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## ANTELOPE SPECIALIST GROUP



**IUCN Species Survival Commission**  
*Antelope Specialist Group*



**GNUSLETTER** is the biannual newsletter of the IUCN Species Survival Commission Antelope Specialist Group (ASG). First published in 1982 by 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. Today **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](mailto:asgpo@marwell.org.uk).

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**Front Cover.** *Free-ranging Western bongo (Tragelaphus eurycerus eurycerus) at 'Kewin saltlick', 'Secteur de chasse' n°42 named Daradou in Vovodo Conservancy, a savanna-forest mosaic landscape in south-eastern Central African Republic (©Alain & Kewin Lefol). The Western or lowland bongo has most recently been assessed for the IUCN Red List of Threatened Species in 2016 and listed as Near Threatened by the IUCN SSC Antelope Specialist Group (<https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22047A50195617.en>).*

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# FROM IUCN AND ASG

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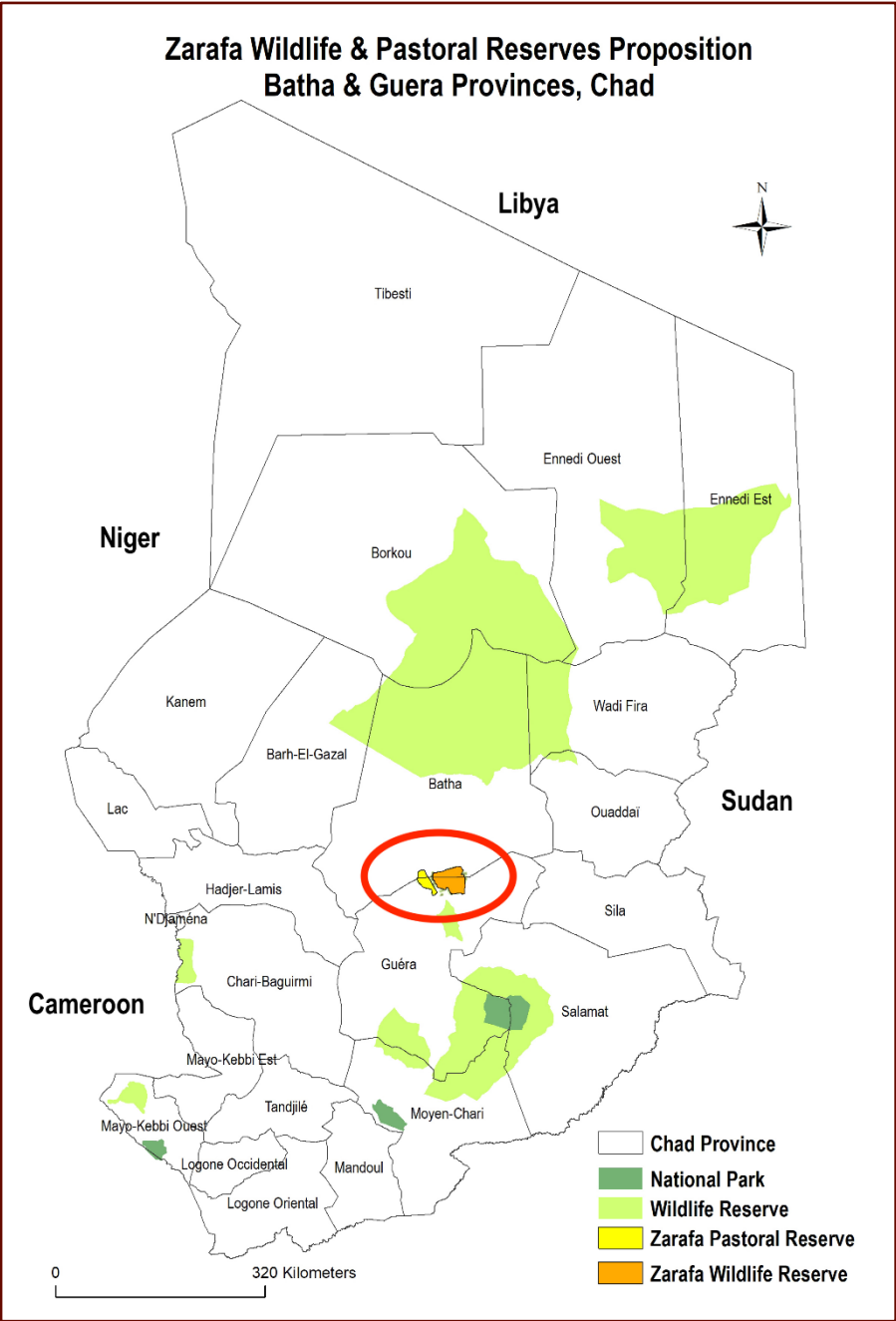
# RESEARCH AND REPORTS

## Wildlife conservation potential revealed in Koundjourou area, Batha and Guéra provinces, Chad

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*Figure 1. Location of the proposed Zafara Wildlife and Pastoral Reserves in Koundjourou area (red oval), Chad*



## Summary

An aerial survey was conducted in the Provinces of Batha and Guera, central Chad, from 28.02.2022 to 06.03.2022, by the NGOs ‘Wild Africa Conservation’ and ‘Wings for Conservation’ to support the *Direction de la Faune et des Aires Protégées du Tchad* (Chad Department of Wildlife and Protected Areas). The survey was funded by the NGO ‘Giraffe Conservation Foundation’. The survey revealed the presence of a formerly poorly known - even unnoticed - assemblage of resident wildlife species, notably: several antelope species including red-fronted gazelle, and also Kordofan giraffe, warthog, common jackal, spotted hyena, striped hyena, North African ostrich, Arabian bustard and lappet-faced vulture. The area is also known to seasonally host several mammal species, notably elephant (a small population named the Birket Fatimé population), tiang and lelwel hartebeest moving from Zakouma Great Ecosystem. According to local communities, lion and greater kudu are also present. Few human activities were recorded in the study area, apart from the presence of cattle and “ferricks”, the nomad camps. At first glance, this area looks important for the conservation of antelopes with an assemblage of at least five species. The area holds the characteristics needed for being gazetted as a Protected Area under the category of ‘*Réserve de faune*’ (Faunal Reserve or Wildlife Reserve) in Chad.

## Introduction

The Chadian State has developed a 2030 national strategy and action plan for wildlife conservation which recommends, among other things, strengthening the existing network of protected areas to reach 17% of its national area (Aichi Target). The Chadian State is also committed to the conservation of megafauna through the signing of several conventions such as the Bonn Convention for the Conservation of Migratory Species of Wild Animals (CMS) and in particular the action plan for the conservation of the Sahelo-Saharan Megafauna ratified by Chad in 1998 with the addition of the red-fronted gazelle (*Eudorcas rufifrons*) in 2014.

During a mission carried out in December 2020 (as part of the development of the national ostrich conservation strategy), the area located south-east of Koundjourou near Mount Etéjen and the villages of Delep and Bedine, caught the attention of experts (Figure 1). The quality of the habitat, the observations of red-fronted gazelles and very scarce presence of livestock, compared to elsewhere in Batha and Guera provinces, were noted and confirmed by consultations with local communities. Interviewees mentioned the presence of ostrich (*Struthio camelus*), giraffe (*Giraffa camelopardalis*), red-fronted gazelle, greater kudu (*Tragelaphus strepsiceros*) and, seasonally, elephant (*Loxodonta africana*). In addition, during a flight between Mongo and Ati in February 2021, the NGO ‘Wings for Conservation’ clearly observed a Kordofan giraffe (*G. c. antiquorum*), thus confirming the statements of local communities.

Also during this mission, we observed that this area was made up of a very dense wooded savanna with plant species characteristic of both the Sahelian biome and the Sudano-Sahelian ecotone, notably the following tree species: *Acacia erythrocalyx*, *Acacia mellifera*, *Acacia seyal*, *Anogeissus leiocarpus*, *Balanites aegyptiaca*, *Boscia senegalensis*, *Combretum glutinosum*, *Grewia tenax*, *Guiera senegalensis*, *Piliostigma sp.* and *Ziziphus mauritania*, to name but a few.

Despite being without any protection status, the Koundjourou area was recommended to the Department of Wildlife and Protected Areas (DFAP) and its technical partners as worth exploring further to collect more information on wildlife and help defining an appropriate status for this area in order to ensure its conservation. That was the trigger for implementing a rapid aerial survey of the area.

## Method

The objective of the second mission in 2022 was to better explore the area initially identified during the first mission in 2020 in order to collect information on the presence and possibly the abundance of key wildlife species.

The methodology was a standard aerial survey (Norton-Griffiths, 1978) as well as a reconnaissance mode along the Batha River. The protocol was adapted according to the characteristics of the aircraft and the experience of the pilot and passenger: the pilot, very experienced in aerial survey, was also the left observer, while the passenger was the right observer and recorder. A sequence adapted to aerial survey was developed on Cybertracker®. When an observation of an iconic species of the area was made or when it came to giraffes for individual identification from the pattern of the coat, the plane left the transect to take the necessary photos. The reconnaissance mode was used to assess the presence of wildlife species along the Batha River since the local communities informed that giraffes in particular but also elephants come to the Batha River for drinking and that a small population of about 25 elephants lives around Birket Fatimé (Dolmia & Jachmann, 2018).

Based on all the information collected, two census areas, named 1 and 2, were inventoried: area 1 covered 800 km<sup>2</sup> and area 2 covered 400 km<sup>2</sup>. The transects were spaced 600 m apart, i.e. an exhaustive total count knowing that the observation strip is 300 m on either side of the aircraft.

## Results

The rapid aerial survey took place from 28.02.2022 to 06.03.2022. Two flights a day were performed over six census days. The transects and reconnaissance flights are presented in Figure 2. The transects had variable lengths ranging from 15 km for zone 2 to 30 km for zone 1. The altitude and speed averages were calculated on 140 recorded data with an average of 2 speed and altitude measurements per transect. In general the average altitude oscillated around 92 m and the average speed around 150 km/h, so the flight conditions were constant within the framework of this survey.



**Figure 2.** Flight tracks of the aerial survey in Koundjourou area

## Wildlife Observations

During the 6 days of the aerial survey, whether in transect or reconnaissance mode, 144 wildlife observations were recorded, including 99 observations of remarkable species (Table 1).

**Table 1.** Summary of wildlife sightings during the rapid aerial survey in Koundjourou area

Species	Observations #	Total individual #
Red-fronted gazelle	18	24
Common duiker	2	2
Kordofan giraffe	13	44
African warthog	19	45
Common jackal	30	39
Spotted hyena	1	2
Striped hyena	1	1
North African ostrich	2	4
Lappet-faced vulture on nest	9	18
Lappet-faced vulture in flight	2	2
Arabian bustard	2	2

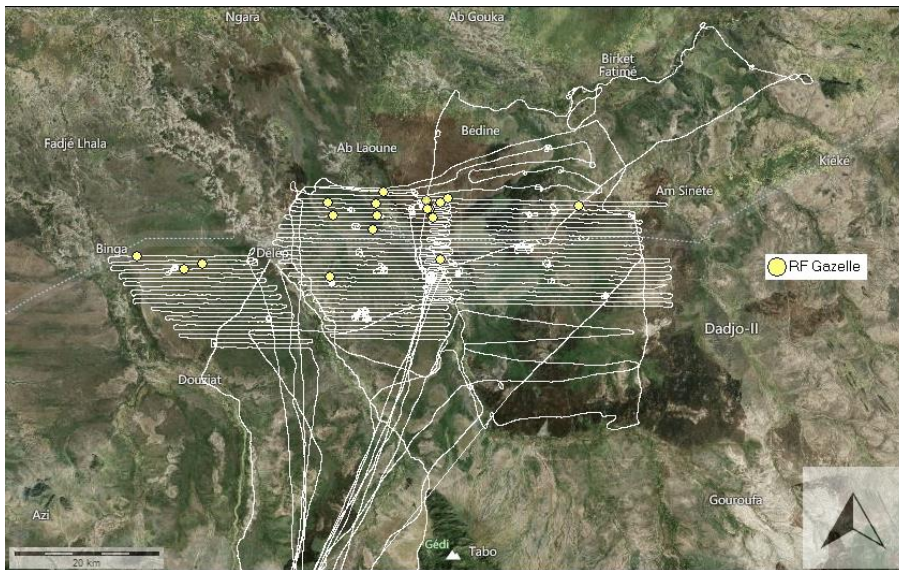
### Red-fronted gazelle

A relatively large number of red-fronted gazelle (IUCN Red listed as Vulnerable under criteria A2cd (IUCN SSC Antelope Specialist Group 2017)) was observed during the survey: up to 24 individuals were counted (Figure 3). Considering the non-gregarious behavior of the species (generally, solitary or in small family groups of 2 to 3 individuals) and the densely vegetated area hampering aerial observations, we estimate that the population of the species is substantial in the area. Interestingly, their distribution looks more latitudinal than longitudinal, as shown by the observations map (Figure 4). They were observed in less dense habitats than those used by giraffes, with a majority of small shrubs such as *Boscia senegalensis* or *Commiphora africana*.



**Figure 3.** Red-fronted Gazelle in Koundjourou area (© Jaime Dias/Wings for Conservation)





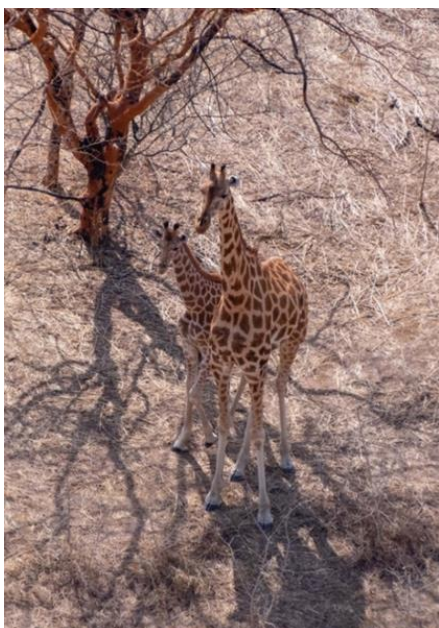
**Figure 4.** Red-fronted gazelle observations in Koudjourou area

### Other antelope species

In addition to the red-fronted gazelle, four other antelope species are known to inhabit the area either as permanent residents or seasonal visitors. The common duiker (*Sylvicapra grimmia*) is resident in the area. The seasonal presence of tiang (*Damaliscus lunatus tiang*) in the southern fringe of the area has been documented by African Parks Network with the collaring of 6 individuals in Zakouma National Park between 2012 and 2014, providing data until February 2016. The lelwel hartebeest (*Alcelaphus buselaphus lelwel*) was reported by local communities. The presence of the greater kudu (*Tragelaphus strepsiceros*) was also reported locally, north of Abu Telfan National Park, in the same area which is visited by tiang and in the vicinity of Batha River according to the literature (Gillet, 1964).

### Kordofan giraffe

During the aerial survey, 44 giraffes split into 13 groups of one to six individuals were observed. Photographs were taken of 12 of the 13 groups, and all of the individuals in these groups, i.e. 43 giraffes, were photographed separately on both profiles, right and left. The data analysis was performed according to an individual identification methodology based on coat patterns.



The giraffes observed were classified by sex and as calf when too young for identifying sex. 34 distinct giraffes were identified, including 19 females, 10 males and 5 calves. This is definitely the minimal size of the population, but we estimate a population size of about fifty knowing that at least 1/3 of the potential hosting area was not inventoried and that we may have missed individuals given the density of the vegetation in some areas. Giraffes were mainly observed in semi-dense savanna of *Acacia seyal*, other acacia species and *Combretaceae*, and even shrubs like *Guiera senegalensis* and *Boscia senegalensis*. Koudjourou area appears as the northernmost population of the Kordofan subspecies of giraffe.

**Figure 5.** Kordofan giraffe spotted from the air in Koudjourou area (© Jaime Dias/Wings for Conservation)

### North African Ostrich

The North African ostrich (*S. c. camelus*) is known to be present in the area (MEPDD *et al.*, 2021). Two observations of two male ostriches were made during the inventory, probably the same individuals. During the discussions we had with traditional leaders of the village of Delep, the gendarmerie and the foresters, ostriches are frequently seen in the area, rather located at west of the village. The two observations we made were though to the east of the village.



**Figure 6.** North African Ostriches seen from the air in Koundjourou area (© Jaime Dias/Wings for Conservation)

### Lappet-faced Vulture

While the survey was mainly focused on antelopes, giraffe and ostrich, it was a very good surprise to observe 9 active nests of lappet-faced vultures (*Torgos tracheliotos*) with chicks. In the Sahelo-Saharan region, lappet-faced vultures favor nesting in areas with very low human activity (Wacher *et al.*, 2013). Koundourou appears as important for the conservation of a species listed as endangered by the IUCN Red List (Ogada *et al.*, 2016). Rüppell's vultures (*Gyps rueppellii*) and hooded vultures (*Necrosyrtes monachus*) were also observed.



**Figure 7.** Lappet-faced vulture observed from the air in Koundjourou area (© Jaime Dias/Wings for Conservation)

### Predators

39 common jackals (*Canis aureus*) were counted during the survey, while 2 spotted hyenas (*Crocuta crocuta*) and 1 striped hyena (*Hyaena hyaena*) were observed in broad daylight (Figure 8). Moreover, local communities told us of the presence of lions during the rainy season.



**Figure 8.** From left to right: common jackal, spotted hyena & striped hyena photographed from the aircraft in Koundjourou area (© Jaime Dias/Wings for Conservation)



### Other wildlife species

Still during the survey but only in reconnaissance mode, nearly a hundred crowned cranes (*Balearica pavonine*, Figure 9) and several dozen baboons (*Papio anubis*) were observed along the Batha River. Another primate is known to be present there, the patas monkey (*Erythrocebus patas*). Large raptors and small bustards were seen from the air but not identified.



*Figure 9. Crowned cranes along the Batha river (© Jaime Dias/Wings for Conservation)*

### Human Activities

As part of the aerial survey, human activities were also recorded including villages, agriculture, tracks, wood collection, livestock, carts, motorcycles, cars, bicycles, and bushfires.

Agriculture is not widespread in the area due to the difficult access to water. There are a few fields, mainly along villages on either side of the main track. Apart from over-dug ponds, we did not observe any hydro-pastoral infrastructure in the surveyed area, which *de facto* limits agriculture and pastoralism to villages with wells and /or boreholes and along the Batha River. Livestock herding is the main human activity in the area. It is centered on villages in the center of the area and on the ferricks to the east and north of the area.

Bush fires and logging in the area are also matters of concern for wildlife conservation. During the survey, wood cutting was observed on 9 occasions, mainly near the village of Delep. Also during the survey, bushfires for clearing land were mainly observed near villages in the southern part of the area, and a fire was noticed near Mount Etéjen, probably lit by cattle herders generating newly grown pasture.

We also analyzed the observations of four wildlife species which are sensitive to human disturbance, namely the giraffe, the red-fronted gazelle, the North African ostrich and active nests of lappet-faced vulture. It was shown that these species occur in areas where human activities are rare or inexistent.

Given the low density of human activities and the confirmed presence of several iconic species of Chad, we devoted the last day of overflight to the delimitation of the area using tangible landmarks such as tracks, fields, villages and ferricks. That allowed us to identify two distinct areas, one with a high density and diversity of fauna which could become a Wildlife Reserve of approximately 1,500 km<sup>2</sup> and another with a lower presence of fauna but an excellent habitat which could become a Pastoral Reserve of about 700 km<sup>2</sup>. These two entities are distinctly separated by a track with villages and camps along.

## **Recommendations**

The area overflowed as part of this aerial survey presents appropriate characteristics to launch a process for creating a Wildlife Reserve and a Pastoral Reserve. The diversity and density of wildlife and the low scale of human activities provide the area with strong assets to candidate for being gazetted as protected area. During the mission, we had meetings with the traditional rulers of Delep (Mr. Malik Ahmat Hassane and Mr. Said Atoum), the head of the gendarmerie and the head of the forest post. The prospect of creating a Wildlife Reserve and a Pastoral Reserve was very much appreciated by the local administrative and traditional authorities who expressed their interest in supporting the DFAP in this initiative. They highlighted the benefits that would be generated for the local communities. The prospect was also raised with the traditional authorities of Bedine and the Prefect of Koundjourou and was also much appreciated. The hydro-geological characteristics of the area partly explain the low density of human activities. The only perennial open source of water is the Batha River. Agriculture and sedentary livestock herding are very difficult undertakings there. Moreover, the area is flooded and inaccessible in the rainy season, which is another limiting factor for human activities, but on the contrary allows some large mammals like elephants to take advantage of the abundant wood resources.

Other socio-economic factors also come into play for explaining the characteristics of the area and will require further study. In the south of the proposed Pastoral Reserve, we observed attempts to clear land for agriculture. The agricultural pioneer front is a source of potential conflict within communities. The creation of the Pastoral Reserve beside the Wildlife Reserve could partly mitigate latent conflicts by developing spaces reserved for livestock.

The perimetral delimitation of the Wildlife and Pastoral Reserves should be relatively easy from both logistical and social points of view. There are no permanent settlements within the proposed Wildlife Reserve and the tracks and natural barriers such as watercourses can be used to facilitate the demarcation.

The name of Zarafa Wildlife Reserve was suggested by the authors. Indeed, several villages in the area bear this name whether in the Province of Guera or in that of Batha, and there are several toponyms with this term which means giraffe in Arabic. The proposed designation of Zarafa Wildlife Reserve linked to these local characteristics and of course to the reality that the giraffe is one of the iconic wildlife species of Chad.

## **Acknowledgments**

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**Figure 10.** Kordofan giraffe photographed from the aeroplane in northern Guera, Central Chad (© Jaime Dias/Wings for Conservation)



# Recent incursions of nilgais (*Boselaphus tragocamelus*) into Bangladesh, a former range country

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## Abstract

The blue bull or nilgai (*Boselaphus tragocamelus*), the largest Asian antelope, has been extinct in Bangladesh for a century. However, of late, there have been periodic records in the country where the nearest known range is about 300 km away. Here, we present an overview of these occurrences extracted from media reports. In the last five years (2018–2022), 13 incidents took place, all confined to north-western Bangladesh. Adjacent to the region is West Bengal, India, where 18 incidents occurred in the same timeline, which is indicative of a patterned scenario that mostly took place in winter and early summer. Historically, north-western Bangladesh and north-eastern West Bengal formed the easternmost range of the species that never went beyond the natural barriers posed by the Ganges–Brahmaputra River. The visiting nilgais were mostly strays wandering out of Bihar, Odisha, Jharkhand (India), and Nepal—all share borders with West Bengal, India, and hold nilgai populations. Trafficking was also stated as an underlying reason behind these incidents—in some cases, which was—however, it requires further investigation. The animals, being unknown to the areas visited, faced retaliation and were often chased for several kilometres in almost all cases. There were incidents where the nilgai died of cardiac arrest or was slaughtered for meat. Community education programs are necessary to alleviate the situation. Bangladesh can also think of introducing the species—being easy to be taken care of—in the north-western and central wet deciduous patches.

Note: The supplementary materials referred to are available on request from the ASG Programme Office [asgpo@marwell.org.uk](mailto:asgpo@marwell.org.uk)



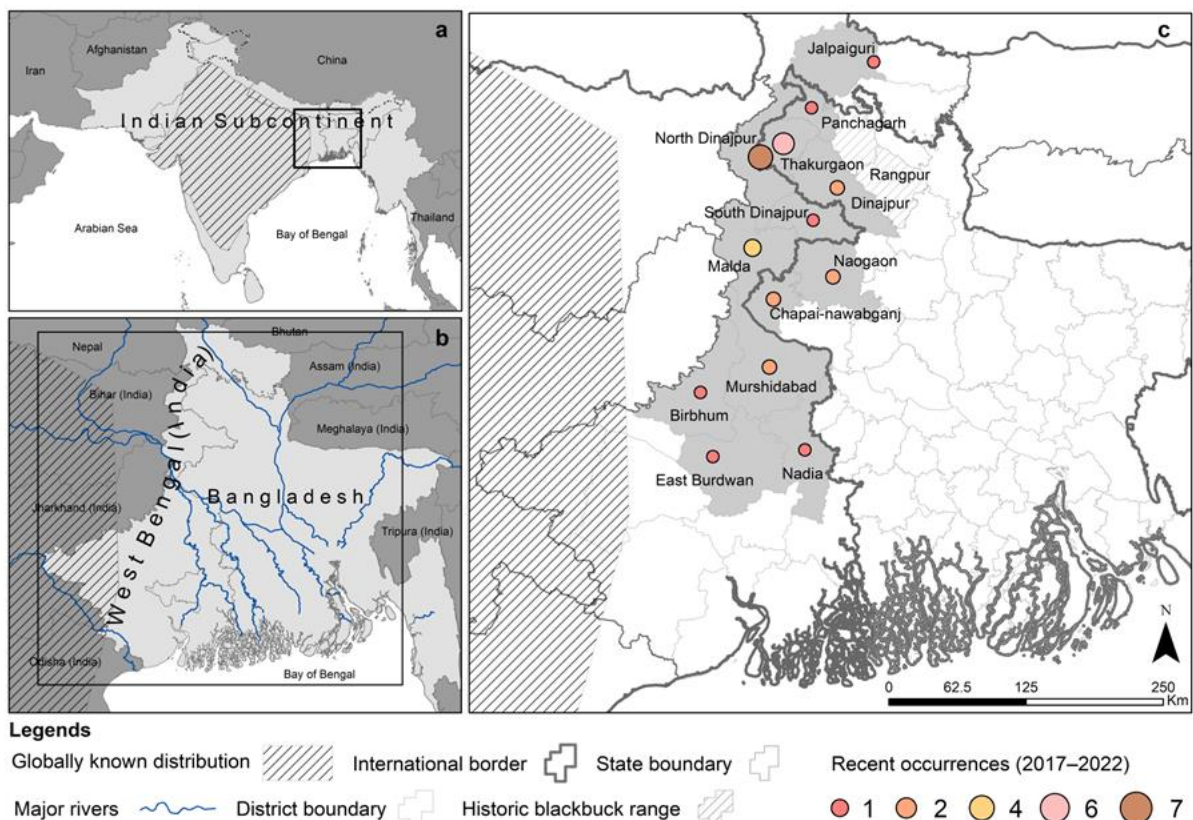
**Left picture:** Female nilgai captured in 2018 in Ranisankail sub-district, later rescued (Source: <https://en.prothomalo.com/environment/Endangered-nilgai-found-in-Thakurgaon>)

**Right picture:** Male nilgai captured in 2019 in Patnitola sub-district, later rescued (Source: <https://www.thedailystar.net/city/news/another-nilgai-found-naogaon-1723582>)

## Introduction

The nilgai or blue bull (*Boselaphus tragocamelus*), the largest antelope in Asia, is the sole member of its genus and stands out from the rest of the antelopes with its distinctive features such as large stocky build, short and stout horns, bluish-grey coat and dewlaps in males (Leslie 2008). Nilgais prefer grassy plains and scrubland over densely forested areas, and once lived throughout the open vegetation of the Indian Subcontinent (Blanford 1888, Brander 1923, Prater 1971). Although their presence in eastern Bengal and east of the Bay of Bengal is not generally considered (Leslie 2008), it is often suspected that they might be present beyond the Ganges-Brahmaputra barrier (The Business Standard 2021, September 1).

This bovid is globally declared Least Concern by the IUCN SSC Antelope Specialist Group (2016) with a stable population of 70,000-100,000 mature individuals mostly confined to India extending from the base of the Himalayas, through central India, down to Karnataka in the south, except for the north-eastern and southernmost parts (Sankar & Goyal 2004, Leslie 2008, Aryal *et al.* 2016). A sliver of its range spreads into northeastern Pakistan (Mirza & Khan 1975) and Nepal (Dinerstein 1979). The global range of nilgai has now substantially decreased in response to rapidly vanishing habitats along with illegal hunting, poaching, poisoning, and human-nilgai conflicts (Khan & Khan 2016, Khanal *et al.* 2017). Nilgais are vulnerable in Nepal (Amin *et al.* 2018) and extinct in Bangladesh (Mallon 2003), and Pakistan is likewise at risk of losing its nilgai population (Khan *et al.* 2015).



**Figure 1.** Nilgai in Bangladesh and West Bengal (India). Solid grey areas indicate the historic easternmost range of the species. The currently known range was mapped from IUCN SSC Antelope Specialist Group (2016).



In Bangladesh, nilgais became extinct around the 1930s (IUCN Bangladesh 2015), however, there were occurrences as late as the 1950s (Khan 2001). The states of India that border Bangladesh do not harbor the species except for West Bengal: the nilgai is present there on the south-western side, about 1,000 km from the India-Bangladesh border with no habitat connectivity (Figure 1a). The nearest wild population is in Bihar state, miles distant from Bangladesh with no common border (Prasad *et al.* 2020). But, in recent years, this long-lost species has made multiple appearances in Bangladesh. A database to log the incidents and chalk out occurrence hotspots is now needed.

Here, we aimed to compile the recent occurrences of nilgai in Bangladesh. We followed a structured methodology to retrieve verifiable events. We also looked for similar incidents in West Bengal, India, the state that still holds a portion of the nilgai range. We provide an overview of the trends, outcomes, and underlying reasons for these incidents, and compared them with the historical distribution.

## Methods

### *Collecting occurrence data*

We searched for recent incidents through online databases of newspapers and news portals in Bangladesh and West Bengal, India. The sources were chosen based on their highest circulation rates (e.g., BD Information 2021). Our search was restricted between 2013 and 2022 due to the unavailability of older data as the selected newspaper sources started publishing online around 2013. We registered the location and time of sightings, the number and sex of reported individuals, and their condition (dead or rescued). We also noted the anthropogenic responses induced by these incidences.

We extracted peer-reviewed scientific works (research papers/articles) relevant to nilgai distribution from Google Scholar, and ResearchGate. To review past and present distributions, we consulted Blanford (1888), Brander (1923), Prater (1971), Mirza & Khan (1975), Dinerstein (1979), Sankar & Goyal (2004), and IUCN SSC Antelope Specialist Group (2016). We studied several series of gazetteers used in a similar study (Akash *et al.* 2021): A Statistical Account of Bengal (20 volumes; published between 1869 and 1877), The Imperial Gazetteer of India (a 26-volume gazetteer of the then British Indian Empire; published between 1881 and 1887, revised editions until the 1930s), Bengal District Gazetteers (published until the first quarter of the twentieth century), West Bengal District Gazetteer (a state-wide initiative by the Government of India to update the previous gazetteers; published in multiple volumes between 1958 and 1990), and Bangladesh District Gazetteer (an initiative by the Government of Bangladesh; published in multiple volumes between 1971 and 1990). We also looked into diaries and descriptions of hunting carried out in the 1800s and the 1900s.

### *Search protocol*

In every attempt of our search, we adjusted the keywords with the scientific or common name of the species” *i.e.*, “*Boselaphus tragocamelus*” or “blue bull” or “nilgai” together with “country / state name” *i.e.*, “Bangladesh”, “West Bengal”. Both Bangla and English versions of these keywords were employed in search engines. We considered the extracted data valid only when the news reports had been published with verifiable images of nilgai (dead or alive) with specified locations and/or included expert opinions confirming its identification. For example, we rejected a report (The Independent 2021, July 3) since it only mentioned the blue bull occurrence in 2016 in Thakurgaon, Bangladesh, without providing any supporting image or expert testimony.



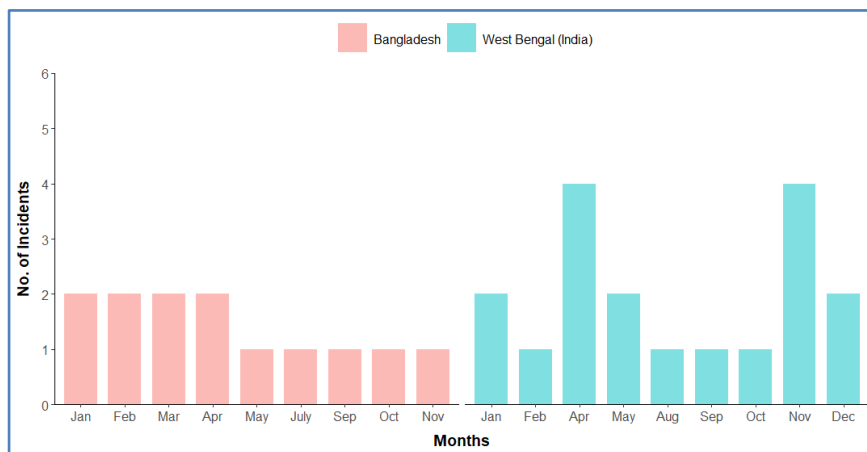
## Results and Discussion

### *Recent nilgai occurrences*

We noted 31 confirmed reports each involving a single nilgai (13 in Bangladesh) since 2017 (Table 1, Figures 1–2, Supplementary Materials 1–2). In Bangladesh, the incidents were confined to two divisions, with Rangpur, the northernmost division accounting for nine of the events (six in the Thakurgaon district, two in the Dinajpur district, one in the Panchagarh district). The other four were reported from the Rajshahi division situated west of the country (two each in Naogaon district and Chapainawabganj district). All these five districts of Rangpur and Rajshahi share borders with the state of West Bengal, India (Figure 1). There were no incidents from Rajshahi in the years 2018 and 2021.

Seven districts in West Bengal, North Dinajpur, South Dinajpur, Malda, Murshidabad (Malda division), Nadia (Presidency division), Birbhum, and East Bardhaman (Burdwan division), stood for 18 incidences (Table 1, Supplementary Material 1). Except for Birbhum and East Bardhaman, all of these districts share borders with Bangladesh (Figure 1b,c, Supplementary material 1). The district of North Dinajpur stood for the highest seven incidents. The Thakurgaon district in Bangladesh lies next that accounted for six incidents, about 50% of incidents occurred there.

In total, there were 17 females (2 in Bangladesh, 15 in West Bengal) and 14 males (11 in Bangladesh, 3 in West Bengal) (Supplementary Material 1). Six nilgais died (5 in Bangladesh, 1 in West Bengal) but we found no reported instances of human injuries. All incidents involved chasing and retaliatory responses upon sighting a nilgai. In three cases, the animal was chased to death (in Thakurgaon, Panchagarh, and North Dinajpur; Supplementary Material 1). The incidents largely took place in winter and early summer (Figure 2).



**Figure 2.** Monthly occurrences of nilgai in Bangladesh and West Bengal (India).

### *Historical evidence*

Review of historical anecdotes revealed a remarkable overview of nilgai distribution in the recent past (Table 2, Figure 2, Supplementary Material 1-2). Firstly, it is evident that the species never crossed to the east of the major rivers of Bangladesh. Secondly, the historical nilgai range appeared to be limited to the region where the present-day incidents are happening. Lastly, the accounts on large mammals that were considered ‘game’ were already (nilgai almost absent) dwindling in the late 1880s and the early 1900s. For example, the presence of sambar (*Rusa unicolor*) was mentioned from Dhaka, the present-day capital of Bangladesh (Hunter 1876g). Similarly, these accounts were vivid in detailing the then status of ‘game animals’ such as hog-deer (*Axis porcinus*), spotted deer (*A. axis*), barking deer (*M. muntjac*). The presence of the second antelope, the blackbuck (*Antelope cervicapra*)—now extinct in both West Bengal and

Bangladesh—was more prevalent than the nilgai in the historical accounts. Only Malda (West Bengal) and Rangpur (Bangladesh) were stated to have nilgais (Table 2). The remarks of Khan (2001) supported the historical anecdotes and specifically mentioned that the species, on its last leg in Bangladesh, was confined to only the north-western tip of the country. Its extirpation took place around the 1930s.

#### *Accounts for possible entryways in Bangladesh*

All records in Bangladesh were from the northwestern bordering districts. The media accounts also indicated the possible entryways for the nilgais. The state of West Bengal in India shares more than 2,200 km of border with Bangladesh (Figure 1). Among the 13 nilgais sighted in Bangladesh, one was rescued from the bank of the Kulik River in 2018, and another from the Nagar River in 2021. Both are transboundary rivers that flow through Bangladesh and West Bengal. The nilgai rescued from Chapainawabganj, Rajshahi, in 2020 was spotted only about 100 m from the international border, suggesting its entrance from India (The Daily Star 2020, February 22). Another nilgai was sighted in October 2022 in the Bilbhatia border, Chapainawabganj, Rajshahi, which might have arrived via the border (The Daily Star 2022, October 26). The media reported six nilgais from the border areas in the Rangpur division between 2021 and 2022, three of which were spotted while crossing the border. Two nilgais were reported almost a year apart from the Dharmagarh border area, Thakurgaon, Rangpur, implying they might have entered by the same route from India (Table 1, Supplementary Material 1). The reports made it clear that all these nilgais came from India, particularly crossing the state of West Bengal.

In West Bengal, it was suspected that the nilgais entered from Bihar or south-western West Bengal, both regions have a nilgai population. One possible explanation behind these instances is that the nilgais entered Bangladesh to evade the chase by locals of the bordering West Bengal districts (Prothom Alo 2021, November 27). Another possibility is that nilgais were being trafficked into the country. According to the Eliminate, Neutralize, and Disrupt (END) Wildlife Trafficking Act Report (2021), Bangladesh is among the Focus Countries that are the major source, transit point, or consumer of wildlife trafficking products or their derivatives. According to the media claims, two nilgais were rescued three months apart in 2019 in the Naogaon district and were allegedly smuggled into the country. One of these nilgais jumped off a truck while being transported with cattle (The Daily Star 2019, April 2). However, periodic events pose questions and make it more likely that the animals are originating from Bihar, India, where it is regarded as vermin (Indian Express 2016, September 13). With an estimated population of 5,500 (Chauhan 2011), free-roaming nilgais present in 31 of 38 districts in Bihar, cause crop damage becoming a subject of retaliation (Prasad 2022).

#### *Accounts for possible entryways of nilgais in West Bengal*

Nilgais are prevalent in central and northern India (Meena *et al.* 2014), where four states (Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh) make up the vast majority (about 60%) of the overall blue bull population of the country (Sankar & Goyal 2004). The population density in India can be as low as 0.23–0.34 individuals/km<sup>2</sup> (Indravati National Park, Chhattisgarh) (Pandey 1988) to 7.0 individuals/km<sup>2</sup> (Keoladeo National Park, Rajasthan) (Bagchi *et al.* 2004). According to media accounts, three of the total nilgais recorded in West Bengal came from the state of Bihar, which is contiguous with West Bengal. One of these animals arrived from Bihar via the Mahananda River (News18 2022, April 9). The state of Jharkhand, also contiguous with West Bengal, has a known wild population of nilgais (Sankar & Goyal 2004), and two reports indicated entry of the animal through this state. Similar to Bangladesh, allegations of ‘smuggling’ in West Bengal are pervasive. In 2020, a badly injured blue bull was found on the national highway of East Bardhaman district, allegedly falling off a

vehicle during smuggling (News18 2020, November 17). One incident was recorded from the Jalpaiguri district, the farthest northeast locality out of the known nilgai range (Table 1, Figure 1c) (Today's Bangla 2022, April). This could come out of Nepal or be due to trafficking.

#### *Anthropogenic responses to the incidents*

Lack of awareness and unfamiliarity with nilgai, along with the tendency to kill wild animals, turned out to be the root cause behind the incidents. The locals panicked after sighting a nilgai. Nearly always the locals chased the animal for hours, and two incidences in the Rangpur division reported nilgais dying from cardiac arrests. In addition, in 2021 and 2022, two nilgais were rescued from locals in the Rangpur division but died afterward as a result of serious injuries incurred during the chase. Another blue bull was beaten and slaughtered for meat in Thakurgaon district (Prothom Alo 2022, May 12). In other cases, the authorities took immediate action to rescue the animals. However, the rescued nilgais are also mistreated in Bangladesh. The first blue bull captured in 2018 died only after a year in captivity after being entangled with a fence bar (Daily Sun 2019, March 17). Another nilgai died here barely four months after being rescued in 2019 (Banglanews24 2022, March 17).

#### **Conclusion**

The study provides an in-depth overview of recent nilgai occurrences in Bangladesh. It is evident that a similar scenario is happening in West Bengal, India. The incidents are more likely due to nilgais straying from their nearest known range than to wildlife trafficking. The study also sketches out remarks made on the historical range of nilgai. Nilgais used to roam the regions of West Bengal and Bangladesh that are experiencing the present periodic incidents. It is also clear that the animals were harried on sight without provocation, often beaten, chased, or treated poorly after being captured. Community education programs can be considered to alleviate the situation common with all wildlife in Bangladesh. The country can also think of introducing the species—being easy to be taken care of—in the existing north-western and central wet deciduous patches.

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# Addax (*Addax nasomaculatus*) monitoring using dromedary patrols in the Tin-Toumma desert, Niger

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The monitoring of addax (*Addax nasomaculatus*) is tremendously challenging, primarily due to its rarity and the harsh environment in which it lives. The last wild addax population in Niger, with an estimated 30 to 50 individuals remaining, lives in the Tin-Toumma Desert bordering the eastern boundary of the Termit and Tin-Toumma National Nature Reserve (TTNNR). With a size of 86,215 km<sup>2</sup>, the TTNNR is the largest terrestrial protected area in Africa, although the Tin-Toumma Desert is no longer part of the TTNNR since 2021, when the boundaries of the reserve were changed. The French NGO Noé had been mandated by the Nigerian government in 2018 with the management of the TTNNR through a long-term Public-Private Partnerships (PPP). Since then, Noé has carried out numerous vehicle patrols to monitor the addax population in the Tin-Toumma Desert.

From September to October 2022, Noé tested a novel approach in the field with financial support from IUCN's Save Our Species (SOS) initiative. Using dromedary patrols, two areas in the Tin-Toumma Desert were surveyed independently for one month. For this, two teams were set up, each consisting of a community agent (a Noé employee supporting community activities), his local assistant, and four dromedaries (Figures 1 and 2, ©Noé). Team members received introductory training in data collection with the SMART Mobile smartphone application and were equipped with satellite communication devices to enable tracking of teams and communication with the reserve headquarters. During the study period, Noé set up two supply points for each team where field teams were provided with fresh water and food for dromedaries and team members. A total of 1.4 tons of dromedary food and 8400 liters of water (drawn from a well on the periphery of the study area) were deposited at the supply points. The teams covered 415 km and 393 km, respectively, in the Tin-Toumma Desert and were able to make several observations, including a direct observation of a group of three addaxes (1M, 2F) and a set of tracks of a group of 12 individuals.



**Figure 1.** TTNNR dromedary patrol team 01



**Figure 2.** TTNNR dromedary patrol team 02

Based on this success, Noé initiated a second addax monitoring program using dromedary patrols with financial support from the Mohamed bin Zayed Species Conservation Fund. The first two teams were active in the field from mid-May to mid-June 2023. This time, three supply points were set up per team, where 1.5 tons of dromedary food, and due to the less abundant pastures and harsher climatic conditions at this time of the year, much more water (13,200 liters) were provided. The two teams covered 290 km and 320 km, respectively. Each team observed groups of three addaxes (G1: 1M, 1F, 1SA; G2: 1M, 1F, 1A) and one team identified a set of tracks with five individuals. Noé intends to continue these types of patrols as they are an excellent example of involving local communities and their local knowledge and skills in conservation of a critically endangered species.



**Figure 2.** Screenshot taken by a dromedary patrol team of a video of two of the very last remaining wild addax, Tin-Toumma desert, Niger (©Noé)

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Addax *Addax nasomaculatus* has most recently been assessed for *The IUCN Red List of Threatened Species* in 2016. *Addax nasomaculatus* is listed as Critically Endangered under criteria A2cd; C2a(ii); D (IUCN SSC Antelope Specialist Group (2016)).

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# ANTELOPE NEWS

## AFRICA

### 3<sup>rd</sup> Regional Seminar on the Conservation and Restoration of Sahelo-Saharan Megafauna, Agadir, Morocco, 14 to 16 March 2023



The Sahelo-Saharan region is home of the most threatened ungulate species in the world. Direct killing, habitat degradation and climate change have led to a significant decline in the numbers and range of populations of addax (*Addax nasomaculatus*), Cuvier's gazelle (*Gazella cuvieri*), dama gazelle (*Nanger dama*), scimitar-horned oryx (*Oryx dammah*), slender-horned gazelle (*Gazella leptoceros*), dorcas gazelle (*Gazella dorcas*), the red-fronted gazelle (*Eurdorcas rufifrons*) and of the barbary sheep (*Ammotragus lervia*), all of which are protected under the Convention on the Conservation of Migratory Species of Wild Animals (CMS). Some species, such as the addax, only have a few dozen individuals left in the wild while others, such as scimitar-horned oryx, are already extinct in the wild and reintroduced from captive stock. In order to restore and maintain ungulate populations of all eight species in the Sahara and the Sahel, an Action Plan was adopted in 1998 by all 14 Range States under the auspices of CMS. However, the regional action plan for Sahelo-Saharan megafauna has not been updated since 2003.



From 14 to 16 March, the Range States of the Sahelo-Saharan region met at the Third Regional Seminar on the Conservation and Restoration of Sahelo-Saharan Megafauna, in Agadir, Morocco, to adopt an updated Action Plan, as mandated by the CMS Conference of the Parties at its 13th meeting (COP13, Gandhinagar, India, 2020).

Range States representatives, research experts and representatives of academic institutions, IGOs and NGOs participated in the meeting co-organized by the CMS Secretariat and the National Agency of Waters and Forests of Morocco, with funds provided by the Government of Germany.

Chaired by Mr. Khalid Cherki, Head of the Department of International Cooperation at the National Agency of Waters and Forests of Morocco, the meeting discussed and endorsed the updated Action Plan prepared by the IUCN SSC Antelope Specialist Group for the CMS Secretariat. Furthermore, the meeting agreed to recommend to CMS COP14 the establishment of a Sahelo-Saharan Megafauna Initiative, based on the example of CMS' Central Asian Mammals Initiative and include the African Wild Ass (*Equus africanus*) in its coverage. A [proposal](#) to this effect was submitted by the Government of Morocco in May. The meeting also gave room to relevant organizations working in the region to present on their work with a focus on opportunities for funding and partnerships for the implementation of the updated Action Plan. Further detailed information on the meeting can be found [here](#).

## **22<sup>nd</sup> annual meeting of SSIG (Sahel & Sahara Interest Group), Almeria, Spain, 4 and 5 May 2023**



The Sahel & Sahara Interest Group was born in 1998 on the back of a meeting organized by the Convention on Migratory Species in Djerba, Tunisia, to adopt an action plan for endangered Sahelo-Saharan antelopes. Since then, the meeting has become an annual forum for experts

working on environment, conservation and sustainable development in arid lands of North Africa and the Middle East. Facilitated by SaharaConservation, the meeting is a unique opportunity to bring people together to share ideas and projects, and to continue a strong tradition of collaboration on behalf of wildlife and people in the Sahel and the Sahara.

Due to the covid-19 pandemic, the meeting had to be cancelled in 2020, and then organized on Zoom the following 2 years. This year's reunion in Almeria, after 4 years without seeing each other, was all the more joyous! The meeting was hosted by the Estación Experimental de Zonas Áridas (Superior Council of Scientific Research). The EEZA is a Spanish research center under the Spanish National Research Council, dedicated to the study of the landscape, ecosystem and biology of arid and semi-arid zones. It also stands out for its efforts in the recovery of North African species of ungulates close to extinction.

This year's session was organized around four themes:

1. Protected area management models in the Sahara and Sahel region
2. Insights on species biology and implications for *in situ* and *ex situ* conservation of populations
3. Human-wildlife interactions and community engagement in the Sahara and Sahel
4. Animal, human, and environmental health concerns in the Sahara and Sahel



**64 participants from 15 different countries among 4 continents attended the 2-days event** EEZA's Director, Francisco Domingo Poveda, opened the meeting on Thursday 4<sup>th</sup> May, followed by introducing remarks from Margarita Paneque Sosa, CSIC Institutional Delegate for Andalusia and Extremadura, and John Watkin, Sahara Conservation's CEO.

During the meeting, 23 speakers presented their field work, research and studies on subjects as varied as species reintroduction, genetic research, animal ecology and behavior, management of *ex situ* populations, or animal movement's monitoring.

Initially focused on desert antelopes, year after year the subjects presented include more and more species, such as ostriches, vultures, reptiles, elephants and jackals.

### **This year's special feature – the Great Green Wall Initiative**

For the first time this year, the Great Green Wall initiative was in the spotlight. Sakhoudia Thiam, Head of Research and Development Office for the Pan African Agency of the Great Green Wall, and Jaime Garcia Moreno, International Program Coordinator at Vogelbescherming Nederland, hosted a dedicated workshop on biodiversity monitoring along the Great Green Wall Corridor. Although the Great Green Wall (GGW) Initiative includes biodiversity aspirations in its original plans, these have received little attention thus far. The

aim of the workshop was to provide an overview of the scope of work that the GGW Initiative is considering around biodiversity, elaborate a stakeholder map – at both regional and national scales – to identify actors with whom collaboration is necessary or desirable, and explore channels of information exchange with groups that are already working in the GGW.

The annual SSIG meeting is a great opportunity for professional exchanges, but also for conviviality, passionate and fascinating discussions, laughter, sharing and memories. This 22<sup>nd</sup> edition was the opportunity to remember and honor Mark Stanley Price's memory, who sadly left us in 2022. Mark was a valued member and friend of the SSIG community, and it was with great emotion that Koenrad de Smet and John Watkin shared some memories with us.

## **Anthrax suspected in African buffalo (*Syncerus caffer*) and cattle, Southern Province, Zambia**

A ProMED-mail post <http://www.promedmail.org>, Fri 4 Nov 2022 (ProMED-mail is a program of the International Society for Infectious Diseases) <http://www.isid.org>  
Source: Lusaka Times [edited] <https://www.lusakatimes.com/2022/11/04/anthrax-breaks-out-in-kazungula/>

An outbreak of anthrax among wildlife has been reported in Kazungula district in Southern Province. District Veterinary Officer Cliff Kakandelwa disclosed that the anthrax outbreak has been reported in Sikaunzwe veterinary camp among the buffaloes (*Syncerus caffer*). Dr Kakandelwa further stated that suspicious cattle deaths have also been reported in Kasaya area in the district.

He warned that anthrax is a deadly bacterial disease that can be transmitted from animals to people, adding that it mainly affects domestic and wild herbivores and is characterized by sudden death and bleeding from natural openings. "In order to control further spread of the disease and avert a public health catastrophe, measures have since been put in place until the outbreak is contained," Dr Kakandelwa said.

Dr Kakandelwa mentioned that no livestock product or animal by-product will be allowed to move out of Sikaunzwe veterinary camp and that all livestock product or animal by-product transiting through the infected area should be under veterinary escort.

He added that carcasses of dead animals in the area should not be opened or consumed but buried with lime. "Where there are sudden deaths of animals or suspicious signs, the owner of the animal should immediately report to the area veterinary assistant, district veterinary office or village headman," Dr Kakandelwa said.

He explained that further, active surveillance of the disease among cattle, mass sensitization of farmers and livestock vaccination options have been [and] will be carried out. Dr Kakandelwa has appealed to farmers, traders, transporters and the general public to cooperate with veterinary officials in controlling and preventing further spread of the disease by complying with animal movement restrictions, surveillance and biosecurity measures. [There is no mention of livestock vaccination.] He warned that if measures are violated, offenders will be prosecuted and the animals will be destroyed pursuant to the Animal Health Act No 27 of 2010 of the laws of Zambia.



# Forest wildlife and savanna wildlife are sympatric in Vovodo Conservancy, south-eastern Central African Republic

Alain Lefol and Kewin Lefol

*Vovodo Conservancy, Central African Republic*



**Figure 1.** Free-ranging western bongo (*Tragelaphus eurycerus eurycerus*) on the left, central African forest hog (*Hylochoerus meinertzhageni rimator*) in the center, and common warthog (*Phacochoerus africanus*) on the right. Savanna wildlife (warthog) and rain forest wildlife (the two other species) are sympatric in this savanna-forest mosaic landscape, Vovodo Conservancy, south-eastern Central African Republic (CAR) (©Alain & Kewin Lefol)



**Figure 2.** Defassa waterbuck (*Kobus ellipsiprymnus defassa*) on the left, bongo on the right: another example of free-ranging savanna wildlife (waterbuck) and rain forest wildlife (bongo) cohabitating in Vovodo Conservancy, far south-eastern CAR (©Alain & Kewin Lefol)

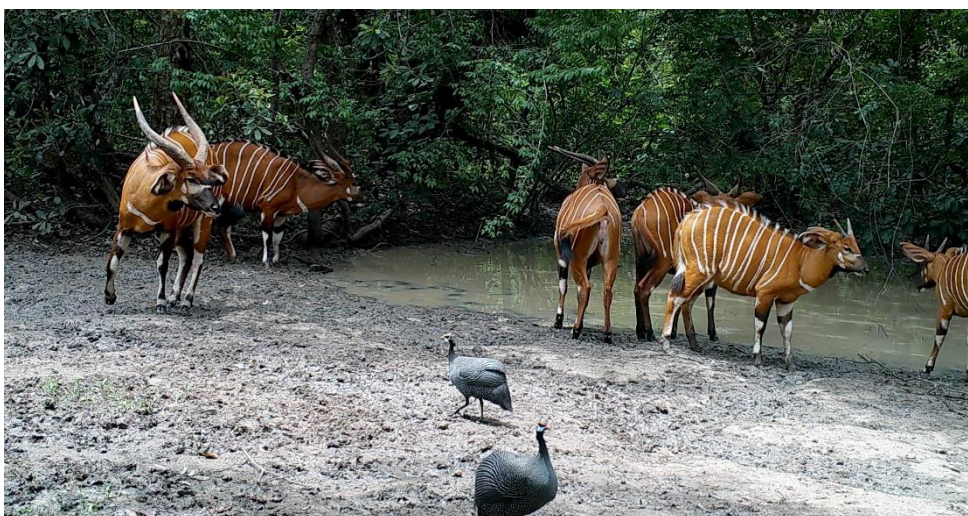




**Figure 3.**  
*Bongo family and forest hog family sharing a saltlick, Vovodo conservancy, CAR (©Alain & Kewin Lefol)*



**Figure 4.**  
*Bongo adult male and forest hog adult male sharing a saltlick, Vovodo conservancy, CAR (©Alain & Kewin Lefol)*



**Figure 5.**  
*Bongo and helmeted guineafowl (Numida meleagris) at a waterhole, Vovodo conservancy, CAR (©Alain & Kewin Lefol)*



## AMERICA

### **Mycoplasmosis outbreak in pronghorn (*Antilocapra americana*), Wyoming, USA**

A ProMED-mail post (<http://www.promedmail.org>), Wed 8 Mar 2023 (ProMED-mail is a program of the International Society for Infectious Diseases <http://www.isid.org>)

Source: SweetwaterNow [edited] <https://www.sweetwaternow.com/around-200-pronghorn-have-died-from-rare-disease-outbreak-near-pinedale>



*Dead pronghorn around the southern end of the Mesa south of Pinedale, Wyoming, USA (Source: SweetwaterNow, Wed 8 Mar 2023)*

The Wyoming Game and Fish Department, in collaboration with the Wyoming State Veterinary Laboratory, is investigating a rare disease outbreak in pronghorn (*Antilocapra americana*) in western Wyoming.

Game and Fish is estimating that approximately 200 animals have died since mid-February 2023, centered around the southern end of the Mesa south of Pinedale. Preliminary lab results identify *Mycoplasma bovis* as the pathogen causing the mortalities.

*M. bovis* should not be confused with *Mycobacterium bovis* which causes tuberculosis in cattle [and in other domestic and wild mammals, and humans, editor's note]. They are 2 unrelated bacteria that cause very different diseases. [There are also other wildlife diseases due to several *Mycoplasma* other than *M. bovis* e.g., CCPP, IKC, contagious agalactia etc. editor's note].

The source of infection of the *M. bovis* and the ability to predict the duration and the geographic distribution of this outbreak in pronghorn is unknown at this time.

"While reported *M. bovis* outbreaks causing mortality in wildlife are rare, this is not the 1st occurrence of *M. bovis* being linked to pronghorn mortalities in Wyoming," said Wyoming Game and Fish Wildlife Disease Specialist Hank Edwards.

The 1<sup>st</sup> reported cases of pneumonia in pronghorn occurred during the winters of 2019 and 2020 near Gillette, involving at least 460 animals. Those outbreaks started at a similar time in mid-February and then tapered down by the beginning of April.

Game and Fish continues to monitor for this disease across the state. With the exception of the Gillette area, this bacterium has not been reported to be associated with significant mortality in other wildlife populations in Wyoming.

To date, this pathogen has not been shown to affect domestic pets such as horses, dogs, or cats and is not considered a human health risk. Local Game and Fish personnel will periodically remove carcasses and euthanize dying pronghorn in relatively accessible areas when disturbance to other healthy wintering pronghorn is minimal to help reduce the prevalence of this pathogen on the landscape.

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Communicated by ProMED:

*Mycoplasma bovis* is a pathogen causing respiratory disease, otitis media, arthritis, mastitis, and a variety of other diseases in cattle worldwide. There are not many reports of *M. bovis* infecting and causing disease in wildlife. In the early 2000s, *M. bovis* caused outbreaks with high mortality rates in bison (*Bison bison*). There were also reports in farmed white-tailed deer (*Odocoileus virginianus*) and in free-ranging mule deer (*Odocoileus hemionus*). The 1<sup>st</sup> documented die-off attributable to *M. bovis* in pronghorn was in February-April 2019, in Wyoming.

The pronghorn (*Antilocapra americana*) is an ungulate (artiodactyl) of western North America. Pronghorns are commonly sympatric with range cattle and ranched bison. For pictures go to [https://en.wikipedia.org/wiki/Pronghorn#/media/File:Antilocapra\\_ americana.jpg](https://en.wikipedia.org/wiki/Pronghorn#/media/File:Antilocapra_ americana.jpg).

ProMED map: Wyoming, United States: <https://promedmail.org/promed-post?place=8708864,251>

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Pronghorn *Antilocapra americana* has most recently been assessed for *The IUCN Red List of Threatened Species* in 2016, and is listed as Least Concern (IUCN SSC Antelope Specialist Group, 2016).

**Reference**

IUCN SSC Antelope Specialist Group (2016). *Antilocapra americana* (errata version published in 2017). *The IUCN Red List of Threatened Species* 2016: e.T1677A115056938. <https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T1677A50181848.en>.



## ASIA

### **IUCN SOS Central Asia Initiative: Protecting the goitered gazelle (*Gazella subgutturosa*) and promoting wildlife conservation**

**Sophie Whitemore, Tania Gilbert & Phil Riordan**

*Marwell Wildlife*



*Goitered gazelles  
in Kazakhstan (©  
Saltore Saparbaev)*

Wildlife Without Borders Kazakhstan and Marwell Wildlife partnered to deliver a project on goitered gazelle population distributions, connectivity and conservation in Kazakhstan as part of the IUCN Save Our Species (SOS) Central Asia Initiative. This initiative supported seven projects on critical conservation efforts for goitered gazelle and snow leopards across Kazakhstan, Kyrgyzstan, and Tajikistan, focusing on populations, habitat connectivity, protected area management, species monitoring, and raising awareness.

The Wildlife Without Borders Kazakhstan-Marwell Wildlife project on ‘connecting arid steppe and mountain ecosystems for goitered gazelle conservation in southeast Kazakhstan’ aimed to elucidate the threats to goitered gazelles outside of the protected area network in the Ili River catchment area, including the border area with China, and within the Altyn Emel and Charyn Canyon National Parks. These areas support the core goitered gazelle population and the project yielded crucial information on wild goitered gazelle status, distribution, and the threats that they are facing in the wild whilst enhancing capacity for improved monitoring and conservation efforts.

These new data revealed the presence of approximately 1,000 goitered gazelles outside of areas of any protection, emphasising the urgent need for multi-use landscape management strategies to ensure their survival. Detailed analyses also shed light on the crucial influence of human factors, including population density, land use, and infrastructure, on the gazelle population. This resulted in the production of landscape resistance maps that identified obstacles to animal movement and highlighted priority areas for habitat restoration to enhance connectivity. Such

maps are a key resource for local and national governments, and protected area managers, enabling informed conservation decision-making and facilitating targeted efforts to protect the species.



*Goitered gazelle  
in Kazakhstan (©  
Saltore Saparbaev)*

The project integrated the needs of people alongside those of nature and instigated comprehensive training programs for 73 personnel from Altyn-Emel and Charyn National Parks, equipping them with advanced gazelle and habitat monitoring techniques. By enhancing their monitoring capabilities, these parks are better equipped to manage and protect the goitered gazelle populations and their habitats. This work sat alongside the development of a robust Theory of Change model that serves as a framework for supporting policy development and ensuring long-term conservation impact.

The SOS Central Asia initiative, with its specific focus on the goitered gazelle and snow leopards has made substantial progress in wildlife conservation across the region. Through species monitoring, the discovery of previously undocumented gazelles highlighted the need for effective multi-use landscape management. Our efforts to enhance habitat connectivity and build capacity through training programs have enhanced protected area management. The collective efforts of the SOS initiative, local communities, governments, and conservation organisations have underscored the importance of collaborative approaches in safeguarding Central Asia's biodiversity for generations to come.

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Goitered gazelle *Gazella subgutturosa* has most recently been assessed for *The IUCN Red List of Threatened Species* in 2016. *Gazella subgutturosa* is listed as Vulnerable under criteria A2acd (IUCN SSC Antelope Specialist Group, 2017).

### **Reference**

IUCN SSC Antelope Specialist Group (2017). *Gazella subgutturosa*. *The IUCN Red List of Threatened Species* 2017: e.T8976A50187422. <https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T8976A50187422.en>

## Lumpy skin disease in Indian gazelle (*Gazella bennettii*) in Rajasthan, India

A ProMED-mail post <http://www.promedmail.org>, Tue 6 Jun 2021 (ProMED-mail is a program of the International Society for Infectious Diseases <http://www.isid.org>)

Source: Emerging Infectious Diseases [edited] [https://wwwnc.cdc.gov/eid/article/29/7/23-0043\\_article](https://wwwnc.cdc.gov/eid/article/29/7/23-0043_article)

### Abstract

Near a zoo in Bikaner, India, 2 free-ranging Indian gazelles (*Gazella bennettii*) displayed nodular skin lesions. Molecular testing revealed lumpy skin disease virus (LSDV) infection. Subsequent genome analyses revealed LSDV wild-type strain of Middle Eastern lineage. Evidence of natural LSDV infection in wild gazelles in this area indicates a broadening host range.

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Communicated by ProMED:

Capripox viruses (Poxviridae) cause sheep pox, goat pox, and lumpy skin disease in cattle, a malignant cutaneous disease. Sheep pox is caused by the sheeppox virus (SPPV), goatpox by the goatpox virus (GTPV), and lumpy skin disease of cattle is caused by the lumpy skin disease virus (LSDV). These viruses may infect wild bovids, and occasionally ungulates of other families (such as Cervidae and Suidae).

According to the authors of the paper above, genetic and phylogenetic analysis "revealed that the LSDV from the Indian gazelles clustered with the LSDV wild-type strains of SG-1 lineage commonly circulating in the Middle East, the Balkans, and Europe," and not with LSDV strains circulating in India since 2019 (SG-2 lineage). Hence, their "findings suggest a new introduction of LSDV of exotic origin into India."

ProMED map:

Bikaner, Rajasthan, India: <https://promedmail.org/promed-post?place=8710463,2167>

See also:

Sheep pox & goat pox outbreak in Himalayan serow (*Capricornis thar*) in 2015 in Mizoram state, India: <http://promedmail.org/post/20151013.3712578>

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The Indian gazelle or Chinkara *Gazella bennettii* has most recently been assessed for *The IUCN Red List of Threatened Species* in 2016. *Gazella bennettii* is listed as Least Concern.

### Reference

IUCN SSC Antelope Specialist Group (2017). *Gazella bennettii*. The IUCN Red List of Threatened Species 2017: e.T8978A50187762. <http://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T8978A50187762.en>



# RECENTLY PUBLISHED ARTICLES

## AFRICAN ANTELOPE

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

Worku, E.A., Bro-Jørgensen, J., Evangelista, P.H., Bekele, A., Atickem, A. & N.C. Stenseth (2023)

*Global Ecology and Conservation*, 2023: 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.

### **Status of Eastern giant eland *Tragelaphus derbianus gigas* (Heuglin, 1863) in the Bouba-Ndjidda National Park, North Cameroon: challenges and conservation prospects**

Taïga Léa Kondasso, Serge Alexis Kamgang, Patrick Ntonga Akono, Aaron Manga Mongombe, Serge Patrick Tadjou, Paul Bour & Eric Moïse Bakwo Fils (2023)

*Biodiversity* - <https://doi.org/10.1080/14888386.2023.2210118>

#### **Abstract**

The conservation of many species may be hampered by a lack of sufficient ecological data. This study is aimed at assessing the population status of the giant eland (*Tragelaphus derbianus gigas*) in the Bouba Ndjidda National Park (BNNP). From May to September 2021, 90 line transects spaced at 2.5 km were established, with 83 of them being census-walked once. The data collected were analysed using Distance 7.2 and QGIS software. The encounter rate of giant eland sightings was 1.91 elands/km, while the encounter rate for signs of giant eland activity was 2.11 dung/km; 0.89 footprints/km, and 0.02 carcasses/km. The abundance was estimated at 2924 individuals, with a density of 1.329 individuals/km<sup>2</sup>. The giant eland population was mainly concentrated in the central part of the park while human activities were mainly concentrated in the periphery. We also observed that poaching and transhumance/pastoralism were the most common human activities in the park. Our results revealed that human activities negatively impact the antelope's density and distribution in the BNNP.

## **Angolan Giant Sable: Rediscovery, Rescue and Recovery**

Huntley, B. J. (2023)

In *Strategic Opportunism: What Works in Africa: Twelve Fundamentals for Conservation Success* (pp. 13-20). Cham: Springer Nature Switzerland

### **Abstract**

By the end of Angola's 30-year civil war, the country's national icon, the giant sable antelope, was believed to be extinct. The remarkable story of one man's commitment to the re-discovery, rescue and recovery of the 'finest antelope in Africa' is described. Following twenty years of indefatigable effort, the long-term future of this magnificent antelope has been secured.

## **Camera trap inventory of wild mammals in the Hinda District, Republic of Congo**

Orban, B., Mottram, P., Melville, H., Gaugris, C.A.V., Thomas, A., Drescher, K., Kabafouako, G.N. & J. Gaugris (2023)

*African Journal of Ecology*, 61(2), 504-512

<https://onlinelibrary.wiley.com/doi/abs/10.1111/aje.13116>

### **Abstract**

Mammals play a crucial role in ecosystem functioning; knowledge of their presence and distribution is important for conservation and development planning. In this study, camera traps were used to survey mammals in the Republic of Congo's Kouilou Department. After 985 trap nights 15 species were recorded. Notable records include the endangered white bellied pangolin (*Phataginus tricuspis*) and side striped jackal (*Canis adustus*). No evidence of primate activity was recorded. Species diversity comparisons highlighted the high conservation potential of Terra Firma forests. Savanna and grassland systems showed limited conservation potential due to low species detectability resulting from anthropogenic disturbance.

## **Feeding Ecology of the Cuvier's Gazelle (*Gazella cuvieri*, Ogilby, 1841) in the Sahara Desert**

Herrera-Sánchez, F. J., López, O., Rodríguez-Siles, J., Díaz-Portero, M. Á., Arredondo, Á., Sáez, J. M., ... & J. M. Gil-Sánchez (2023)

*Animals*, 13(4), 567 <https://doi.org/10.3390/ani13040567>

### **Abstract**

Knowledge of the feeding ecology of ungulates in arid biomes offers an interesting model for understanding the drought resistance of large desert-adapted herbivores, a crucial issue in the face of increasing desertification due to climate change. To assess the feeding ecology of the endangered Cuvier's gazelle (*Gazella cuvieri*) in the Sahara desert, we used a multi-method approach combining faecal samples, direct observations, and the recording of indirect signs of feeding. We hypothesised that browser behaviour is the best foraging strategy for species living in hyper-arid environments, mainly due to long periods without grazing opportunities. Complementarily, we explored the effects of the main environmental descriptors (rainfalls and NDVI) on feeding patterns and diet quality. We found that Cuvier's diets are based mainly on acacias (*Vachellia tortilis*, *V. flava*) and occasionally on the annual forb *Anastatica hierochuntica*. In total, eighteen species (five trees, nine shrubs, three herbs, and one grass) belonging to fifteen families were recorded. Our result confirmed the browsers' characteristic of this species, reaffirming its ability to settle in a hostile environment. Acacias stand out as key species consumed at the southernmost limit of their range; hence, future conservation plans and strategies should take this into account for the survival of Cuvier's gazelle in desert environments.

## **Anthropogenically driven spatial niche partitioning in a large herbivore assemblage**

Arumooogum, N., Marshal, J. P. & F. Parrini (2023)  
*Oecologia*, 201(3), 797-812

### **Abstract**

Understanding how human activity can influence species distributions and spatial niche partitioning between sympatric species is a key area of contemporary ecology. Extirpations of large mammalian populations, the result of a 15-year civil war, within the Gorongosa National Park in Mozambique, have been followed by an extended period of restoration. The species-specific recovery of these populations has provided an ideal system to identify how niche partitioning between coexisting species is altered as a consequence of extreme disturbance events. Here, we aimed to understand how distribution patterns of grazing herbivores, as well as spatial niche overlap between them, changed between the pre- and post-war scenarios. We focused on the following four grazer species: buffalo (*Syncerus caffer*); sable (*Hippotragus niger*); waterbuck (*Kobus ellipsiprymnus*); and zebra (*Equus quagga*). Using long-term aerial survey data, we quantified range size for each species, as well as spatial niche overlap between each species pair, for pre- and post-war periods. Range size of buffalo and zebra decreased drastically from the pre-war period; with both species inhabiting subsets of their historical distribution in the park. Sable and waterbuck have both colonised historically avoided habitat, with waterbuck doubling their pre-war range size. Spatial overlap between all four grazers pre-war was significantly high, indicating niche similarity; however, this decreased in the post-war period, with some species pairs displaying spatial niche dissimilarity. Our findings highlight how population responses to anthropogenic disturbance can result in significant alterations to species' distributions, with consequences for patterns of niche similarity.

## **AMERICAN ANTELOPE**

### **Owning the Right to Migrate: A Proposal for Migration Corridors in the Greater Yellowstone Ecosystem**

Alyssa Florack-Hess (2023)  
ULR 249 (2023). <https://doi.org/10.26054/0d-51g3-dnyk>

### **Abstract**

The Greater Yellowstone Ecosystem (GYE), one of the world's most treasured regions, consists of an interconnected patchwork of federal, state, and private lands. The GYE's elk, mule deer, and pronghorn antelope (pronghorn) rely on this vast range to complete their seasonal migrations, but development increasingly threatens this natural cycle. Moreover, the GYE's existing wildlife management framework fails to resolve the tension between wildlife and growth, leaving both wildlife and local communities vulnerable. After reviewing the scope of the GYE's ecological challenges, this Note proposes a new solution: a policy establishing affirmative easements across designated migration corridors in the GYE and granting ownership of the easements to the GYE's elk, mule deer, and pronghorn herds. This proposal builds on the Rights of Nature movement by granting property rights to ungulate herds and identifying new strategies to overcome traditional barriers to standing in environmental lawsuits. This Note concludes by arguing that such an innovative proposal is not only possible but critical to preserving these keystone species and the open landscapes they rely on.



## ASIAN ANTELOPE

### **Habitats change of Tibetan antelope and its influencing factors on the North Tibetan Plateau from 2020 to 2050**

Wei, Z., Xu, Z., Qiao, T., Wang, S., Ishwaran, N. & M. Yang (2023)

*Global Ecology and Conservation*, 43, p.e02462

#### **Abstract**

As an alpine environment sensitive to global climate change and human activities, habitats of Tibetan antelope are exposed to a variety of challenges. Wintering and calving habitats of Tibetan antelopes in 2020 and 2050 on the North Tibetan Plateau (NTP), China were simulated with Maxent model using data of sites where Tibetan antelopes were present; contribution of environmental variables to the habitats distribution in current and future scenarios was analyzed via jackknife test; and current levels of human disturbances were quantified with InVEST model. Conclusions were: 1) in 2020, wintering habitats of Tibetan antelope concentrated in the central and southern parts of the NTP, covered an area of 216,000 km<sup>2</sup>. The calving habitats, scattered extensively in the NTP, covered an area of 348,768 km<sup>2</sup>. Mean precipitation of the warmest quarter, land cover and NPP were predicted to be large contributors to habitats. 2) During 2020–2050, the wintering habitats coverage was projected to increase 5.93 %, 12.87 % and 4.52 %, and the calving habitats to increase 5.20 %, 8.77 % and 21.23 %, under the Representative Concentration Pathway (RCP)2.6, RCP 4.5, and RCP 8.5 scenarios, respectively. The wintering habitats was predicted to expand by roughly 27,000 km<sup>2</sup> and the calving habitats by 30,500 km<sup>2</sup> in 2050. Mean temperature of the warmest quarter, land cover, NPP, and distance from water sources were predicted to be large contributors to habitats. 3) In 2020, human activities in the middle and southern parts of the NTP were more intense compared to those in the northern parts. Disturbed areas accounted for 48 % of the total wintering habitats, and 1/3 of the total calving habitats, respectively. In the future, human activities in the middle and southern parts of the NTP may intensify, concurrent with the predicted expansion of antelope habitats, resulting in exacerbation of conflicts between community development and wildlife conservation. In the northern parts of NTP, human disturbance may decrease. For better understanding habitats scenarios, we need to gather more data on distribution patterns and behavioral ecology of Tibetan antelope within the wintering and calving seasons. We recommend setting up systems for monitoring habitats changes of Tibetan antelope that could help in defining the national park area to cover critical antelope habitats and manage herdsmen and livestock uses of the areas within the carrying capacity of grasslands, particularly through diversification of livelihoods and support to green development of local communities.

### **Steppe ungulate count in Great Gobi B Strictly Protected area 2022**

Vogler, T., Altansukh, N., Ganbaatar, O., Sukhbaatar, D., Devineau, O. & P. Kaczensky (2023)  
Oppdragsrapport nr. 3 – 2023, Høgskolen i Innlandet, Norway

#### **Abstract**

The plains of Great Gobi B Strictly Protected Area (subsequently “Great Gobi B”) in southwestern Mongolia are home to three endangered wild ungulates, khulan (*Equus hemionus*), takhi (*Equus ferus przewalskii*), and goitered gazelle (*Gazella subgutturosa*). With Mongolia holding the largest populations of these species, their conservation is of global importance. To assess the effectiveness of conservation efforts, robust survey methods are needed to monitor population development.

In late summer 2022 we conducted the 3rd plains ungulate count in Great Gobi B to estimate population size of khulan and goitered gazelle and describe population development since the

counts in 2010 and 2015 and tested the method for estimating the growing population of reintroduced Przewalski's horses.

We conducted Distance Sampling point counts at 101 observation points over 6 counting events (at 19:00, 7:00, 9:00, 11:00, 13:00, and 15:00) at each observation point. During each counting event the observers scanned the surroundings using binoculars and registered species, number of animals, time, bearing and distance for each observation. Over the 606 counts, we observed 5,744 khulan, 3,150 gazelles and 922 Przewalski's horses. Using these observations, we created global models (over all observation points and counting events) using the distance analysis framework and selected models with the best fit based on AIC values.

Populations estimates for 2022 were 5,204 (95% CI = 2,121 – 12,771) khulan, 10,980 (95% CI = 7,473 – 16,132) goitered gazelles, and 1,288 (95% CI = 213 – 7,776) Przewalski's horses within the 13,000 km<sup>2</sup> survey area. Population estimates of both khulan and goitered gazelle suggested an increase from 2010 to 2015, while the 2022 estimated is closer to the 2010 estimates for khulan and in between for goitered gazelles. However, confidence intervals, especially for khulan, are large and population development cannot be determined conclusively. The uncertainty in the khulan estimate for 2022 was caused by the combination of a highly clumped distribution due to drought conditions and a large variation in group sizes. Goitered gazelles were more evenly distributed and group sizes less variable.

Estimating Przewalski's horse population resulted in a gross overestimate because of the knowledge rangers had about the location of Przewalski's horse groups from intensive weekly monitoring. The data suggests that they specifically looked for groups, as Przewalski's horses were detected almost equally likely over all distance categories. Confidence intervals were large because the population is still small (numbering just over 400) and distribution was also highly clumped due to the drought condition.

The 2022 population estimates for khulan and goitered gazelles and the comparison with the estimates from 2010 and 2015 should be regarded as preliminary because: 1) The 3 surveys were analysed using slightly different distance analysis frameworks and 2) Distance Sampling does not take the spatial distribution of groups into account and we plan to explore such methods before we will reanalyse the 3 surveys within the same analysis framework.

## **Ecology and Conservation of Mountain Ungulate in the Western and Trans Himalayas, India**

Ahmad, Khursheed (2022)

*Animal Science*, Annual Volume 2023, DOI: 10.5772/intechopen.108809

<https://www.intechopen.com/online-first/85126>

### **Abstract**

The Western and Trans-Himalayan region of India is home to several unique and threatened mountain ungulates including Kashmir red deer or Hangul, Kashmir Musk deer, Urial, Argali, Tibetan Antelope or Chiru, Tibetan Gazelle, Wild Yak, and Wild Ass that are endemic to this region. However, this ecologically significant and diverse biodiversity is threatened by climate change, habitat degradation, and fragmentation accompanied by overexploitation in the form of poaching. In locations where the ungulates are common, the situation inevitably leads to human-wildlife conflict. All these have caused many wildlife species to become ecologically isolated, reduced in numbers, and in the process of becoming locally extinct. Over the years, I have undertaken extensive surveys to assess the status of 20 ungulate species inhabiting the Himalayan region belonging to four families, namely Bovidae, Cervidae, Equidae, and Moschidea including the eight out of the 10 most highly endangered ungulates in India, which are unique to this region. The results of our findings on the current status, information on the lesser known aspects of ecology, and critical factors determining the population decline, knowledge gaps, conservation threats, and management suggestions are presented in this paper.

## **Conservation of the goitered gazelle (*Gazella subgutturosa*) under climate changes in Iraq**

Kaky, E., Nolan, V., Khalil, M.I., Mohammed, A.M.A., Jaf, A.A.A., Mohammed-Amin, S.M., Mahmood, Y.A. & F. Gilbert (2022)  
*Heliyon*, 2023, 9(2), p.e12501.

### **Abstract**

Climate is a vital factor that shapes habitat suitability for many species across space and time. *Gazella subgutturosa* (Goitered gazelle) is a globally vulnerable mammal already extinct in some areas of Armenia and Georgia and is highly threatened in other areas of its distribution. In this study, new data were gathered for 33 locations in north-eastern Iraq, and then together with literature data, Species Distribution Models (SDMs) were used to explore the geographical distribution of the gazelle under current and future climate change scenarios. We studied the relationship between seven climate variables and 43 occurrence records to predict habitat suitability of the gazelle under the current climate, and also under four future climate scenarios (RCP2.6 and RCP8.5 for both 2050 and 2080). Annual precipitation and isothermality had the most influence on the distribution of *Gazella subgutturosa*. The most suitable habitat in both the current and future scenarios was located in north-eastern Iraq close to the Iranian border near the Zagros Mountains. There was no difference in habitat suitability for the gazelle inside Iraqi Protected Areas (PAs) compared to outside the PAs. Using the occurrence records and IUCN Red List national assessments, we found Iraqi Goitered gazelle populations to be classified as Endangered (EN). Our results suggest urgent conservation planning is needed to save this species, including the establishment of new PAs. These results contribute new baseline information, which was currently missing Goitered gazelle in about Iraq, to the IUCN SSC Antelope Specialist Group, which will hopefully aid with future global assessments and conservation.

## **Behavioural biology and ecology of Blackbuck (*Antelope cervicapra*): A Review**

Choudhary, N.L. & N. Chisty (2022)  
*Flora and Fauna*, 2022, 28 (2), 355-361  
<https://doi.org/10.33451/floraf fauna.v28i2pp355-361>

### **Abstract**

Blackbuck (*Antelope cervicapra*) belongs to the Bovidae family and subfamily Antilopinae and is distributed in India, Pakistan, Nepal and United Arab Emirates. It can live in wide variety of habitats, including grassland, bush land, scrubland and dry thorn habitats. Sexual dimorphism is very clear. Males have blackish or dark brown coat colours, while females have a yellowish coat colour. Males have a shorter lifespan as compared to females. Generally, blackbuck forage in the daytime but sometimes also forage at night and their foraging activity patterns are influenced by environmental factors and seasonal variations. They use to prefer wide variety of food materials, like leaves, grasses, cereals, vegetables, shrubs and varieties of crops. During the breeding season, males become territorial. Herd size is also affected by the seasons and environmental factors. Exotic species invasion, habitat loss, anthropogenic activity, overgrazing and agricultural expansion, urbanization and industrialization all reduce suitable habitat for blackbuck survival. Illegal hunting, poaching, habitat loss, road killing and lack of genetic variation are also responsible for the dramatic decline in the population of blackbuck. Study of genetic variation, captive breeding and the establishment of a blackbuck rescue centre might be helpful for enhancing the population and survival of blackbucks.

## **Ensuring the Reproduction of Gazelles, Whose Numbers are Decreasing in Türkiye and Whose Habitats are Confined to a Narrow Region, in New Habitats**

Orman, A. & A. Uztemur (2022)

*Journal of Research in Veterinary Medicine*, 41(2), 127-132

<https://dergipark.org.tr/en/pub/jrvm/issue/74697/1172798>

### **Abstract**

The aim of this study was to resettle *Gazella marica*, whose habitats are declining in Türkiye, to the foothills of Cudi Mountain, which is connected to the Silopi District of Şırnak Province, which was previously located within the natural habitat zone. The gazelles obtained from the 75<sup>th</sup> Year Gazelle Production Station were placed in individual crates of 100x36x90 cm made of plywood, with 51 numbers (24 females, 27 males) gazelles in 2020 and 40 numbers (19 females and 21 males) in 2021. Mass releases were made with a ceremony in an area with similar climatic characteristics, which is approximately 380 km away. 1 gazelle died in 2020, 6 gazelles died in 2021. During the post-release monitoring activities, the first reproduction records of gazelles released in 2020 were successfully recorded in 2021 and 23 new individuals were obtained. The current number of individuals reached 106. It has been observed that gazelles have adapted to the area in the 2 years. Illegal hunting is prevented as the region is within the borders of military security. Monitoring studies continue for the long-term management plan.

## **ANTELOPE HEALTH**

### **Peste Des Petits Ruminants Screening and Diagnostic Tests in African Wildlife in the Context of Rinderpest Eradication (1994–2007)**

Vladimir Grosbois, Olivier Kwiatek, Nicolas Gaidet, Philippe Chardonnet, Bertrand Chardonnet, Arnaud Bataille, Satya Parida, François Roger, Richard Kock, Geneviève Libeau & Alexandre Caron (2023)

*Transboundary and Emerging Diseases*, 2023, 5542497,1-17.

<https://doi.org/10.1155/2023/5542497>

### **Abstract**

Peste des petits ruminants (PPR) virus causes a major disease in domestic and wild small ruminants. Understanding the role of wildlife in PPR virus ecology is important for PPR control and its eradication targeted worldwide in 2030. Developing diagnostic tools that provide reliable data for PPR detection in wildlife will help monitor wild populations for PPR and support the eradication program. We analyze a continental-scale dataset from African free-ranging wild ungulates (n = 2570) collected between 1994 and 2007. A Bayesian model estimated the performance of ELISA tests against PPR and rinderpest and their prevalence in African buffalo. The H- and N-ELISA tests used, not initially developed for wildlife, showed poor sensitivities for the detection of PPR antibodies in African buffalo. The estimations of PPR antibody prevalence derived from the results of these tests for animals presumably not exposed or potentially exposed to PPR were uncertain. Thus, poor performances of these PPR serological tests in wildlife would not allow robust estimations of PPR antibody prevalence in African buffalo and would be extremely speculative in non-buffalo wild ungulate species. We recommend that current and new tests be validated for wildlife hosts to provide sufficient sensitivity and specificity of detection and a diagnostic protocol be developed for PPR wildlife research.



## **The Saharan antelope addax (*Addax nasomaculatus*) as a host for *Hyalomma marginatum*, tick vector of Crimean-Congo hemorrhagic fever virus**

Rodríguez, O., de la Fuente, G., de Mera, I. G. F., Vaz-Rodrigues, R., Gortázar, C., & J. de la Fuente (2022).

*Ticks and Tick-borne Diseases*, 13(6), 102034.

### **Abstract**

Tick infestation and pathogen prevalence in ticks infesting the Saharan antelope addax (*Addax nasomaculatus*) are factors that may constitute a risk for both human and animal health. In this study we describe season distribution of adult *Hyalomma marginatum* and analyzed the tick-borne pathogens and their seroprevalence in natural-living addax in Morocco. The results showed that addax is an important host species for *H. marginatum* adults. The seroprevalence of Bluetongue virus (BTV; 61.5–92.3%,  $n = 8/13$ -84/91), *Coxiella burnetii* (36.3–69.2%,  $n = 33/91$ -9/13) and *Brucella* spp. (0.0–4.8%,  $n = 0/50$ -2/42) was characterized in addax during various years (sampled animals per year,  $n = 13$ –91). Presence of Aigai virus (AIGV), a recent taxonomic differentiation of Crimean-Congo hemorrhagic fever virus (CCHFV) of 100% (4/4, years 2016 and 2017) together with *Babesia ovis* (75%, 3/4, year 2014), *Anaplasma* spp. (75%, 3/4, year 2014), *Rickettsia* spp. (50%, 2/4, year 2014) and *Theileria* spp. (25%, 1/4, year 2014) was observed in *H. marginatum* collected from the addax (4 pools of 10 adult ticks each). The results support the role of addax host in *H. marginatum* life cycle and exposure to AIGV and other tick-borne pathogens. The development of control interventions including anti-tick vaccines for wildlife species will contribute to the implementation of effective measures for the prevention and control of tick-borne diseases and might be relevant for the preservation of this threatened species and others such as Arabian oryx (*Oryx leucoryx*) and African elk (*Taurotragus oryx*) that share habitat.

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### **Note of *Gnusletter*'s editors:**

Regarding the so-called African elk (*Taurotragus oryx*) as named in the article:

- It is not an elk (Cervidae) but an eland (Bovidae)
  - It should be named Common eland, not African elk
  - Its scientific name used by IUCN is *Tragelaphus oryx* (<https://www.iucnredlist.org/species/22055/115166135> )
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## **Theileriosis in naturally infected roan antelope (*Hippotragus equinus*)**

Clift, S. J., Martí-García, B., Lawrence, J. A., Mitchell, E. P., Fehrsen, J., Martínez, J., ... & J.C. Steyl (2022)

*Veterinary Pathology*, 59(6), 1031-1046

### **Abstract**

Cases of *Theileria*-associated mortality are rarely reported in African wild artiodactyls. Descriptions of lesions are limited, particularly in endangered hippotraginids. Here, we analyzed retrospectively the gross and histologic findings in 55 roan antelope (*Hippotragus equinus*) with fatal natural theileriosis. The most frequently recorded gross findings in 40 cases were widespread petechiae and ecchymoses (72.5%), probable anemia (67.5%), icterus (60%), splenomegaly (60%), hepatomegaly (52.5%), and pulmonary edema (50%). Histologic lesions in 34 cases were characterized by multi-organ infiltrates of parasitized and nonparasitized mononuclear leukocytes (MLs), and fewer multinucleate giant cells (MNGCs). Liver, lung, kidney, adrenal gland, and heart were most consistently infiltrated, followed by spleen and lymph nodes. Leukocytes were phenotyped in lung, liver, kidney, and heart specimens from 16 cases, using immunohistochemistry to detect CD20, CD3, myeloid/histiocyte antigen

(MAC387), IBA-1, and CD204 surface receptors. A roan polyclonal anti-*Theileria* sp. (sable) antibody was applied to the same tissues to identify intraleukocytic parasite antigens. Similar proportions of intravascular and extravascular IBA-1-, CD204-, and MAC387-reactive putative monocyte-macrophages and fewer CD3-positive putative T-lymphocytes were identified in all organs, especially the lungs in infected roan. CD20-positive putative B-lymphocytes were significantly scarcer than in uninfected controls. Intraleukocytic *Theileria* parasites labeled consistently in affected tissues. Some parasitized and nonparasitized MLs and the MNGCs failed to label with selected leukocyte markers. Fatal theileriosis in roans may largely be the result of multi-organ monocyte-macrophage activation with associated tissue injury and overwhelming systemic inflammation. The identity of the parasitized leukocytes and characteristics of the lymphohistiocytic response require further clarification in roans.

## **Environmental drivers of biseasonal anthrax outbreak dynamics in two multihost savanna systems**

Huang, Y. H., Kausrud, K., Hassim, A., Ochai, S. O., van Schalkwyk, O. L., Dekker, E. H., ... & W.C. Turner (2022)

*Ecological Monographs*, 92(4), e1526

### **Abstract**

Environmental factors are common forces driving infectious disease dynamics. We compared interannual and seasonal patterns of anthrax infections in two multihost systems in southern Africa: Etosha National Park, Namibia, and Kruger National Park, South Africa. Using several decades of mortality data from each system, we assessed possible transmission mechanisms behind anthrax dynamics, examining (1) within- and between-species temporal case correlations and (2) associations between anthrax mortalities and environmental factors, specifically rainfall and the Normalized Difference Vegetation Index (NDVI), with empirical dynamic modeling.

Anthrax cases in Kruger had wide interannual variation in case numbers, and large outbreaks seemed to follow a roughly decadal cycle. In contrast, outbreaks in Etosha were smaller in magnitude and occurred annually. In Etosha, the host species commonly affected remained consistent over several decades, although plains zebra (*Equus quagga*) became relatively more dominant. In Kruger, turnover of the main host species occurred after the 1990s, where the previously dominant host species, greater kudu (*Tragelaphus strepsiceros*), was replaced by impala (*Aepyceros melampus*). In both parks, anthrax infections showed two seasonal peaks, with each species having only one peak in a year. Zebra, springbok (*Antidorcas marsupialis*), wildebeest (*Connochaetes taurinus*), and impala cases peaked in wet seasons, while elephant (*Loxodonta africana*), kudu, and buffalo (*Syncerus caffer*) cases peaked in dry seasons. For common host species shared between the two parks, anthrax mortalities peaked in the same season in both systems. Among host species with cases peaking in the same season, anthrax mortalities were mostly synchronized, which implies similar transmission mechanisms or shared sources of exposure. Between seasons, outbreaks in one species may contribute to more cases in another species in the following season. Higher vegetation greenness was associated with more zebra and springbok anthrax mortalities in Etosha but fewer elephant cases in Kruger. These results suggest that host behavioral responses to changing environmental conditions may affect anthrax transmission risk, with differences in transmission mechanisms leading to multihost biseasonal outbreaks. This study reveals the dynamics and potential environmental drivers of anthrax in two savanna systems, providing a better understanding of factors driving biseasonal dynamics and outbreak variation among locations.

## **Facultative cleaning of spiral-horned antelope by the African paradise flycatcher (*Terpsiphone viridis*)**

Gijsman, F. (2022)

*Ecology and Evolution*, 12(7), e9080.

### **Abstract**

In cleaning associations, individuals known as “cleaners” remove and feed on parasites and pests found on, or around, other animals known as “clients.” While best documented in marine environments and as mutualisms, cleaning associations are widespread in terrestrial systems and range along a spectrum of obligate to facultative associations. In African savannas, cleaning associations primarily comprise facultative interactions between mammals and birds that remove attached parasites. Few reports, however, exist on cleaning associations that involve the removal of unattached pests.

In this short note, I report a novel facultative bird–ungulate cleaning association involving the removal of unattached pests, between the African paradise flycatcher (*Terpsiphone viridis*) and two species of spiral-horned antelope (*Tragelaphus* spp.): greater kudu (*T. strepsiceros*) and Cape bushbuck (*T. sylvaticus*). On multiple occasions, I observed African paradise flycatchers hawking flying insects around greater kudu and a Cape bushbuck during the dry season at the Mpala Research Centre in Laikipia, Kenya. These observations document a rare feeding strategy for the African paradise flycatcher and are among the few records on cleaning interactions involving the removal of unattached pests.

## **Unsuccessful Chemical Immobilization of a Roan Antelope (*Hippotragus equinus*) by Using a Premixed Medetomidine-Ketamine Combination**

Nunez, C. M., Thomas, L. F., Benn, J. S., Richison, J. J., Derr, J. N. & W.E. Cook (2022)

*Journal of Wildlife Diseases*. <https://doi.org/10.7589/JWD-D-21-00198>

### **Abstract**

We unsuccessfully attempted to safely chemically immobilize a roan antelope (*Hippotragus equinus*) with a premixed combination of medetomidine (5 mg/mL) and ketamine (150 mg/mL) for injury treatment. This dose (0.066 mg/kg medetomidine and 1.96 mg/kg ketamine) produced poor quality of immobilization, probably exacerbated by stimulation before completing induction.

## **Impacts of Trace metals on Roan Antelope, *Hippotragus equinus* and its Endoparasite *Strongyloides* spp., sampled in the Tropical Rainforests of Odo Ona Kekere, Ibadan, Oyo State, Nigeria**

Elizabeth, A., Bamidele, A., Excellence, A., Olaleru, F., Lanrewaju, O. A. & I.P. Omoregie (2022)

*Scientific African*, e01224. <https://doi.org/10.1016/j.sciaf.2022.e01224>

### **Abstract**

Roan antelopes, together with other mammals, serve as man's proteins. Parasitic infections affect their growth and development and therefore reduce their yield. Samples of hunted roan antelopes (*Hippotragus equinus*) were collected from Oluwo bushmeat Market, Epe, and Odo Ona Kekere in Oluyole Local Government Area of Ibadan, Nigeria. The intestine and liver of the roan antelopes were assessed based on endoparasites, accumulated trace metals, lipid profile, antioxidant biomarkers, and histopathology. The study was conducted to determine the impacts of trace metals on the enteric parasite *Strongyloides* spp. as an early warning to metal toxicity impacts on the antelopes and the consumers.

The study showed that the enteric parasites of the Roan antelope accumulated barium at a higher level than the host. The parasites showed great potentials for storage of cadmium and nickel,

with the second-highest bioaccumulation factors in the study (>2), after zinc with bioaccumulation factor > 3. Vanadium's significant bioaccumulation factors are recorded only in the liver and intestine of the roan antelopes. The negative impact of the multi-stress conditions was evident in this study. For example, the significantly highest concentrations of zinc and barium in the parasites than the intestines and liver of the roan antelopes may partly be implicated in the outstandingly higher cholesterol, and low-lipid lipoproteins indicate dyslipidemia, which results from cellular damage due to stress. In stress conditions, some physiological reactions occur, including changes in hormones and components in the blood. These events might lead to higher cholesterol levels which may result in dyslipidemia. As seen in this study, although the levels of MDA in the investigated tissues were reasonably fairly stable, the upregulated SOD in the investigated tissues of the parasite served as an early warning signal of stress in the roan antelopes.

The study revealed that *Strongyloides* spp. might be a reliable bioindicator of the metal burden in the roan antelopes. The enteric parasite may also serve as a good biosequestration tool to alleviate the toxic load of cadmium and nickel from the roan antelope. The synergistic impacts of cadmium and nickel on the parasites might reduce the infection intensity in the host. This study has demonstrated an empirical early warning against the deleterious accumulation of vanadium, barium, and zinc, which might rise beyond acceptable levels in the future, thus providing prognostic data for proactive decisions by stakeholders to make pragmatic plans and policy towards a sustainable conservation of the roan antelopes.

### **Tibetan antelope migration during mass calving as parasite avoidance strategy**

Cao, Y., Foggin, M. & X. Zhao (2022)

*The Innovation*, 3(6), 100326

<https://www.sciencedirect.com/science/article/pii/S2666675822001229/pdf?md5=7659c059c4da6cf78f45beef85efec32&pid=1-s2.0-S2666675822001229-main.pdf>

### **The Presence of Blastocystis in Tibetan Antelope**

Geng, H. L., Sun, Y. Z., Jiang, J., Sun, H. T., Li, Y. G., Qin, S. Y., ... & H.B. Ni (2022)

*Advances in Diagnosis and Therapeutic Intervention for Foodborne Parasitic Diseases, Volume II*

[https://books.google.fr/books?hl=fr&lr=&id=p5t1EAAAQBAJ&oi=fnd&pg=PA65&dq=antelope+2022&ots=oTQ\\_8-u2JL&sig=VEA8AA-](https://books.google.fr/books?hl=fr&lr=&id=p5t1EAAAQBAJ&oi=fnd&pg=PA65&dq=antelope+2022&ots=oTQ_8-u2JL&sig=VEA8AA-Fan0A47h0Ay6ESQz4Xis&redir_esc=y#v=onepage&q=antelope%202022&f=false)

[Fan0A47h0Ay6ESQz4Xis&redir\\_esc=y#v=onepage&q=antelope%202022&f=false](https://books.google.fr/books?hl=fr&lr=&id=p5t1EAAAQBAJ&oi=fnd&pg=PA65&dq=antelope+2022&ots=oTQ_8-u2JL&sig=VEA8AA-Fan0A47h0Ay6ESQz4Xis&redir_esc=y#v=onepage&q=antelope%202022&f=false)

### **The Palearctic blackfly *Simulium equinum* (Diptera: Simuliidae) as a biting pest of captive nyala antelopes (*Tragelaphus angasii*)**

Ebmer, D., Balfanz, F., Voracek, T., Hering-Hagenbeck, S., Pichler-Scheder, C., Walochnik, J., & E. Kniha (2022)

*Zoo Biology* 42(1), 21719. <https://doi.org/10.1002/zoo.21719>

#### **Abstract**

Blackflies (Diptera: Simuliidae) are cosmopolitan nuisance pests of great economic importance as well as vectors of many pathogens. After reports of massive blackfly biting of captive nyala antelopes in the Vienna Zoo, Austria, this study aimed to identify the species causing multiple skin lesions on the antelope hosts. The Palearctic species *Simulium equinum*, belonging to the medically and veterinary important *Wilhelmia* subgenus, was identified as the most likely causative agent. Barcoding and maximum likelihood analysis supported morphological species identification and highlighted the complex phylogeny of the subgenus *Wilhelmia*. Our study



gives first evidence of the multi-host feeding blackfly *S. equinum* in the Vienna Zoo, thereby raising the question whether other hosts could also be bitten on a regular basis. The preliminary results urge for further analysis of blackfly breeding sites as well as the clarification of the host spectrum to assess the medical and veterinary importance of blackflies in the Zoo.

### **Metastatic Uterine Adenocarcinoma in a Sable Antelope (*Hippotragus niger*)**

Van der Weyden, L., Bezuidenhout, A., van Wilpe, E. & N. O'Dell (2022)

*Veterinary Sciences*, 9(7), 339

#### **Simple summary**

A female sable antelope with a history of gradual loss of body condition was found dead by the owner. Macroscopic examination revealed an enlarged spleen and liver that were covered in white-to-cream-coloured nodules. The uterus also showed a few small, white-to-cream-coloured nodules, with similar nodules present in other parts of the body. Microscopic analysis of sections of the uterus revealed tumour cells with an appearance that was similar those seen in sections of the other tissues. Critically, tumour cells were seen in the lymphatics within the lungs. The tumour cells in the uterus showed positive staining for cytokeratin as did the tumour cells in the sections of other tissues, confirming they were of epithelial origin. In addition, electron microscopy of the uterus and liver showed tumour cells arranged in groups with junctions present between the cells. This confirmed that the tumour cells seen in the liver were the same as those seen in the uterus and were of epithelial origin. Thus, a diagnosis was made of uterine adenocarcinoma with widespread metastasis. This is the first report of uterine adenocarcinoma in a sable antelope.

### **Effect of sustained-release trace element ruminal bolus on plasma trace mineral profiles in captive blesbok antelopes (*Damaliscus pygargus phillipsi*)**

Potier, R., Blanc, B., Braud, C., Freret, S. & N. Cesbron (2022)

*Journal of Zoo and Wildlife Medicine*, 53(2), 259-265

#### **Abstract**

Nutritional deficiencies in mineral metabolism have been described or suspected in managed and wild ungulate populations. In blesboks (*Damaliscus pygargus phillipsi*), clinical signs of copper deficiencies have been described in the wild as well as in captivity. Plasma concentrations of cobalt (Co), copper (Cu), iodine (I), manganese (Mn), selenium (Se), and zinc (Zn) were measured over a 6-mon period by inductively coupled plasma mass spectrometry in two groups of five apparently healthy blesboks from a single zoological collection. The control group did not receive any treatment, whereas animals from the treatment group were given an oral drench in October with two sustained-release trace element ruminal boluses. Plasma samples were obtained prior to the start of treatment (October) and in November, February, and April following treatment.

No significant differences were found between treatment and control groups for any of the measured minerals over the course of the study. The plasma concentrations of Co, Cu, Se, and Zn were significantly different ( $P < 0.05$ ) over time for all individuals, but this effect could not be linked to a change in the diet or husbandry. Copper plasma values fluctuated between deficient and normal ranges for cattle. Zinc plasma values were within a range consistent with deficiency in cattle. The great variability of these results should prompt caution in the interpretation of the efficacy of oral trace mineral intake or the expected effect of a dietary modification on trace mineral status based on plasma values.

## AFRICAN BUFFALO

### **Bovine tuberculosis in African buffalo (*Syncerus caffer*): Progression of pathology during infection**

Lakin, H. A., Tavalire, H., Sakamoto, K., Buss, P., Miller, M., Budischak, S. A., ... & A. Jolles (2022)

*PLOS Neglected Tropical Diseases*, 16(11), e0010906

#### **Abstract**

Bovine tuberculosis affects many mammals worldwide, including the African buffalo. Within the African buffalo population in Kruger National Park, South Africa, bovine tuberculosis is endemic, thus buffalo within this area are regularly infected and act as a reservoir for infection of other wildlife, livestock, and humans in the area. Due to the risk to humans and other mammals, bovine tuberculosis is considered a disease of global importance; cattle are used to model the disease progression in humans.

This study seeks to compare the progression of bovine tuberculosis in free-ranging buffalo to the progression in experimental cattle models. Free-ranging buffalo encounter more variables than experimental cattle, including variations in feed, co-morbidities, and birth rate, similar to humans. Overall, the progression of disease, both grossly and microscopically, in African buffalo mirrors the progression in cattle models despite the increase in variables, providing support that free-ranging models can be used for disease progression studies, with the added benefit of representing the variation in lifestyles present outside of controlled studies. Lastly, we looked at the genetic basis of disease within the herd and found a genetic marker that marginally correlated to disease progression, indicating a need for further work understanding the genetic basis of bovine tuberculosis.

### **High-specificity test algorithm for Bovine Tuberculosis diagnosis in African Buffalo (*Syncerus caffer*) herds**

Clarke, C., Bernitz, N., Goosen, W. J. & M.A. Miller (2022)

*Pathogens*, 11(12), 1393

#### **Abstract**

Ante-mortem bovine tuberculosis (bTB) tests for buffaloes include the single comparative intradermal tuberculin test (SCITT), interferon-gamma (IFN- $\gamma$ ) release assay (IGRA) and IFN- $\gamma$ -inducible protein 10 release assay (IPRA). Although parallel test interpretation increases the detection of *Mycobacterium bovis* (*M. bovis*)-infected buffaloes, these algorithms may not be suitable for screening buffaloes in historically bTB-free herds.

In this study, the specificities of three assays were determined using *M. bovis*-unexposed herds, historically negative, and a high-specificity diagnostic algorithm was developed. Serial test interpretation (positive on both) using the IGRA and IPRA showed significantly greater specificity (98.3%) than individual (90.4% and 80.9%, respectively) tests or parallel testing (73%). When the SCITT was added, the algorithm had 100% specificity. Since the cytokine assays had imperfect specificity, potential cross-reactivity with nontuberculous mycobacteria (NTM) was investigated. No association was found between NTM presence (in oronasal swab cultures) and positive cytokine assay results. As a proof-of-principle, serial testing was applied to buffaloes (n = 153) in a historically bTB-free herd. Buffaloes positive on a single test (n = 28) were regarded as test-negative. Four buffaloes were positive on IGRA and IPRA, and *M. bovis* infection was confirmed by culture. These results demonstrate the value of using IGRA and IPRA in series to screen buffalo herds with no previous history of *M. bovis* infection.

## **Detection of *Mycobacterium tuberculosis* complex DNA in oronasal swabs from infected African buffaloes (*Syncerus caffer*)**

Clarke, C., Cooper, D. V., Miller, M. A. & W.J. Goosen (2022)

*Scientific Reports*, 12(1), 1-6

### **Abstract**

*Mycobacterium bovis* (*M. bovis*), a member of the *Mycobacterium tuberculosis* complex (MTBC), is the causative agent of bovine TB (bTB) in animals. Spread occurs through inhalation or ingestion of bacilli transmitted from infected individuals. Early and accurate detection of infected African buffaloes shedding *M. bovis* is essential for interrupting transmission.

In this pilot study, we determined if MTBC DNA could be detected in *M. bovis* infected buffalo oronasal secretions using a molecular transport media (PrimeStore MTM) with oronasal swabs and a rapid qPCR assay (Xpert MTB/RIF Ultra). Bovine TB test-positive buffaloes were culled, then tissue samples and oronasal swabs collected post-mortem for mycobacterial culture and Ultra testing, respectively.

The Ultra detected MTBC DNA in 5/12 swabs from *M. bovis* culture-confirmed buffaloes. Oronasal swabs from *M. bovis* negative buffaloes ( $n = 20$ ) were negative on Ultra, indicating the high specificity of this test. This study showed that MTM can successfully preserve MTBC DNA in oronasal swabs. The proportion of MTBC positive oronasal swabs was higher than expected and suggests that the Ultra may be an additional method for identifying infected buffaloes. Further studies are needed to confirm the utility of the Ultra assay with oronasal swabs as an assay to evaluate possible MTBC shedding in buffaloes.

## **Identification and Characterisation of Nontuberculous Mycobacteria in African Buffaloes (*Syncerus caffer*), South Africa**

Clarke, C., Kerr, T. J., Warren, R. M., Kleynhans, L., Miller, M. A. & W.J. Goosen (2022)

*Microorganisms*, 10(9), 1861

### **Abstract**

Diagnosis of bovine tuberculosis (bTB) may be confounded by immunological cross-reactivity to *Mycobacterium bovis* antigens when animals are sensitised by certain nontuberculous mycobacteria (NTMs). Therefore, this study aimed to investigate NTM species diversity in African buffalo (*Syncerus caffer*) respiratory secretions and tissue samples, using a combination of novel molecular tools. Oronasal swabs were collected opportunistically from 120 immobilised buffaloes in historically bTB-free herds. In addition, bronchoalveolar lavage fluid (BALF;  $n = 10$ ) and tissue samples ( $n = 19$ ) were obtained during post-mortem examination. Mycobacterial species were identified directly from oronasal swab samples using the Xpert MTB/RIF Ultra qPCR (14/120 positive) and GenoType CMdirect (104/120 positive). In addition, all samples underwent mycobacterial culture, and PCRs targeting *hsp65* and *rpoB* were performed.

Overall, 55 NTM species were identified in 36 mycobacterial culture-positive swab samples with presence of *esat-6* or *cfp-10* detected in 20 of 36 isolates. The predominant species were *M. avium* complex and *M. komanii*. Nontuberculous mycobacteria were also isolated from 6 of 10 culture-positive BALF and 4 of 19 culture-positive tissue samples. Our findings demonstrate that there is a high diversity of NTMs present in buffaloes, and further investigation should determine their role in confounding bTB diagnosis in this species.



## **Investigation of foot and mouth disease virus and other animal pathogens in cattle, buffaloes and goats at the interface with Akagera National Park 2017–2020**

Udahemuka, J. C., Aboge, G., Obiero, G., Ingabire, A., Beeton, N., Uwibambe, E., & Lebea, P. (2022)

*BMC Veterinary Research*, 18(1), 1-12

### **Abstract**

Foot-and-Mouth Disease Virus (FMDV) is a positive-sense RNA virus of the family of the picornaviridae that is responsible for one of the livestock diseases with the highest economic impact, the Foot-and-Mouth Disease (FMD). FMD is endemic in Rwanda but there are gaps in knowing its seroprevalence and molecular epidemiology. This study reports the FMD seroprevalence and molecular characterization of FMDV in Eastern Rwanda.

The overall seroprevalence of FMD in the study area is at 9.36% in cattle and 2.65% in goats. We detected FMDV using molecular diagnostic tools such as RT-PCR and RT-LAMP and the phylogenetic analysis of the obtained sequences revealed the presence of FMDV serotype SAT 2, lineage II. Sequencing of the oropharyngeal fluid samples collected from African buffaloes revealed the presence of *Prevotella ruminicola*, *Spathidium amphoriforme*, *Moraxella bovoculi*, *Onchocerca flexuosa*, *Eudiplodinium moggii*, *Metadinium medium* and *Verrucomicrobia bacterium* among other pathogens but no FMDV was detected in African buffaloes.

We recommend further studies to focus on sampling more African buffaloes since the number sampled was statistically insignificant to conclusively exclude the presence or absence of FMDV in Eastern Rwanda buffaloes. The use of RT-PCR alongside RT-LAMP demonstrates that the latter can be adopted in endemic areas such as Rwanda to fill in the gaps in terms of molecular diagnostics. The identification of lineage II of SAT 2 in Rwanda for the first time shows that the categorised FMDV pools as previously established are not static over time.

## **Viral dynamics and immune responses to foot-and-mouth disease virus in African buffalo (*Syncerus caffer*)**

Perez-Martin, E., Beechler, B., Zhang, F., Scott, K., de Klerk-Lorist, L. M., Limon, G., ... & B. Charleston (2022)

*Veterinary research*, 53(1), 1-14

### **Abstract**

Foot-and-mouth disease (FMD) is one of the most important livestock diseases restricting international trade. While African buffalo (*Syncerus caffer*) act as the main wildlife reservoir, viral and immune response dynamics during FMD virus acute infection have not been described before in this species. We used experimental needle inoculation and contact infections with three Southern African Territories serotypes to assess clinical, virological and immunological dynamics for thirty days post infection.

Clinical FMD in the needle inoculated buffalo was mild and characterised by pyrexia. Despite the absence of generalised vesicles, all contact animals were readily infected with their respective serotypes within the first two to nine days after being mixed with needle challenged buffalo. Irrespective of the route of infection or serotype, there were positive associations between the viral loads in blood and the induction of host innate pro-inflammatory cytokines and acute phase proteins. Viral loads in blood and tonsil swabs were tightly correlated during the acute phase of the infection, however, viraemia significantly declined after a peak at four days post-infection (dpi), which correlated with the presence of detectable neutralising antibodies. In contrast, infectious virus was isolated in the tonsil swabs until the last sampling point (30 dpi) in most animals. The pattern of virus detection in serum and tonsil swabs was similar for all three serotypes in the direct challenged and contact challenged animals. We have

demonstrated for the first time that African buffalo are indeed systemically affected by FMD virus and clinical FMD in buffalo is characterized by a transient pyrexia. Despite the lack of FMD lesions, infection of African buffalo was characterised by high viral loads in blood and oropharynx, rapid and strong host innate and adaptive immune responses and high transmissibility.

### **Viral population diversity during co-infection of foot-and-mouth disease virus serotypes SAT1 and SAT2 in African buffalo in Kenya**

Palinski, R. M., Brito, B., Jaya, F. R., Sangula, A., Gakuya, F., Bertram, M. R., ... & J. Arzt (2022)

*Viruses*, 14(5), 897

#### **Abstract**

African buffalo are the natural reservoirs of the SAT serotypes of foot-and-mouth disease virus (FMDV) in sub-Saharan Africa. Most buffalo are exposed to multiple FMDV serotypes early in life, and a proportion of them become persistently infected carriers. Understanding the genetic diversity and evolution of FMDV in carrier animals is critical to elucidate how FMDV persists in buffalo populations. In this study, we obtained oropharyngeal (OPF) fluid from naturally infected African buffalo, and characterized the genetic diversity of FMDV. Out of 54 FMDV-positive OPF, 5 were co-infected with SAT1 and SAT2 serotypes. From the five co-infected buffalo, we obtained eighty-nine plaque-purified isolates. Isolates obtained directly from OPF and plaque purification were sequenced using next-generation sequencing (NGS). Phylogenetic analyses of the sequences obtained from recombination-free protein-coding regions revealed a discrepancy in the topology of capsid proteins and non-structural proteins. Despite the high divergence in the capsid phylogeny between SAT1 and SAT2 serotypes, viruses from different serotypes that were collected from the same host had a high genetic similarity in non-structural protein-coding regions P2 and P3, suggesting interserotypic recombination. In two of the SAT1 and SAT2 co-infected buffalo identified at the first passage of viral isolation, the plaque-derived SAT2 genomes were distinctly grouped in two different genotypes. These genotypes were not initially detected with the NGS from the first passage (non-purified) virus isolation sample. In one animal with two SAT2 haplotypes, one plaque-derived chimeric sequence was found. These findings demonstrate within-host evolution through recombination and point mutation contributing to broad viral diversity in the wildlife reservoir. These mechanisms may be critical to FMDV persistence at the individual animal and population levels, and may contribute to the emergence of new viruses that have the ability to spill-over to livestock and other wildlife species.

