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

ASG Members are an important network of individuals and experts working across disciplines throughout Africa, Asia and America. Contributions (original articles, field notes, other material relevant to antelope biology, ecology, and conservation) are welcomed and should be sent to ASG Programme Officer. The next edition of GNUSLETTER is expected later this year (December), please share your contributions by mid-November.

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Front Cover: Male dibatag *Ammodorcas clarkei*, Gurdumi, Ethiopia, January 2026 (© Squack Evans)

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Foreword

Dear ASG Members and Friends,

Welcome to *GNUSLETTER* 43.1! This edition highlights the beginning of a new chapter for the Antelope Specialist Group (ASG), following the appointment of a new leadership team and several important developments within the IUCN Species Survival Commission (SSC) specialist group network.

In this context, as announced a couple of months ago, IUCN SSC appointed Violeta Barrios and Dr Robert Aruho as Co-Chairs of ASG, and David Mallon was named Emeritus Chair of the group. We are also delighted that Marwell Wildlife confirmed they will continue to support Sophie Whitemore, ASG Programme Officer, and the ASG Programme Office. Sophie has also taken on the role of ASG Red List Authority Coordinator. Finally, Philippe Chardonnet was appointed on a new role as Co-Chair of the Afro-Asian Wild Cattle Specialist Group (AWCSG).

Besides changes in the structure, this new quadrennium also brings some changes to the scope and structure of ASG. In line with the continuing evolution of SSC specialist groups, responsibility for African buffalo conservation has been transferred to the newly established AWCSG. Likewise, wild camels are now covered by the Camelid Specialist Group. We look forward to maintaining close collaboration with both groups on issues of shared interest and conservation concern.

While these changes slightly refine the taxonomic scope of ASG, our mission remains unchanged: to promote the conservation of the world's antelopes through science, collaboration, and practical conservation action. The challenges facing antelope species remain considerable, ranging from habitat loss and fragmentation to climate change, unsustainable use, and emerging disease threats. At the same time, there are many reasons for optimism. Across the antelope world, dedicated conservationists, researchers, protected area managers, local communities, governments and partner organisations continue to demonstrate that coordinated action can achieve remarkable results.

As this issue is published just before August, we would like to encourage all members to take part in Antelope Month. It is an excellent opportunity to celebrate the extraordinary diversity of antelope species and to raise awareness of the conservation challenges they face. Whether through public talks, media articles, social media posts, educational activities or simply by sharing your own field experiences and successes, every effort helps bring greater recognition to these remarkable mammals and the need to conserve them.

The strength of ASG has always resided in its members. We encourage all members and friends to remain actively engaged, share their experiences and successes, and contribute to future issues of *Gnusletter*. We thank you for your continued commitment and look forward to working with all of you over the coming four years.

Violeta Barrios & Dr. Robert Aruho
Co-Chairs, IUCN SSC Antelope Specialist Group

Research and Notes from the Field

60 years surveying antelope populations in Awash National Park, a former wildlife stronghold in Ethiopia

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Introduction

Awash was the first national park (NP) established in Ethiopia in 1966, with diverse dry savanna wildlife, including the enigmatic Beisa oryx (*Oryx beisa*) (Photo 1) and other antelopes such as Soemmerring's gazelle (*Nanger soemmerringii*) (Photo 2), greater and lesser kudu (*Tragelaphus strepsiceros, T. imberbis*), mountain reedbuck (*Redunca fulvorufula*), Salt's dikdik (*Madoqua saltiana*) (Photo 3), klipspringer (*Oreotragus oreotragus*) and waterbuck (*Kobus ellipsiprymnus*). Bushbuck (*Tragelaphus scriptus*) and Swayne's hartebeest (*Alcelaphus buselaphus swaynei*) were rare at the establishment of the park, yet until the 1990s several (reintroduced) hartebeest individuals were observed; Grevy's zebra (*Equus grevyi*) was still present till the early 1970s (Schloeder & Jacobs 1993; Hay 1998). Awash NP constitutes the limit of distribution of the arid-zone adapted hamadryas baboon (*Papio hamadryas*), and of the savanna Anubis baboon (*Papio anubis*), species that hybridise, the subject of multiple studies since the 1960s (Kummer 1998). Amongst the large carnivores, lion and spotted hyena survive today, albeit in very low numbers, whereas cheetah and likely leopard have become locally extinct.

Photo 1. *Beisa oryx, concentrating in rainy season on the Ilala Sala plains ('plain of the oryx') (© P. Scholte, July 2024).*

Awash NP is located on the main road and railway to Djibouti, 200 km or a three-hour drive from the capital Addis Ababa. After its establishment, Awash NP rapidly became a tourist attraction reaching 10,000 visitors in 1973 and with c. 12,000 visitors remained the country's best visited

park till the mid-2000s. Subsequently, visitor numbers went steadily down, likely because of declining wildlife and security issues (Admasu et al. 2026).

Awash NP also stands out because throughout much of the 60 years of its existence, it has been subject of several large mammal surveys - mainly targeting antelopes - with monthly counts in 1966-1968, 1990-1992 and 1999-2000. We recently assessed long-term population trends of threatened large mammals across Ethiopia's eight main protected areas as well as their explaining drivers. Despite the large number of counts conducted in Awash NP, only 10 assessments of the abundance of Beisa oryx, Soemmerring's gazelle, and waterbuck could be included in our study, out of a total of 289, fewer than in any of the other seven protected areas. Obtaining data on potential drivers was also challenging. Here we explain what, despite several limitations, the counts of Awash NP contribute to our knowledge of its antelopes' distribution and abundance over the past 60 years. We also provide insight into the limitations of the surveys, relevant for Awash NP and other protected areas in Ethiopia and beyond, that are confronted with human encroachment and insecurity, and subsequent low wildlife abundance rendering the assessment of long-term population trends increasingly challenging.

Photo 2. *Soemmerring's gazelle, a species avoiding areas with shrubs as well as livestock, with only few areas left in Awash NP (© P. Scholte, December 2025)*

Photo 3. *Salt's dikdik, the most widespread and common antelope remaining in Awash NP (© P. Scholte, July 2024).*

Location and history

The Middle Awash Valley starts in Awash NP where the Awash River changes its course from the highland plains through the Awash Falls into a gorge that forms the southern boundary of the park. A century ago, rich wildlife was here observed by Thesiger (1935) with savanna elephant and African buffalo, in addition to species still found today especially in the nearby Alledeghi wildlife reserve (Scholte et al. in prep). The Meta Hara reserve was already mentioned during Italian occupation (1936-1941), afterwards the area became an imperial hunting zone (1200 km^2). Identified by the UNESCO mission as proposed national park, Huxley et al. (1963) stressed the need for an adequate number of rangers and cautioned about the frequent livestock intrusion. Management structures and park personnel were put in place in 1966, in an area of 756 km^2, with its formal gazettement in 1969. A highlight in the history of the park was that some 90 Swayne's hartebeest were reintroduced in May 1974 from the highly threatened Senkelle Sanctuary population (Berhanu 1974).

In 2014, Awash NP was reduced by 20% in size to 591 km^2, excluding most notably the north-western Sabober plains (Figure 1). Located on the boundary between two regional states, Oromia in the southwest, Afar in the northeast (Figure 1), the management authority was the federal Ethiopian Wildlife Conservation Authority.

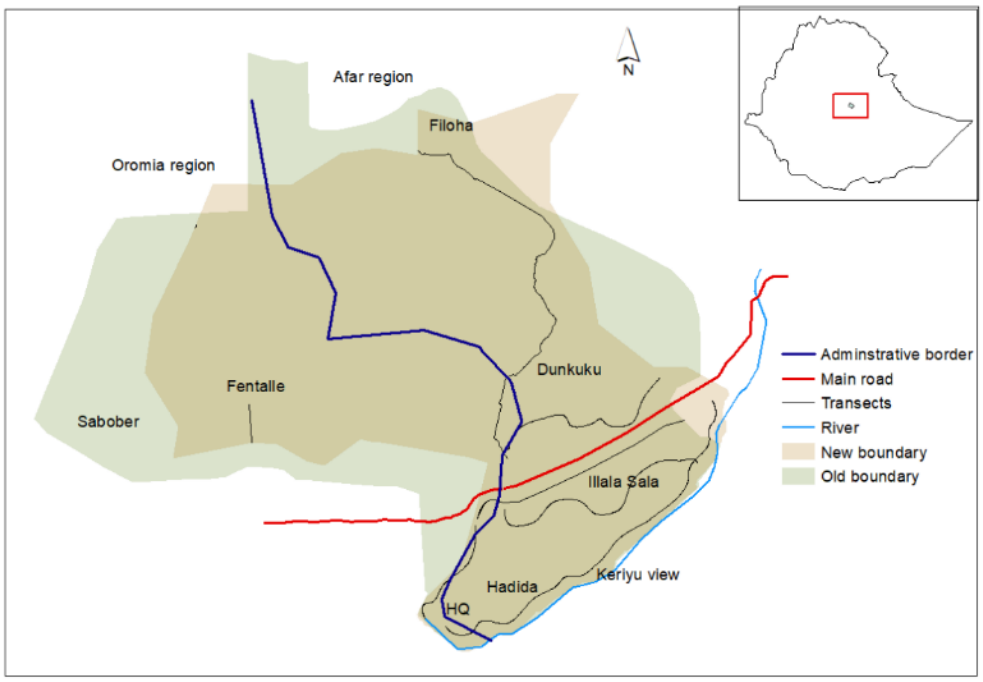

Figure 1. *Awash National Park changed boundary (2014), main locations and transects as operational till 2016.*

Awash NP's road network has been largely designed for tourism purposes. Tourism to Awash NP has been concentrated in the SW part of the park where the park HQ are based, close to the main campsite in the riverine forest. Until c. 2016 the Keriyu lodge overlooking the Awash River canyon was operational, whereas from c. 2010 onwards lodges were located at the SW Awash Falls, and later on at Doho in the NE part of Awash NP. With the building of a new luxury Awash Falls lodge (2022), the track network was also overhauled. In 2025, a fence was built on the southern and western boundary of the park mainly on the upper part of the Awash canyon, with potentially major consequences for the movement of antelopes (Photo 4) and changing once more the road

network. Since 2016 and intensifying since 2021, access to Fentalle mountain (SW) has become restricted, as in other parts in the north that have become considered unsafe. With the resulting reduced traffic, the condition of the tracks into the northern part of the park has also become difficult, e.g. towards the Filoha hot springs, where *Prosopis juliflora* has now spread, rendering many tracks no longer accessible.

Photo 4. *Newly erected (and pushed down) fence and parallel track, with Beisa oryx returning towards the inside of the fence. (© P. Scholte, December 2025).*

Surveys

1966-1969. The first systematic large mammal surveys of Awash date back to 1966, when Peter Hay, Awash NP's first warden, counted track trajectories monthly from February 1966 to December 1968. After Hay's departure these counts were temporarily continued by his deputy, park ecologist Robertson (March-May, July 1969), who reported them in the draft management plan (Jacobs & Schloeder 1993). We have limited information on the methodology applied, however. This holds in particular for the identification of the seven survey areas, where the transects were located although Hay explicitly mentioned Ilala Sala, the 'oryx plains' in local language, or the southern grassland plains (Figure 1). On each side of the car, a 400 m wide strip was counted along a 20 km long transect, representing an area of 16 km^2, extrapolated to 100 km^2 (Hay, November 1966 report). Results were presented in the Awash NP's monthly reports of which we found hand-typed copies in the EWCA archives (Blanc 2022). In the EWCA's archives we also found the graphs depicting counted numbers of Beisa oryx, Soemmerring's gazelle and warthog (1966-1969), of which we present the former two in Figure 2. Note the considerable monthly variation, of Beisa oryx from 112-432 (May-June 1967) and Soemmerring's gazelle from 180-445 (May-June 1968), a factor of 3.9 and 2.5 respectively, see Table 1 for population estimates.

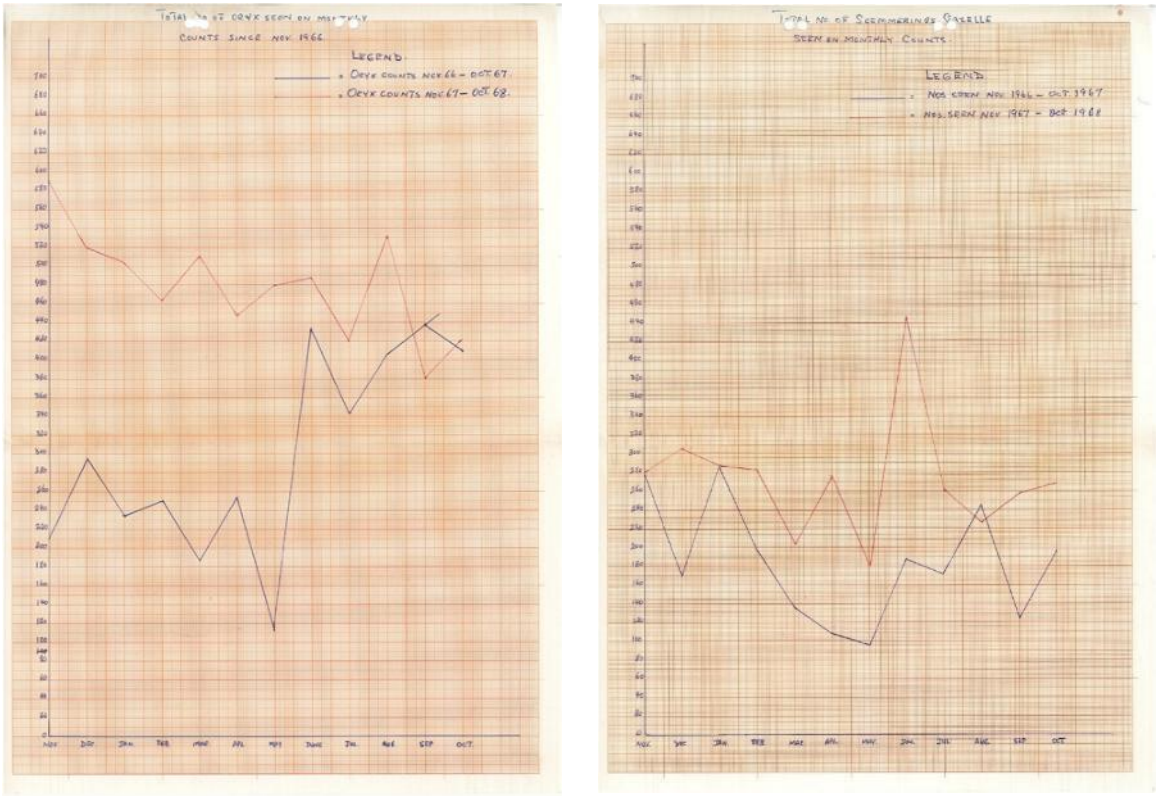

Figure 2. *Monthly road counts (7 transects) in Awash NP (November 1966 – October 1968). Total numbers seen of: Beisa oryx (left) and Soemmerring's gazelle (right). Source warden Hay (1968) EWCA archives (reported in Blanc 2022)*

1990–2004. Large mammal surveys were again regularly conducted in the 1990s and early 2000s. The earlier counts were initiated as part of support programs by conservation and development organizations (WCS, UNDP, CARE), whereas affiliated staff of the Ethiopian wildlife conservation authority (EWCA) gradually took over.

In the early 1990s, Awash NP received support from WCS, hitherto operating in Bale Mountain NP, for the development of its management plan. The management plan compilers, Jacobs & Schloeder (1993) repeated monthly road counts from June 1990 to June 1992, covering four transects, i.e. Ilala Sala, Hadeda, Dunkuku, Sabober (the latter outside the 2014 park boundaries), (Figure 1). We may assume that they overlapped the transects followed by Peter Hay 25 years earlier. Unfortunately, results have been presented as monthly averages only. Also an aerial count took place, but wildlife results were subsequently disregarded, contrary to livestock numbers, amongst the few records (Jacobs & Schloeder 1993).

In 1995, an aerial survey was conducted of the Middle Awash valley, funded through UNDP. While Alledeghi Wildlife Reserve was subject of a dedicated total count, Awash NP was included in the total sample survey covering c. 17,000 km^2, or 20 times the size of Awash NP, with numbers difficult to break down so could not be included in Table 1.

Between August 1999 and June 2000, one of us (FK), then park ecologist, and researcher Mizuno counted monthly the maximum concentrations of oryx and other antelopes. Numbers observed varied from 23 oryx (January 2000) to 294 (November 1999), resulting in a population estimate

of 300-350 entirely confined to Ilala Sala. The population of Soemmerring's gazelle was estimated at 32, also confined to Ilala Sala with none on Sabober plains that comprised over half of their number in the 1960s (Kebede & Mizuno, 2000).

In 2000, numbers of Soemmerring's gazelle varied from 19 (October 2000) to 127 (January 2000), (Gebremedhin & Yirga, 2005). Mean population size was estimated at 41.45, average 66, whereas we set the population estimate at the maximum number observed (127), cf. the methodology applied by Kebede & Mizuno (2000). No estimations of other antelope species were reported.

In 2003-4, Enawgaw (2004) as part of his MSc studies, studied Beisa oryx and Soemmerring's gazelle confined to the southern grasslands Ilala Sala, where he replicated the methodology of Jacobs and Schloeder (1993) and Robertson (1970), with a 400 m-wide strip on each side of the car and a transect length of 22 km, covering an area of 43 km^2. He also surveyed lesser kudu and Salt's dik-dik for which he added the Hadida Daba area with a 100 and 30 m transect width respectively.

2011: A team of Kenyan and Ethiopian scientists, sponsored by the GEF/EWCA SDPASE project, surveyed Beisa oryx by transect, and compared their population trend with mapping of an increasing bush encroachment.

2016: Upon their start, the German development organization GIZ organized a rapid large mammal survey as part of a compilation of existing information on Awash NP. They followed the earlier used road transects (Figure 1). In their report they also cite results of a count conducted by park personnel earlier in 2016, see Table 1.

2022–2025: When compiling wildlife surveys from Ethiopian protected areas, we realized that no systematic road count has been conducted in Awash since 2016, nor was there ranger-based monitoring (such as SMART or Earthranger) in place. We started by trying to replicate the 2016 transects, targeting Ilala Sala, but also those other parts of the park where security and track accessibility allowed (Figure 1). Confronted with an extremely low density of Beisa oryx and Soemmerring's gazelle, over half of the counts we did not observe a single individual. We therefore simplified our counting, keeping track of the maximum number of our own observations, as well as those of head ranger Ledy while guiding tourists and guarding missions, cf. Kebede & Mizuno (2000).

Methodological challenges

Including Awash NP counts in a country-wide analysis was challenging, for a number of interacting reasons, related with natural and man-made changes in the park, as well as with limitations of count methodology and their reporting. Below we address each of them:

'Natural' changes: (i) Changes in land cover, from grassland to dense shrubland - bush encroachment due to high livestock grazing pressure - rendering counts, total or sample / transect, increasingly difficult. (ii) Declining abundance of wildlife, rendering sample counts, transects or others that need at least 30 observations for each stratum and species, increasingly obsolete.

'Man-made' changes: (i) Changes of park size from 756 to 591 km^2, and subsequent changes in boundaries (2014) (Figure 1). (ii) Insecurity that no longer allowed access to the northern part of the park, in particular Mount Fentelle in the north-west, since 2021. (iii) Recently dramatic changes

have taken place in Awash NP's road network from where most of the counts were conducted. This became obvious during the construction of new lodge (2022) when an entirely new road system was also put in place. The recent (2025) construction of fence along the Awash River gorge on the southern part of the park has further changed the road network (Photo 4).

Limitations related to count methodology and reporting: (i) Sampling methodology has been poorly documented, rendering any repetition rather complicated. It also hampered interpretation of results. This holds in particular for the lack of description and mapping of the transects. (ii) Awash NP was included in three aerial counts that targeted much larger areas making it impossible to use the data for the park. (iii) Livestock was often not included in surveys, except the one from 2022-25, and one of the above-mentioned aerial surveys. (iv) Several count results, including 'raw data', have been presented as monthly or seasonally (wet, dry) average figures, masking important variations as illustrated by Hay's monthly counts. It also renders the smoothing character of GAM analyses almost redundant.

Land cover changes

Here we highlight only one of several drivers that explain observed declines in antelope population numbers. Land cover change not only causes the most dramatic changes in Awash NP, but is the only driver also directly affecting the methodology applied (see above). Land cover changes have been dramatic over the past decades. Grassland and scattered grassland cover both declined four-fold between 1986 and 2023. Forest and woodland cover also declined, albeit at a much lower rate. In this period, bushland and bare land increased a massive four and three-fold respectively (Figure 3). Changes in land cover in Awash NP as well as some other protected areas, are thought to have been a major driver of the observed decline of antelope populations in Ethiopia (Scholte et al. in prep). Kebede & Mizuno (2000) were the first to draw attention to 'bush invasion is now the major problem on Ilala Sala plain and the coverage is increasing'. Mekonnen et al. (2012) further elaborated on this subject, reporting a significant habitat change where grassland and scattered grasses were replaced by bushland. We attributed the massive increase of bushland to the detriment of (scattered-) grasslands, so-called bush-encroachment, to the massive, yet poorly documented incursion of livestock into Awash NP throughout its existence (Hay 1968; 1998).

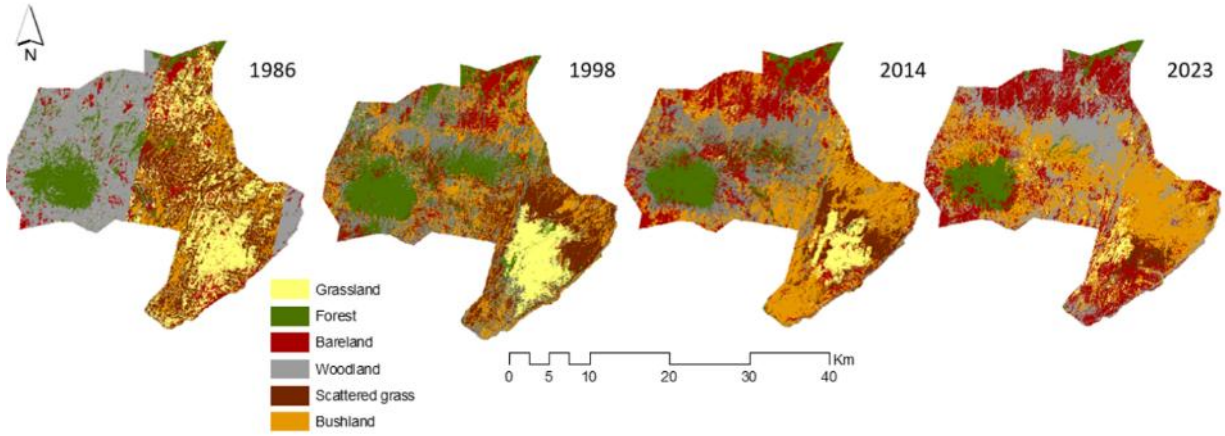

Figure 3. *Land cover changes in Awash NP (1986–2023).*

Conclusions

The Awash antelope counts are methodologically quite heterogeneous, comprising terrestrial but also a few aerial counts. Most counts are sample counts, i.e. road transects, of which Awash NP includes the first systematic monthly large mammal surveys conducted in Ethiopia, highlighting an enormous monthly fluctuation in numbers observed. Counts conducted in Awash NP allow, despite the limitations presented above, to conclude that antelope population numbers have declined by as much as two orders of magnitude, a decline larger than reported from any other protected area of Ethiopia. Beisa oryx declined from c. 2000 in 1966 to less than 100 in 2025, only c.25 Soemmerring's gazelles remain, waterbuck has declined to a handful remaining individuals, whereas Swayne's hartebeest and bushbuck are no longer observed (Table 1). The status of mountain reedbuck, klipspringer and greater kudu remains unclear because of inaccessibility of their (possibly remaining) distribution area on the Fentalle mountain. Only Salt's dikdik and possibly lesser kudu have survived in somewhat larger numbers. Our hypothesis is that numbers of both browsers first went up since the 1960s (with the bush encroachment), but that human pressure has become so extreme, that their numbers have since gone down. Table 1, showing equal Salt's dikdik and lesser kudu numbers in 1966 and 2003-4, in contrast to all other antelopes, seems to be in line with this supposition.

Twenty-five years ago, one of us (FK) warned against extrapolations from transect counts with a low number of observations, resulting in unrealistically large population numbers as for example the 1969 estimations showed (Table 1). They proposed using total maximum counts of targeted species such as Beisa oryx, in particular during periods when they concentrate. Under the present circumstances, with extremely low densities, this seems to be the only way to obtain realistic, albeit minimum, population estimates.

Acknowledgements

We acknowledge the painstaking work conducted over the past 60 years by dozens of surveyors, accompanied by numerous rangers and drivers. We thank the Awash NP authorities for having facilitated access to the park and providing us with the 2024 count results. Head ranger Ledy has been a source of information over the past years, and we are grateful for his skilled and guiding and pleasant company. We thank David Mallon for constructive feedback.

References

Admasu, S., Van Zyl, H., Worku, D. & Scholte, P. (2026). Enhancing the financing of Ethiopia's Protected Areas through revisiting the organisation of setting entrance fees and expanding private investments. *Journal of Revenue and Price Management*.

Berhanu, L., 1974. Operation Swayne's hartebeest. *Oryx* 12(5): 556-564.

Blanc, G. (2022). At the roots of a global environmental history: An Ethiopian loop in nature's archives. *Sources: Materials & Fieldwork in African Studies* 4: 333-379.

Blower, J. (2005). *In Ethiopia. A Game Warden's Adventures in Haile Sellassie's Medieval Empire*. Librario Publishing, Moray UK.

Enawgaw, C. (2004). Population status and distribution of artiodactyls in the Awash National Park, with special reference to Beisa Oryx (*Oryx beisa*). Unpublished master thesis, Addis Ababa University.

Gebremedhin, B. & Yirga, S. (2005). A study on abundance, group size and composition of Soemmering's Gazelle (*Gazella soemmerringii*) in Awash National Park and Alledeghi Wildlife Reserve, Ethiopia. *SINET: Ethiopian Journal of Science* 28(2): 161-170.

Gebretensae, K., Chira, M.R., Githaig, J. & Habte, J. (2025). Density, distribution and conflict of apex predators in and around the Awash National Park, Ethiopia. *Natural Resources and Sustainable Development* 15: 363-383.

GIZ-BFP (2016). Baseline study of Awash national park. Internal report, Addis Ababa, Ethiopia.

Hay, P. (1967, 1968). *Annual reports*. Archives EWCA (see also Blanc 2022).

Hay, P. (1998). *One long safari*. Trophy Room Books, Agoura, USA.

Huxley, J., Gille, A., Monod, M., Swift, L. & Worthington, E. (1963). *The Conservation of Nature and Natural Resources in Ethiopia*. Report to the Government of Ethiopia, UNESCO/ NS/NR/47.

Jacobs, M.J. & Schloeder, C.A. (1993). The Awash national park management plan 1993-1997. Ethiopia Wildlife Conservation Organization, Addis Ababa, Ethiopia.

Kebede, F. & Mizuno, A. (2000) A progress report on ecological monitoring of Oryx, Gazelle and Ostrich Population and their habitat in Awash National Park.

Kebede, S., Tessema, Z.K., Urge, M., Alebachew, M. & Ebro, A. (2022). *Impact of bush encroachment on wildlife in Awash National Park, Eastern Ethiopia.* Pp 768-781 In: F. Feyissa, T. Jembere, G. Kitaw & G. Kebede (eds). Livestock Research Results. Ethiopian Institute of Agricultural Research, Addis Ababa, Ethiopia

Kummer, H. (1998). *In quest of the sacred baboon: A scientist's journey*. Princeton University Press.

Mekonnen, A., Kairu, J.K.& Kimanzi, J.K. (2012). *Mapping and evaluation of habitat suitability for Beisa Oryx in Awash National Park: Implications for management*. Unpublished report to GEF-EWCA.

Scholte, P., Kamgang, S.A. & Sabuhoro, E. (2023). Beyond the big five and birds: Divergent ecotourism perspectives in rapidly changing Africa. *Animal Conservation* 26(4): 443-445.

Scholte, P., Admasu, S., Berhanu, L., Damtie, M., Gizaw, G., Oehm S. & Wakjira, K. (2025a). The Protected Area System of Ethiopia: Development, present state and perspectives towards the 30x30 Target. *PARKS* 31: 59-70

Scholte, P., Abebe, B., Seraw, E., Abedela, F., Kinfe, M., May, B., Mekuria, W., Pays, O., Regassa, F., Simegn, T. & Solomon, S. (2025b). Severe decline of the only remaining population of walia ibex in Ethiopia: proposed actions and recommended recategorization as Critically Endangered. *Oryx* 59(3): 404-408.

Scholte, P., Pays, O., Abebe, B., Endriss, A., Gizaw, B., Haile, T., Gashe, S., Seraw, E. & Admasu, S. (in preparation). Habitat degradation, recurrent conflicts and other park-specific drivers, push the decline of Ethiopia's threatened wildlife (1963-2024).

Table 1. Population counts and estimates of antelopes in Awash NP and their overall decline (1966-2025), *including those to be disregarded (in italics)* or otherwise to be corrected ().

Species Year	1966-1968	*1969**	1990-1992	1999-2000	2000	2003-2004	*2011**	*2016**	2016	2024	2022-2025	Decline
Total/Transect	TR	*TR*	TR	TO	TO	TR	*TR*	*TO*	TO	TO		
Beisa oryx	2550	*4020*	925	325		446	*626 (510)*	*182*	227	55	70	93%
Soemmerring's gazelle	2080	*1701*	215	32*	66 (127)*	65 (73)*		*41*	29	12	25	99%
Waterbuck	100	*263*	200			35		*83*	60		10?	90%
Lesser kudu	328	*3800*	995			413 (485)*		*2172*	66		present	~80%
Greater kudu	64 (200)	*670*	84			3					?	100%?
Salt's dikdik	2500	*9000*	5297			2770		*876*	140		100s	~80%?
Klipspringer	600	*5000*	rare						0		Awash gorge	?
Mountain Reedbuck	?	*1000*	77						0		?	?
Bushbuck	uncommon	*1000*	0						0		0	
Swayne's hartebeest	0	*?*	0			1		*0*	0	0	0	100%
Source	Hay 1968	Robertson (1970) in Jacobs & Schloeder (1993)	Jacobs & Schloeder (1993)	Kebede & Mizuno (2000)	Gebremedhin & Yirga (2005)	Enawgaw (2004)	Mekonnen et al. (2012)	Park GIZ GIZ 2016		Bekel Gizaw (pers.comm)	Scholte & Ledy (pers. obs.)	

* disregarded count or estimate by Scholte et al in prep.; ( ): correction by a guestimate by the author ; ( )* : proposed correction, based on total maximum.

Restoring the last grasslands: Rangeland recovery as the lifeline for Hirola conservation

Abdullahi H. Ali & George M. Muriuki
Hirola Conservation Program

The hirola (*Beatragus hunteri*), often described as the world's most endangered antelope, is inseparable from open, seasonally productive grasslands (King et al. 2011; Ali et al. 2019). Unlike many African antelopes that can switch between grazing and browsing, the hirola is a specialist feeder, dependent on short, nutritious grasses that flush after rainfall (Probert et al. 2019; Ali & Kivai 2026). When these grasslands fail, the hirola has nowhere else to go. Over the past five decades, the collapse of hirola populations, from tens of thousands to fewer than 500 individuals, has closely mirrored the degradation of its rangeland home (Ali et al. 2017). Long-term droughts, woody encroachment, overgrazing, disruption of traditional pastoral mobility, invasive plant species, and the loss of native grass seed banks have fundamentally altered ecosystem function across the species' remaining range. While predation and disease have contributed to declines, habitat degradation leading to declining forage remains the underlying driver (Ali et al. 2017). In this context, therefore, hirola conservation has increasingly become a rangeland restoration challenge, rather than a single-species management problem.

Figure 1. *Hirola family group © A.H. Ali*

From emergency protection to ecosystem recovery

Early conservation responses understandably focused on preventing immediate extinction. Predator-proof sanctuaries and translocations into managed areas provided critical insurance populations. However, these interventions also revealed an uncomfortable reality: fenced refuges cannot substitute for functioning landscapes (O'Connor et al. 2022). The hirola evolved in a system defined by seasonal rainfall, mobile pastoralism, fire-maintained grasslands, and open visibility across the savanna grasslands. When these processes break down, grasslands shift towards shrub dominance, bare ground expands, and drought impacts intensify. Restoring the hirola therefore means restoring ecological processes, not just protecting animals.

Rebuilding grass from the ground up

Recent rangeland restoration efforts in Garissa County and surrounding landscapes have adopted a multi-layered approach that combines ecological science with local knowledge and community leadership (Mureithi et al. 2016).

Native grass reseeding and soil recovery

Degraded patches are being actively reseeded using native perennial grasses historically associated with hirola habitats, including drought-tolerant and nutrient-rich species such as *Cenchrus ciliaris* and *Enteropogon superbus* (Kimiti et al. 2017; Ali & Muriuki 2025). Species selection is guided by soil type, rainfall variability, and forage nutritional value (Ali & Kivai 2026). In some areas, reseeding is paired with soil scarification and micro-catchments to improve establishment under increasingly erratic rainfall. Rather than reseeding entire landscapes, restoration often begins with dense "restoration islands" that are small but strategically placed patches that stabilize soils, improve water infiltration, and act as nuclei for grass spread (Kimiti et al. 2017). Over time, these islands expand naturally, reclaiming ground from woody species that are encroaching.

Figure 2. *restored grassland © A.H. Ali*

Community-led grass seed banks
One of the most transformative developments has been the establishment of local grass seed banks, many led by women's groups. These initiatives conserve locally adapted seed, reduce dependence on external inputs, and generate income while restoring grazing areas. Seed banks also serve as living repositories of rangeland biodiversity that would otherwise be lost after repeated droughts.

Grazing management and negotiated resting zones
Rather than excluding livestock, restoration efforts increasingly work with pastoralists to establish seasonal grazing agreements. Temporary resting of key grasslands during wet seasons allows seed set and recovery, benefiting both livestock and wildlife during subsequent dry periods (Western et al. 2020). These negotiated arrangements reintroduce rotational grazing patterns that historically maintained productive grasslands.

Controlling woody encroachment
Targeted removal of invasive shrubs and encroaching woody species, particularly *Acacia reficiens* and *Prosopis juliflora*, is helping reopen grassland structure (Witt et al. 2021). In some sites, cleared biomass is converted into fuel briquettes by local youth groups, creating alternative livelihoods while reducing pressure on indigenous trees.

Climate change: restoring resilience, not the past
Climate projections for north-eastern Kenya point to increasing rainfall variability, longer dry spells, and more frequent extreme events (IPCC 2023). Restoration efforts therefore do not aim to recreate a fixed historical state, but to build resilient, flexible systems. This means prioritizing drought-tolerant native grasses, maintaining landscape connectivity so hirola can track resources, preserving habitat heterogeneity rather than uniform grass cover, and integrating restoration with water availability and movement corridors. In this sense, hirola rangelands are becoming living laboratories for climate-smart restoration in arid and semi-arid lands (Ali & Muriuki 2025).

Communities at the centre of recovery
A defining lesson from recent years is that hirola will not survive without pastoralist stewardship (Letai & Tiampati 2021). Many restoration sites overlap with areas that communities depend on for grazing, water, and cultural identity. Rather than framing conservation as restriction, current approaches emphasize shared benefits: improved dry-season forage, reduced erosion and dust storms, enhanced livestock productivity, and new livelihood options linked to seed production, restoration labour, and nature-based enterprises. Local ecological knowledge, particularly around historical grass distribution, seasonal movements, and drought indicators, has proven invaluable in guiding restoration priorities and identifying sites with the greatest recovery potential (Letai & Tiampati 2021).

Tracking recovery on the ground
Restoration outcomes are monitored using a combination of satellite imagery and field observations. NDVI analysis helps track changes in vegetation cover and productivity across large areas (Mwangi et al. 2024), while community rangeland technicians record grass regrowth, grazing pressure, and wildlife use. Hirola sightings and movements are increasingly documented using digital platforms, allowing managers to assess whether restored areas are being

recolonized. Early signs are encouraging. Restored plots show higher grass cover and improved forage quality, and hirola have begun revisiting sites that had been abandoned for years, particularly following good rains. These gains remain fragile, however. A single failed rainy season can erase years of progress, and pressures from insecurity, funding shortfalls, and land-use change persist.

Figure 2. *Village meeting. © A.H. Ali*

Figure 4. *Erecting a CCTV camera to monitor hirola. © A.H. Ali.*

The hirola's plight has come to symbolize the broader challenges facing dryland ecosystems across the Horn of Africa. By placing rangeland restoration at the heart of species recovery, conservation practitioners are demonstrating that saving one of the world's rarest antelopes is inseparable from restoring landscapes that support millions of people (World Hirola Day 2025 Proceedings 2025). As highlighted during World Hirola Day 2025, endangered species recovery through ecosystem restoration is not just a slogan, it is an emerging reality on the ground. The future of the hirola will

ultimately be written in grass: in the seeds saved, the soils healed, and the collective choices made about how rangelands are valued and managed.

References

Ali, A.H. & Kivai, S. (2026). Drivers of hirola antelope diet selection in natural and managed habitat in eastern Kenya. *Ecology and Evolution* 16(1), e72980.

Ali, A.H., & Muriuki, G. M. (2025). Ecological niche modeling for determining grass species suitable for Hirola range-wide restoration and reintroduction in eastern Kenya. *Restoration Ecology* 34(2), e70284.

Ali, A.H., et al. (2017). Resource selection and landscape change reveal mechanisms suppressing population recovery for the world's most endangered antelope. *Journal of Applied Ecology* 54(6), 1720-1729.

IPCC. (2023). *Climate Change 2023: Synthesis Report*. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Kimiti, D.W., Riginos, C., & Belnap, J. (2017). Low-cost grass restoration using erosion barriers In a degraded African rangeland. *Restoration Ecology 25*(3), 376-384.

King, J., Ihwagi, F., & Andanje, S. (2011). *Beatragus hunteri* (Hirola). The IUCN Red List of Threatened Species 2011. https://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T6234A17739997.en

Letai, J., & Tiampati, M. (2021). The role of pastoralists' indigenous knowledge in drought management and hirola conservation in Ijara, Kenya. *Pastoralism* 11(1), 1-12.

Mureithi, S.M., Verdoodt, A., Njoka, J.T., Gachene, C.K., & Van Ranst, E. (2016). Benefits derived from rehabilitating a degraded semi-arid rangeland in communal enclosures, Kenya. *Land Degradation & Development* 27(8), 1853-1862.

Mwangi, P.N., et al. (2024). Tracking rangeland recovery in a community conservancy using Sentinel-2 NDVI time series. *Remote Sensing Applications: Society and Environment* 33, 101121.

O'Connor, D., et al. (2022). Integrating community conservation and rangeland restoration for hirola recovery in Kenya. *Conservation Science and Practice*, 4(8), e12765.

Probert, J.R., et al. (2019). Habitat conversion and loss affect the functional diversity of an endangered antelope. *Biodiversity and Conservation* 28(1), 269-286.

Western, D., et al. (2020). Rangeland restoration in action: lessons from community conservancies in Kenya. *Parks*, 26.1, 65-76.

Witt, A., et al. (2021). The distribution and socio-ecological impacts of *Prosopis juliflora* in eastern Africa. *CABI Reviews*, 2021.

World Hirola Day 2025 Proceedings. (2025). Ishaqbini Hirola Community Conservancy & Hirola Conservation Programme. Garissa, Kenya.

Action before extinction: Reintroduction of addax to Chad's Ouadi Rimé-Ouadi Achim Faunal Reserve

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Summary
The addax (*Addax nasomaculatus*) is among the rarest antelope species on Earth, with fewer than 100 individuals believed to survive in the wild outside current reintroduction efforts in Chad. Building on the success of the scimitar-horned oryx reintroduction programme in Chad's Ouadi Rimé-Ouadi Achim Faunal Reserve (OROAFR), addax reintroduction began in 2019 using captive-bred animals from Abu Dhabi. Early release groups remained largely associated with the Oryx Base Camp area, raising concern that release in sub-desert habitat was limiting dispersal into the species' more typical northern desert range. In 2025, two further groups were therefore released from a temporary boma established within prime addax habitat in the northern sector of the reserve. Both groups moved extensively within desert habitat after release, and births were recorded in one group within six months. These early observations suggest that direct release into suitable desert habitat may better support recolonisation of the species' former ecological range in Chad, although longer-term monitoring will be needed to assess survival, reproduction, and persistence through extreme dry-season conditions.

Introduction
The addax (*Addax nasomaculatus* de Blainville, 1812) is among the rarest antelope species on Earth. Excluding current reintroduction efforts in Chad, fewer than 100 individuals are thought to persist in the wild, primarily within the species' former stronghold in the Tin Toumma Desert of eastern Niger (Ref). In 2023, an intensive survey aimed at locating, capturing, and collaring addax reportedly occurring east of Niger's Termit Massif failed to detect any individuals, despite the deployment of an expert field team supported by helicopter and fixed-ing aircraft (Ref). Occasional, unverified reports of addax sightings continue to be received from local desert travellers; however, these contrast sharply with more worrying evidence from social media documenting the active pursuit and killing of addax by hunters using high-speed all-terrain vehicles. In Chad, reports of a small number of addax along the Chad-Niger border persist, although no confirmed evidence has been obtained for several years.

Historically, addax occurred in Chad in fair numbers north of 17°N, particularly in the sandy deserts of the Djourab, Mourdi, and Erdi regions. They undertook seasonal southward movements during the hot season into sub-desert areas, including the Ouadi Rimé-Ouadi Achim Faunal Reserve, in search of pasture and shade (Gillet, Newby). Data from the 1960s and 1970s indicate that addax and oryx regularly shared these sub-desert pastures before dispersing northwards with the onset of the rains in July and August. Intensive hunting, however, led to the near-total extirpation of addax in Chad over a ten-year period from the late 1970s to the late 1980s. The species' critically endangered status, together with the very limited remaining opportunities for effective protection and recovery of the wild population, provided a compelling rationale for reintroduction.

Building on the proven success of the scimitar-horned oryx (*Oryx dammah*) reintroduction in OROAFR, the programme was extended to addax as a case of "action before extinction". The feasibility of large-scale reintroduction for a closely related, arid-adapted species provided strong operational confidence, while experience with the oryx has shown that restoring species still within the living memory of local communities can generate substantial local acceptance and support. This short communication summarises the addax reintroduction programme to date and describes the first direct releases into prime desert habitat in the northern part of the reserve.

Figure 1. *Addax Group 7, Pre-release Boma, OROAFR, 25 October 2025 © John Newby*

Programme background and release context

A first group of 15 addax, bred at the Environment Agency-Abu Dhabi's Deleika Conservation Breeding Centre in the United Arab Emirates, arrived in Chad by charter flight on 14 November 2019. Upon release from quarantine and acclimatisation, it was hoped that the animals would disperse northwards towards typical addax habitat. To facilitate this, the plan was to release them from a temporary boma erected some 30 km north of the pre-release pens. After 66 days of captivity in Chad, the animals were transported to the boma and released into the wild on 18 January 2020. Despite a brief movement northward after release, they soon returned south, where they remained for the rest of the dry season.

Unlike the oryx, which quickly established an extensive seasonal distribution pattern and travelled as much as 200 km from the release site, the majority of addax proved far less wide-ranging, tending to remain where suitable grazing was available. GPS collar data for the first release groups indicated a much more limited pattern of dispersal than that observed in oryx. A small number of individuals did wander outside the reserve, and in at least 3 cases getting into difficulties with

settled communities in villages up to 160 km from the release site. In at least one case, a wandering addax successfully navigated back to the release area from outside the reserve boundaries. This reluctance to move away from the release area may also have contributed to slower population growth and to a series of health issues, including burdens of biting flies, ticks, and cestodes in animals lingering around the base camp area.

Between the first release on 18 January 2020 and 16 January 2024, a further 100 addax were released into the reserve (Table 1). There have been 157 addax births recorded in the south. Addax survivorship in 2020-2025 was consistently lower than that observed in oryx 2016-2023. However, the currently available oryx estimates do not include the difficult year 2024, so the comparison is not balanced, but it does indicate slower progress observed in addax than in the oryx. The latest formal monitoring surveys indicate a current population of around 150 animals. As with the oryx and other ungulates, both wild and domestic, numbers declined during the particularly hot dry season of 2024, despite the presence of reasonable pasture resulting from the previous year's wet season.

Study area

Typical open, sandy desert habitat suitable for addax begins approximately 150 km due north of the pre-release pens and associated Oryx Base Camp (OBC), a site originally selected for its relevance to the oryx reintroduction programme. Climate in addax habitat is Saharan, with rainfall typically below 100 mm annually. Vegetation is composed of ephemeral leguminous annuals (*Indigofera, Tephrosia*), interspersed with perennial grasses (*Panicum, Stipagrostis* spp.) and succulents such as *Cornulaca monacantha*. Tree cover (*Acacia, Maerua*) is sparse and highly localised. Rainfall is patchy, and large areas may go without rain for years. In the absence of rainfall, ephemerals dry up and disappear, while perennials die back. The landscape is dominated by large tracts of open sand sheet interspersed with fields of mobile barchan dunes. Compared with oryx habitat, addax habitat lacks the dense seasonal sward typical of Sahelian grasslands.

Releasing addax directly into this habitat presents several challenges. To avoid loyalty to an atypical release site and a subsequent reluctance to disperse, newly imported animals should ideally be quarantined and acclimatised at the desert release site itself. Under current conditions in Chad, this entails an overland journey of approximately 350 km by heavy lorry across poor roads and desert tracks, taking around 18 hours, in addition to the 10-12 hours required for crating at Deleika and subsequent road and air transport to Abéché airport. While husbandry at the release site is relatively straightforward, post-release monitoring is more complicated, as staff are based at OBC, some 150 km to the south, equivalent to a journey of 5-6 hours by four-wheel-drive vehicle. GPS satellite tags, an EarthRanger interface, regular patrols, and adequate provision of vehicles and fuel are therefore essential.

In 2024, following an exceptionally hot dry season, rainfall in Chad was abundant, reviving desert perennials and triggering substantial new growth of annual plants in the northern part of the reserve. With the onset of cooler winter conditions, plant growth continued and matured. The rains also initiated a new age class of perennial forage species, including *Stipagrostis vulnerans* and *Panicum turgidum*. On this basis, it was decided to attempt direct release into prime addax habitat.

Northern release operations in 2025

Site selection and temporary boma

Reconnaissance surveys conducted in September 2025 identified a suitable site for the construction of a temporary boma within high-quality addax habitat in the northern sector of OROAFR. Site selection criteria included proximity to existing tracks to facilitate animal transport, access to a permanent water source, and the potential for post-release dispersal into adjacent favourable habitat.

The area was also used seasonally by local pastoralists, primarily camel herders, necessitating early engagement and information-sharing with nearby communities to support the release operation and subsequent monitoring activities. Northern Chad, including the reserve, is criss-crossed by an extensive network of informal tracks and trails, some heavily used by light and heavy goods vehicles moving people and merchandise locally and across the borders with Niger, Libya, and Sudan. Releasing addax far from the operational headquarters at OBC was therefore recognised as carrying a degree of risk, but it was also the only realistic way to test the species' ability to recolonise its typical desert habitat under conditions of enhanced protection and monitoring.

A temporary, approximately circular boma covering around 0.5 ha was constructed on 1-2 October 2025 using mobile fencing units and equipped with food and water troughs. A small, tented camp was established nearby, and two local herders were recruited to care for the animals and to act as intermediaries with pastoralist communities in the vicinity.

Figure 2. *Addax Group 6, OROAFR, Chad, 3 June 2026 © Marc Dethier*

Release of Group 6
Group 6, composed of 15 addax (6 males and 9 females), arrived in Chad on 23 February 2025 and was initially acclimatised at OBC. All individuals were fitted with identification and satellite tracking devices prior to release. Four animals (two males and two females) were equipped with satellite collars, satellite ear tags, and large numbered ear tags, while the remaining individuals carried satellite collars and a combination of large and small numbered ear tags. Instrumentation was completed at the base camp on 18 September 2025.

The group was subsequently transported overnight to the temporary boma, departing on the evening of 4 October 2025 and arriving at 00:40 on 5 October 2025. The animals were held briefly in the boma before being released into the surrounding habitat on 8 October 2025. In total, they were held in pre-release for 228 days, of which 224 were spent at OBC and 4 at the boma. This release represented the first attempt to introduce addax directly into prime desert habitat at a considerable distance from the project's operational headquarters.

Release of Group 7
Group 7, consisting of 10 individuals (5 males and 5 females), also originated from Abu Dhabi and was equipped with monitoring devices prior to departure. Four individuals were fitted with GPS units mounted on one horn, with collars fitted to the remainder. The group arrived in Abéché on 24 October 2025 and continued to OBC and then to the temporary northern boma following nearly 24 hours of combined air and ground transport. The addax were placed in the boma on the morning of 25 October 2025 and released into the wild on 4 November 2025. The animals were therefore held in pre-release for 11 days, all of them at the boma. This short acclimatisation period was necessitated by the unforeseen deterioration of vegetation within the boma following the presence of Group 6. It remains to be seen if this very short period of acclimatisation has an impact on survivorship.

Early post-release observations
The releases of Groups 6 and 7 in the Ouadi Hawach region marked a significant operational shift in the addax reintroduction strategy, testing the feasibility of direct release into typical addax habitat rather than sub-desert habitat near OBC. Following release, the two groups behaved differently. We could speculate that a main difference might be related to age and sex structure. Group 7 seem to stay more closely together for longer, perhaps linked to the fact that half of them are young females less than 2 years old. In group 6, which has been scattering into smaller groups earlier (though remaining within a similar general area), 8 of the 9 females are older than 2 and, some have started calving, which is clearly associated with more independent social behaviour in oryx and addax. Group 6 moved northwards, crossing several major truck trails and remaining in areas of good grazing. Group 7 moved more to the west, also crossing major tracks, into an area lying between the eastern boundary of OROAFR and the western boundary of the adjacent Ennedi Natural and Cultural Reserve (ENCR), managed by African Parks. Vegetation there was moderately good.

Figure 3.
Group 6 Calf, 26 March 2026 © Marc Dethier

A milestone was reached in late March, when a monitoring mission documented the recent births of two addax calves within Group 6. These young had been conceived while the adults were still in the pre-release pens at OBC.

By early April, almost six months after release, Group 6 remained north of the release site near the north-western border of the reserve, approximately 90 km from the release point. Group 7 had moved further, approximately 140 km by early April, first westwards and then northwards to the border of ENCR. Both groups remained in suitable habitat, with conditions for Group 6 appearing slightly better. These initial observations are encouraging, indicating a willingness by the addax to remain in and explore desert habitats and, in the case of Group 6, to reproduce successfully.

Table 1. Summary of Addax Release Groups (2019–2025) (Source: T. Wacher)

Group	Arrival Date	Release Date	Males	Females	Total	Release Site
1	14/11/2019	18/01/2020	4	11	15	Oryx Base Camp[1]
2	06/03/2020	07/09/2020	8	17	25	Oryx Base Camp
3	16/11/2021	10/12/2021	8	17	25	Oryx Base Camp
4	08/03/2022	24/08/2022	8	17	25	Oryx Base Camp
5	14/11/2023	16/01/2024	8	17	25	Oryx Base Camp
6	23/02/2025	08/10/2025	6	9	15	Ouadi Hawach[2]
7	24/10/2025	04/11/2025	5	5	10	Ouadi Hawach[2]
Total			47	93	140	

[1] Initial release; [2] Northern release

Discussion and conclusion

Although still preliminary, the first results from the northern releases are promising. Earlier release groups remained largely associated with the base camp zone, suggesting that release in sub-desert habitat may have constrained wider recolonisation of the species' historical desert range. The 2025 releases suggest that direct release into suitable northern habitat is operationally feasible and may better align the animals' post-release movements with the ecology of the species. They also provide further evidence (alongside oryx births in pre-release) that catching and moving addax or oryx in first 3 months of pregnancy is feasible, and can be used to maximise genetic representation and improve cost efficiency when transporting founders, if planned in ex situ breeding programs contributing to future reintroduction.

At the same time, the approach entails substantial logistical, monitoring, and security demands. The reserve lies within a highly open landscape crossed by informal transport routes and used seasonally by pastoralists, and effective protection of released animals will remain central to the success of any future desert-based release strategy. Above all, longer-term monitoring will be needed to assess survival, reproduction, seasonal movements, and persistence as the hot dry season intensifies and shade temperatures exceed 45°C.

Figure 4. *Addax Group 6, Female & Calf, 26 March 2026 © Marc Dethier*

Dibatag sighting in the Somali Region of Ethiopia

Kenneth K. Coe

In January of 2026, I sought out the rare dibatag (*Ammodorcas clarkei*) in the Somali region of Ethiopia in an expedition led by Brook Kassa of Magic Land Tours, Hassan Yusuf Kaariye, a local naturalist, and Squack Evans, a professional safari guide. Recently, a few such expeditions had led to success, after the region, which had been a "no-go zone" due to insecurity, largely disarmed itself several years ago. This particular effort resulted in a couple of unobstructed and reasonably close views, seldom afforded to anyone by this species, but not without significant difficulty and exertion. From Jijiga, we travelled southeast to the village of Gurdumi (or "Gurdume" or "Gerdame"; 8.008747, 44.336556; elevation 1,035 m) where we set up camp and made twice daily walking forays onto the open rangelands south and southeast of the village. The terrain was flat, moderately dense bushland on red, sandy soil, reminiscent of denser parts of Tsavo East in Kenya. *Vachellia [Acacia]* (especially *V. tortilis*, *V. horrida*, *V. bussei*, and *V. nilotica*), *Senegelia* (especially *S. mellifera* and *S. senegal*), *Commiphora*, *Grewia*, and *Boscia* species were prominent in the landscape. The rains, which normally fall from April to September, had been scant, and the greater region was experiencing significant drought conditions. As a result, the Somali pastoralists were herding their livestock (mostly sheep and goats) further away from the wells at Gurdumi, the only source of water around.

Figure 1. *Female gerenuk. Note the duller pelage colour than is normal for this species and the distinctive darker dorsal area. Gurdumi, Ethiopia, January 2026 © Kenneth K. Coe*

While historical accounts describe the dibatag as being partial to open grass-covered plains with small shrubs as well as moderately dense bushland (Meester 1960), the dibatags in the vicinity of Gurdumi occur exclusively in the latter environment according to the locals. In fact, every area we canvassed could be described as such, with trees or bushes/shrubs generally separated from one another by about 2–8 m. Other antelope species of note in the area were gerenuk (*Litocranius walleri,* Figures 1 and 2) and three species of dik-dik— Salt's dik-dik of the Harar race (*Madoqua saltiana hararensis,* Figure 3), Günther's dik-dik (*M. guentheri*, Figure 4), and silver dik-dik (*M. piacentinii*, Figure 5).

Figure 2. *Male gerenuk, Gurdumi, Ethiopia, January 2026 © Kenneth K. Coe*

Figure 3. *Male Salt's dik-dik of the Harar race, Gurdumi, Ethiopia, January 2026 © Kenneth K. Coe*

Figure 4. *Female Günther's dik-dik, Gurdumi, Ethiopia, Jan 2026*
© Kenneth K. Coe

Figure 5. *Female silver dik-dik, Gurdumi, Ethiopia, Jan 2026 © Kenneth K. Coe*

Four full days of trekking involving approximately five to six hours of walking each day yielded no dibatag sightings, although signs of the animal were detected multiple times a day. Dibatag's legendary alertness and shyness were in full display, as the lead trackers were able to catch a few glimpses, only to have the animals quickly melt into the bush. It was apparent that the dibatag possesses superior senses of hearing and smell. Gerenuks, much more numerous in the area, were seen multiple times a day and provided several "false alarm" moments. Not only are Gerenuks and dibatags extremely similar in general appearance to begin with, but also the gerenuks in the region sport a noticeably duller pelage that resembles that of dibatags. Aside from the differently shaped horns (lyrate in the case of gerenuk; reedbuck-like in the case of dibatag) in the males, the most practical diagnostic features in the field were gerenuk's two-toned pelage (i.e., darker dorsal area) and dibatag's long, thick, furry, dark brown tail that extends nearly to the knees. The dik-diks provided a different kind of challenge. Abundant in the area, they would utter their alarm calls at our approach, alerting the already hyper-alert dibatags. On the afternoon of the final full day, we adjusted our strategy and with the help of a ladder climbed a tall *V. tortilis* tree located near an area with some dibatag tracks and *Boscia* bushes, which still had green leaves and thus were actively sought as forage. This method served to improve our field of vision as well as mitigate our scent dispersing at ground level. Finally, we were rewarded with a good but brief view of a male–female pair (cover photo and Figure 6). The next morning, the same strategy at the same location delivered a different male that froze for a brief moment and then trotted away after catching our scent (Figure 7).

Figure 6. *Female dibatag, Gurdumi, Ethiopia, January 2026 © Squack Evans*

This experience yielded a couple of things to ponder: the exact nature of the ecological separation between dibatag and gerenuk; and dibatag's "excessive" alertness and shyness. Despite historical accounts pointing to the dibatag sometimes being found in the open, at least in the Gurdumi area the dibatag appears to be restricted to bushland, if anything preferring slightly denser vegetation and sandier soil compared to the gerenuk. This may be one factor that explains the wider distribution of gerenuk, which is routinely found in relatively open areas and on stony as well as sandy soil throughout its range. The two species share many of the same food items, and according to Hassan Kaariye, the two share nearly identical food preferences during the dry season, seeking still-green foliage (e.g., leaves of *Boscia*) or fruits that are obtainable. It appears that whatever marginal ecological separation there is between the two species effectively disappears during the dry season. One is left to wonder if the gerenuk, larger, more populous, and seemingly more generalized, outcompetes the dibatag, especially in times of stress. Certainly, the gerenuk is capable of browsing at higher heights than the dibatag when both stand bipedally. Separately, the alertness and shyness of the dibatag were every bit as advertised. The animal is not hunted in the area and routinely encounters pastoralists on foot. But unlike most other antelopes of bushland that face little pressure other than from natural predators, the dibatag rarely freezes upon visual detection, and if it does, it is likely to flee momentarily and without stopping. There is an obvious physiological cost to being unnecessarily wary, and dibatag's amplified anti-predatory behaviour is mystifying.

Figure 7. *Male dibatag, Gurdumi, Ethiopia, January 2026 (© Kenneth K. Coe)*

According to Hassan Kaaryie, suitable dibatag habitat is still intact in much of southern Ogaden and parts of Somalia, although the species may have been extirpated in Somalia due to poaching. The current population estimates, based not on actual broad counts but on extrapolations, land somewhere in the low thousands (Wilhelmi 2013). The entire range of dibatag is under no formal protection, and the species' survival appears to be largely dependent on its resilience to competition from livestock.

References

Meester, J. 1960. The Dibatag, *Ammodorcas clarkei* (Thos.) in Somalia. *Annals of the Transvaal Museum* 24: 53–60.

Wilhelmi, F. K. 2013. *Ammodorcas clarkei* Dibatag (Clarke's gazelle). In: J. S. Kingdon and M. Hoffmann (eds). *Mammals of Africa, Volume VI: Pigs, Hippopotamuses, Chevrotain, Giraffes, Deer and Bovids*, pp 388–390. Bloomsbury Publishing, London, U.K.

Genetic distinction between the Western and Eastern Giant Eland

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The giant eland (*Tragelaphus derbianus*) is one of the largest antelopes in the world and it is distributed in western and central Africa. Two subspecies, Western giant eland (WGE; *T. d. derbianus*) and Eastern giant eland (EGE; *T. d. gigas*) are generally distinguished (East 1999; Planton & Michaux 2013; Frost 2014; Castelló 2016; IUCN SSC Antelope Specialist Group 2017a). The WGE is considered Critically Endangered (IUCN SSC Antelope Specialist Group 2017b) and restricted to three populations in Senegal (Antelope Conservation 2024). The last remaining wild population with the estimated size of less than 500 animals (Stehlíková, 2023) resides in Niokolo Koba National Park, while the two semi-captive populations established in Bandia and Fathala reserves total 175 individuals (Antelope Conservation 2024). The EGE is attributed the status Vulnerable (IUCN SSC Antelope Specialist Group 2017c), and it is found in Cameroon, Central African Republic, Chad, South Sudan (Planton & Michaux 2013; IUCN SSC Antelope Specialist Group 2017c). A census of the EGE has not been conducted, but the total number of wild animals is expected to be at most 8,000-9,000 mature individuals (IUCN SSC Antelope Specialist Group 2017c). Unlike the Western subspecies, a captive population of the EGE has been established (McCaffree, 2011).

Figure 1. *Western giant eland, Bandia Reserve, Senegal © Antelope Conservation*

While several studies on the genetics of the WGE population have been conducted (Zemanová et al. 2015; Kubátová et al. 2020), no molecular analyses have been performed on the EGE population. Our aim was to use microsatellite data to assess the distinctiveness of the EGE in relation to the Western subspecies and evaluate its genetic diversity. We analysed a total of 19 EGE samples, collected from both wild and zoo animals, in the form of tissue and hair. These comprised

8 hair samples from captive animals (2 from the Los Angeles Zoo, 6 from White Oak Conservation), 9 tissue samples from the wild (6 from Cameroon, 3 from Chinko Nature Reserve in Central African Republic; CAR), and 2 museum samples (1 from Prague National Museum, 1 from Berlin Naturkunde Museum) (details in Table 1).

Figure 2. *Eastern giant eland © Arthur Laboureur*

The samples were genotyped at 10 microsatellite loci, and genetic clustering was assessed in STRUCTURE 2.3.4. (Pritchard et al. 2000) and GenAlEx 6.503 (Peakall & Smouse 2006; 2012), using a comparative dataset of 82 WGE from Bandia and Fathala reserves. EGE samples were analysed using the DNeasy Blood & Tissue kit (QIAGEN), following the manufacturers' protocol. Descriptive parameters of nuclear diversity were computed using GenAlEx 6.503 (Peakall & Smouse 2006; 2012) and Genetix 4.05 (Belkhir et al. 1996-2004).

Amplification was successful in 17 EGE samples (89.5%). The distinction of the EGE from the WGE is clear from both the PCoA and STRUCTURE analyses. The highest supported number of clusters in STRUCTURE was 2, with one cluster comprising all WGE samples and the other all EGE (Figure 3). The Principal Coordinates Analysis (Figure 4) confirmed the distinction of the two subspecies and further differentiated the captive from wild EGE. The genetic distinction of the two subspecies is consistent with their non-overlapping distribution. Despite the lack of detailed information on the historical occurrence of the giant eland, Ghana is considered to have been the easternmost recent location of the WGE. The westernmost point of recent EGE occurrence has been reported in eastern Nigeria on the other side of the Dahomey gap (East 1999), and the lack of recent opportunity for contact and mating between the taxa is likely responsible for their genetic distinction. The differentiation of the wild and captive EGE populations may have been

caused by the fact that the wild population of origin of the captive animals was not sampled or by a human-induced founder effect during the establishment of the zoo population.

Table 1: Information on EGE samples and their estimated origin.

Sample	Collection Site	Estimated Origin	Sample Type
G1	Berlin Naturkunde Museum	unknown	tissue
G2	Prague National Museum (archive Radonice)	unknown	tissue
G3	Los Angeles Zoo	CAR	hair
G4	Los Angeles Zoo	CAR	hair
G5	White Oak Conservation	CAR	hair
G6	White Oak Conservation	CAR	hair
G7	White Oak Conservation	CAR	hair
G8	White Oak Conservation	CAR	hair
G9	White Oak Conservation	CAR	hair
G10	White Oak Conservation	CAR	hair
G11	Cameroon	Cameroon	tissue
G12	Cameroon	Cameroon	tissue
G13	Cameroon	Cameroon	tissue
G14	Cameroon	Cameroon	tissue
G15	Cameroon	Cameroon	tissue
G16	Cameroon	Cameroon	tissue
G17	Chinko Nature Reserve	CAR	tissue
G18	Chinko Nature Reserve	CAR	tissue
G19	Chinko Nature Reserve	CAR	tissue

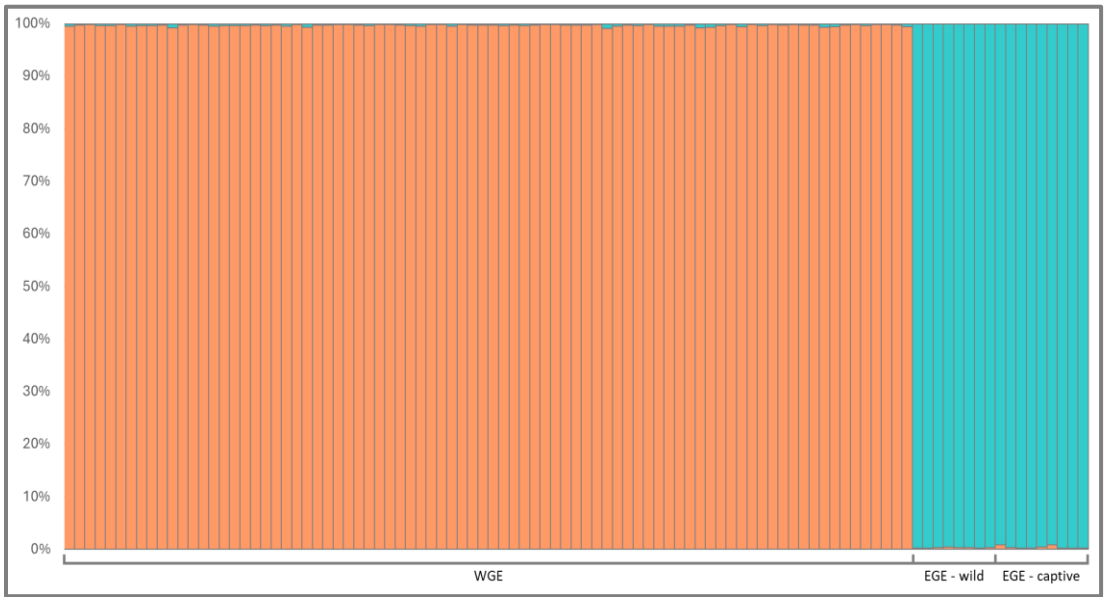

Figure 3. STRUCTURE results at K=2. Each column represents one individual, and the different populations are marked below the graph. The two clusters are differentiated by the different colours.

Both the wild and captive EGE displayed limited genetic diversity, which is apparent from the low number of alleles and moderate level of heterozygosity. The values are higher in the wild population than the captive one. Both populations showed a negative inbreeding coefficient. See Table 2 for an overview of the genetic parameters.

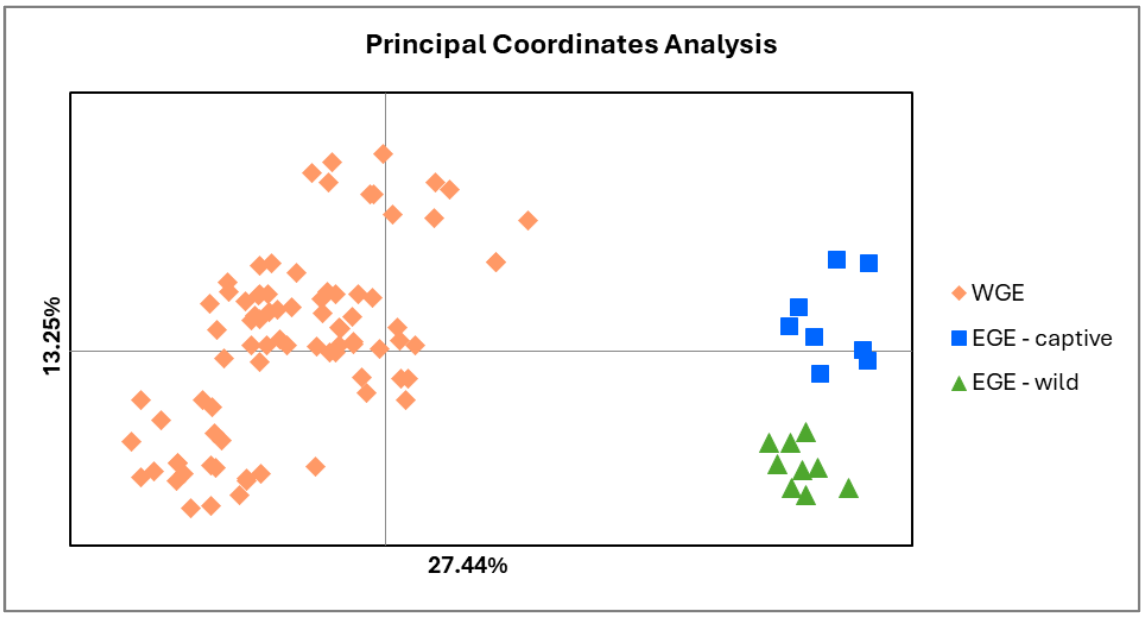

Figure 4. Results of Principal Coordinates Analysis, where each individual is represented by one symbol, and the different populations are designated by different colours.

The founder effect could have reduced the genetic diversity in the captive EGE population. On the contrary, the comparatively higher genetic diversity in the wild population may have been caused by the fact that the samples were collected from a geographically wide area. The extent of the sample collection area could equally serve as an explanation for the low inbreeding coefficient observed in the wild population, whereas the values found in the captive population might be linked to the efficiency of management in preventing mating between related animals.

Table 2. Descriptive genetic parameters of the EGE wild and captive population (n = number of samples, Na = number of alleles, Ne = effective number of alleles, Ho = observed heterozygosity, He = expected heterozygosity, Fis = inbreeding coefficient). Note that that due to the limited number of samples the estimated values should be considered with caution.

	n	Na	Ne	Ho	He	Fis
EGE – wild	9	3.400	2.518	0.567	0.499	−0.26977
EGE – captive	8	2.200	1.746	0.488	0.366	−0.07794

Although these results provide an insight into the genetics of the EGE, they should be interpreted with caution as they are based on a very limited number of samples and loci, and they cannot be considered representative of the subspecies in a wider context. A more thorough sampling effort and the use of markers that cover a larger proportion of the genome would provide a deeper understanding of the EGE genetics and should thus be applied in future research.

References

Belkhir, K., Borsa, P., Chikhi, L., Raufaste, N., Bonhomme, F. 1996-2004. GENETIX 4.05, logiciel sous Windows TM pour la génétique des populations. Laboratoire Génome, Populations, Interactions, Université de Montpellier II, Montpellier.

Castelló, J.R. 2016. *Bovids of the World: Antelopes, Gazelles, Cattle, Goats, Sheep, and Relatives*. Princeton University Press, Princeton.

Derbianus Conservation. 2022. Annual Report 2022. Derbianus Conservation, Prague.

East, R. 1999. *African Antelope Database 1998*. International Union for Conservation of Nature and Natural Resources, Gland and Cambridge.

Frost, W. 2014. *The Antelope of Africa*. Jacana Media, Johannesburg.

IUCN SSC Antelope Specialist Group. 2017a. Giant Eland – *Tragelaphus derbianus*. Available from https://www.iucnredlist.org/species/44172/50197518 (accessed September 2024).

IUCN SSC Antelope Specialist Group. 2017b. Western Giant Eland – *Tragelaphus derbianus* ssp. *derbianus*. Available from https://www.iucnredlist.org/species/22056/50197188 (accessed September 2024).

IUCN SSC Antelope Specialist Group. 2017c. Eastern Giant Eland – *Tragelaphus derbianus* ssp. *gigas*. Available from https://www.iucnredlist.org/species/22059/50197308 (accessed September 2024).

Kubátová, A., Štochlová, K., Brandlová, K., Jůnková Vymyslická, P., Černá Bolfíková, B. 2020. Comparison of divergent breeding management strategies in two species of semi-captive eland in Senegal. *Scientific Reports* 10: 8841.

McCafree, L. 2011. Eastern giant eland (*Tragelaphus derbianus gigas*) International Studbook. San Diego Zoo and Safari Park. Volume XII.

Peakall, R., Smouse P.E. 2006. GenAlEx 6: genetic analysis in Excel. Population genetic software for teaching and research. *Molecular Ecology Notes* 6: 288-295.

Peakall, R., Smouse, P.E. 2012. GenAlEx 6.5: genetic analysis in Excel. Population genetic software for teaching and research-an update. *Bioinformatics* 28: 2537-2539.

Planton, H.P., Michaux, I.G. 2013. *Tragelaphus derbianus* Giant Eland (Lord Derby's Eland). Pages 186-190 in Kingdon, J., Hoffmann, M., eds. *Mammals of Africa Volume VI: Hippopotamuses, Pigs, Deer, Giraffe, and Bovids*. Bloomsbury, London.

Pritchard, J.K., Stephens, M., Donnelly, P. 2000. Inference of population structure using multilocus genotype data. *Genetics* 155: 945-959.

Stehlíková, K. 2023. Population structure of critically endangered Western Derby eland in the Niokolo Koba National Park, Senegal. MSc Thesis. Czech University of Life Sciences, Prague.

Zemanová, H., Černá Bolfíková, B., Brandlová, K., Hejcmanová, P., Hulva, P. 2015. Conservation genetics of the Western Derby eland (*Taurotragus derbianus derbianus*) in Senegal: Integration of pedigree and microsatellite data. *Mammalian Biology* 80: 328-332.

Slender-horned Gazelle recovery in Tunisia: Project update from Marwell Wildlife

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The slender-horned gazelle, *Gazella leptoceros,* is an Endangered species adapted to arid desert environments of North Africa. Historically found across Algeria, Tunisia, Libya, and Egypt, the species has undergone a substantial decline due to poaching, habitat degradation, and disturbance. In Tunisia, recent surveys identified very few individuals in the Grand Erg Oriental and highlighted the urgent need for conservation action to halt its decline (Meliane et al. 2023).

Marwell Wildlife, in partnership with the Direction Générale des Forêts (Ministry of Agriculture, Water Resources and Sea Fisheries, Tunisia) and the Commissariats Régionaux au Développement Agricole of Medenine and Sfax, continues to support efforts to secure its survival through improved management of *ex situ* populations. This work contributes to regional and national conservation frameworks, including the CMS Concerted Action for Sahelo-Saharan Megafauna, the Slender-horned Gazelle Conservation Strategy 2020–2029, Tunisia's National Strategy for the Conservation and Restoration of Sahel-Saharan Antelopes and their Habitats, the National Biodiversity Strategy and Action Plan 2018-2030, as well as the national strategy for forests and rangelands sustainable development (SNDDFP 2025-2050), and the 2026 *Declaration of Tozeur*, through which 14 partners committed to accelerating coordinated recovery action for *G. leptoceros* across North Africa.

The *ex situ* population in Tunisia represents a vital component of global conservation efforts for the species. As of June 2026, 24 individuals (12.12) are held in Sidi Toui National Park (NP), supplemented by a smaller group of six individuals (4.2) at El Gonna National Reserve (NR). Despite the strong commitment and dedication of all partners involved, the 2025–2026 breeding season did not result in any surviving calves. Although this outcome represents a setback, it has also highlighted important gaps in husbandry and veterinary management, while providing valuable lessons to inform future population management. Considerable progress has since been made through the establishment of a multidisciplinary network of animal managers, veterinarians, nutritionists and conservation specialists, enabling the rapid identification of mortality factors and the implementation of targeted mitigation measures.

Consequently, the population remains stable relative to previous years, while the knowledge, skills and management systems required to support successful breeding have been substantially

strengthened. These advances provide a solid foundation for improving reproductive success in future breeding seasons.

Between 2024 and 2026, the project also advanced across infrastructure development, animal management and capacity building. At Sidi Toui NP, four breeding enclosures and one bachelor enclosure were constructed in 2024, followed by a further two enclosures in 2025, bringing the total number of 15 × 20m units to seven. Each unit is equipped with a water network and visual screening to reduce aggression between males. At El Gonna NR, four of the eight existing enclosures were divided, increasing the total number of units to twelve. In 2026, new doors were installed to facilitate the movement of individuals between enclosures, and two additional enclosures were constructed to create space for further breeding groups.

***Figure 1**. Restraint of Slender-horned Gazelle to carry out individual health assessment and microchipping, El Gonna National Reserve, October 2024 © Marwell Wildlife*

Alongside these infrastructure improvements, the project has strengthened professional links between Sidi Toui NP and El Gonna NR through joint training and exchange visits, helping to build a coordinated network of practitioners engaged in gazelle conservation in Tunisia, in line with the commitments expressed in the *Declaration of Tozeur*. Marwell Wildlife teams have delivered practical training in animal management, veterinary care and health monitoring. Working alongside Tunisian colleagues, including state veterinarians from the National Centre for Animal Health Monitoring (CNVZ) and private practitioners Dr Aya Handous, Dr Mawaked Hannachi and Dr Fetah Souayah, the teams conducted individual health assessments, tagging and microchipping of all gazelles, and collected biological samples for future genetic analysis to inform population management planning. The active involvement of Tunisian veterinarians and field personnel has been central to building the long-term national capacity required for recovery of the species.

Looking ahead, priorities for 2026–2027 include completing and maintaining enclosures at both sites, continuing training for park guards and veterinarians, developing a formal population management plan, and undertaking further assessment of potential reintroduction sites in Jbil and Senghar-Jabbes National Parks.

Marwell Wildlife is grateful for the continued collaboration with the Direction Générale des Forêts, the CRDA of Medenine, Sfax, Tataouine and Kebili, and support of our institutional partners including Planckendael Zoo, Fossil Rim Wildlife Center, Partnership For Species, the CNVZ, Institut de la Recherche Vétérinaire de Tunisie, Dublin Zoo, Parco Faunistico Le Cornelle, Wrocław Zoo Foundation DODO, Wrocław Zoo, Branféré Parc Animalier et Botanique, and Artis Amsterdam Royal Zoo. This collective effort provides a foundation for the eventual restoration of *Gazella leptoceros* throughout its indigenous range.

Figure 2*. Keeper in his new daily routine at Sidi Toui National Park, November 2025 © Marwell Wildlife*

Figure 3. *Group of Slender-horned gazelle, Sidi Toui National Park, July 2024 © Marwell Wildlife*

Antelope News

CITES appendix changes

The CITES CoP 20 took place in Samarkand, Uzbekistan in December 2025. Three proposals relating to listing of antelopes on the Appendices were adopted.

Bontebok *Damaliscus pygargus pygargus*. Removed from Appendix II

Proposed by South Africa. Bontebok no longer meets the criteria for inclusion on Appendix II since it is not threatened by trade. As the result of dedicated efforts by local farmers, the private wildlife industry, and conservation authorities, as well as a CITES Appendix I listing in 1975 (transferred to Appendix II in 1981), bontebok has made a remarkable recovery. Numbers have increased from ca. 17 individuals in the 1930s to an estimated 9,819-11,069 today. However, fewer than 2,500 bontebok remain within the subspecies' natural and extended natural range in the Western Cape, where habitat loss, fragmentation, and limited renosterveld and grassy fynbos patches constrain population growth. Over 70% of the population now occurs outside this range, in Eastern Cape, Free State, and Northern Cape provinces, primarily on private land. Regulation of trade is no longer needed to avoid the bontebok from becoming eligible for Appendix I in the near future, nor is regulation of trade required to ensure that the harvest of wild specimens is not reducing the population to a level at which its survival might be threatened. Bontebok are managed through a mix of private and government initiatives under national legislation and a Biodiversity Management Plan. Key measures such as translocation and genetic monitoring are being implemented, and hybridization addressed through provincial and industry protocols requiring individual DNA profiles, using verified microsatellite markers, before any animals are moved or exported as a hunting trophy. Legal offtakes, including trophy hunting and live sales, are regulated and generate conservation incentives for private landowners.

Dorcas gazelle *Gazella dorcas* Added to Appendix II.

Proposed by Benin, Burkina Faso, Mali, Mauritania, Niger, Nigeria, Senegal, Sudan and Tunisia. National and international illegal trade for live animals and parts like horns, meat, skin, occurs in many countries. Legal international trade occurs with parts and live animals from captive breeding facilities and wild caught animals. Live animals represent 94.8% of all exports. The species was included in CITES Appendix III by Tunisia in 1976.

Saiga *Saiga tatarica*. A zero export quota for wild specimens traded for commercial purposes, except for specimens from the population of *Saiga tatarica* of Kazakhstan under the following conditions:

a) Trade only in government-owned whole horns, originating in Kazakhstan, stockpiled and marked in accordance with traceability requirements developed by Kazakhstan;

b) Prior verification by the Secretariat and Kazakhstan, in consultation with the Standing Committee through its Chair, that sufficient control mechanisms and traceability systems are already in place in Kazakhstan and trade partners;

c) Kazakhstan supervises the first shipment to each new trading partner to ensure the marking and traceability systems are in place and working adequately; and

d) Limited to a total amount of 30 tons until CoP21, to be reviewed in order to determine a potential for further trade based on a revised proposal.

On a proposal from the Secretariat, the Standing Committee can decide to cause this trade to cease partially or completely in the event of non-compliance by exporting or importing countries, or in the case of proven detrimental impacts of the trade on the saiga population.

Source: https://cites.org/eng/app/appendices.php

Sahel-Sahara Interest Group (SSIG) meeting 2026

The 25th SSIG meeting took place in in Cairo, on 4-6 May 2026 and was organised by Sahara Conservation in partnership with the Arab Network for Environment and Development (RAED). Almost 70 participants from 15 countries took part in the three days of discussions, presentations exchanges and collaboration dedicated to the conservation of the Sahel and Sahara regions. Participants comprised researchers, conservation practitioners, government representatives, NGOs, zoological institutions and international organisations.

Among the 34 presentations were several on dama gazelle, dorcas, gazelle, slender-horned gazelle, and the reintroduction of addax and scimitar-horned oryx to Chad. A side-session was held to gather updates on the current status of the critically endangered dama gazelle.

During the meeting, former ASG Co-Chairs Philippe Chardonnet and David Mallon, and members Tim Wacher and Marie Petretto, were among six people presented with the *Wadis and Dunes Excellence Award* in recognition of their commitment and expertise to the conservation of the Sahel and Sahara.

Source: https://saharaconservation.org/news/ssig-2026-in-cairo-celebrating-25-years-of-collaboration-for-sahel-sahara-conservation/

Mountain Bongo transferred to Kenya

On 29 April 2026 four critically endangered male mountain bongos originating from several zoos in Europe arrived in Kenya from the Czech Republic. The male bongos were welcomed at Nairobi's main airport by Kenya's foreign and tourism ministers, along with other officials before being transported to the Mount Kenya Wildlife Conservancy (MKWC). The transfer was led by experts from England's Chester Zoo in collaboration with the Kenya Wildlife Service (KWS) and the European Association of Zoos and Aquariums. The four bongos, Fitz, Maue, Kudu and Bon64, had been held in a quarantine facility in the Czech Republic before the flight back home. Two wildlife officers from MKWC spent two weeks in the Czech Republic, learning the animals' routines, earning their trust, and studying each individual.

The four male bongos will play an important role in strengthening the gene pool of the captive breeding herd at MKWC whose existing population numbers 102 mountain bongos.
Sources: *https://www.bbc.co.uk/news/articles/c202l3gzvp7o*
https://www.theguardian.com/environment/2026/may/24/bringing-the-boys-back-home-how-mountain-bongos-maue-fitz-kudu-and-bon64-made-their-way-back-to-kenya

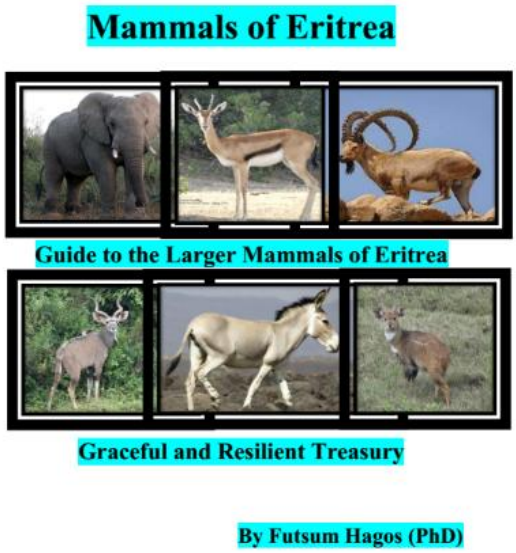
Dryland Antelopes Conservation Initiative (DACI): Puntland State of Somalia

DACI is a new, species-led conservation programme designed to address critical knowledge gaps surrounding threatened antelope species inhabiting Somalia's arid and semi-arid ecosystems. The initiative operates through a modular architecture in which individual field projects focus on priority species such as Speke's gazelle, Beira, Dibatag, and Silver dik-dik, while simultaneously documenting other sympatric wildlife across their respective habitats. Each module will generate baseline ecological data on species presence, habitat condition, and emerging threats through rapid field assessments combined with structured Local Ecological Knowledge (LEK) from indigenous & pastoralist communities. Together, these modules are designed to contribute to a national evidence base for dryland ungulate conservation while laying the groundwork for future community-based conservation initiatives and landscape-level wildlife management strategies. The initiative will be implemented by the Species Saviour Initiative (SSI), led by Abdirasak Ibrahim, in collaboration with national authorities, pastoralist communities, and international technical partners including the IUCN SSC Antelope Specialist Group. An initial set of surveys targeted at Speke's gazelle will take place in mid-2026.

Horn of Africa Antelope Survey reports

Results of Phase 2 of this survey *Northern Kenya*, by Tom Butynski and Yvonne de Jongh, has now been published. It complements Phase One *Northeast Kenya*. Phase Three of the survey, on the antelopes of Northwest Kenya, is currently being conducted.
The reports are available from Wildsolutions:
https://www.wildsolutions.nl/publications/publications/

Guide to the larger mammals of Eritrea



ASG member Futsum Hagos is producing a field guide to the larger mammals of Eritrea. This will be the first publication in the history of the country. It is intended to aid understanding of the wildlife and associated habitats, and assist citizens as well as visitors to identify the larger mammal species found in the country. There is little recent literature on wildlife and habitats of Eritrea so the information contained can serve as a baseline reference. The account of each species included in the book will include a diagnostic description, behaviour, reproduction, habitat, diet, range (global and national), supplemented a photo of the species and distribution maps. The guidebook is based on the author's 25 years of work experience (1996-2021) on wildlife conservation of the state of Eritrea. If anyone can suggest possible sources of funding to cover the costs of printing of hard copies, please contact Futsum Hagos at: *fuhageb@gmail.com*

Global Initiative on Ungulate Migrations (GIUM)

Maps of the migratory routes of all three subspecies of saiga (*Sagia tatarica*) have now been added to the interactive Atlas of Ungulate Migration. They join maps of several other antelope species.
Available at: https://www.cms.int/gium

Attack on Upemba National Park

On March 3 2026, a group of armed militants attacked the headquarters of Upemba N.P. in the southern Democratic Republic of Congo. Tragically, seven people were killed and the park HQ was severely damaged. Upemba is home to the only population of the Critically Endangered Upemba lechwe *Kobus leche anselli*.

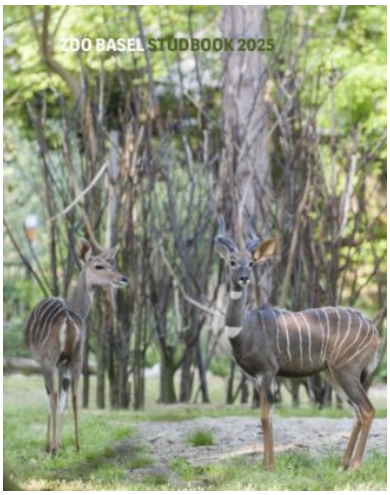
Source: https://news.mongabay.com/2026/03/upemba-national-park-staff-recount-assault-that-left-seven-dead/

Bluebuck to be ‘de-extincted’

Colossal Biosciences has announced plans to bring back the bluebuck *Hippotragus leucophaeus*, which became extinct by the start of the 19th century. The company used samples from a specimen at the Swedish Museum of Natural History to decode its genetic make-up and identify DNA that distinguishes it from other antelopes. The team involved has created roan antelope stem cells which can be used to plug in the new DNA and grow into tissue. The roan stem cells can also be programmed to become sperm and egg cells. The bluebuck DNA will be transferred into the roan sperm and eggs, which can then be fertilised, and the resulting embryo transferred to a roan surrogate mother.

Source: *https://www.telegraph.co.uk/news/2026/04/30/bluebuck-antelope-extinction-jurassic-park-technology/*

Lesser kudu European Studbook



The latest edition of the lesser kudu European studbook was published in January 2026 by Zoo Basel. On 31 December 2025, there were records of 80 (28.52) lesser kudus kept in 11 EEP (EAZA Ex situ Programme) in member institutions. A genetic and demographic analysis has been performed and a new EAZA species committee elected.

Available from: Zoo Basel, the European studbook keeper (Beatrice.Steck@zoobasel.ch)

Scimitar-horned Oryx International Studbook

The 20th edition of the Scimitar-horned oryx International Studbook report was published by Marwell Wildlife in May 2026. This publication contains demographic and genetic information to inform holders of scimitar-horned oryx about the general status of the global *ex situ* population. Of those that we are able to keep track of, the population remains stable providing information on the global *ex situ* population. As of 31 December 2025, the living population was 3331 (1435.1784.112) animals in 181 institutions across the world.

Available from: *Marwell Wildlife*

Recently Published Articles

Genetic diversity and demographic history of the largest remaining migratory population of brindled wildebeest (*Connochaetes taurinus taurinus*) in southern Africa

Szarmach, S.J., Teeter, K.C., M'soka, J., Dröge, E., Ndakala, H., Chifunte, C., et al. (2025). *PLoS One* 20(4), e0310580.

Abstract

The blue wildebeest (*Connochaetes taurinus*) is a keystone species in the savannahs of southern Africa, where it maintains shortgrass plains and serves as an important prey source for large carnivores. Despite being the second-largest migratory wildebeest population, the brindled wildebeest (*C. t. taurinus*) of the Greater Liuwa Ecosystem (GLE) of western Zambia have remained largely unstudied, until recently. While studies have increased understanding of recent demography, migration, and population limiting factors, the level of genetic diversity, patterns of gene flow, and long-term demographic history of brindled wildebeest in the GLE remains unknown. Most genetic studies of wildebeest have focused on small, heavily-managed populations, rather than large, migratory populations of high conservation significance. We used restriction-site associated DNA sequencing (RAD-seq) to assess genetic diversity, population structure, and demographic history of brindled wildebeest in the GLE. Using SNPs from 1,730 loci genotyped across 75 individuals, we found moderate levels of genetic diversity in GLE brindled wildebeest (He = 0.210), very low levels of inbreeding (FIS = 0.033), and an effective population size of about one tenth the estimated population size. No genetic population structure was evident within the GLE. Analyses of the site frequency spectrum found signatures of expansion during the Middle Pleistocene followed by population decline in the Late Pleistocene and early Holocene, a pattern previously observed in other African ungulates. These results will supplement field studies in developing effective conservation plans for wildebeest as they face continued and increasing threats of habitat loss, poaching, and other human impacts across their remaining range.

Predicting the impact of targeted fence removal on connectivity in a migratory ecosystem

Schwandner, I.A., Morrison, T.A., Hopcraft, G.C., Wall, J., Hughey, L., Boone, R.B., Ogutu, J.O., et al. (2025). *Ecological Applications* 35(1), e3094.

Abstract

Fencing is one of the most widely utilized tools for reducing human-wildlife conflict in agricultural landscapes. However, the increasing global footprint of fencing exceeds millions of kilometers and has unintended consequences for wildlife, including habitat fragmentation, movement restriction, entanglement, and mortality. Here, we present a novel and quantitative approach to prioritize fence removal within historic migratory pathways of white-bearded wildebeest (*Connochaetes taurinus*) across Kenya's Greater Masai Mara Ecosystem. Our approach first assesses historic and contemporary landscape connectivity of wildebeest between seasonal ranges by incorporating two sets of GPS tracking data and fine-scale fencing data. We then predict connectivity gains from simulated fence removal and evaluate the impact of different corridor widths and locations on connectivity and removal costs derived from locally implemented interventions. Within the study system, we found that modest levels of fence removal resulted in

substantial connectivity gains (39%–54% improvement in connectivity for 15–140 km of fence line removed). By identifying the most suitable corridor site, we show that strategically placed narrow corridors outperform larger, more expensive interventions. Our results demonstrate how and where targeted fence removal can enhance connectivity for wildlife. Our framework can aid in identifying suitable and cost-effective corridor restoration sites to guide decision-makers on the removal of fences and other linear barriers. Our approach is transferable to other landscapes where the removal or modification of fences or similar barriers is a feasible mitigation strategy to restore habitat and migratory connectivity.

Unveiling the hidden threat: Diversity of ticks infesting the Critically Endangered Mountain Bongo in Kenya

King'ori, E.M., Chiyo, P.I. and Behangana, M. (2025).
African Journal of Ecology 63(8), e70129

Abstract

The mountain bongo (*Tragelaphus eurycerus isaaci*) is a critically endangered antelope native to the montane forests of Kenya. Population recovery efforts through breeding programs have been hampered by mortality from tick-borne diseases and yet the tick fauna of this species is poorly known. To document ticks infesting the mountain bongo, 18 animals from Mount Kenya Wildlife Conservancy were examined for ticks. All mountain bongos had ticks with a mean abundance (±SE) of 12.06 ± 1.9. A total of 217 ticks representing nine species from three genera (*Rhipicephalus, Ixodes* and *Haemaphysalis*) were collected. The species found in the highest proportion of hosts were *Rhipicephalus appendiculatus* (77.78%), *Haemaphysalis aciculifer* (72.22%) and *Ixodes nairobiensis* (33.33%). Analyses of diversity indices revealed high tick diversity in the mountain bongo population (Hill-Shannon diversity index = 6.41; Hill-Simpson diversity = 5.55; Simpson Dominance index, D = 0.18). Compared to related antelope species and livestock, the mountain bongo's tick community is both diverse and equitably distributed among species. This research marks the first comprehensive documentation of tick species infesting the mountain bongo and provides baseline data on its tick fauna. Results underscore the need for veterinary interventions, to mitigate health risks from tick-borne pathogens and enhance bongo conservation.

Home range dynamics and habitat preferences of sable antelope in a recovering post-war population

Mangueze, A.d.N., Mamugy, F. P. S., Briers-Louw, W. and Macandza, V.A. (2026).
African Journal of Ecology 64(1), e70140.

Abstract

Large herbivore spatial ecology is shaped by the spatio-temporal heterogeneity of biotic and abiotic factors. This study investigated space use and habitat selection of sable antelope (*Hippotragus niger*) in the Marromeu Complex of central Mozambique, which supports one of the largest populations in Africa. Telemetry-based data were collected from three adult females over 3 years (2018–2020) to estimate annual and seasonal variations in home range size and habitat use. Annual home ranges were small (11–20 km2), representing some of the smallest recorded sizes across Africa to date, which is likely explained by the high population density and resource availability. While no distinct seasonal differences were recorded in home range sizes, home range overlap was smaller during the dry season, suggesting a more patchy distribution of resource availability. Habitat use varied across years and seasons, with sable antelope generally showing a

preference for grassland, flooded grassland and shrubland vegetation. These patterns demonstrate the value of incorporating spatio-temporal variability into better understanding species movement ecology, which may contribute toward species-specific conservation strategies. This study also provides important insights into the spatial dynamics of a recovering, post-war sable antelope population, which is of both national and international importance.

Ecological niche modeling for determining grass species suitable for Hirola range-wide restoration and reintroduction in eastern Kenya

Ali, A.H., & Muriuki, G.M. (2025). *Restoration Ecology* e70284.

Abstract

Introduction: Reintroduction of species into their historical ranges requires careful planning to avoid re-exposing populations to conditions that previously led to extirpation. In such contexts, species distribution models offer valuable tools for predicting the suitability of habitats under current and future conditions, allowing for more informed and climate-resilient restoration planning. One such case is the critically endangered Hirola antelope, which has experienced a 95% population decline driven by habitat loss.

Objectives: We (1) assessed the current and future habitat suitability of key native grass species (2) identified ecologically distinct species groups based on environmental preferences, and (3) prioritized grass species for restoration under future climate scenarios.

Methods: We modeled species distributions using MaxEnt v3.4.3 via the ENMeval R package and grouped them by environmental niche characteristics using principal component analysis and hierarchical clustering. We then generated future projections under two general circulation models (BCC-CSM2-MR and MIROC6), two Shared Socioeconomic Pathways (SSP2-4.5 and SSP5-8.5), and two time-horizons (2050 and 2070).

Results: Key drivers of distribution included temperature seasonality, solar radiation, and soil organic carbon. Clustering revealed three ecological guilds: drought-tolerant, high-fertility, and alkaline/wind-adapted species. Projected future suitability varied widely: some species (e.g. *Chloris roxburghiana*, *Eragrostis superba*, and *Aristida adscensionis*) exhibited major habitat expansion, while others (e.g. *Panicum maximum* and *Digitaria rivae*) were projected to lose 90–100% of suitable area.

Conclusions: We recommend *C. roxburghiana*, *E. superba*, and *Cenchrus ciliaris* as restoration priorities based on their current habitat suitability, projected future stability, and ecological adaptability.

Drivers of Hirola Antelope diet selection in natural and managed habitat in Eastern Kenya

Ali, A.H., & Kivai, S. (2026). *Ecology and Evolution* 16(1), e72980.

Abstract

Diet selection, referring to the food that is ingested by an animal along with its nutritional composition, is essential for animal fitness, survival and behavior. The hirola (*Beatragus hunteri*), with ~500 individuals remaining, is classified as Critically Endangered by IUCN and with range degradation from tree encroachment implicated in their decline. For effective hirola recovery, there

has to be a clear understanding of habitat-specific forage quality, prior to planned re-introduction efforts from managed into natural habitats. We studied populations in natural and managed breeding habitat in eastern Kenya to assess the dietary selection of hirola. Hirola consumed a total of 17 species with *Chloris virgata* being the most preferred grass, while *Commelina benghalensis* and *Commelina diffusa* were the most preferred forbs. *Cyperus kilimandscharicus* was the only moderately preferred sedge. We then analyzed nutrient content for 14 variables, including crude protein (CP), fiber fractions, in vitro dry matter digestibility (IVDMD), and key minerals. Forage in natural habitats was more closely associated with higher levels of phosphorus (P), magnesium (Mg), and IVDMD, while managed habitats were characterized by elevated sodium (Na), potassium (K), and CP levels. Seasonal differences were also detected, particularly in calcium (Ca) and Mg concentrations. Our results reveal substantial variation in plant chemical composition, forage quality and diversity between habitats, necessitating adaptive foraging strategies. Future habitat restoration programs should focus on monitoring and reseeding preferred forage species and the provisioning of supplementary diets with appropriate chemicals to support newly released herds or in the breeding facility.

Taxonomic and ecological characterization of the extinct Levantine hartebeest, *Alcelaphus buselaphus* (Pallas, 1766) (Bovidae: Alcelaphini)

Wolkowski, U., Horwitz, L.K., Di Crosta, G., Slon, V., Bar-Oz, G., Meiri, M., Marom, N. (2025). *Zoological Journal of the Linnean Society* 205(3), zlaf153

Abstract

The hartebeest (*Alcelaphus buselaphus*), once widespread across all of Africa and the Levant, was extirpated in Northern Africa in the early 20th century and from the Levant in the first millennium CE. To this day, the biogeographical origins of the Levantine hartebeest are poorly understood, as are the taxon-specific ecology and reason for its extirpation at the northern edge of its global range. The aim of this study was to fill this gap by generating the first high-coverage mitogenomes of Levantine and North African hartebeest, conducting phylogenetic analyses to determine their relationship to extant *Alcelaphus* subspecies, and estimating divergence times. Additionally, we have applied ecological niche models to assess climatic suitability of the southern Levant to hartebeest populations over time. Our findings confirm that Levantine hartebeest belonged to the North African Bubal (*A. b. buselaphus*) lineage. Furthermore, we suggest that human pressure, rather than climate change, drove their regional extinction in the Levant, as in North Africa. Ecological niche model projections indicate that reintroducing hartebeest to the Levant remains feasible under current and future climatic scenarios.

Cascading effects of anthropogenic excess food for predators on a peri-urban population of an Endangered ungulate

A. Arnon, T. Wronski, D. Malkinson, I. Izhaki and M. Davis (2025).
Animal Conservation 28, 686-698.

Abstract

A major side effect of urbanization is the increased availability of food for wildlife in peri-urban areas. Most research has focused on highly adaptive exploiter species that thrive under such conditions, overlooking avoider species, which are often predated upon by exploiters. Moreover, peri-urban areas are often grazed by livestock, mainly to reduce the frequency and intensity of fires, a practice that can also adversely affect vulnerable wildlife species. We examined the long-term effects of excess food provided to discourage exploiter species, namely golden jackal (*Canis*

aureus) and wild boar (*Sus scrofa*), from foraging on farmland and in human residencies. Both species prey on endangered mountain gazelles (*Gazella gazella*) in our peri-urban study area, which is nested within a mosaic of settlements and agricultural lands in Mediterranean Israel. Because the park is routinely subjected to seasonal cattle ranching, we included cattle stocking rate (mean ± SD: 51.77 ± 18.21 cow grazing days/ha) as an alternative factor, into our analysis. We used Generalized Linear Mixed Models to analyze an extensive dataset, comprising 724 surveys conducted over 17 years, and modeled gazelle encounter rates in response to excess food and cattle ranching, while controlling for environmental factors. Our results suggest that anthropogenic excess food through diversionary feeding led to decreasing gazelle densities, probably through increased predation by exploiter species. When diversionary feeding ceased after 12 years, gazelle encounter rates increased. We argue that this increase corresponds to population recovery, although it could be consistent with alternative mechanisms such as altered space-use and movement patterns. To conserve vulnerable and endangered wildlife species in urban and peri-urban areas, managers should reduce the availability of anthropogenic food for predators and scavengers. Furthermore, moderate cattle ranching (i.e., seasonal with low stocking rates) could mitigate potential adverse impacts of cattle ranching on mountain gazelle populations.

Exploring the complexity of community perceptions toward Przewalski's gazelle conservation

Ma, W., Liu, J., Fan, X., Liu, Y., Guo, H., & Xue, F. (2026). *Conservation Science and Practice*, e70266. https://doi.org/10.1111/csp2.70266

Abstract

Przewalski's gazelle (*Procapra przewalskii*) inhabits Qinghai Lake National Nature Reserve and surrounding areas, with extensive range overlap between gazelle habitats and pastoral grasslands intensifying human–wildlife interactions. Given that local communities are directly involved in multiple conservation actions for Przewalski's gazelle, it is essential to understand community perspectives in order to promote coexistence, while recognizing that the differences among groups can facilitate the design of more targeted intervention measures. We conducted a study in two communities exhibiting significant overlap with the distribution range of Przewalski's gazelle. There we investigated residents' perceptions, including cognition, attitude, and behavioral intention toward conservation using semi-structured interviews and questionnaires. Subsequently, we combined hierarchical clustering and k-means clustering to identify distinct cognition-attitude-intention combinations and explored their associations with residents' socio-demographic characteristics. Our results revealed four types of cognition–attitude–intention combinations among residents, which were respectively characterized by adequate cognition, supportive attitude, and positive intention (cluster 1); limited cognition, supportive attitude, and positive intention (cluster 2); adequate cognition, unsupportive attitude, and positive intention (cluster 3); and adequate cognition, supportive attitude, and negative intention (cluster 4). Cluster 1 had the highest proportion. Further analysis revealed that the level of conservation cognition was primarily correlated with direct exposure to Przewalski's gazelle. Livelihood dependence was associated with conservation attitudes, whereas economic incentives showed stronger links to behavioural intention, particularly among primary labourers within households. The influences exerted by religious belief, age, and educational attainment were not singular; rather, they interacted with each other. These findings provide insights for designing more effective intervention measures to promote coexistence.

Habitat occupancy and conservation implications for an isolated Blackbuck population in a tropical semi-arid human-dominated landscape

Mesariya, D., Kaid Johar, S.R., Mehta, D. (2026).
Proceedings of the Zoological Society https://doi.org/10.1007/s12595-026-00607-6

Abstract

The blackbuck (*Antilope cervicapra rajputanae*) is endemic to the Indian sub-continent, with a current range distribution in isolated pockets. The blackbuck inhabiting the multi-use north-central region of Gujarat, India occur in the form of an isolated and arguably the only remaining population whose numbers indicate a drastic population decline (from over 300 individuals to less than 50 in the past four decades). Unprecedented land use change, anthropogenic activities, feral dog predation, human–blackbuck conflict and lack of a protected area are key factors that threaten the species with local extirpation. Knowledge about where and how species persist in human dominated landscapes is essential to aid conservation planning. We employed a detection-corrected occupancy modelling framework using a single-species single-season model using a maximum likelihood-based approach in the PRESENCE 2.13.18 software to identify the parameters driving blackbuck distribution in the region. We also conducted informal discussions with the villagers during the field work to understand their perceptions regarding wildlife conservation and management of community lands. The sampling was undertaken in 38 grids (1.5×1.5 km each) with a total survey effort of 161.22 km. The modelled occupancy was estimated to be 49% with a detection probability of 0.5. The occupancy probability was positively influenced by the extent of a water body, but negatively influenced by the extent of human habitation and terrain ruggedness. This baseline study reemphasized the conservation significance of refuge patches in human dominated landscapes. The local perceptions were majorly positive towards human–blackbuck coexistence and towards restoration and better management of community lands. An inclusive conservation planning approach that consolidates social-ecological perspectives can ensure long term blackbuck persistence in the landscape.

Status and social structure of the critically endangered dama gazelle (*Nanger dama*) in the Aïr & Ténéré National Nature Reserve, Niger

Abdoul Razack Moussa Zabeirou, Thomas Rabeil, Violeta Barrios, Tim Wacher, John Newby, David Mallon, Pavla Hejcmanová, Karolína Brandlová (2025).
Global Ecology and Conservation, https://doi.org/10.1016/j.gecco.2025.e03976.

Abstract

The dama gazelle (*Nanger dama* (Pallas, 1766)) is one of the largest of all gazelles, and also one of the world's most endangered antelopes listed as Critically Endangered on the IUCN Red List. Today, only a few small and highly scattered populations persist, mainly in Niger and Chad. This study provides recent insights into the population status, structure, and phenotypic diversity of dama gazelles in the Aïr & Ténéré National Nature Reserve (ATNNR), focusing on the Mount Takolokouzet, and based on 15 field missions conducted between 2017 and 2023. Distribution and relative abundance were assessed using direct observations, indirect signs, and camera traps. The Kilometric Index of Abundance (KIA) averaged 0.058 for direct observations and 0.16 for indirect observations, showing a positive trend over time, particularly for indirect evidence. Camera trap data revealed an overall capture rate (CTR) of 1.59 independent events per 100 trap-days, with

increased detection during recent targeted efforts. Demographic analysis was based on 39 direct sightings (84 individuals) and 200 independent camera trap events (244 individuals). Solitary individuals were primarily adults, representing 83 % of camera trap records and less than half of direct sightings. Group sizes were from 2 to 7 (direct) and 2–4 (camera traps), with an overall mean of 2.95 individuals. Adults were dominant in both datasets, while juveniles and subadults comprised less than 20 % of individuals. Calving was observed in two distinct seasonal periods. Phenotypic diversity in the dama gazelle population at ATNNR was marked by traits associated with different coat patterns. The *N. d. dama* phenotype was the most common (73 %), with smaller proportions exhibiting distinct variations (18 % and 9 %). This suggests a phenotypically mixed population, but caution is needed as subspecies differentiation remains debated. The variation may represent a spectrum rather than distinct subspecies. Our results highlight the importance and fragility of a small, little-known population of dama gazelle on Mount Takolokouzet. The consistently low proportion of young individuals highlights concerns about recruitment. Our findings justify urgent conservation measures focused on securing refuges, reducing disturbance, sustaining monitoring, and protecting breeding females during calving peaks, while ecological drivers will be examined in future work.

Seasonal trade-offs between resources and human activity shape habitat selection in reintroduced scimitar-horned oryx in the Sahel

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Frontiers in Ecology and Evolution, https://doi.org/10.3389/fevo.2026.1849632

Abstract

Background: The spatial distribution of Sahelo-Saharan antelopes is affected by environmental and anthropogenic factors that exhibit strong seasonal variation. Understanding how seasonal factors modulate movement decisions and space use of scimitar-horned oryx reintroduced into the Ouadi Rimé - Ouadi Achim Faunal Reserve (Chad) will support ongoing species conservation activities and guide habitat management efforts.

Methods: We combined more than 1.5 million GPS collar locations fitted to 262 individuals over 8 years, in situ data, and remote sensing variables in integrated step selection functions (iSSFs). We competed all possible combinations of environmental and anthropogenic covariates to investigate the habitat preferences of reintroduced oryx.

Results: Scimitar-horned oryx strongly selected for higher wooded vegetation density during the hot dry season and selected more weakly for this factor during the rainy season. This selection leads to an unexpected overlap between the oryx habitat preferences and human activity sites during this period. Oryx were also negatively associated with burned areas during most of the year – except for the hot dry season. Similarly, oryx exhibited weak selection for depressions during the rainy and cool dry seasons, but significantly intensified selection for depressions during the hot dry season.

Conclusions: During the hot dry season, both oryx and people prefer wooded areas that provide a much-needed thermal refuge from high temperature. This seasonal convergence of habitat preferences may increase interactions between oryx, people, and livestock during this period, and

heighten the risk of human – wildlife – livestock conflict within the reserve. However, limited data are available on human activities and livestock movements within the reserve, as well as typical oryx behavioral responses to human presence. Our results therefore emphasize the need for spatially explicit information about livestock movements, particularly with reference to woody cover density during the hot dry season, to mitigate potential conflicts between reintroduced antelope and humans grazing livestock in the reserve.