providing additional free water sources could facilitate greater movement, enabling pronghorn to access more and higher quality forage and areas with lower predation risk. To clarify how pronghorn persisted for thousands of years in this harsh environment, we must gain a better understanding of their historical metapopulation and migratory behaviors in the arid Southwest.

Effects of large-scale gold mining on habitat use and selection by American pronghorn

Osterhout, M. J., Stewart, K. M., Wakeling, B. F., Schroeder, C. A., Blum, M. E., Brockman, J. C., & Shoemaker, K. T. (2024).
Science of The Total Environment 921: 170750.

Abstract

Anthropogenic disturbances, including extraction of natural resources and development of alternative energy, are reducing and fragmenting habitat for wildlife across the globe. Effects of those disturbances have been explored by studying populations that migrate through oil and gas fields or alternative energy facilities. Extraction of minerals, including precious metals and lithium, is increasing rapidly in remote areas, which results in dramatically altered landscapes in areas of resident populations of wildlife. Our goal was to examine how a resident population of American pronghorn (*Antilocapra americana*) in the Great Basin ecosystem selected resources near a large-scale disturbance year around. We investigated how individuals selected resources around a large, open-pit gold mine. We classified levels of disturbance associated with the mine, and used a random forest model to select ecological covariates associated with habitat selection by pronghorn. We used resource selection functions to examine how disturbances affected habitat selection by pronghorn both annually and seasonally. Pronghorn strongly avoided areas of high disturbance, which included open pits, heap leach fields, rock disposal areas, and a tram. Pronghorn selected areas near roads, although selection was strongest about 2 km away. We observed relatively broad variation among individuals in selection of resources, and how they responded to the mine. The Great Basin is a mineral-rich area that continues to be exploited for natural resources, especially minerals. Sagebrush-dependent species, including pronghorn, that rely on this critical habitat were directly affected by that transformation of the landscape, which is likely to increase with expansion of the mine. As extraction of minerals from remote landscapes around the world continues to fragment habitats for wildlife, increasing our understanding of impacts of those changes on behaviors of wildlife before populations decline, may assist in the mitigation and minimization of negative impacts on mineral-rich landscapes and on wildlife populations.

Declining pronghorn (*Antilocapra americana*) population productivity caused by woody encroachment and oil and gas development.

Donovan, V. M., Beck, J. L., Wonkka, C. L., Roberts, C. P., Allen, C. R., & Twidwell, D. (2024).
Global Ecology and Conservation 50: e02848.

Abstract

Conservation is increasingly focused on preventing losses in species' populations before they occur. Tracking changes in demographic parameters that can impact a population's resilience in response to drivers of global change can support early conservation efforts. We assessed trends in population productivity (late summer juveniles per 100 females) relative to drivers of global change in 40 pronghorn (*Antilocapra americana*) herds across sagebrush (*Artemisia* spp.) steppe in Wyoming. Pronghorn are an iconic rangeland species that have been exposed to increasing levels of anthropogenic, climatic, and land-use change. Using data collected across the state of Wyoming, we (1) assessed long-term trends in population productivity, (2) identified patterns in large-scale drivers of global change (i.e., climate, land cover change) across pronghorn habitat, and (3) determined the relationship between drivers of global change and population productivity over a 35-year (1984–2019) period. While Wyoming hosts some of the most abundant populations of pronghorn in North America that have been largely stable in recent years, we found many herds are experiencing long-term declines in productivity.

Long-term declines in productivity were associated with increases in oil and gas development and woody encroachment. Although increasing across almost all herd units, woody vegetation cover remains at low levels, suggesting that pre-emptive management may help to prevent losses in pronghorn populations.

Temporal and Spatial Influences on Fawn Summer Survival in Pronghorn Populations: Management Implications from Noninvasive Monitoring

Bleke, C. A., Gese, E. M., Villalba, J. J., Roberts, S. B., & French, S. S. (2024).
Animals 14(10): 1468.

Abstract

Monitoring vital rates allows managers to estimate trends in growth rates of ungulate populations. However, connecting the influence of nutrition on ungulate demography is challenging. Noninvasive sampling offers a low-cost, low-effort alternative for measuring nutritional indices, allowing for an increased understanding of the mechanistic relationships between environmental factors, nutrition, and specific population vital rates. We examined the temporal influence of intrinsic and extrinsic factors on pronghorn (*Antilocapra americana*) fawn recruitment. We collected fresh fecal samples from adult female pronghorn in five subpopulations spanning three sampling periods associated with critical maternal life-history stages (late gestation, early lactation, breeding season) for 2 years to investigate both intra- and interannual influences. Intrinsic factors were fecal glucocorticoid metabolites (FGMs), nutritional indices (fecal nitrogen (FN) and 2,6-diaminopimelic acid (DAPA)), and dietary composition (protein intake of forbs, graminoids, legumes, other, shrubs), while the extrinsic factor was vegetative greenness (normalized difference vegetation index (NDVI)). We found variations in DAPA, protein intake of forbs, variation in forb protein intake, and protein intake of legumes during late gestation positively influenced fawn recruitment. Fecal nitrogen during early lactation showed the strongest positive influence on the recruitment of any measured parameter. Finally, breeding season NDVI and the variation in DAPA values positively influenced the subsequent year's fawn recruitment. Our longitudinal study enabled us to investigate which parameter was most important to specific periods of fawn development and recruitment. We combined the results across five subpopulations, but interpretation and subsequent management decisions should be made at the subpopulation level such that pronghorn subpopulations with low recruitment can be positively influenced by increasing nitrogen on the landscape available to adult females during the early lactation period. As the use of noninvasive monitoring methods continues to expand, we believe our methodologies and results can be broadly applied to other ungulate monitoring programs.

Feral horses and pronghorn: a test of the forage maturation hypothesis in an arid shrubland

Hennig, J. D., Beck, J. L., & Scasta, J. D. (2024).
Animal Behaviour 210: 55-61.

Abstract

Ecologists strive for laws that explain interactions between organisms. Myriad hypotheses have been fundamental in increasing our understanding of plant–herbivore interactions, including the forage maturation hypothesis (FMH). The FMH has recently been extended to include contingencies of body size and digestive system: selection for greater energy potential should be negatively correlated with body mass and selection for proximity to surface water should be greater for hindgut fermenters compared to foregut fermenters or ruminants. While these general trends hold at a broad scale, intrapopulation variability still exists. For feral species that did not coevolve within their current ecological context, variability in habitat selection among

populations may be greater. Consequently, understanding habitat selection of each population is imperative to properly inform management. For the case of feral horses, *Equus ferus caballus*, a large-bodied hindgut fermenter, understanding how they compare in habitat selection to sympatric species is of particular interest due to habitat alteration and potential competition. Across much of their range in western North America, horses are sympatric with the smaller-bodied ruminant pronghorn, *Antilocapra americana*. The two species overlap in space use, but we lack information on how each species selects resources within areas of overlap. Accordingly, we compared habitat selection between these two species during the growing season to understand how each responded to predictions of the FMH and to better guide potential management actions. Horses followed FMH predictions by selecting proximity to surface water and greater forage biomass. Meanwhile, pronghorn did not follow predictions of the FMH; pronghorn selected greater forage biomass but did not select greater energy potential. Both species selected greater herbaceous cover, flatter slopes and farther distances from oil and gas well pads. Our analysis reveals a high degree of selection overlap and underscores the importance of conducting population level studies to best understand how herbivores interact with the unique environments they inhabit.

Asia and Middle East

Asia

Changes in habitat suitability and population size of the endangered Przewalski's gazelle

Tian Liu, Zhigang Jiang, Wei Wang, Guangyao Wang, Xiangrong Song, Aichun Xu, Chunlin Li (2023).
Global Change Biology 43: e02465

Abstract

Habitat loss and degradation has become one of the greatest threats to global biodiversity. To protect threatened species, it is essential to explore the spatial-temporal dynamics of its habitat suitability, i.e. the extent of how the habitat quality is suitable for the species. The Przewalski's gazelle *Procapra przewalskii* is a rare and endangered ungulate endemic to the Qinghai-Tibet Plateau in China. Its historical distribution range covered a large area of the western China, but had shrunk to several fragmented areas around the Qinghai Lake during the 20th century. Along with environment changes and economic development in its current range, the gazelle population size and habitat quality may undergo related changes, which should be studied based on rigorous comparisons. In this study, we conducted field surveys during two periods, from 2009 to 2011 and from 2020 to 2021, to quantify changes in population size of Przewalski's gazelle, and used MaxEnt models to assess the change in its habitat suitability. We found that the overall population size of the species increased from 1544 to 4078, with declines in some subpopulations. The subpopulation changes could be generally related to changes in habitat suitability which exhibited an overall decline but improvement in areas on the northern side of the Qinghai Lake. Among the environmental variables, distance to nearest railways and highways, distance to nearest arable lands, NDVI, and DEM were the key factors affecting habitat suitability of the gazelle. To effectively protect the wild populations of Przewalski's gazelle, we suggest continuously monitoring the trends of all subpopulations and critical habitats, constructing ecological corridors, and improving the current conservation systems.

Genetic diversity and structure of Mongolian gazelle (*Procapra gutturosa*) populations in fragmented habitats

Lupeng Shi, Xiufeng Yang, Muha Cha, Tianshu Lyu, Lidong Wang, Shengyang Zhou, Yuehuan Dong, Huashan Dou and Honghai Zhang (2023).
BMC Genomics 24: 507. doi: 10.1186/s12864-023-09574-0

Abstract

Background: The Mongolian gazelle *Procapra gutturosa* population has shown a considerable range of contractions and local extinctions over the last century, owing to habitat fragmentation and poaching. A thorough understanding of the genetic diversity and structure of Mongolian gazelle populations in fragmented habitats is critical for planning effective conservation strategies.

Result: In this study, we used eight microsatellite loci and mitochondrial cytochrome b (*Cytb*) to compare the levels of genetic diversity and genetic structure of Mongolian gazelle populations in the Hulun Lake National Nature Reserve (HLH) with those in the China-Mongolia border area (BJ). The results showed that the nucleotide diversity and observed heterozygosity of the HLH population were lower than those of the BJ population. Moreover, the HLH and BJ populations showed genetic differentiation. We concluded that the HLH population had lower genetic diversity and a distinct genetic structure compared with the BJ population.

Conclusion: The genetic diversity of fragmented Mongolian gazelle populations can be improved by protecting these populations while reinforcing their gene exchange with other populations. For example, attempts can be made to introduce new individuals with higher genetic diversity from other populations to reduce inbreeding.

Potential spatial distributions of Tibetan antelope and protected areas on the Qinghai-Tibetan Plateau, China

Hu, H., Wei, Y., Wang, W., & Chen, Z. (2024).
Biodiversity and Conservation 33: 1845-1867.

Abstract

Climate change has been regarded as a major factor affecting the geographic distribution of many endemic rare species on the Qinghai-Tibetan Plateau. Tibetan antelope, an endemic rare wildlife, is identified as a national first-class protected wild animal in China. To explore the impacts of human activities and climate change on the spatial distribution pattern of Tibetan antelope, the MaxEnt model was used to simulate the potential distribution of Tibetan antelope under four Shared Socio-economic Pathways in 2050s and 2070s and combined the modelling results of the main forage plants considering the food chains. The results showed that the environment indicators, e.g., elevation, mean temperature of wettest quarter, slope, mean temperature of warmest quarter, landcover, max temperature of warmest month, precipitation of driest month, *Stipa capillata*, *Oxytropis ochrocephala*, human influence intensity, were the main factors controlling the distribution of Tibetan antelope. The potential distributions of Tibetan antelope and their 10 forage plants were significantly different under future climate scenarios such as expanding, contracting and shifting. The mean elevation of suitable habitats for Tibetan antelope all increased under the four future scenarios compared with current value. There were protection gaps for Tibetan antelope. Considering the long-distance migration, the integrity of the ecosystem including Qiangtang National Nature Reserve, Altun National Nature Reserve, and Kekexili National Nature Reserve would be established for Tibetan antelope. Our findings will provide important references for the protection and investigation of Tibetan antelope.

From isolation to integration: assessing habitat connectivity of the endangered saiga antelope in Mongolia

Chimeddorj, B., Buuveibaatar, B., Galsandorj, N., Dolgorjav, S., Myanganbuu, N., Bayandonoi, G., & Gombobaatar, S. (2024).
Mammalian Biology 104: 221-229.

Abstract

This study provides the first comprehensive assessment of habitat connectivity for the Mongolian saiga, a species endemic to Western Mongolia. We utilized a resource selection function (RSF) to identify core habitats (CHs) throughout the saiga's entire range. Additionally, the Circuitscape approach was employed to map the least-cost paths (LCPs) among these core habitats. The RSF models revealed a strong preference for high productivity areas, while avoiding disturbed regions. Through a spatially explicit model, 34 CHs covering an area of 12,480 km^2 (30.7% of the saiga's range) were identified. The connectivity models identified 68 LCPs between various pairs of CHs, totaling 1700 km in length across the entire saiga range. The core habitat in the center of the saiga range displayed the highest centrality scores, highlighting their critical importance in maintaining their habitat interconnectedness. Furthermore, the presence of pinch points was observed in several CH pairs within the northwest region, suggesting potential bottlenecks that may hinder movement between these habitats. It is imperative to implement measures aimed at addressing these pinch points and establishing secure corridors to facilitate the saiga movement between the CHs. To ensure the survival of the saiga, it is also crucial to mitigate the impact of existing and planned linear infrastructures, as well as other human disturbances that have the potential to fragment habitats and disrupt connectivity. These findings serve as valuable insights for targeted conservation efforts and the formulation of effective management strategies geared toward safeguarding this iconic species in Western Mongolia.

Mechanism and functional substances of Saiga antelope horn in treating hypertension with liver-yang hyperactivity syndrome explored using network pharmacology and metabolomics

Wu, W., Liu, R., Guo, S., Song, W., Hua, Y., Hong, M., ... & Duan, J. A. (2024). *Journal of Ethnopharmacology* 330: 118193.

Abstract

Saiga antelope horn (SAH) is a traditional Chinese medicine for treating hypertension with liver-yang hyperactivity syndrome (Gan-Yang-Shang-Kang, GYSK), that has a long history of clinical application and precise efficacy, but its mechanism and functional substances are still unknown. Based on the demand for alternative research on the rare and endangered SAH, the group designed and carried out the following studies.

The purpose of this research was to demonstrate the functional substances and mechanisms of SAH in the treatment of GYSK hypertension.

The GYSK-SHR model was constructed by administering a decoction of aconite to spontaneously hypertensive rats (SHRs). Blood pressure (BP), behavioural tests related to GYSK, and pathological changes in the kidneys, heart and aorta were measured to investigate the effects of SAH on GYSK-SHRs. Proteomic analysis was used to identify the keratins and peptides of SAH. Moreover, network pharmacology and plasma metabolomics studies were carried out to reveal the mechanisms by which functional peptides in SAH regulate GYSK-hypertension.

SAH has a significant antihypertensive effect on GYSK hypertensive animals. It has also been proven to be effective in protecting the function and structural integrity of the kidneys, heart and aorta. Moreover, SAH improved the abnormalities of 31 plasma biomarkers in rats.

By constructing a “biomarker-target-peptide” network, 10 functional peptides and two key targets were screened for antihypertensive effects of SAH. The results indicated that SAH may exert a therapeutic effect by re-establishing the imbalance of renin-angiotensin (RAS) system.
Functional peptides from keratin contained in SAH are the main material basis for the treatment of GYSK-hypertension and exhibited the protective effect on the GYSK-SHR model through the RAS system.

A nose for trouble: ecotoxicological implications for climate change and disease in Saiga antelope (*S. t. tatarica*)

Mullineaux, S. T., McKinley, J. M., Marks, N. J., Doherty, R., & Scantlebury, D. M. (2024). *Environmental Geochemistry and Health* 46(3): 93.

Abstract

In recent decades, Saiga antelope (*Saiga t. tatarica*) mass die-offs have become more common. The mass die-off of 2015 in central Kazakhstan, recorded 140,000 individual deaths across multiple herds. Previously, research has shown atmospheric humidity, the bacterium *Pasteurella multocida* serotype B, and resultant haemorrhagic septicaemia, were the primary cause. However, other synergistic factors may have impacted this process. Here we use a multivariate compositional data analysis (CoDA) approach to assess what other factors may have been involved. We show a pollutant linkage mechanism where relative humidity and dewpoint temperature combine with environmental pollutants, potentially toxic elements (e.g., Hg, As), complex carbon compounds (e.g., Acetone, Toluene), and inorganic compounds (e.g., CHx, SO_2) which affected the Saiga during the calving season (start and peak) and at the onset of the mass die-off. We suggest a mechanism for this process. Upon arrival at their carving grounds, the Saiga experienced a sudden precipitation event, a spike in temperatures, and resultant high humidity occurs. The infectious bacterium *P. multocida* serotype B then spreads. Further, environmental pollutants contained within steppe soils are released to the air, forming localised smog events, these synergistically combine, and mass die-off occurs.

Middle East

Reproductive biology of *Gazella arabica*: Predictors of offspring weight and short- and long-term offspring survival

Ryan A. Martin, Rüdiger Riesch, Martin Plath, Naif A. Al Hanoosh, & Torsten Wronski (2023).

Current Zoology 69(6): 643–653. (Open access)

Abstract

Reproductive traits are central to organismal fitness, and so the factors influencing patterns of reproduction and offspring survival are at the heart of biology. Making use of breeding data collected over 16 years at the King Khalid Wildlife Research Centre in Saudi Arabia, we investigated the reproductive biology of Arabian gazelles Gazella arabica. Offspring survival was mainly a function of birth weight, with heavier offspring having higher survival rates than lighter offspring. However, while sons were heavier than daughters, daughters had higher survival rates. We could not find evidence that giving birth to sons negatively impacts offspring weight in the following year. We uncovered large narrow-sense heritability (h2) in offspring weight at birth, while maternal effects (m2) on birth weight were of lesser importance. However, maternal effects on offspring survival were strong until weaning age, while paternal

effects dominated survival to sexual maturity and first reproduction. We propose that variation in maternal postnatal care might overshadow the effects of maternal inheritance of birth weights, while the overall strong heritability of weight at birth and the paternal effects on survival illustrates strong variance in sire fitness based on genetic quality, suggesting a role for sexual selection by female mate choice in wild populations.

Revisiting the radiation of *Gazella arabica* on the Arabian Peninsula and testing the suitability of captive breeding stock for reintroduction, using mitochondrial and nuclear markers

Mohamed Al Mutairi, Hannes Lerp, Naif Al Hanosh, William Macasero, Mohammed F. Al Beshr, Torsten Wronski (2023).
Saudi Journal of Biological Sciences 30(11): 103823.

Abstract

Today, the Arabian gazelle *G. arabica* occurs only in small, scattered populations on the Arabian Peninsula and is classified as 'vulnerable', due to intensive hunting and competition with livestock. The taxonomy of this threatened species is still under debate, hampering conservation efforts while ex-situ breeding programs could be an appropriate conservation measure to prevent the species from going extinct. In our study, we attempted to elucidate the radiation of *G. arabica* on the Arabian Peninsula, and to ask whether the population genetic structure allows to distinguish between discrete conservation units. We used mitochondrial markers, microsatellite markers, and three intron markers to identify conservation units, to match them with genotypes found in the captive breeding stock held in Saudi Arabia, and to ensure that genotype diversity of potential founder individuals corresponds to that prevailing at targeted reintroduction sites. The sequence divergence was low among nuclear and mitochondrial markers, with gazelles originating from the north of the Arabian Peninsula showing the largest diversity, while south-western and eastern populations showed a decreased diversity. A haplotype network based on the relatively heterogeneous cytochrome *b* gene found no signs of a prolonged separate evolutionary history of any investigated mainland population, suggesting limitations of gene-flow after the colonization of the Arabian Peninsula leading to a founder effect-like distribution of mitochondrial haplotypes. The ex-situ breeding population held in Saudi Arabia showed a good haplotype diversity, underlining its general suitability for reintroductions. However, it is recommended that genetic data of founders should be assessed prior to future reintroduction.

Reproductive biology of *Gazella arabica*: Predictors of offspring weight and short- and long-term offspring survival

Ryan A. Martin, Rüdiger Riesch, Martin Plath, Naif A. Al Hanoosh, & Torsten Wronski (2022).
Current Zoology 69: 643-653.

Abstract

Reproductive traits are central to organismal fitness, and so the factors influencing patterns of reproduction and offspring survival are at the heart of biology. Making use of breeding data collected over 16 years at the King Khalid Wildlife Research Centre in Saudi Arabia, we investigated the reproductive biology of Arabian gazelles *Gazella arabica*. Offspring survival was mainly a function of birth weight, with heavier offspring having higher survival rates than lighter offspring. However, while sons were heavier than daughters, daughters had higher survival rates. We could not find evidence that giving birth to sons negatively impacts offspring weight in the following year. We uncovered large narrow-sense heritability ($h2$) in offspring weight at birth, while maternal effects ($m2$) on birth weight were of lesser Importance. However, maternal effects on offspring survival were strong until weaning age, while paternal

effects dominated survival to sexual maturity and first reproduction. We propose that variation in maternal postnatal care might overshadow the effects of maternal inheritance of birth weights, while the overall strong heritability of weight at birth and the paternal effects on survival illustrates strong variance in sire fitness based on genetic quality, suggesting a role for sexual selection by female mate choice in wild populations.

First confirmed record of Arabian Gazelle *Gazella arabica* Lichtenstein, 1827 (Mammalia: Artiodactyla: Bovidae) on Masirah Island, off the coast of eastern Oman in the Arabian Sea

Taimur Al Said, Haitham Al Rawahi, Maha Al Ansari, Al Mutasim Al Hinai, Ahmed Al Amri, Ahmed Al Wahaibi, Ghasi Al Farsi, Saud Al Wihibi, & Salman Al Fars (2023). *Journal of Threatened Taxa* 15(12): 24443–24446.

Abstract

In Oman, the Arabian Gazelle *Gazella arabica* is known to be distributed in the Hajar mountains of the north, desert plains in central of Oman, and Jabal Samhan foothills & Nejd area in the south. We report the first confirmed record of the Arabian Gazelle on Masirah island, 15 km off the mainland of eastern Oman. This finding was part of a national survey of biodiversity in Oman in which 29 camera traps were set to survey the majority of the island which covers about 400 km^2. Only two camera traps detected Arabian Gazelle, in an area covering only 22 km^2. The survey on the island suggests that the population is small and isolated. Future research studies are required both in the field of ecology and genetics.

Connecting protected areas in the North Mesopotamian steppes: can this ensure the survival of the Arabian Sand Gazelle (*Gazella marica*)?

Ali Uğur Özcan, Derya Gülçin, Nihan Yenilmez Arpa & Kerim Çiçek (2022).
Zoology in the Middle East 68: 198-211.

Abstract

The Arabian Sand Gazelle *Gazella marica* Thomas, 1897 is endemic to the Middle East and its populations in South-eastern Anatolia in Turkey are in danger of extinction. Here, we focus on its protected habitats in the Mesopotamian steppes and examine how to create connectivity between habitats under changing climate conditions. We use ecological niche modelling for four time periods, as simulated in five General Circulation Models (GCMs), to assess the distributional shifts of *G. marica* over the decades and predict its future ecological connection effectivity based on a least-cost model. We suggest establishing three potential corridors between core protected areas. The findings indicate that there will be a southward and westward shift in the distribution of the species due to future climate change. Overall, the results of the GCMs suggest that climate change will trigger habitat loss for *G. marica*. Unless conservation measures take the forecasted changes in habitat into consideration, the extinction of this species will be unavoidable.

AFRICAN BUFFALO

Disruption of an ant-plant mutualism shapes interactions between lions and their primary prey.

Kamaru, D. N., Palmer, T. M., Riginos, C., Ford, A. T., Belnap, J., ... & Goheen, J. R. (2024). *Science* 383(6681): 433-438.

Abstract

Mutualisms often define ecosystems, but they are susceptible to human activities. Combining experiments, animal tracking, and mortality investigations, we show that the invasive big-headed ant (*Pheidole megacephala*) makes lions (*Panthera leo*) less effective at killing their primary prey, plains zebra (Equus quagga). Big-headed ants disrupted the mutualism between native ants (*Crematogaster* spp.) and the dominant whistling-thorn tree (*Vachellia drepanolobium*), rendering trees vulnerable to elephant (*Loxodonta africana*) browsing and resulting in landscapes with higher visibility. Although zebra kills were significantly less likely to occur in higher-visibility, invaded areas, lion numbers did not decline since the onset of the invasion, likely because of prey-switching to African buffalo (*Syncerus caffer*). We show that by controlling biophysical structure across landscapes, a tiny invader reconfigured predator-prey dynamics among iconic species.

Genome-wide diversity, population structure and signatures of inbreeding in the African buffalo in Mozambique

Colangelo, P., Di Civita, M., Bento, C. M., Franchini, P., Meyer, A., ... & Sabatelli, S. (2024). *BMC Ecology and Evolution* 24: 1-14.

Abstract

The African buffalo, *Syncerus caffer*, is a key species in African ecosystems. Like other large herbivores, it plays a fundamental role in its habitat acting as an ecosystem engineer. Over the last few centuries, African buffalo populations have declined because of range contraction and demographic decline caused by direct or indirect human activities. In Mozambique, historically home to large buffalo herds, the combined effect of colonialism and subsequent civil wars has created a critical situation that urgently needs to be addressed. In this study, we focused on the analysis of genetic diversity of *S. c. caffer* populations from six areas of Mozambique. Using genome-wide SNPs obtained from ddRAD sequencing, we examined the population structure across the country, estimated gene flow between areas under conservation management, including national reserves, and assessed the inbreeding coefficients. Our results indicate that all studied populations of buffalo are genetically depauperate, with a high level of inbreeding. Moreover, buffaloes in Mozambique present a significant population differentiation between southern and central areas. We found an unexpected genotype in the Gorongosa National Park, where buffaloes experienced a dramatic population size reduction, that shares a common ancestry with southern populations of Catuane and Namaacha. This could suggest the past occurrence of a connection between southern and central Mozambique and that the observed population structuring could reflect recent events of anthropogenic origin. All the populations analysed showed high levels of homozygosity, likely due to extensive inbreeding over the last few decades, which could have increased the frequency of recessive deleterious alleles. Improving the resilience of buffalo in Mozambique is essential for preserving the ecosystem integrity. The most viable approach appears to be facilitating translocations and re-establishing connectivity between isolated herds. However, our results also highlight the importance of assessing intraspecific genetic diversity when considering interventions aimed at enhancing population viability such as selecting suitable source populations.